Practical Issues in Geriatrics
Series Editor: Stefania Maggi

Regina Roller-Wirnsberger
Katrin Singler
Maria Cristina Polidori
Editors

Learning Geriatric Medicine

A Study Guide for Medical Students

EXTRAS ONLINE

Springer

Practical Issues in Geriatrics

Series Editor

Stefania Maggi
Ageing Branch
CNR-Neuroscience Institute
Padua
Italy

This practically oriented series presents state-of-the-art knowledge on the principal diseases encountered in older patients and addresses all aspects of management, including current multidisciplinary diagnostic and therapeutic approaches. It is intended as an educational tool that will enhance the everyday clinical practice of both young geriatricians and residents and also assist other specialists who deal with aged patients. Each volume is designed to provide comprehensive information on the topic that it covers, and whenever appropriate the text is complemented by additional material of high educational and practical value, including informative video-clips, standardised diagnostic flow charts and descriptive clinical cases. *Practical Issues in Geriatrics* will be of value to the scientific and professional community worldwide, improving understanding of the many clinical and social issues in Geriatrics and assisting in the delivery of optimal clinical care.

More information about this series at http://www.springer.com/series/15090

Regina Roller-Wirnsberger • Katrin Singler
Maria Cristina Polidori
Editors

Learning Geriatric Medicine

A Study Guide for Medical Students

Springer

Editors
Regina Roller-Wirnsberger
Department of Internal Medicine
Medical University of Graz
Graz, Austria

Maria Cristina Polidori
Ageing Clinical Research
Department Medicine II
University Hospital of Cologne
Cologne, Germany

Katrin Singler
Institute for Biomedicine of Ageing
Friedrich-Alexander-University
Erlangen-Nuremberg
Erlangen, Germany

Klinikum Nuremberg
Paracelsus Private Medical University
Nuremberg, Germany

ISSN 2509-6060 ISSN 2509-6079 (electronic)
Practical Issues in Geriatrics
ISBN 978-3-319-61996-5 ISBN 978-3-319-61997-2 (eBook)
https://doi.org/10.1007/978-3-319-61997-2

Library of Congress Control Number: 2017960818

This Springer imprint is published by the registered company Springer International Publishing AG part of Springer Nature
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Foreword

It is with great pleasure that I respond to the invitation to write a foreword to this book. Many outstanding authors have brought to their chapters a wealth of clinical experience and scientific expertise in the field of geriatric medicine, and the result is a reference book that focuses on the most relevant health issues, concisely and precisely presented. They have taken into consideration a large volume of literature and have provided state-of-the-art knowledge upon which modern clinical practice can and should be based. I sincerely congratulate the editors for the outstanding contributions they have made, as I am confident that this book will prove to be an invaluable reference guide not only for young geriatricians and nurses but also for any health care professionals caring for older patients.

Padova, Italy

Stefania Maggi, M.D., M.P.H., Ph.D.

Contents

List of Electronic Supplementary Material

Electronic supplementary material is available in the online version of the related chapter on SpringerLink: http://link.springer.com

Chapter 2 Teaching and Learning the Content of Geriatric Medicine
Further Reading
Chapter 4 The Concept of Frailty and Functional Decline
Further Reading
Pocket Card
Chapter 5 Atypical Presentation of Disease with Aging
Further Reading
Pocket Card
Chapter 6 The Complexity of the Geriatric Patient
Further Reading
Chapter 7 Cognitive Decline
Further Reading
Pocket Card
Chapter 8 Delirium
Pocket Card
Chapter 9 Falls
Video 1
Video 2
Video 3
Video 4
Pocket Card
Chapter 10 Sarcopenia
Pocket Card
Chapter 11 Incontinence
Pocket Card
Chapter 12 Diabetes Mellitus
Pocket Card
Chapter 13 Cardiovascular Diseases
Further Reading
Pocket Card

Abbreviations

AAs	Amino acids
ABUEL	ABUse and health among ELderly in Europe
ACE	Angiotensin converting enzyme
AChEIs	Acetylcholinesterase inhibitors
ACP	Advanced care planning
AD	Alzheimer's disease
ADEs	Adverse drug events
ADH	Antidiuretic hormone
ADL	Activities of daily living
ADRs	Adverse drug reactions
AF	Atrial fibrillation
AMD	Age-related macular degeneration
AOP	Abuse of older persons
ARB	Angiotensin Release Blocker
ARF	Acute renal failure
ARHL	Aging-related hearing loss
AS	Aortic stenosis
ASA	Acetylsalicylic acid
ASCVD	Atherosclerotic cardiovascular disease
ATN	Acute tubular necrosis
AV	Atrioventricular
AVP	Arginine vasopressin
BCE	Bone collagen equivalents
BIA	Bioimpedanciometry
BMD	Bone mineral density
BMI	Body mass index
BP	Blood pressure
BPH	Benign prostatic hyperplasia
BUN	Blood urea nitrogen
BW	Body weight
CAD	Coronary artery disease
CAL	Computer-aided learning
CAM	Confusion Assessment Method
CAP	Community-acquired pneumonia

CCB	Calcium channel blocker
CDSS	Calgary depression scale for schizophrenia
CFS	Clinical Frailty Scale
CGA	Comprehensive geriatric assessment
CHD	Coronary heart disease
CHF	Congestive heart failure
CHS	Cardiovascular Health Study
CI	Confidence interval
CIRS	Cumulative Illness Rating Scale
CIRS-CI	Cumulative Index Rating Scale-Comorbidity Index
CKD	Chronic kidney diseases
CN	Community nursing
CNS	Central nervous system
COPD	Chronic obstructive pulmonary disease
CPT II	Carnitine O-palmitoyltransferase 2
Cr	Creatinine
CRP	C-reactive protein
CSDD	Cornell Scale for Depression in Dementia
CTX	Beta CrossLaps
CVD	Cardiovascular disease
DDI	Drug–drug interactions
DDisI	Drug–disease interactions
DFLE	Disability-free life expectancy
DGEM	Deutsche Gesellschaft für Ernährungsmedizin
DNA	Deoxyribonucleic acid
DPP-4	Dipeptidyl-peptidase inhibitors
DRGs	Diagnosis related groups
DRIP	Delirium, Restricted mobility, Infection and Inflammation, Psychogenic polyuria
DRPs	Drug-related problems
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
DXA	Dual energy X-ray absorptiometry
EAA	Essential amino acid
EASI	Elder Abuse Suspicion Index
EBM	Evidence-based medicine
EC	European community
ECFVD	Extracellular fluid volume deficit
ECFVE	Extracellular fluid volume excess
ECG	Electrocardiography
ECV	Extracellular volume
ED	Emergency department
EEG	Electroencephalography
EF	Ejection fraction
EFS	Edmonton Frailty Scale

EGFR	Estimated glomerular filtration rate
EIP AHA	EU Innovation Partnership on Active and Healthy Ageing
ENT	Ear nose throat
EPUAP	European Pressure Ulcer Advisory Panel
ER	Extended or sustained release
ERS	Exercise referral schemes
ESAS	Edmonton Symptom Assessment System
ESPEN	European Society for Clinical Nutrition and Metabolism
ESRD	End-stage renal disease
ESS	Exton Smith Scale
EU	European Union
EU15	15-Member European Union
EUGMS	European Union Geriatric Medicine Society
FE_{Na}	Fractional excretion of sodium
FE_{Urea}	Fractional excretion of urea
FI	Frailty Index
FLS	Fracture liaison service
FM	Family members
FOAM	Free, open-access "Meducation"
FTO	Fat mass and obesity-associated
FTS	Frailty Trait Scale
GDP	Gross domestic product
GDS	Geriatric Depression Scale
GDS	Geriatric Depression Screening Scale
GEMUs	Geriatric Evaluation and Management Units
GFR	Glomerular filtration rate
GFST	Gerontopole Frailty Screening Tool
GH	Growth hormone
GLP-1	Glucagon-like peptide
GnRH	Gonadotropin-releasing hormone
GPs	General practitioner
HCPs	Healthcare professionals
HF	Heart failure
HHIE	Hearing Handicap Inventory for the Elderly
HMB	β-Hydroxy β-methylbutyric acid
HR	Hazard ratio
HR	Heart rate
HRR	Heart rate at rest
HTA	Health technology assessment
HYVET	Hypertension in the Very Elderly Trial
IA	Intra-articular
IAD	Incontinence-associated dermatitis
IADL	Instrumental activities of daily living
IANA	International Academy on Nutrition and Aging
IASP	International Association for the Study of Pain

IC	Institutional car
ICD	International Classification of Diseases
ICD	International Statistical Classification of Diseases and Related Health Problems
ICF	International Classification of Functioning, Disability and Health
IGT	Impaired glucose tolerance
IL	Interleukins
IMO	Inhibitors of monoamine oxidase
IMP	Inappropriate medication prescription
INR	International normalized ratio
INS	Insurance companies
IR	Immediate release
ISAR	Identification of seniors at risk
ITC	Interprofessional conferences
IU	International units
IV	Intravenous
KDIGO	Kidney Disease: Improving Global Outcomes
LCP	Liverpool Care Pathway
LDL	Low density lipid
LE	Life expectancy
LHH	Likelihood of being helped versus being harmed
LOS	Length of stay
LUSQ	Leicester Urinary Symptom Questionnaire
LV	Left ventricle
LVEF	Left ventricular ejection fraction
M3G	Morphine-3-glucuronide
M6G	Morphine-6-glucuronide
MADRS	Montgomery and Asberg depression scale
MAI	Medication Appropriateness Index
MAO-B	Monoamino oxydase inhibitor-B
MCI	Mild cognitive impairment
MDT	Multidisciplinary team
METs	Metabolic equivalents
MI	Mitral insufficiency
Mini-GEMs	Mini Geriatric E-Learning Modules
MMSE	Mini-mental state examination
MNA	Mini-Nutritional Assessment
MNA-SF	Mini-Nutritional Assessment (Short Form)
MoCA	Montreal Cognitive Assessment
MOS SF	Short Form Medical Outcome Study
MPI	Multidimensional Prognostic Index
MRI	Magnetic resonance imaging
MUST	Malnutrition Universal Screening Tool
NA	Not applicable

NCD	Neurocognitive disorder
NH	Nursing homes
NIA-AA	National Institute on Aging-Alzheimer's Association
NICE	National Institute for Health and Care Excellence
NINCDS-ADRDA	National Institute of Neurological and Communicative Disorders and Stroke and the Alzheimer's Disease and Related Disorders Association
NMDA	*N*-Methyl-d-aspartate
NNH	Number needed to harm
NNT	Number needed to treat
NOAC	Non-vitamin K antagonist oral anticoagulants
NOPAIN	Non-Communicative Patient's Pain Assessment Instrument
NPUAP	National Pressure Ulcer Advisory Panel
NRS	Nutritional Risk Screening
NSAID	Non-steroidal anti-inflammatory drug
NSTEMI	Non-ST Elevation Myocardial Infarction
NT-proBNP	N-terminal pro B-type natriuretic peptide
NTX	N-terminal telopeptide
NYHA	New York Heart Association
OAB	Overactive bladder
OECD	Economic Co-operation and Development
OGTT	Oral glucose tolerance test
OH	Orthostatic hypotension
ONS	Oral nutritional supplements
OR	Odds ratio
OSCEs	Observed Structured Clinical Examinations
OT/SLT	Occupational Therapy/Speech Language Therapy
PACE	Program for all-inclusive care for the elderly
PACSLAC	Pain Assessment Checklist for Seniors with Limited Ability to Communicate
PAD	Peripheral artery disease
PAINAD	Pain Assessment in Advanced Dementia
PAS	Physician Assisted Suicide
PC	Primary care
PCAG	Primary closed angle glaucoma
PCI	Percutaneous intervention
PD	Parkinson's disease
PDF	Portable document format
PEG	Percutaneous endoscopic gastrostomy
PET	Positron emission tomography
PIP	Potentially inappropriate prescribing
POA	Power of attorney
POAG	Primary open angle glaucoma
POGOe	Portal of Geriatrics Online Education
PPI	Proton pump inhibitor

PTH	Parathyroid hormone
QUADAS	Quality assessment of diagnostic accuracy studies
RAAS	Renin–angiotensin–aldosterone system
RAI-Palliative Care	Resident Assessment Instrument for Palliative Care
RANKL	Receptor activator of NF-κB ligand
RCTs	Randomized controlled trials
RE-AIM	Reach, efficacy, adoption, implementation and maintenance
RLS	Restless legs syndrome
ROS	Reactive oxygen species
RPE	Rating of perceived exertion
RR	Relative risk
SAMW	Schweizerische Akademie der Medizinischen Wissenschaften
SARC-F	Strength, assistance walking, rise from a chair, climb stairs, and falls
SC	Social care
SCI	Subjective cognitive impairment
SD	Standard deviation
SDM	Substitute decision maker
SGLT-2	Sodium/glucose cotransporter
SHARE	Survey of Health, Aging and Retirement in Europe
SIGN	Scottish Intercollegiate Guidelines Network
SLICE	Service learning in communities of elders
SMART	Specific, Measurable, Achievable, Realistic, Time-delimited
SNRI	Selective serotonin norepinephrine reuptake inhibitor
SPMSQ	Short Portable Mental Status Questionnaire
SPPB	Short physical performance battery
SSRI	Selective serotonin reuptake inhibitor
SSS	Sick sinus syndrome
START	Screening Tool to Alert doctors to Right Treatment
STEMI	ST Elevation Myocardial Infarction
STIKO	Ständige Impfkommission
STOPP	Screening Tool of Older Persons' Prescriptions
SUI	Stress urinary incontinence
TAVI	Transcatheter aortic valve implantation
Tdap	Tetanus-diphtheria-acellular pertussis
TEL	Technology-enhanced learning
TENS	Transcutaneous Electrical Nerve Stimulation
TIA	Transient ischemic attack
TMP/SMX	Trimethoprim/sulphamethoxazole
TNF-α	Tumor necrosis factor
TOT	Transobturator tape
TSH	Thyroid-stimulating hormone
TUG	Timed Up and Go Test
TUG-DT	Dual-Task Timed Up and Go Test
TUGi	Imagined Timed Up and Go Test

TUGr	Real (actual) Timed Up and Go Test
TURP	Transurethral resection of the prostate
TVT	Tension-free vaginal tape
TZDs	Thiazolidinediones
UDI	Urogenital Distress Inventory
UEMS	Union of European Medical Specialties
UI	Urinary incontinence
USPSTF	US Preventive Service Task Force
UTI	Urinary tract infection
UUI	Urinary urge incontinence
VFA	Vertebral fracture assessment
VKA	Vitamin K antagonist
WHO	World Health Organization
YEL-AND	Yellow fever vaccine-associated neurotropic disease
YEL-AVD	Yellow fever vaccine-associated viscerotropic disease
YLD	Years Lived with Disability

Part I

Learning Geriatric Medicine

Introduction: Age-Attuning Medical Education, Fostering Geriatric Thinking

1

Maria Cristina Polidori, Katrin Singler, and Regina Roller-Wirnsberger

From the demographic perspective, the world population is not only aged (with a global life expectancy of 71.4 years according to the World Health Organization (WHO)), but it is also at risk of (or suffering from) multimorbidity and related disability (Table 1.1). The latter are highly prevalent through the third phase of the epidemiologic transition, characterized by reduced mortality rates together with a unique ageing rate of the population. As multimorbidity predicts 5-year mortality and disability, multimorbid subjects must expect to live 12–17 years disabled (Table 1.1).

As the population ages, health care professionals face the enormous challenges of diagnosing and managing more and more frequently older adults presenting with several problems—medical, mental, and socioeconomic. However, older persons can be healthy and vital, constitute a resource for human wisdom and evolution, and be willing to stay healthy as long as possible independent of their age. Furthermore when looking closer at older persons, however, together with the healthy ones we will not find a homogeneous population of multimorbid adults: some of them will be found to be ill and some of them will be observed as coping well despite multimorbidity.

M.C. Polidori (✉)
Ageing Clinical Research, Department Medicine II, University Hospital of Cologne, Cologne, Germany
e-mail: maria.polidori-nelles@uk-koeln.de

K. Singler
Institute for Biomedicine of Ageing, Friedrich-Alexander-University Erlangen-Nuremberg, Erlangen, Germany

Klinikum Nuremberg, Paracelsus Private Medical University, Nuremberg, Germany
e-mail: katrin.singler@fau.de

R. Roller-Wirnsberger
Department of Internal Medicine, Medical University of Graz, Graz, Austria
e-mail: Regina.Roller-Wirnsberger@medunigraz.at

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*, Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_1

Table 1.1 Terminology related to ageing medicine

Ageing	The human condition of becoming old
Disability	The International Classification of Functioning, Disability and Health (ICF) defines disability as a superfamily of impairments, activity limitations, and participation restrictions. Disability is the interaction between individuals with a health condition and personal and environmental factors (World Health Organization (WHO) International Classification of Functioning, Disability and Health (ICF)). Years Lived with Disability = YLD
Geriatrics	The discipline dealing with the medical, mental, functional, and social aspects of older persons
Gerontology	The study of the ageing process
Healthy life expectancy	Disability-free life expectancy = DFLE
Life expectancy	The average time an organism is expected to live
Life span	The maximal duration of life within a species
Longevity	The long duration of individual life
Multimorbidity	Coexistence of two or more medically (somatic or psychiatric) diagnosed chronic (not fully curable) or long-lasting (at least 6 months) diseases, of which at least one is of a primarily somatic nature
Senescence	The endogenous process of accumulative changes in the passage of time resulting in functional deterioration

In other words, a critical feature of this third, large group of older adults—not really vital, not really ill—is that they do not fall within the frame of a specific disease-associated algorithm; therefore, they are not easy to identify. This is also due to the lack of "age-attuned" medical thinking and language. Older persons with diminished organ reserve and increased susceptibility to system failure are defined *frail* and benefit extremely from age-attuned medical multidimensional interdisciplinary management.

Another critical aspect deserving a good deal of attention is that vulnerability in advanced age bases pathophysiologically upon biomolecular changes that challenge the "cutoff" thinking and are rarely, if at all, taken into account in the clinical decision making for age-related diseases. There is, however, a large body of evidence showing the role of biomolecular alterations associated with the diseases of ageing. The study of ageing, senescence, and molecular basis of disease in recent years has delivered a considerable amount of methods to feasibly, reliably, noninvasively measure indicators of age-related dysregulated systems. Ageing science rapidly improves through the fascinating search for multibiomarkers of biological versus chronological age on the one hand and through forward-looking geroscience, on the other hand (Ferrucci et al. 2017). Medical gerontology, geriatrics, and ageing medicine, by this means, get more inputs from ageing science and these two research fields are less and less distinct and disjoint (Walston et al. 2017). On the other hand, even the best clinical decision algorithm for multimorbid older subjects might be negatively influenced by the lack of information on ongoing biomolecular alterations such as senescence, hidden malnutrition, oxidative stress, or impaired adaptive

response (Ames 2006, Sies 2017). In the heterogeneous age-associated continuum from organ integrity to organ pathology, multiple changes occur which hit intra- and interindividually different anatomic regions, display different mechanisms, and convey therefore into unpredictable clinical consequences. As a matter of fact, diversity of age-related changes deserved an atlas of more than 3000 of these (Craig et al. 2015). Therefore, complexity of ageing and geriatrics warrants systematic consideration and incorporation of multifactoriality and mortality risk in decision making as well as in the performance of studies.

The excellent achievements in medicine in the past century have simultaneously occurred with the relentless increase of number and percentage of the aged population, in particular of the oldest-old population which is by nature vulnerable and multimorbid. The vast majority of oldest-old subjects are *survivors* and *delayers*, i.e., those who reach advanced age *despite* several illnesses and those who get affected by illness later during the course of life, respectively. *Escapers* are those successfully aged oldest-old adults, like healthy centenarians, achieving very advanced age basically without disease (Evert et al. 2003). Several government ongoing actions (summarized at www.Icare4EU.gov) target diagnosis and care of disease in older adults Europe-wide to limit reductive focus on disease and implementing integration and communication (ec.europa.eu/health/ageing/docs/ev_20151027_ccl_en.pdf).

With this book, we tried to offer to the reader, in particular if young and/or at a novice level, a snapshot of the rapidly growing patient population needing skills and competencies related to the management of "complexity and subtlety" (Hazzard 2004) often outside of classical medicine textbooks (Tinetti and Fried 2004). The challenges of the field reflect well in the large (in progress) vocabulary used to describe age-related biology and medicine (see Table 1.1).

Geriatric medicine as *a specialty of medicine concerned with physical, mental, functional, and social conditions in acute, chronic, rehabilitative, preventive, and end-of-life care in older patients* has been described at bedside by the pioneer of the specialty, the woman surgeon Marjorie Warren (Warren 1943). Geriatric medicine is not specifically age defined but will deal with the typical morbidity found in older patients. These are generally considered to be patients over 65 years of age, i.e., the population which is doubling from 87.5 million in 2010 to 152.6 million in 2060. However, the problems best dealt with by the specialty of geriatric medicine are very frequent and common in the oldest-old population, in which the multidimensional approach is known, if properly used, to accurately identify geriatric syndromes. The cornerstone of the geriatric methodology is the comprehensive geriatric assessment (CGA), described 30 years ago by Lawrence Rubinstein with its hallmarks of *employment of interdisciplinary teams* and the use of any number of standardized instruments to evaluate aspects of patient functioning, impairments, and social supports (revised in Rubenstein 2015).

Interestingly, Warren achieved substantial improvements in the management of older persons not only by identifying multifactorial risks for poor prognosis, but

also by advocating teaching of medical students about the care of older persons. We are deeply grateful to the several renowned experts in Geriatrics who participated to this adventure as well as to the European Union Geriatric Medicine Society (EUGMS) for having encouraged this endeavour.

The editors of the book expressly wished to provide together with the experts in the field separate concise material to be printed out by the readers—students, residents, novice, and expert health care professionals. The pocket cards are thought to be used at the bedside of our older patients.

References

Ames BN. Low micronutrient intake may accelerate the degenerative diseases of aging through allocation of scarce micronutrients by triage. Proc Natl Acad Sci U S A. 2006;103(47):17589–94.

Craig T, Smelick C, Tacutu R, Wuttke D, Wood SH, Stanley H, Janssens G, Savitskaya E, Moskalev A, Arking R, de Magalhães JP. The digital ageing atlas: integrating the diversity of age-related changes into a unified resource. Nucleic Acids Res. 2015;43(Database issue):D873–8.

Evert J, Lawler E, Bogan H, Perls T. Morbidity profiles of centenarians: survivors, delayers, and escapers. J Gerontol A Biol Sci Med Sci. 2003;58(3):232–7.

Ferrucci L, Fabbri E, Walston JD. Frailty. In: Hazzard W, editor. Geriatric medicine; 2017.

Hazzard WZ. I am a Geriatrician. J Am Geriatr Soc. 2004;52(1):161.

Rubenstein LZ. Evolving models of comprehensive geriatric assessment. J Am Med Dir Assoc. 2015;16(6):446–7.

Sies H. Hydrogen peroxide as a central redox signaling molecule in physiological oxidative stress: oxidative eustress. Redox Biol. 2017;11:613–9.

Tinetti ME, Fried T. The end of the disease era. Am J Med. 2004;116(3):179–85.

Walston J, Robinson TN, Zieman S, McFarland F, Carpenter CR, Althoff KN, Andrew MK, Blaum CS, Brown PJ, Buta B, Ely EW, Ferrucci L, High KP, Kritchevsky SB, Rockwood K, Schmader KE, Sierra F, Sink KM, Varadhan R, Hurria A. Integrating frailty research into the medical specialties-report from a U13 conference. J Am Geriatr Soc. 2017.

Warren MW. Care of chronic sick. Br Med J. 1943;2(4329):822–3.

Teaching and Learning the Content of Geriatric Medicine

2

Adrian Blundell and Tahir Masud

Abstract

Different theories of learning can be successfully applied to the teaching of geriatric medicine to undergraduates. These include andragogy, reflection, experiential learning and motivation. It is important to have robust assessments for students and also evaluation of educational programmes. In recent years there has been an increasing literature on the practicalities of teaching undergraduates and several examples are discussed in this chapter.

Learning Objectives

By the end of the chapter, the reader will be able to

- Describe the domains of learning and the concept of taxonomies of learning
- Discuss the concept and theories of learning and describe some examples
- Describe a framework for assessing clinical competence
- List examples of available learning resources for geriatric medicine

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_2) contains supplementary material, which is available to authorized users.

Further Reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_2.

A. Blundell (✉)
Consultant and Honorary Associate Professor in Medicine of Older Adults, Department of Geriatric Medicine, Nottingham University Hospitals NHS Trust, Nottingham, UK
e-mail: Adrian.blundell@nuh.nhs.uk

T. Masud
Professor of Geriatric Medicine, Department of Geriatric Medicine, Nottingham University Hospitals NHS Trust, Nottingham, UK
e-mail: Tahir.masud@nuh.nhs.uk

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_2

2.1 Introduction

This book, in essence, sets out information related to the topic of geriatric medicine that is felt essential to practise in the field. This chapter describes some of the theories and practicalities as to how best to actually learn or be taught the information.

Learning is about change and is frequently separated into three main domains: knowledge (the cognitive domain), skills (the psychomotor domain) and attitudes (the affective domain). Modern curricula are often presented utilising this domain structure. Within each domain lie degrees of difficulty and these can be presented as taxonomies for learning whereby lower levels of learning are prerequisites for higher levels. For example, the levels in the cognitive domain were described by Bloom (1956) and range from basic knowledge "recall" at a lower level to the more complex thinking required for "evaluation" at a higher level. These so-called descriptors are often used as part of the learning objectives or outcomes for a course.

There are numerous theoretical learning theories and we present several for consideration and then describe example curricula for geriatric medicine and several available resources to help learners.

2.2 Theories of Learning

2.2.1 Andragogy

There is a recognition that adults learn differently and Knowles coined the term "andragogy" as reference to the principles used in adult education. Knowles et al. (1998) described several assumptions based on the fact that as we mature, we become more self-directed learners.

2.2.2 Reflection

Reflection has become increasingly utilised as part of modern medical courses. Reflection is based on several epistemologies with developments by Schon (1983) in the 1980s leading to the description of "reflection in action" and "reflection on action". The principle is that the theoretical teaching and preparation for medical students do not always prepare a learner for the uncertainty of professional practice leading to unexpected occurrences in day-to-day life which can help professionals develop by both reflecting on the issue immediately and retrospectively. Many educational programmes include reflective practice based on personal experiences. There are several models or frameworks that can be used for reflection, e.g. Gibbs (1988)—Fig. 2.1.

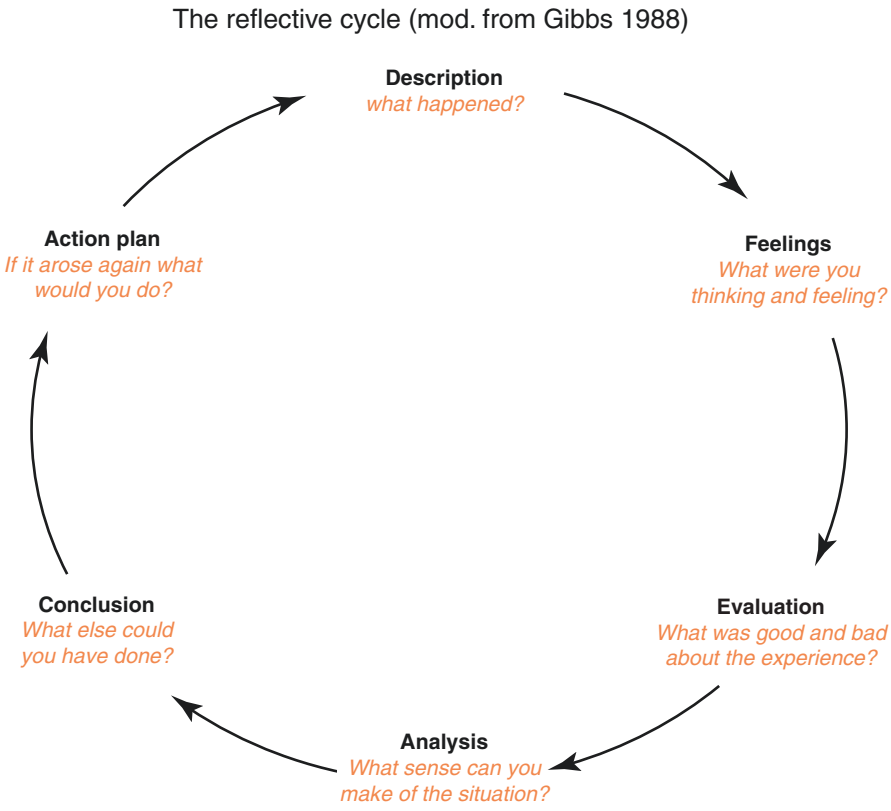


Fig. 2.1 Gibbs reflective cycle

2.2.3 Experiential Learning

Building on the concept of reflection is that of "experiential learning" which describes the process of learning through experience and was developed by Kolb (1984). This suggests that learning is the process of transforming experiences into knowledge, skills or attitudes. Again several models have been described with the dominant feature of a cyclical process involving concrete experience, abstract conceptualisation, reflection and planning (Fig. 2.2).

2.2.4 Motivation

Motivation is a key factor for successful learning and can be divided into intrinsic motivation (completion due to personal interest or enjoyment) and extrinsic motivation (completion due to an external factor, e.g. exam). In general medical

students and doctors in training are highly motivated learners. It is, however, essential to ensure that the right conditions and environment are implemented in order to optimise learning. Abraham Maslow introduced the concept of a hierarchy of basic human needs in the 1960s (Maslow 1968) (Fig. 2.3). This theory suggests that lower level needs have to be met before a learner can progress.

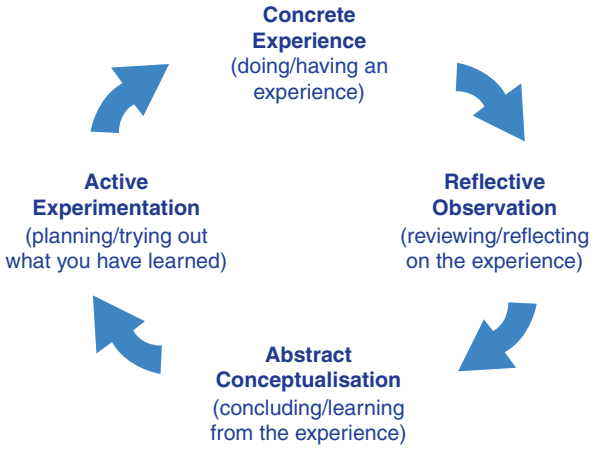


Fig. 2.2 Kolb's experiential learning cycle

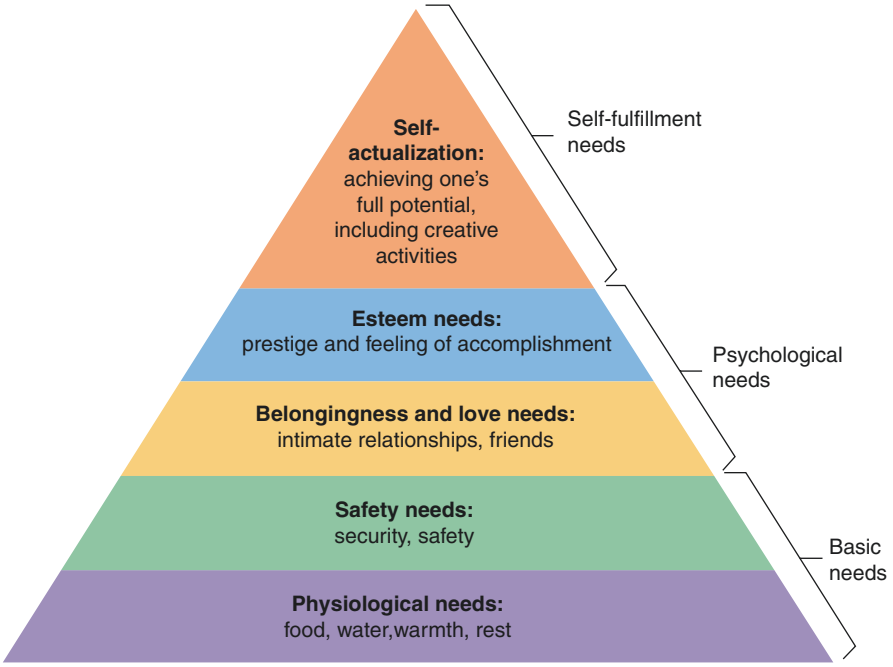


Fig. 2.3 Maslow's hierarchy of needs

2.2.5 Learning Styles

Whilst there are several learning theories and methods of teaching, one should also consider the different learning styles that individuals may have. This concept helps explain the potential variety in evaluation of the same teaching session by different individuals. You may wish to consider your own learning style by completing a learning style questionnaire. Honey and Mumford (1986) described four learning styles in their published manual (activists, reflectors, theorists and pragmatists).

2.2.6 Assessment

Curriculum alignment describes the idea that all the processes in the learning journey align, from the learning outcomes through the content delivery to ultimately the assessment. Following your acquisition of the relevant knowledge, skills and attitudes, it is important to consider the assessment processes that you may undertake. Assessment describes the processes used to measure a learner's progress. Assessing clinical competence is an essential part of an undergraduate curriculum. George Miller introduced a framework for assessing such competence in the 1990s (Miller 1990) (Fig. 2.4). This describes different levels ranging from "knows" at the lowest level to "does" at the highest level. This concept also allows a learner to understand the different types of assessment that could be implemented for each level ranging from relatively simple multiple-choice questions up to direct observation in the workplace.

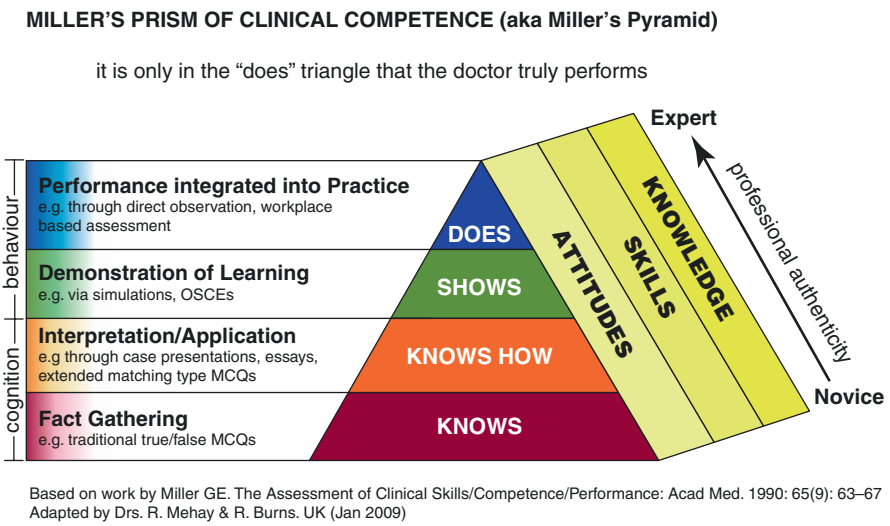


Fig. 2.4 Miller's framework for assessing clinical competence

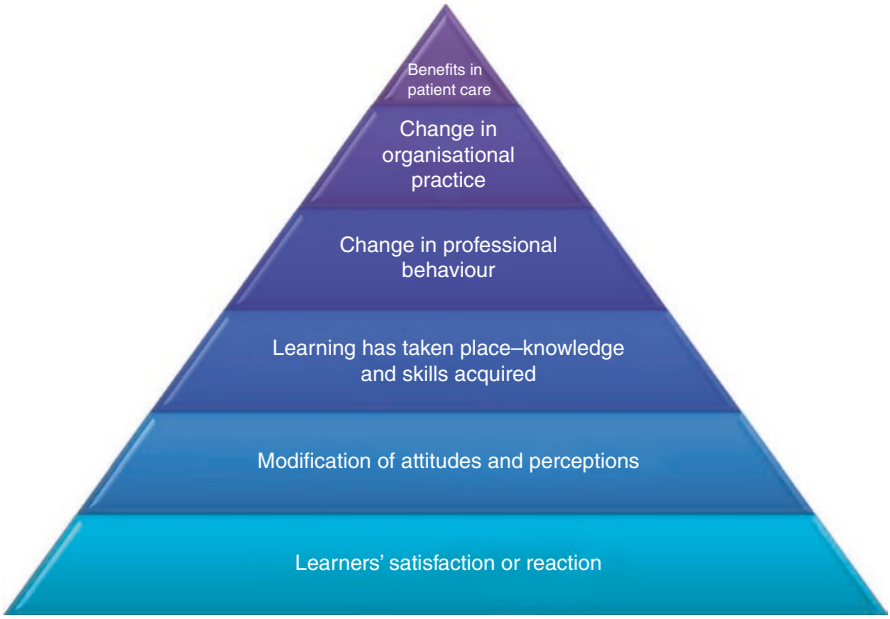


Fig. 2.5 Kirkpatrick's hierarchy of evaluation

2.2.7 Evaluation of Educational Programmes

Evaluation of the programmes that you attend is essential to help inform future changes, ensuring that curriculums are fit for purpose and that they are meeting learners' needs. As with the previously described components of medical education there are several models that are utilised in evaluation. Kirkpatrick developed a hierarchy of evaluation in the 1960s (Kirkpatrick 1967) (Fig. 2.5) and this has been applied for use within medical education with lower levels being defined as participation in learning progressing to improved patient care at the highest level-highlighting the importance placed on patient safety as the highest priority within healthcare.

2.3 Teaching Undergraduates: The Practicalities

One challenge for the field of geriatric medicine is to attract medical students and junior doctors to the specialty and to encourage them to pursue a career in it. An important aspect of this is to challenge and change stereotypes and attitudes towards older people and the specialty. Early exposure to older patients in the medical students' journey is reportedly important in this regard as well as being the key to understanding geriatric medicine principles (Ray-Grifiths et al. 2016; Daughtridge 2016; Moye et al. 2017). A review of the Portal of Geriatrics Online Education (POGOe)

literature emphasises that the early clinical experience is vital and highlights various schemes which try and achieve this (Ramaswamy et al. 2015, Blanchard et al. 2015). Interaction with older people considered exemplars of successful ageing and pairing with older patients and observing their clinical interactions can potentially combat the negative stereotypes about ageing and older patients. "Preflection" in medical students prior to their first geriatric medicine clinical placement using photographs, reflective questioning prompts, older adults' narratives and collaborative dialogue was shown to be a useful tool to challenge medical students' assumptions around ageing (Brand et al. 2016). In a service learning in communities of elders (SLICE) elective programme, preclinical medical students conducted needs assessments in diverse older adult communities, created health education projects to address community-identified needs and reflected on their experiences through written assignments and presentations and subsequent analysis of attitude surveys demonstrated an increased interest in geriatrics as a career (Laks et al. 2016).

Geriatric medicine curricula are useful in guiding students and doctors in the principles of the specialty, and in persuading medical schools to improve teaching of geriatric medicine. National curricula can be used to map teaching in medical schools, any gaps identified can be fed back to the teaching institutions and re-audits can determine if teaching in individual medical schools has improved (Gordon et al. 2010; Gordon et al. 2014). Following a literature search and a Delphi process, the geriatric medicine section of the Union of European Medical Specialties (UEMS) developed a European Undergraduate Curriculum in Geriatric Medicine with the aim of improving and harmonising geriatric medicine teaching across Europe (Masud et al. 2014). Whilst in some countries the challenge remains in encouraging medical schools to teach geriatric medicine adequately, the curriculum has been translated into several languages showing a growing interest in its use.

Recent years have seen several innovations in the teaching of geriatric medicine to undergraduates (Blundell et al. 2011). Technology-enhanced learning (TEL) methods are increasingly being developed. A computer-aided learning (CAL) package derived from the British Geriatrics Society recommended curriculum which enhanced traditional teaching methods in a blended approach was shown to increase student examination performance (Daunt et al. 2013). Mini Geriatric E-Learning Modules (Mini-GEMs)—short, focused, e-learning videos on geriatric medicine topics, hosted on YouTube and developed for junior doctors, but can be used by students—were shown to consolidate learning and increase confidence in managing older patients (Garside et al. 2016). The POGOe resource provides access to a variety of TEL resources (Ramaswamy et al. 2015). Among medical educators there is increasing support for the concept of high-quality, free, open-access "Meducation" (FOAM) (Shaw 2013). Widespread mobile device ownership and usage (Forgie, Duff, & Ross) have made it possible for social media, such as YouTube and Twitter, to be increasingly used in the delivery of medical education (Cheston et al. 2013).

Student-led teaching and multi-professional teaching are also increasingly being used in medical schools. In order to improve interpersonal communication and interdisciplinary team working, a simulated-based curriculum to introduce key teamwork principles to entering medical students delivered as a 1-day course was

developed and proved useful in improving team working skills (Bannerjee et al. 2016). Assessment of medical students in geriatric medicine topics is likely to increase learning motivation among students. Innovative developments in assessment have included the introduction of Observed Structured Clinical Examinations (OSCEs) which have been evaluated as being an appropriate method of assessing geriatric medicine learning (Vanlint et al. 2016).

With the increasing ageing population and the complexity of health and social care that this brings, the teaching and learning of geriatric medicine have never been more important. This book sets out core topics within geriatric medicine and this chapter introduces some of the evidence for the methods of learning and teaching the topics including some guidance on the curricula and other resources that are available for learners.

References

Bannerjee A, Slagle JM, Mercaldo ND, Booker R, Miller A, France DJ, Rawn L, Weinger MB. A simulation-based curriculum to introduce key teamwork principles to entering medical students. BMC Med Educ. 2016;16(1):295.

Blanchard G, Oleson E, Fitzgerald M, Gurwitz JH. Formative clinical geriatrics experiences for first- and second-year medical students: an elusive goal. J Am Geriatr Soc. 2015;63(11):2438–40.

Bloom BS. Taxonomy of educational objectives. New York: David McKay; 1956.

Blundell A, Gordon AL, Masud T, Gladman JR. Innovations in teaching undergraduates about geriatric medicine and ageing—results from the UK National Survey of teaching in ageing and geriatric medicine. Eur Geriatr Med. 2011;2:12–4.

Brand G, Osborne A, Carroll M, Carr SE, Etherton-Beer C. Do photographs, older adults' narratives and collaborative dialogue foster anticipatory reflection ("preflection") in medical students? BMC Med Educ. 2016;16(1):289.

Cheston CC, Flickinger TE, Chisolm MS. Social media use in medical education: a systematic review. Acad Med. 2013;88(6):893–901.

Daughtridge G. Learn from your elders: why we need to increase exposure to geriatrics in medical training. J Am Geriatr Soc. 2016;64(2):452–3.

Daunt LA, Umeonusulu PI, Gladman JR, Blundell AG, Conroy SP, Gordon AL. Undergraduate teaching in geriatric medicine using computer-aided learning improves student performance in examinations. Age Ageing. 2013;42(4):541–4.

Forgie SE, Duff JP, Ross S. Twelve tips for using Twitter as a learning tool in medical education. Med Teach. 2013;35(1):8–14.

Garside MJ, Fisher JM, Blundell AG, Gordon AL. The development and evaluation of mini-GEMs—short, focused, online e-learning videos in geriatric medicine. Gerontol Geriatr Educ. 2016:1–12.

Gibbs G. Learning by doing: a guide to teaching and learning methods. Oxford: Further Education Unit. Oxford Polytechnic; 1988.

Gordon AL, Blundell AG, Gladman JR, Masud T. Are we teaching our students what they need to know about ageing? Results from the UK National Survey of undergraduate teaching in ageing and geriatric medicine. Age Ageing. 2010;39(3):385–8.

Gordon AL, Blundell A, Dhesi JK, Forrester-Paton C, Forrester-Paton J, Mitchell HK, Bracewell N, Mjojo J, Masud T, Gladman JR. UK medical teaching about ageing is improving but there is still work to be done: the second National Survey of undergraduate teaching in ageing and geriatric medicine. Age Ageing. 2014;43(2):293–7.

Honey P, Mumford A. Using your learning styles. Maidenhead: Peter Honey; 1986.

Kirkpatrick DI. Evaluation of training. In: Craig R, Mittel I, editors. Training and development handbook. New York: McGraw Hill; 1967.

Knowles M, Holton EF, Swanson RA. The adult leaner. Gulf: Houston; 1998.
Kolb DA. Experiential learning: experience as the source of learning and development. New Jersey: Prentice Hall; 1984.
Laks J, Wilson LA, Khandelwal C, Footman E, Jamison M, Roberts E. Service-Learning in Communities of Elders (SLICE): Development and Evaluation of an Introductory Geriatrics Course for Medical Students. Teach Learn Med. 2016;28(2):210–8.
Maslow A. Towards a psychology of being. New York: Van Nostrand; 1968.
Masud T, Blundell A, Gordon AL, Mulpeter K, Roller R, Singler K, Goeldlin A, Stuck A. European undergraduate curriculum in geriatric medicine developed using an international modified Delphi technique. Age Ageing. 2014;43(5):695–702.
Miller GE. The assessment of clinical skills/competence/performance. Acad Med. 1990;65(9):S63–7.
Moye J, Molinari VA, Karel MJ, Naik AD, Sakai E, Carpenter BD. Come, join, lead: attracting students to careers in aging and promoting involvement in gerontological societies. Gerontol Geriatr Educ. 2017. [Epub ahead of print].
Ramaswamy R, Leipzig RM, Howe CL, Sauvigne K, Usiak C, Soriano RP. The portal of geriatrics online education: a 21st-century resource for teaching geriatrics. J Am Geriatr Soc. 2015;63(2):335–40.
Ray-Griffiths SL, Krain L, Messias E, Wilkins KM. Fostering medical student interest in geriatrics and geriatric psychiatry. Acad Psychiatr. 2016;40(6):960–1.
Schon DA. The reflective practitioner. London: Temple Smith; 1983.
Shaw G. Breaking news: don't call it social media: FOAM and the future of medical education. Emerg Med News. 2013;35(2):1–30.
Vanlint A, Tam KL, Yu S, Visvanathan R. Evaluation of the introduction of the OSCE to the fifth-year geriatric medicine teaching Programme. Australas J Ageing. 2016;35(4):285–8.

Further Reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_2.

Part II

Characteristics of Aging and Geriatric Medicine

Age: Heterogeneity—Individuality

3

Jean-Pierre Michel

Abstract

This chapter focuses on different aspects of the heterogeneity of aging populations. Careful analysis of demographic data demonstrates that beyond the increasing number of adults around the world who are aged 60 and over, health inequalities exist everywhere: between high- and low-resource countries, between already-old and growing-old countries, and between life expectancy and disability-free life expectancy. This large population heterogeneity is mainly explained by various life-course trajectories, with differential accumulation of risks from conception through childhood and midlife, explaining why it is nonsensical to consider old age separately. Moreover, aging individuals live in a range of multiple cultures that exacerbate the initial existing heterogeneity, and even worsen it when age discrimination negatively intervenes. One excellent means to challenge these multiple aspects of aging is better education in gerontology and geriatrics for all categories of healthcare professionals.

Learning Objectives

By the end of the chapter, the reader will be able to

- Explain individual heterogeneity as a result of various life-course determinants
- Understand the consequences of variations in the speed of aging among different populations
- Explain the differences in life expectancy and disease-free life expectancy as well as their importance for the expansion of disability
- Discuss influences on perceptions of aging

J.-P. Michel
Honorary Professor of Medicine, Geneva University, Geneva, Switzerland

Member of the French National Academy of Medicine, Paris, France
e-mail: Jean-Pierre.Michel@unige.ch

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_3

3.1 Heterogeneity of the Aging Population

Worldwide, the percentage and absolute number of older individuals are greater than ever before. With no historical example of such large and rapidly growing cohorts of older adults, the world is entering uncharted waters (Bloom et al. 2018). The United Nations Population Division projects an increase in the number of adults aged 60+ from about 901 million today (approximately 12% of the world population) to 2.1 billion by 2050 (21.5%). The number of "oldest-old" individuals, defined as those aged 80+, is projected to more than triple from 125 million today (2% of the world population) to 434 million by 2050 (4.5%) (Bloom et al., in press).

This global demographic approach to aging in the world needs to be complemented by keeping a few important issues in mind.

Firstly, the speed of aging of populations varies considerably from one country to another. It took 120 years to go from 10% of adults aged 60+ to 20% in France. The same transition took 80 years in Sweden and the United Kingdom, but only 30 years in Japan. This same demographic change will last 80 years in the United States, but only 40 years in Brazil, China, and India, explaining the enormous aging challenges that Asia will have to face in the near future (World Health Organization 2015).

Second, life expectancy (LE) at birth depends on the gross domestic product (GDP) of the different parts of the world. Today, "aging is a great opportunity" as can be seen by comparing LE at birth in the highest vs. lowest resource countries (Monaco: 89.5 years vs. Chad: 49.8 years). Mortality in high-resource countries more often affects those aged over 75 years of age, while in low-resource countries, mortinatality is still predominant (World Health Organization 2015). It should be mentioned here that health inequities also exist between high and low socioeconomic strata of the population within the same country. For example, in Washington DC, there is a difference of 17 years in LE at birth between inhabitants living in downtown Washington vs. those in the Maryland suburbs. In Glasgow, the difference reaches 28 years between the richest and poorest areas of the same city. These huge differences in LE can be explained by "health determinants," which include mainly social gradient, stress, early life, education, social exclusion, work, and employment (Marmot 2005).

Thirdly, beyond simple LE, the importance of disability-free life expectancy (DFLE or health expectancy) also deserves to be stressed. The International Classification of Functioning, Disability and Health (ICF) defines disability as *an umbrella term for impairments, activity limitations, and participation restrictions*. Disability is the interaction between individuals with a health condition and personal and environmental factors. In the previous 15-member European Union (EU15), over a period of 17 years, from 1995 to 2012, LE at age 65 increased, respectively, in women and men by 13% and 20%, to reach 21.8 and 18.1 years. In contrast, DFLE remained almost unchanged over the whole period, stagnating, respectively, around the values of 9.6 years and 8.8 years for females and males. These two contrasting trends provide strong evidence for the expansion of disability among older adults in Western Europe over the last two decades, even though the

level of disability is less severe (Robine and Jagger 2018). For this reason, increasing the average healthy life span in the EU by 2 years by 2020 has been established as the primary objective of the EU Innovation Partnership on Active and Healthy Ageing (EIP AHA), which is a flagship initiative under Europe 2020.

3.2 Individual Heterogeneity: A Life-Course Perspective

The data detailed above explain the compelling need for a life-course approach in geriatric medicine to better understand the substantial variation in aging processes. The analysis of 19,064 US participants aged 65 and over, included in the Health and Retirement Study, showed that only 7% had successful aging, 6–8% did not experience cognitive decline, 35–42% had no chronic disease, and 48–50% had no disability (McLaughlin et al. 2012). In this context, the World Health Organization (WHO) proposed a new definition of "healthy aging" in 2015, defining it as *the process of developing and maintaining the functional ability that enables well-being in older age* (WHO 2015). Clearly, investigating the different interactions that exist between biological, behavioral, and socioeconomic pathways and experiences over one's lifetime will enable us to better apprehend the profile of health and disease/disability risk in later life (Hardy et al. 2015).

This chapter focuses only on the life-course approach to changes in mobility, as well as cardio-metabolic and cognitive health, which demonstrates to a large extent why such enormous differences in clinical and functional conditions exist in older age.

3.2.1 Life-Course Determinants of Changes in Mobility

Longitudinal data from the InCHIANTI (Invecchiare in Chianti, aging in the Chianti area) study at baseline and at 3-, 6-, 9-, and 14-year follow-up demonstrate that a decline in mobility with aging only starts to become apparent early in adulthood when challenging tasks are assessed. Although the rate of decline in the 400-m walking test is already evident in participants who entered the study at the age of 20–25 years, performance in the 4-m fast speed task only declines after the age of 40–50 years, and performance in the 4-m usual speed is relatively stable up to the age of 65–70 years. These findings suggest that early declines in mobility are detectable and may guide strategies for preventing functional impairment targeting both the individual and the population (Ferrucci et al. 2016).

3.2.2 Life-Course Determinants of Blood Pressure and Cardio-metabolic Health in Older Adults

Various cross-sectional studies have provided evidence affirming that systolic blood pressure (BP) starts to increase at midlife more than diastolic BP, before subsequently decreasing at very old age. Uncontrolled or poorly controlled arterial

hypertension leads to diseases specific to older age, such as peripheral arterial disease, coronary artery disease, heart failure, stroke, and chronic kidney disease, to mention but a few. It should be remembered that hypertension in old adults is the result of an accumulation of life-course events. The association between birth weight and BP remains constant at all adult ages. Babies conceived through assisted reproductive technologies have, on average, lower birth weights and greater risks of preterm birth than those conceived naturally, which suggests that they may be at increased risk of subsequent coronary heart disease (CHD).

Children delivered by cesarean section have also been shown to have greater odds of obesity than those delivered naturally (Hardy et al. 2015).

Furthermore, it has been reported that obesity-related risk allele carriers of the FTO (fat mass and obesity-associated) gene show dose-dependent increments in body mass index (BMI) during aging. There are positive associations between BMI measured at ages 7 and 13 years and a higher risk of CHD in older age. Greater adiposity at any age is associated with more adverse lipid, glucose, and insulin profiles. In parallel, disadvantaged conditions in childhood have also been linked to a greater risk of hypertension in adulthood and more adverse lipid and glucose profiles. Moreover, adults with the worst socioeconomic status have the highest mean BP. Whatever the causes, there is evidence that weight loss, including during childhood, results in improvements in lipid profiles and BP (Hardy et al. 2015).

CHD and stroke occur rarely before midlife. However, the pathophysiological process of atherosclerosis, which ultimately leads to cardiovascular disease (CVD), is initiated in early life. Fatty streaks have even been found to occur in the aorta of premature fetuses, particularly among those whose mothers have hypercholesterolemia during pregnancy. This accumulating data testifies that the early acquisition and life-course accumulation of risk factors (including socioeconomic conditions) impact greatly on the onset of chronic diseases leading to disability at an older age.

3.2.3 Life-Course Determinants of Cognitive Ability in Older Age

It is also important to note that there is a strong continuity between child development and cognitive functioning in adult life. In clinical practice, it has to be stressed that midlife modifiable risk factors of cognitive decline at an older age are perfectly identified. These include low level of education, midlife depression, a sedentary lifestyle (less than 30 min of exercise, five times per week), midlife obesity, smoking at midlife, hypertension (in 35–64-year-olds), and diabetes (20–79-year-olds) (Norton et al. 2014). Moreover, midlife hypercholesterolemia and chronic kidney disease as well as atrial fibrillation also contribute to altered cognition in older age. The majority of the items on this impressive list of modifiable risk factors perfectly demonstrate the high impact of midlife cardiovascular risk factors on cognitive health. Heretofore, few interventions have been shown to have a protective effect against cognitive impairment in old age. Nonetheless, a meta-analysis of

high-to-moderate physical activities and a randomized controlled intervention of Mediterranean diet supplemented in virgin olive oil or nuts (Martinez-Lapiscina et al. 2013) support the posit that exercise and a Mediterranean diet have a consistent protective effect against cognitive decline.

3.3 Cultural and Ethical Issues Related to the Heterogeneity of the Aging Population

Perceptions of aging are multidimensional and encompass both positive and negative characteristics, reflecting a mix between accurate depictions of age-related changes and distorted views of older people. As previously mentioned, socioeconomic status impacts not only longevity, but also self-rated health (Vauclair et al. 2015). Moreover, it has been reported that industrialization lessens the societal status of older adults by devaluing their experience-based knowledge and by breaking up the traditional family structure. Cross-cultural differences also affected perceptions of aging, and may partially explain the ageist perceptions.

3.3.1 Cultural Differences in Aging

A large survey of 3435 college students from 26 worldwide countries investigated the students' perceptions of the old population in their country, and revealed the following trends: a) there was consensus regarding the direction of the aging trajectory, namely a perceived decline in societal views of aging, physical attractiveness, and ability to deal with activities of daily living (ADL) and new learning; b) perceived increases in wisdom, knowledge, and received respect; and c) a perception of stability in family authority and life satisfaction. Moreover, this survey showed favorable perceptions in countries with a low proportion of old adults and frequent intergenerational contacts. Unfavorable perceptions of old age by the students were more common in Western vs. Asian countries, and in the most progressive and industrialized countries (Lockenhoff et al. 2009). Conversely, in a study presenting a cultural comparison between Jews and Arabs in Israel, Bergman et al. reported that Arabs rated their culture as more tolerant toward their older adults than those of Jewish origin. Arabs also perceived older adults as contributing significantly more to society, and reported engaging in less avoidance behaviors toward them. Arabs (predominantly women) also exhibited less general fears of growing old and concerns over their physical appearance in older age.

Other studies focused on cultural and psychosocial factors show that older Americans overwhelmingly report a high sense of personal control (a strong tendency to believe that events in their lives are a result of their own behavior), whereas older Britons tend to interpret events as the result of luck, chance, or fate (also called fate control or fatalism). In any case, individuals in each culture learn to be more culturally appropriate as they grow older. This is particularly true for aging people from different cultural contexts who live in foreign surroundings.

3.3.2 Ageism and Age Discrimination

The word "ageism" was coined for the first time in 1969 by Robert Butler, to describe an ongoing irrational hostility against a group of people because they were old and powerless. Butler concluded that ageism was *a process of systematic stereotyping and discrimination against older people because of their age*. The prejudice, stereotyping, and discrimination embedded in ageism appear to be based on the belief that there is an inevitable decline in physical and mental capabilities in old age, even though there is wide variation in these capacities among people who have reached a given chronological age. Pervasive ageism serves to marginalize older people and deny them the rights and opportunities available to other adults.

Ageism and age discrimination can be expressed on three levels:

- At the individual level:
  A large cross-sectional study including 7500 English citizens demonstrated that age discrimination (less respect or courtesy, perception of being not mentally accurate, feeling of being threatened, experiencing poorer service in restaurants or healthcare facilities) was perceived by 33% of all respondents aged 52 years and over. Perceived age discrimination was associated with older age, higher education, lower levels of household wealth, and being retired or not in employment (Rippon et al. 2014).
- At the institutional level:
  Firstly, it appears that working with the older population is considered less attractive and prestigious for healthcare professionals (HCPs), explaining the shortage of high-quality human capital. Secondly, too often, the behavior of untrained HCPs leads to a paternalistic attitude, for example helping older patients who do not require help. Thirdly, by considering older people as senile, doctors undermine the abilities of older persons, and may lead them to live up to the disabilities expected of them (Rippon et al. 2014). Age discrimination in healthcare was reported by 12.6% of 6017 patients aged over 50 years who participated in a 4-year longitudinal study in the United States. Age discrimination was found to be linked to patient's age, gender, financial status, weight, physical appearance or disability, and ancestry. Compared to patients who did not complain of age discrimination, those who complained of such attitudes suffered significantly more frequently from new disability or worsening of preexisting disability (adjusted hazard ratio = 1.63).
- At the societal level:
  The 2008–2009 European social survey including 7819 adults aged 70 years and over, and living in 28 different European countries, proved that income inequality and perceived age discrimination were associated with poor self-rated health in older adults.

Training in gerontology and geriatric medicine for all HCPs clearly offers one of the best strategies for coping with the major age issues that the entire world will face in the coming decades.

The wide heterogeneity of the aging populations around the world can be explained by both socioeconomic living conditions and large variations in positive or negative exposures at the individual life-course level. Indeed, cultures intervene greatly in individual and population heterogeneity, and the consequences of this unfortunately include ageism and age discrimination. Education for all categories of HCPs appears to be one promising way of coping with the major problems the world will face in the near future.

References

Bloom D, Osher B, Mitgang L. Demography of global aging. In: Michel JP, editor. Oxford textbook of geriatric medicine. Oxford: Oxford University Press; in press.

Ferrucci L, Cooper R, Shardell M, Simonsick EM, Schrack JA, Kuh D. Age-related change in mobility: perspectives from life course epidemiology and geroscience. J Gerontol A Biol Sci Med Sci. 2016;71:1184–94.

Hardy R, Lawlor DA, Kuh D. A life course approach to cardiovascular aging. Futur Cardiol. 2015;11:101–13.

Lockenhoff CE, De Fruyt F, Terracciano A, et al. Perceptions of aging across 26 cultures and their culture-level associates. Psychol Aging. 2009;24:941–54.

Marmot M. Social determinants of health inequalities. Lancet. 2005;365:1099–104.

Martinez-Lapiscina EH, Clavero P, Toledo E, Estruch R, Salas-Salvado J, San Julian B, Sanchez-Tainta A, Ros E, Valls-Pedret C, Martinez-Gonzalez MA. Mediterranean diet improves cognition: the PREDIMED-NAVARRA randomised trial. J Neurol Neurosurg Psychiatry. 2013;84:1318–25.

Mclaughlin SJ, Jette AM, Connell CM. An examination of healthy aging across a conceptual continuum: prevalence estimates, demographic patterns, and validity. J Gerontol A Biol Sci Med Sci. 2012;67:783–9.

Norton S, Matthews FE, Barnes DE, Yaffe K, Brayne C. Potential for primary prevention of Alzheimer's disease: an analysis of population-based data. Lancet Neurol. 2014;13:788–94.

Rippon I, Kneale D, De Oliveira C, Demakakos P, Steptoe A. Perceived age discrimination in older adults. Age Ageing. 2014;43:379–86.

Robine J, Jagger C. Health expectancies. In: Michel JP, editor. Oxford textbook of geriatric medicine. 3rd ed. Oxford: Oxford University Press; 2018.

Vauclair CM, Marques S, Lima ML, Abrams D, Swift H, Bratt C. Perceived age discrimination as a mediator of the association between income inequality and older people's self-rated health in the European region. J Gerontol B Psychol Sci Soc Sci. 2015;70:901–12.

World Health Organization. World report on ageing and health. Geneva: WHO; 2015.

The Concept of Frailty and Functional Decline

4

María Ángeles Caballero Mora
and Leocadio Rodriguez Mañas

Abstract

Frailty is a condition characterized by a high vulnerability to low-power stressors affecting around 10% of people older than 65 years.

The importance of frailty stems from two main facts: its usefulness to stratify the risk of adverse events, such as disability, hospitalization, falls, or death, and, secondly, its reversibility.

These two facts put frailty in the center of the strategies to fight against disability in older people by detecting the early stages of functional decline and by planning and implementing interventions. Thus, screen, diagnose, and manage frailty appropriately should be incorporated to the usual clinical practice in geriatric medicine.

Learning Objectives

By the end of the chapter, the reader will be able to

- Know the concept of frailty as a component of functional status
- Know about functional trajectories and the potential triggers and modulators of functional decline
- Decide how to measure and detect frailty and functional decline
- Know the basic management features of frailty

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_4) contains supplementary material, which is available to authorized users.

Further Reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_4.

M.Á. Caballero Mora • L. Rodriguez Mañas (✉)
Service of Geriatrics, Getafe University Hospital, Madrid, Spain
e-mail: mariaangeles.caballero@salud.madrid.org; leocadio.rodriguez@salud.madrid.org

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_4

4.1 Concept of Frailty

Several demographic changes have taken place during the last century, accompanied by the emergence of some new concepts to describe the occurrence of conditions previously neglected or unusual in older people. One of the fields where these new concepts are numerous is in the field of functionality that is the main domain associated to the health-related quality of life.

This attention paid currently to functional issues derives from three main facts. First, the proportion of older people in modern populations has increased. Second, the distribution of mortality has changed, concentrating in those with an age of 80–90 years (Xue et al. 2008). And finally, the number of newborns reaching adulthood has increased exponentially and the probability of dying at ages of 80–90 years has decreased, thus increasing the number of centenarians (Christensen et al. 2009). It therefore seems that our populations are approaching the maximum life expectancy, estimated to be around 110 years for humans, and toward the maximum life span for humans (around 120 years) (Coles et al. 2004). It makes very unlikely to prolong significantly the life expectancy, both in populations and in individuals, and very especially in older people. Accordingly, the focus has moved from trying to increase the length of the life to achieve living in better conditions that means to live as functionally independent as possible. Thus, maintaining function has become the supreme aim in the care of the older person. To get this aim, the best strategy is to prevent disability, taking into account that once disability is established, it is very unlikely to recover the full autonomy. This challenge is changing the approach of geriatric medicine, moving from a practice based in the correction of disability, usually by the use of aids and the assessment of what the patient is not able to do, to a practice based in the detection and management of people at risk for developing disability, by preventing functional decline.

In this effort, frailty has gained increasing acceptance as the main predictor of disability and death in older people. Campbell and Buchner considered frailty a decline in the functional reserve of multiple systems, which places the patient at risk for disability or at risk of death with the slightest stress (Campbell et al. 1997). Over the next years the term has evolved to encompass different aspects of health, according to different authors, including being dependent or at risk of dependence; loss of physiological reserves; disengagement with the environment; chronicity of illness; medical and psychosocial problems; atypical presentation of the disease; being the potential beneficiary of geriatric care; or experiencing accelerated aging.

From all of those conceptual approaches, only two survive currently (Fig. 4.1).

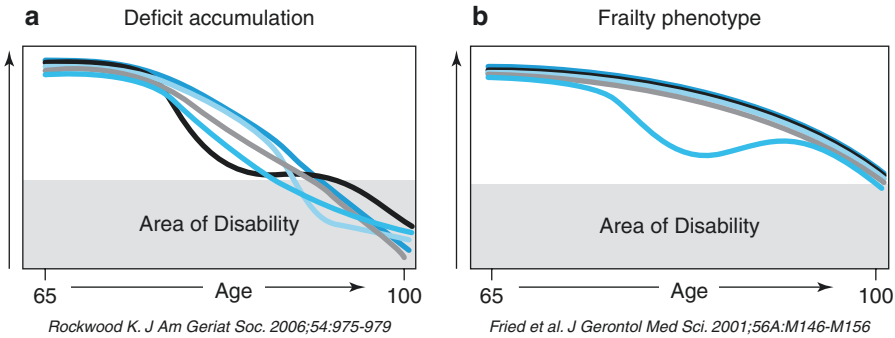


Fig. 4.1 Frailty conceptual models. (**a**) Frailty as a process from the robustness to the most severe disability: frailty reflects the progressive deterioration of the functional capacity of human beings, reflecting the biological age of an individual, and it is clinically manifest by the presence of added deficits and it is measured using an index, without a clear cutoff point (Rockwood et al. 2006). Accordingly, along the whole process you are more or less frail, disease should be a component of frailty, and disability should be the expression of the deepest frailty. Described, built, and developed by the group led by Rockwood in the Canadian Study of Health and Aging, this conceptual model has the virtuality of embracing in a unique concept the whole disabling process and it has been shown to be useful in different settings, including the clinical ones. However, its contribution to a better understanding and definition of pre-disability states and its biological fundamentals are the main weakness of this model. (**b**) Frailty as a stage in the disabling process that it is clinically manifest by the presence of a deterioration in the performance of some tasks and that usually precedes the development of disability, with usually clear cutoff points. Although frailty and disability can overlap, they are different entities and disease is a contributing factor to frailty, but is not a part of it. This model, with strong biological basis, has allowed a strong characterization and individualization of the patients in the pre-disability stages of disability, allowing their identification and intervention to prevent and delay disability. In 2001, Linda Fried's group proposed their Frailty Phenotype, based upon their findings in the Cardiovascular Health Study (CHS). This is the most common model used because it is built with measurable physical parameters (Fried et al. 2001). According to it, frailty is a clinical state in which there is an increase in an individual's vulnerability for developing dependency and/or mortality when exposed to a low-power stressor. In other words, frailty is not only the previous stage to disability (as disability may stem from a status of robustness, as it is the case for the so-called catastrophic disability), but also the predisposition to develop disability. Its main domains include several physical items (slowness, weakness, weight loss, exhaustion, and low physical activity) in an effort to capture the manifestations of a poor energy balance and a low functional reserve, the two main issues underlying frailty. However, other authors claim to incorporate cognitive impairment or psychosocial dimensions in the definition of frailty (Rodriguez-Mañas et al. 2014)

4.2 Etiology

In the last two decades one of the priorities in aging research, including the field of geriatric medicine, has been to understand the mechanisms underlying frailty (Rodriguez-Mañas et al. 2012). Starting from isolated disturbances, the deterioration of several physiologic systems produces an impairment in the regulation of the homeostasis, making it impossible to maintain the balance in the presence of low-potency stressors leading to a status of disability that, when of enough intensity, is not compatible with staying alive (Fig. 4.2).

There are different hypotheses that may explain the process of frailty. We should consider a combination of causes, such as inflammatory, endocrine, skeletal muscle, and neurologic system changes; potential molecular and genetic contributors. Frailty usually is the final result of the interaction of changes in several systems, resulting in a global process in which sarcopenia is considered a major component (Walston et al. 2006) (Fig. 4.3).

Cellular mechanisms altered during *muscle aging* include increased apoptosis; mitochondrial dysfunction with a concomitant decrease in mitochondrial ATP production; and a large increase in oxidative stress (Marzetti et al. 2012). These mechanisms stimulate each other by increasing catabolic gene expression and activating apoptotic pathways, thereby contributing to the progression of sarcopenia (Ryan et al. 2011). Oxidative stress is known to be causal for a number of pathological processes. Reactive oxygen species (ROS) cause muscle damage, stimulate the apoptotic effects of tumor necrosis factor (TNF-α), and are thought to be central to the deficits associated with aging and sarcopenia (Heuberger et al. 2011). This leads to a progressive decrease in the cross-sectional area of muscular fibers, mainly involving type II fibers (the faster ones) (Cesari et al. 2012). In addition, both the repairing mechanisms and the responses to usual stimulus to muscle hypertrophy and mitochondrial biogenesis are impaired (Angulo et al. 2016).

The activation of inflammatory processes increases with age. Different markers for activation of pathways involving components such as interleukins (IL), C-reactive protein (CRP), and others are independently associated with frailty (Heuberger et al. 2011). Frailty is also associated with decreased levels of anti-inflammatory cytokines, such as IL-10 (Walston et al. 2008).

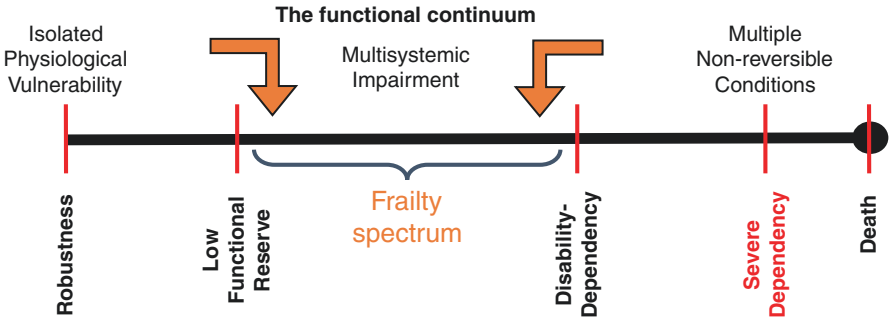


Fig. 4.2 The pathway from robustness to death

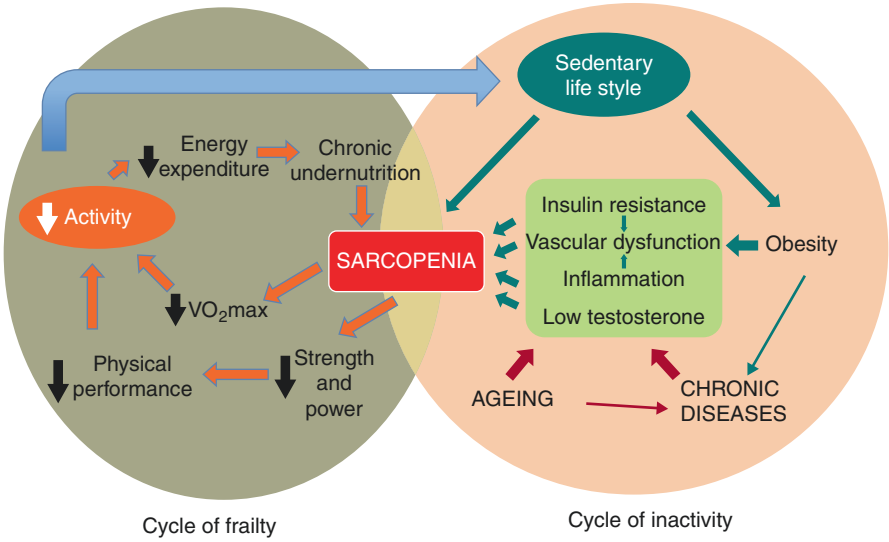


Fig. 4.3 A comprehensive approach to frailty, as displayed in reference Angulo et al. 2016

Hormonal changes that occur with aging are another important contributor to the development of frailty. The relationship between low levels of testosterone and frailty is clearly established in men (Schaap et al. 2005) and has also been confirmed separately in men and women in a large sample of Spanish community dwellers (Wu et al. 2010). Higher levels of estradiol also seem to be associated with frailty in postmenopausal women between 65 and 79 years (Viña et al. 2016). Moreover, a role for insulin resistance seems to be crucial in many of the mechanisms involved in frailty (low-grade inflammation, oxidative stress, vascular dysfunction, among others), with a potential origin in the changes in the adipose tissue that is observed during age and that mainly consists of an increase in inter- and intra-fascicular adiposity in the skeletal muscle (Angulo et al. 2016).

Finally, poor appetite regulation and changes in nutrition play an important role in the decline of function in older persons (Evans et al. 2010). Low levels of proteins like carnitine, mitochondrial carnitine O-palmitoyltransferase 2 (CPT II) (Crentsil et al. 2010), alanine transferase (Le Couteur et al. 2010), and nutritional markers (high-density lipoprotein cholesterol and B-type natriuretic peptide levels) correlate with frailty (Evans et al. 2010). Vitamin B12 and B12 transport proteins (transcobalamin-1, -2, and -3) and their genetic polymorphisms were implicated in frailty in the Women's Health and Aging Study (Matteini et al. 2008).

4.3 Clinical Applications

There is strong evidence of the usefulness of the concept of frailty as an important predictive factor of undesirable outcomes independent of chronic diseases in populations of older adults. The predictive value of frailty for negative outcomes has been confirmed irrespective of the assessment instruments used, the target populations, and the settings. The increased risk of negative health-related events includes falls,

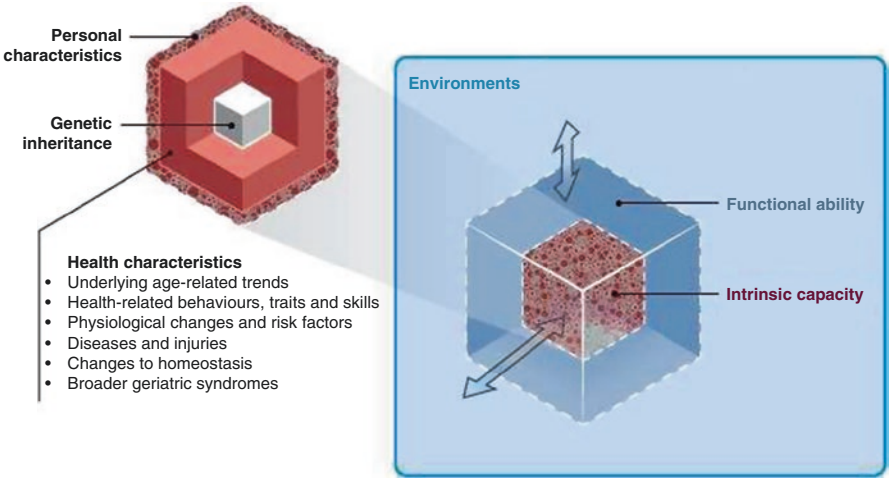


Fig. 4.4 Factors involved in functional status, WHO 2015

hospitalizations, incident disability, institutionalization, and mortality (Fried et al. 2001). Nevertheless, the course of frailty and its consequences varies from individual to individual and it is capable of being altered. This variability depends on the unstable and changing relationship between an individual's intrinsic capacity and the environment and the capacity of the agents involved in this relationship to have their effects modulated by several agents (World Health Organization 2015) (Fig. 4.4).

The individual's ability to adapt to stresses and adversities, which is dependent on the intrinsic capacity, is called "resilience." It is a concept that has become increasingly used in the field of frailty (Ferrucci et al. 2008), and resembles the concept of "functional reserve." Attempting to define resilience offers us an opportunity to explore the stage (or "threshold") at which the individual's ability to limit injury or damage due to stressors declines. After this hypothetical threshold, disability comes and the recovery of the individual's previous health status may be less certain.

WHO should be assessed for functional status including frailty:

The changes in the functional status of older people depend on their basal status, as some studies have reported. In a study by Gill and colleagues (Gill et al. 2006) 754 nondisabled older adults, aged ≥70 years, were followed to explore changes in their functional status over time. 57.5% of them had at least one transition between any two of the three functional states: robust, frail, and disabled. Similar findings were reported in the Survey of Health, Aging and Retirement in Europe (SHARE) study (Borrat-Besson et al. 2013), where 31.7% of robust participants became pre-frail and 2.6% became frail, while 32.4% of pre-frail participants recovered to a robust condition after 2 years of follow-up. The percentage of frail participants returning to a robust state restored at the end of the follow-up in SHARE was 7.0%. Recently, a study by Lee and colleagues (Lee et al. 2014) reported specific characteristics significantly associated with changes in the frailty status. Negative ones (older age, history of cancer, hospitalization events, chronic obstructive pulmonary

disease, cerebrovascular disease, osteoarthritis, and use of some drugs) and positive ones (higher cognitive function, absence of diabetes, higher socioeconomic status, and no history of cerebrovascular disease) influence the outcome. Consequently, evidence suggests that certain characteristics might identify frail older adult status (especially at the earliest stages, or "pre-frail status") with the potential to spontaneously return to a robust level. Moreover, there is evidence supporting the role of several elements in modulating the transitions between different functional statuses.

It is suggested that frailty be routinely screened for in adults aged 70 years and older, or those who have unintentionally lost >5% of their body weight in the previous year (Morley et al. 2013). This screening can occur as part of a Comprehensive Geriatric Assessment (CGA), containing tools designed to assess frailty, which is the current reference standard for identifying and managing frailty (Turner et al. 2014), mainly using a nonsystematic but an opportunistic approach (see also Chapter 26).

4.4 How to Tackle or Prevent Frailty

A CGA determines the medical, functional, and psychosocial aspects of older person using a thorough, multidimensional assessment process, and then uses this information to guide a patient-centered support and care plan (Maurice et al. 2016). CGA and subsequent interventions have been demonstrated to be effective in reducing mortality and institutionalization in numerous randomized controlled trials (RCTs) (Ellis et al. 2011).

Several instruments have been developed to detect frailty or its outcomes such as falls, institutionalization, morbidity, and functional impairment as part of the CGA. They can be constructed using clinical judgment, physical assessments, organ-specific alterations, or biological and molecular markers, either alone or in combination (Sanders et al. 2011). There are now more than 20 instruments to assess frailty, with multiple domains representing the involvement of multiple systems (de Vries et al. 2011). Obtaining a reliable, specific, accurate, feasible, and inexpensive tool to be used in different settings and in different populations for detecting frailty in the clinic remains one of the biggest challenges of epidemiological and clinical research (Rodriguez-Mañas et al. 2012).

Over the past 25 years, numerous criteria have been proposed for diagnosing frailty (see Fig. 4.5), most of them in relation to their causal mechanisms. Some of them, like the Apache and ROL systems, focused on changes in each of the multiple organ systems affected. Others, such as the Geriatric Status Scale, the Barthel Index, and PULSES, mainly evaluated strength and mobility. All these systems highlight locomotor capacity as the gateway to frailty. Campbell and Buchner proposed a combination of measures of fitness (grip strength, 8-min walking test of static equilibrium, and so on) and other quantitative measures [e.g., body mass index and mini-mental state examination (MMSE)].

The two most common and validated frailty measurements are the Fried's Frailty Phenotype (Fried et al. 2001) and the Rockwood and Mitnitski's Frailty Index (FI)

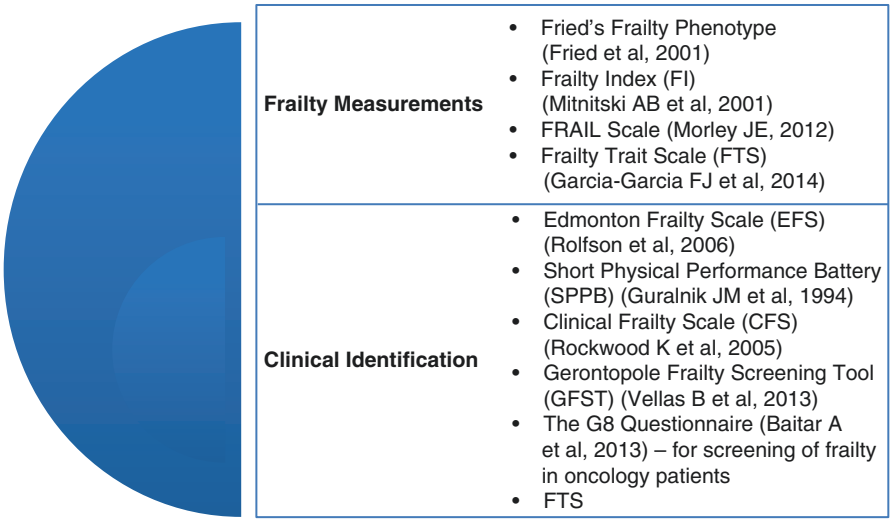


Fig. 4.5 Instrument for diagnosis and screening of frailty. Frailty measurements show scale-specific use to assess and diagnose frailty. The instruments under topic clinical identification regard the assessment of performance based on tests, but are not usual instruments for the definitive diagnostic of frailty

of cumulative health deficits (Mitnitski et al. 2001). Fried's phenotype defines frailty as the presence of three or more physical setbacks out of a list of five: slowness (slow walking speed), weakness (low grip strength), weight loss (≥4.5 kg in the previous year), exhaustion (self-reported), and low physical activity (Fried et al. 2001). The FI, however, considers frailty as a continuum. It provides a total frailty score computed by adding up the number of health deficits divided by the total number of deficits (Mitnitski et al. 2001). A hybrid measure containing elements from both the FI and Fried's Frailty Phenotype was developed: the FRAIL scale (Morley 2012). The FRAIL scale shows similar predictive accuracy to both the FI and Fried's Frailty Phenotype (Woo et al. 2012), and is recommended by the International Academy on Nutrition and Aging (IANA) for use in clinical practice (Abellan van Kan et al. 2008).

Other instruments have been developed in an aim to improve the performance of that two previous cited tools by adding domains or changing some of their components. In addition, some of these other tools have tried to increase the usefulness of the instruments in different clinical and nonclinical settings, where the feasibility, diagnostic accuracy, and prognostic value can change.

This is the case of the Frailty Trait Scale (Garcia-Garcia et al. 2014) that identified 7 frailty dimensions (energy balance nutrition, physical activity, nervous system, vascular system, strength, endurance, and gait speed) represented by 12 items.

In addition to the frailty assessment tools, there is also a huge amount of evidence about frailty markers. Although they do not show the same predictive usefulness as the full construct (Bouillon et al. 2013), they are good surrogates, and can be

very helpful for detecting patients who are potentially frail. Of the many proposed isolated markers of frailty, grip strength is among the most often cited. Loss of grip strength is strongly associated with increasing chronological age but, regardless of this relationship, is a powerful marker of disability, morbidity, and mortality. Its association with these disabilities suggests that the loss of muscle mass associated with aging and voluntary muscle strength can be both a cause and a consequence of physical disability. Studies that focus on the relationship between grip strength and morbidity are targeted to musculoskeletal disorders. Nonetheless, the strongest association is with mortality; therefore, it serves as a predictor of long-term survival. In addition, when compared with chronological age, grip strength provides a better way to detect interindividual variability in the prediction of adverse outcomes and closer association with other markers of frailty, although its validity has yet to be proven in clinical practice (Maurice et al. 2016).

However, if we had to choose a single indicator to assess frailty in clinical practice, this would probably be walking speed (see also Chapters 9 and 10). The speed at which we walk depends on multiple body systems (endocrine, musculoskeletal, neurological, vascular, and visual), and its evaluation is a safe and feasible measure of physical frailty, whose main substrate is sarcopenia. There is also enough evidence about its predictive value of adverse events. Most importantly, although it is one of the criteria of frailty, slow walking speed is a physical manifestation of preclinical frailty, which gives us the option to intervene before the whole spectrum of frailty is established. Therefore, and whenever possible, measuring the speed of motion should be incorporated into the routine evaluation of frail older persons or those suspected of being so (Atkins et al. 2004).

Some components of body composition have also been raised as biomarkers of frailty, mainly an increase in body fat and sarcopenia. Disability occurs when the decline in muscle mass generates an inability to perform the ADLs. Nonetheless, the exact relationship between lean mass and fat mass that results in disability is unclear. Sarcopenia (i.e., loss of lean mass) is suggested in some studies to be the main predictor of functional limitations, while fat mass is argued to be more important by other researches. In addition, little is known about the changes in body composition that lead to disability in some subgroups of older people. This is the case for the obese older person. In these patients, a decreased muscle mass associated with aging, reduced muscle quality, and an excessive proportion of fat mass converge. This clinical picture, called *sarcopenic obesity* by the Roubenoff's group, confers a high risk of disability. However, weight loss can produce adverse functional effects if it is based on caloric restriction, as the first effect will be an additional reduction in muscle mass (Atkins et al. 2004).

Finally, there are also laboratory biomarkers of frailty. This group includes soluble mediators of the inflammatory response, hormones, free radicals, antioxidants, and macro- and micronutrients … and the list goes beyond as well as micronutrients, among others (Erusalimsky et al. 2016). The hypothesis that serves as the starting point for the investigation of laboratory biomarkers of frailty suggests that when damage exceeds a threshold, compensation leads to a tangible deterioration in motor skills. Once this mechanism is activated, it starts a vicious circle, whose progression

to disability is independent of the nature and presence of the causes that generated it. According to this hypothesis, the best way to screening frailty is by identifying measures of physiological subsystems related to this process (biomarkers) that become altered from the early preclinical stages of frailty onward (Reddy et al. 2013).

4.5 Potential Interventions

Different targets have been proposed as therapeutic options for frailty (see Table 4.1), both nonpharmacological (physical exercise and nutritional interventions including from caloric restriction to nutrient supplementation) and pharmacological ones including antioxidants (such as allopurinol and vitamin C), hormonal supplementation (dehydroepiandrostenedione, growth hormone (GH), testosterone, and vitamin D), behavioral interventions (caloric restriction and exercise training), several drugs (acetaminophen, anti-myostatin antibody, and enalapril), and genetic manipulations [such as peroxisome proliferator-activated receptor-γ coactivator 1α (PGC1α) overexpression], among others (Imai et al. 2009, Srinivas-Shankar et al. 2010). Most of these have only been tested in animal studies.

Multidomain interventions seem to be particularly useful among the frailest elders (Rodriguez-Mañas et al. 2014). This multimodal approach embraces the following: interventions on lifestyles, avoiding drug-related adverse events, resetting of clinical targets tailored to the functional status (Laosa et al. 2014), and use of specific drugs oriented to act on some of the pathophysiological mechanisms of frailty.

Among the different measures and interventions that have been assessed and trialed to prevent or reverse frailty, the most effective intervention appears to be physical exercise (Pahor et al. 2014). Physical activity programs for frail older adults should contain exercises to address sarcopenia-related muscle wastage and mobility loss. Among these exercises, it is strongly recommended to include resistance and strength training, which has demonstrated benefits by enhancing strength and power, reducing disability, fatigue, and likelihood of admission to a hospital or a nursing home (Angulo et al. 2016).

Balance and aerobic training is also recommended for older frail adults, even if these modes of exercise may not influence muscle strength. Ongoing participation in a balance program can reduce fear of falling, and improve mobility and balance. When combined with a resistance training program, balance training can also reduce fall risk (Bauman et al. 2016).

Table 4.1 Interventions that have provided some benefits in older frail people

Management/intervention	Recommendation (level of evidence)
CGA	A
Physical exercise	A
Physical exercise + nutrition	B
Nutrition	C
Others	C–D

Other interventions, like nutritional changes, have thrown controversial results: though its role in combination with physical exercise programs is clear, as it was clearly demonstrated for the first time in the seminal manuscript reporting the findings of the FICSIT (Bauman et al. 2016), it does not seem to produce relevant benefits when it is implemented as an isolated measure.

Despite the high prevalence of frailty, there are very few clinical trials based on treatments to prevent or delay its development. Moreover, such trials frequently have low power (few patients) and a great disparity in their methodologies (e.g., inclusion and exclusion criteria, timing and route of drug administration), which does not allow firm conclusions to be reached and makes meta-analysis difficult. Until now, there has only been sufficient evidence to recommend the use of testosterone, and only in the case of men with hypogonadism. Although some changes in corporal composition were observed, effects on bone mineral density and functional measures remain controversial (Srinivas-Shankar et al. 2010).

Supplementation with amino acids (AAs) is suggested for older people with frailty. The benefits of essential amino acid (EAA) protein supplementation may be enhanced when combined with resistance training. It is not yet clear whether a combination of physical activity/protein supplementation impacts muscle mass, with studies reporting different results. The current upper limit of protein supplementation for older adults is not yet clear due to insufficient studies (Fukagawa et al. 2013). There are several meta-analyses and systematic reviews regarding the effectiveness of vitamin D supplementation showing controversial and opposite findings (Muir et al. 2011).

Further large clinical trials assessing pharmacological and nonpharmacological interventions, either alone or multicomponent, are needed to determine new interventions for frailty. These trials should be designed with sufficient power and accuracy.

References

Abellan van Kan G, Rolland Y, Bergman H, Morley JE, Kritchevsky SB, Vellas B. The I.A.N.A Task Force on frailty assessment of older people in clinical practice. J Nutr Health Aging. 2008;12(1):29–37.

Angulo J, El Assar M, Rodríguez-Mañas L. Frailty and sarcopenia as the basis for the phenotypic manifestation of chronic diseases in older adults. Mol Asp Med. 2016;50:1–32.

Atkins D, Best D, Briss PA, et al. Grading quality of evidence and strength of recommendations. BMJ. 2004;328(7454):1490.

Bauman A, Merom D, Bull FC, Buchner DM, Fiatarone Singh MA. Updating the evidence for physical activity: summative reviews of the epidemiological evidence, prevalence, and interventions to promote "active aging". Gerontologist. 2016;56(Suppl 2):S268–80.

Borrat-Besson C, Ryser VA, Wernli B. Transitions between frailty states—A European comparison. In: Börsch-Supan A, Brandt M, Litwin H, Weber G, editors. Active ageing and solidarity between generations in Europe. First results from SHARE after the economic crisis. Berlin, Germany: De Gruyter; 2013. p. 175–85.

Bouillon K, Sabia S, Jokela M, Gale CR, Singh-Manoux A, Shipley MJ, et al. Validating a widely used measure of frailty: are all sub-components necessary? Evidence from the Whitehall II cohort study. Age (Dordr). 2013;35:1457–65.

Campbell AJ, Buchner DM. Unstable disability and the fluctuations of frailty. Age Ageing. 1997;26(4):315–8.

Cesari M, Fielding RA, Pahor M, Goodpaster B, Hellerstein M, Van Kan GA, et al. Biomarkers of sarcopenia in clinical trials—recommendations from the International Working Group on Sarcopenia. J Cachexia Sarcopenia Muscle. 2012;3(3):181–90.
Christensen K, Doblhammer G, Rau R, Vaupel JW. Ageing populations: the challenges ahead. Lancet. 2009;374(9696):1196–208.
Coles LS. Demography of human supercentenarians. J Gerontol A Biol Sci Med Sci. 2004;59(6):B579–86.
Crentsil V. Mechanistic contribution of carnitine deficiency to geriatric frailty. Ageing Res Rev. 2010;9(3):265–8.
Ellis G, Whitehead MA, Robinson D, O'Neill D, Langhorne P. Comprehensive geriatric assessment for older adults admitted to hospital: meta-analysis of randomised controlled trials. BMJ. 2011;343:d6553.
Erusalimsky JD, Grillari J, Grune T, Jansen-Duerr P, Lippi G, Sinclair AJ, et al. In search of 'omics'-based biomarkers to predict risk of frailty and its consequences in older individuals: the FRAILOMIC Initiative. Gerontology. 2016;62:182–90.
Evans WJ, Paolisso G, Abbatecola AM, Corsonello A, Bustacchini S, Strollo F, et al. Frailty and muscle metabolism dysregulation in the elderly. Biogerontology. 2010;11(5):527–36.
Ferrucci L, Giallauria F, Schlessinger D. Mapping the road to resilience: novel math for the study of frailty. Mech Ageing Dev. 2008;129:677–9.
Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, et al. Frailty in older adults: evidence for a phenotype. J Gerontol A Biol Sci Med Sci. 2001;56(3):M146–56.
Fukagawa NK. Protein and amino acid supplementation in older humans. Amino Acids. 2013;44(6):1493–509.
Garcia-Garcia FJ, Carcaillon L, Fernandez-Tresguerres J, Alfaro A, Larrion JL, Castillo C, et al. A new operational definition of frailty: the frailty trait scale. J Am Med Dir Assoc. 2014;15(5):371.e7–371.e13.
Gill TM, Gahbauer EA, Allore HG, Han L. Transitions between frailty states among community-living older persons. Arch Intern Med. 2006;166:418–23.
Heuberger RA. The frailty syndrome: a comprehensive review. J Nutr Gerontol Geriatr. 2011;30(4):315–68.
Imai S. SIRT1 and caloric restriction: an insight into possible trade-offs between robustness and frailty. Curr Opin Clin Nutr Metab Care. 2009;12(4):350–6.
Laosa O, Alonso C, Castro M, Rodriguez-Mañas L. Pharmaceutical interventions for frailty and sarcopenia. Curr Pharm Des. 2014;20:3062–82.
Le Couteur DG, Blyth FM, Creasey HM, Handelsman DJ, Naganathan V, Sambrook PN, et al. The association of alanine transaminase with aging, frailty, and mortality. J Gerontol A Biol Sci Med Sci. 2010;65(7):712–7.
Lee JS, Auyeung TW, Leung J, Kwok T, Woo J. Transitions in frailty states among community-living older adults and their associated factors. J Am Med Dir Assoc. 2014;15:281–6.
Marzetti E, Calvani R, Bernabei R, Leeuwenburgh C. Apoptosis in skeletal myocytes: a potential target for interventions against sarcopenia and physical frailty—a mini-review. Gerontology. 2012;58(2):99–106.
Matteini AM, Walston JD, Fallin MD, Bandeen-Roche K, Kao WH, Semba RD, et al. Markers of B-vitamin deficiency and frailty in older women. J Nutr Health Aging. 2008;12(5):303–8.
Maurice J. WHO puts healthy ageing on the front burner. Lancet. 2016;387(10014):109–10.
Mitnitski AB, Mogilner AJ, Rockwood K. Accumulation of deficits as a proxy measure of aging. Scientific World Journal. 2001;1:323–36.
Morley JE, Malmstrom TK, Miller DK. A simple frailty questionnaire (FRAIL) predicts outcomes in middle aged African Americans. J Nutr Health Aging. 2012 Jul;16(7):601–8.
Morley JE, Vellas B, van Kan GA, et al. Frailty consensus: a call to action. J Am Med Dir Assoc. 2013;14(6):392–7.
Muir SW, Montero-Odasso M. Effect of vitamin D supplementation on muscle strength, gait and balance in older adults: a systematic review and meta-analysis. J Am Geriatr Soc. 2011 Dec;59(12):2291–300.

Pahor M, Guralnik JM, Ambrosius WT, et al. Effect of structured physical activity on prevention of major mobility disability in older adults. The LIFE study randomised clinical trial. JAMA. 2014;311:2387–96.

Reddy SR, Ross-Degnan D, Zaslavsky AM, Soumerai SB, Wagner AK. Health care payments in the Asia Pacific: validation of five survey measures of economic burden. Int J Equity Health. 2013;12:49.

Rockwood K, Mitnitski A, Song X, Steen B, Skoog I. Long-term risks of death and institutionalization of elderly people in relation to deficit accumulation at age 70. J Am Geriatr Soc. 2006;54:975–8.

Rodriguez-Mañas L, Feart C, Mann G, Vina J, Chatterji S, Chodzko-Zajko W, et al. Searching for an operational Definition of frailty: a Delphi method based consensus statement. The frailty operative definition-consensus conference project. J Gerontol A Biol Sci Med Sci. 2012;68(1):62–7.

Rodriguez-Mañas L, Bayer AJ, Kelly M, et al. An evaluation of the effectiveness of a multi-modal intervention in frail and pre-frail older people with type 2 diabetes—the MID-frail study: study protocol for a randomised controlled trial. Trials. 2014;15:34.

Ryan MJ, Jackson JR, Hao Y, Leonard SS, Alway SE. Inhibition of xanthine oxidase reduces oxidative stress and improves skeletal muscle function in response to electrically stimulated isometric contractions in aged mice. Free Radic Biol Med. 2011;51(1):38–52.

Sanders JL, Boudreau RM, Fried LP, Walston JD, Harris TB, Newman AB. Measurement of organ structure and function enhances understanding of the physiological basis of frailty: the Cardiovascular Health Study. J Am Geriatr Soc. 2011;59(9):1581–8.

Schaap LA, Pluijm SM, Smit JH, van Schoor NM, Visser M, Gooren LJ, et al. The association of sex hormone levels with poor mobility, low muscle strength and incidence of falls among older men and women. Clin Endocrinol (Oxf). 2005;63(2):152–60.

Srinivas-Shankar U, Roberts SA, Connolly MJ, O'Connell MD, Adams JE, Oldham JA, et al. Effects of testosterone on muscle strength, physical function, body composition, and quality of life in intermediate-frail and frail elderly men: a randomized, double-blind, placebo-controlled study. J Clin Endocrinol Metab. 2010;95(2):639–50.

Turner G, Clegg A. Best practice guidelines for the management of frailty: a British Geriatrics Society, Age UK and Royal College of General Practitioners report. Age Ageing. 2014;43(6):744–7.

Viña J, Rodriguez-Mañas L, Salvador-Pascual A, Tarazona-Santabalbina FJ, Gomez-Cabrera MC. Biology of frailty: modulation of ageing genes and its importance to prevent age-associated loss of function. Mol Aspects Med. 2016;50:88–108.

de Vries NM, Staal JB, van Ravensberg CD, Hobbelen JS, Olde Rikkert MG. Nijhuis-van der Sanden MW. Outcome instruments to measure frailty: a systematic review. Ageing Res Rev. 2011;10(1):104–14.

Walston J, Hadley EC, Ferrucci L, Guralnik JM, Newman AB, Studenski SA, et al. Research agenda for frailty in older adults: toward a better understanding of physiology and etiology: summary from the American Geriatrics Society/National Institute on Aging Research Conference on Frailty in Older Adults. J Am Geriatr Soc. 2006;54(6):991–1001.

Walston J, Fedarko N, Yang H, Leng S, Beamer B, Espinoza S, et al. The physical and biological characterization of a frail mouse model. J Gerontol A Biol Sci Med Sci. 2008;63(4):391–8.

World Health Organization: World Report on Ageing and Health. http://www.who.int (2015). Accessed 10 Jan 2017.

Wu IC, Lin XZ, Liu PF, Tsai WL, Shiesh SC. Low serum testosterone and frailty in older men and women. Maturitas. 2010;67(4):348–52.

Xue QL, Fried LP, Glass TA, Laffan A, Chaves PH. Life-space constriction, development of frailty, and the competing risk of mortality: the Women's Health and Aging Study I. Am J Epidemiol. 2008;167(2):240–8.

Further Reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_4.

Atypical Presentation of Disease with Aging

5

Marcel Olde Rikkert, Marianne B. van Iersel, Marjolein H.J. van de Pol, and Dieneke van Asselt

Abstract

In frail older patients, an atypical disease presentation such as a sudden mobility problem or hyperactivity in delirium is often the only signal that a new disease episode occurred. Classical signals of disease may be lacking completely. In fact, atypical symptoms are the most typical characteristics of geriatric patients and urge for a comprehensive geriatric assessment (CGA) to find the causes. Frailty causes close interactions between organs with decreased physiological reserve. The atypical symptoms originate from the individual patient's most frail organ, which is closely linked to the ill or stressed organ at which the disease episode started. Atypical symptoms mostly have a multifactorial causality with a recent precipitating factor, also called acute *geriatric syndromes* or *geriatric giants*. Similarly, more chronic atypical presentations may result in chronic geriatric syndromes, such as malnutrition or cognitive decline. The chapter closes with general guidelines on how to apply evidence-based medicine (EBM) and shared decision-making (SDM) to frail older adults with their complex multicausality and varying treatment wishes.

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_5) contains supplementary material, which is available to authorized users.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_5.

M. Olde Rikkert (✉) • M.B. van Iersel • D. van Asselt
Department Geriatrics, Radboud University Medical Center, Nijmegen, The Netherlands
e-mail: Marcel.OldeRikkert@radboudumc.nl; Marianne.vanIersel@Radboudumc.nl; Dieneke.vanAsselt@Radboudumc.nl

M.H.J. van de Pol
Primary and Community Care, Radboud University Medical Center, Nijmegen, The Netherlands
e-mail: Marjolein.vandePol@Radboudumc.nl

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*, Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_5

Learning Objectives

By the end of the chapter, the reader will be able to

- Recognise atypical presentations of disease as sign of frailty in older persons and their increased linkage between organs
- Describe the differences in complexity of pathophysiology between older and younger patients
- Describe how to apply the principles of modernised Evidence-Based Medicine (EBM) to older patients characterised by multimorbidity and frailty
- Describe the additional factors complicating shared decision-making (SDM) with frail older persons

5.1 Atypical Presentation in Older Patients: Diseases of Old Age

Atypical presentations of diseases challenge the physician and the patient. They occur both in younger and older patients, but are much more prevalent in older patients. In fact, several acute and chronic symptoms are typical for disease presentation in frail older adults. Atypical is that these symptoms involve organs that at first sight do not seem to be involved in the pathophysiology of the underlying disease(s). Examples are sudden loss of attention or mobility as presenting symptom of a urinary tract infection of pneumonia. These frequently occurring atypical signs or symptoms are mostly linked to the incidence of a multifactorial geriatric syndrome. For example, rapidly changing attention and cognition are major symptoms of the acute syndrome of a delirium. Similarly, there are more chronically and slower presenting atypical symptoms, such as getting less sleep in heart failure or cognitive decline, which are connected to chronic geriatrics syndromes (Table 5.1) (Olde Rikkert et al. 2003).

Table 5.1 Atypical disease presentation and connection to acute and chronic geriatric syndromes

Atypical symptom	Geriatric syndrome	Acute (A)/chronic (C)
Loss of or variable attention	Delirium	A
Stability decline	Dizziness or fall	A and C
Loss of consciousness	Syncope	A
Involuntary loss of urine	Incontinence	A and C
Loss of independence	Functional decline	A and C
Aspiration	Dysphagia	A and C
Behavioural change	Neuropsychiatric syndrome in dementia	A and C
Weight loss	Malnutrition	C
Depressed or agitated behaviour	Depression	C

Most of these atypical symptoms are common, but not all. An example is the lateral slump sign, bending the upper body half to one side, which often is the side of the infected kidney or urinary tract. Such rare atypical symptoms may be restricted to a few patients, or may even be unique for a single patient. Despite its rarity, the rare symptom often remains the only one that can be monitored. Finally, atypical presentations might be linked to rare diseases. However, this last topic will not be considered here.

5.2 Physiological Changes with Aging

Key characteristics of the pathophysiology of ageing can explain the atypical presentation of diseases in geriatric patients. These key aspects originate from the interaction and organ coupling in frailty and the characteristics of geriatric syndromes:

5.2.1 Frailty, Atypical Signs and Interaction

As frailty increases in geriatric patients, interactions between various organs play a more and more important role. In order for their organs to function correctly and stably, humans possess a complex set of synchronised control systems with many feedback loops. Non-frail, vital older adults have sufficient reserve in the functioning of these organs and systems and therefore the links between them are relatively loose. Consequently, the body can easily deal with a minor malfunction such as a bladder infection. The disease presentation will be classical with no involvement of other organs. In frail older adults, this reserve is much smaller, and the links between systems are much stronger (Fig. 5.1). As a result, if a minor stressor in a frail individual exceeds the tipping point of an organ's reserve function, various acute deteriorations in the linked organs occur. The result is an acute geriatric syndrome, with acute loss of functional performance, mobility or cognition as presenting symptom (Clegg et al. 2013).

When describing acute geriatric syndromes, acute stressors, for example a bladder infection, are often referred to as *the triggering or precipitating factor*. Factors that reduce the reserve capacity of cognition or the sense of balance are often referred to as *contributing or predisposing factors*. Several contributing factors often occur simultaneously, such as multimorbidity, impaired cognition, polypharmacy and sensory impairments. All factors and their interactions together form a pathophysiological route that explains the incidence of a geriatric syndrome.

5.2.1.1 Interactions

In geriatric patients, interactions are defined as the *biopsychosocial interdependence between physical/biological, mental and social dimensions and between the diseases, disorders and disabilities* that occur in these domains. The interactions are not restricted to one organ system, but usually follow the various referred

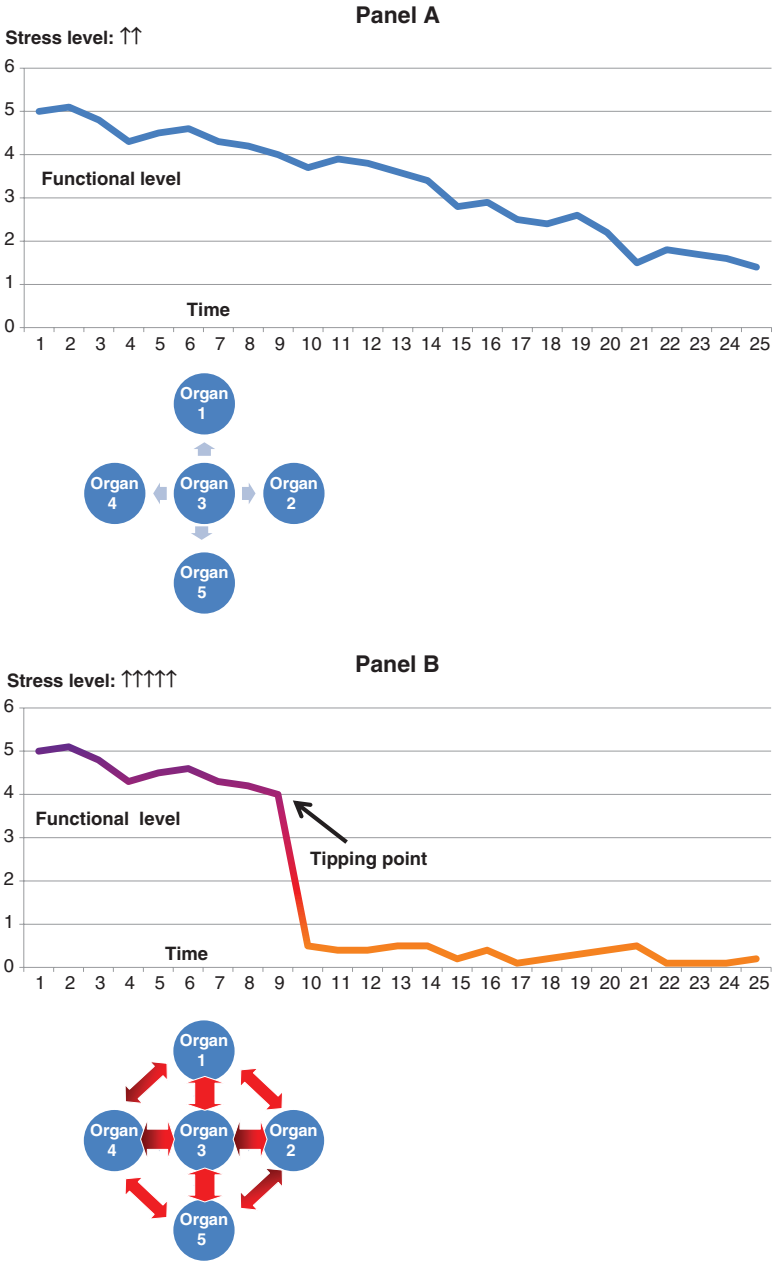


Fig. 5.1 Systems dynamics of complex systems (mod. from Scheffer 2012). As long as the stressors in the case of close coupling (*upper panel*) are not too strong, the homeostatic control can function properly and the systems maintain their stability. However, when a precipitating stressor increases over a certain threshold (*lower panel*), or tipping point, the system collapses, function decreases and new symptoms arise. This is the case in frail older patients and explains why symptoms are not linked anymore to the precipitating stressor but to one of the other organs involved

networks that have been established for certain body functions. For example, to maintain blood pressure when standing up, a close interaction is required between the heart, blood vessels, adrenal glands, autonomic nervous system and brain. These interactions are often present in the form of feedback mechanisms, either with a stimulant effect (*positive feedback*) or with an inhibitory effect (*negative feedback*). This strong correlation between the physical, mental and social dimensions of human beings is now widely acknowledged in medicine, psychology and sociology. In geriatrics this correlation is easily noticeable because disturbances in each of these three dimensions (physical, mental, social domain) can have directly observable consequences for one or both of the other two dimensions. As described in the preceding paragraph, increased frailty actually leads to stronger linkage between systems. The system is moving from the left panel to the right panel of Fig. 5.1, the latter displaying closer coupling of organs involved by numerous interactions with respect to the former. With decreased fine-tuning of control systems with ageing, the daily fluctuation in organ function consequently increases. This leads to the easier triggering of organs the sooner response by interaction. For example, the bladder (often if urinary tract infection is present) becomes more closely linked to the function of the brain: unconsciously, we try to inhibit frequent micturition urgency through increased frontal lobe activity. But there is also more linkage to mobility, for instance because the inflammatory factors of the infection decrease muscle function and increase a risk of falling. Furthermore, changes in the social dimension (death of a partner, moving to a nursing home) can have consequences for the mental dimension (depression) and the physical dimension (insufficient food intake). For this reason, it is important to always consider the problems of the geriatric patient in their biopsychosocial context.

5.2.2 Slowing Down of Recovery and Atypical Signs

Given the theory of system dynamics (Fig. 5.1) (Scheffer et al. 2012), signals are needed that can function as generic warning signals for the development of an acute or a chronic geriatric syndrome in a patient, and for being close to a tipping point. This has already been investigated in complex biological systems as marine biology, ecology and human biology (Olde Rikkert et al. 2016). For this goal, signals need to be dynamic: physicians should be able to quantify and monitor them over time. *The key signal of closeness to a tipping point is the delayed recovery to baseline after a stressor*. This theory of slowing down of recovery can also be applied to atypical signs forecasting geriatric syndromes, as these are also based on the presence of multiple feedback mechanisms similar to the other complex biological systems. For example, in older adults, syncope as presenting symptom of dehydration can be an acute geriatric syndrome, as it is usually multifactorial and often occurs with a rapid progression after a slower preceding process. To maintain fluid balance and prevent dehydration, feedback loops exist on the neuroendocrine, cardiovascular, renal and neuropsychiatric levels. These feedback loops at various levels provide resilience to

external stressors, such as a heat wave or diuretics, and make sure that the dehydration tipping point remains at a safe distance. In a patient with chronic kidney failure, the resilience of these feedback mechanisms declines. External factors influence these regulatory mechanisms in a nonlinear fashion, i.e. not gradually but with specific threshold values. For example, it is only at a certain outdoor temperature that the risk of multiple occurrences of dehydration increases rapidly in older adults. In a classical experiment with dehydration in which fluids were withheld for 24 h from older patients with impaired renal function and from young people, the recovery of fluid balance took much longer in advanced age. The same was also found in the recovery time for overfilling with water after ad libitum drinking in older adults with impaired renal function and less accurate feedback mechanisms. The *delayed recovery times* that were found in these physiological experiments are caused by more strongly linked and less accurate control mechanisms.

5.2.3 Multicausality Instead of Occam's Razor

As clinicians analyse the aetiology of atypical signs, they are often seduced to look for rare and single diseases. Both routes are not fruitful, and may even be harmful for patients. By definition geriatric patients with their highly prevalent atypical signs also have the highly prevalent causes. Next pitfall in the analysis is that clinicians, even geriatricians, tend to practise the principle of Occam's razor: *plurality should not be posited without necessity*. Diagnostic parsimony is at the heart of medicine, and the base of most medical curricula. However, multimorbidity dominates the current phase of health care. Thus, plurality of diseases is a reality, something which is reflected with Hickam's very true observation that a person "can have as many diseases as he darn well pleases". Thus, one first has to look for the multiple components that all together explain the causality of the atypical symptoms in geriatric patients, before moving to the endless list of rare diseases that geriatric patients seldom have.

5.3 Evidence-Based Medicine in Geriatrics

In about the last 25 years, EBM worked with the paradigm that evidence from high-quality randomised controlled trials and observational studies would make clinical care more scientific and empirically grounded and thereby safer, more consistent and cost effective. This resulted in the current methodological standards for research, infrastructure for developing and updating clinical practice guidelines and critical appraisal of evidence. However, the addition that EBM should be combined with clinical expertise and the needs and wishes of patients is often lost in the transition to clinical practice. As David Sackett, who spearheaded the EBM movement, wrote in 1996: "EBM is about integrating individual clinical expertise and the best external evidence". The interrelations between evidence, clinical expertise and patient's values are depicted in Fig. 5.2. With increasing prevalence of chronic diseases in

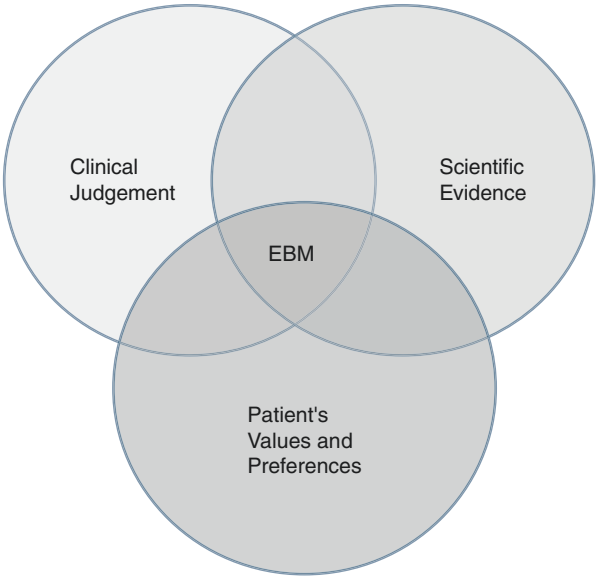


Fig. 5.2 The interrelations between relevant scientific evidence, clinical judgement and patient's values and preferences that form EBM

advancing age, older people with multimorbidity become more the norm instead of the exception. However, geriatric patients with their multimorbidity have often not been included in trials nor have guidelines or a paragraph about how the judge their recommendations in case of multimorbidity or frailty. And even then, multimorbidity and frailty affect each person differently and make it impossible to give purely evidence-based management advices. Thus, a more personalised EBM paradigm is highly needed.

5.3.1 Towards Personalised EBM

Seventy-five years ago, Francis W. Peabody wrote that the physician who attempts to care for a patient while neglecting his emotional life is as unscientific as the investigator who neglects to control all the conditions that may affect his experiment. Protagonists of EBM have adopted this wisdom into the calculation of the *likelihood of being helped versus being harmed* (LHH) (Straus 2000), which may guide us in therapeutic dilemmas (van de Pol et al. 2016). Physicians' clinical experience and their knowledge of risk factors in individual patients can be taken into account in this LHH by adapting the absolute risks for preventable outcome of disease and, most importantly, possible adverse events. Moreover, patient's emotions and experiences, expressed in the explicit weighing of positive outcome versus adverse reactions, are an important ingredient of LHH. Minor cognitive impairment without major problems in judgement does not preclude this. Evidence-based geriatrics with use of the LHH does not resolve treatment dilemmas, but makes the subjective weighting of benefit and harm by both the clinician and the patient explicit and more transparent.

Each dilemma could be helped as part of EBM by the calculation of an individualised LHH, for example, the clinical dilemma of choosing a treatment option in a 90-year-old person with colon cancer without gastrointestinal obstruction. The LHH formula can be written as

$$\mathrm{LHH} = \mathrm{S}\ \frac{\mathrm{P_B}\ (1/\mathrm{NNT})}{\mathrm{P_A}\ (1/\mathrm{NNH})}$$

The LHH formula has three components:

1. Literature based:
   Number needed to treat (NNT) is the number needed to treat to prevent colon obstruction.
   Number needed to harm (NNH) is the number needed to treat to cause one delirium in such major surgery.

2. Physician based:
   P_B is the physician's experience based on correction for the likelihood of benefit of colon surgery in this patient (P_B is the factor that multiplies the EBM figure for chance of benefit with the estimation of how the patient is more or less likely to have this benefit; it is 1 when the patient might have been included in the studies referring to and the chances for benefit are equal to EBM literature).
   P_A is the physician's experience based on correction for the likelihood of adverse reactions such as delirium in this patient (P_A is the factor that multiplies the EBM figure for risk of adverse reactions with the estimation of how the patient is more or less likely to have this risk).

3. Subjective patient preference:
   S is the patient's preference of prevention of gastrointestinal signs of the colon cancer over suffering from a next delirium (e.g. the patient might say that he/she prefers not having a severe (e.g. five times) delirium anymore, over possibly not having future intestinal symptoms: S = 1/5, which additionally to the physician's weighting factor multiplies the ratio by 0.2).

In this case, emotional valuation of atypical and typical symptoms, such as (the recurrence of) delirium as the risk of a major surgical procedure, may largely determine the LHH estimation and thus the clinical decision-making.

The LHH calculation can be made even more than once if different surgical or oncological scenarios are present. There are some limitations of the formal calculation of the LHH in frail older patients. In case of progressive cognitive impairment, patients will finally lose the ability to weigh alternatives accurately. However, in general it is always of advantage for the patient when his/her preferences of care are seriously investigated. Calculating or thinking in the line of the LHH stimulates identification of priorities.

The other precondition of having reliable data on positive outcome and adverse events for geriatric patients will often not be met. There still is a great lack of hard data for geriatric patients. This means that we often must extrapolate data from

more vital, less frail adults and then adapt to geriatric patients. It is unknown and probably depending on the issue studied what error will be introduced this way. The plead of Peacock to always care for the patient, and the Hippocrates' "first do no harm", therefore, must always be kept in mind and play a fundamental role in decision-making.

Using EBM principles in geriatric decision-making may help clarifying geriatric treatment dilemmas by summarising evidence, experience and preferences that are involved. When looking for the evidence, we should not forget to look beyond survival as the relevant outcome. Older people prefer more often psychological and social well-being over morbidity and mortality, especially when they are frail and have a limited life expectancy. Moreover, psychological well-being remains an independent predictive factor for survival even at a (very) advanced age, also outside the industrialised Western societies. Older people in general prefer a focus on well-being, resilience and positive aspects of life and consider these more motivating and less stigmatising than a focus on frailty and functional impairments. Thus, as our societies age, information on well-being becomes more and more important in EBM and should be the preferred outcome of EBM in geriatrics. In this respect, it is very helpful that the National Institute of Clinical Excellence (NICE) in the UK issued a guideline on multimorbidity, which states that disease-oriented guidelines cannot directly be applied in case of older patients with frailty or repeated falls, polypharmacy, serious functional or cognitive dependency and frequent unplanned use of health care services, also because the relevant outcomes mostly are not taken into account (National Guideline Centre 2016).

5.4 Shared Decision-Making

SDM is an approach in which clinicians and patients communicate together using the best available evidence when faced with the task of making decisions. It is increasingly advocated as the preferred way to support patients in making health care choices that are congruent with their goals and preferences. SDM is a dynamic process that takes place throughout consultations.

In a continuous counselling dialogue, the perspectives of both patient and health professional are linked. When physicians make decisions together with patients, patients are more involved and it improves the relationship and commitment of both. However, emotions and difficulties in communication can be barriers that hamper the process and decrease the benefits. Assumptions underlying this process are that the clinical problem at stake has several equal treatment options and that the patient is mentally capable to make a decision. SDM is an element of the whole diagnostic and treatment process.

While in the previous paragraphs differences in clinical reasoning in older patients were described, complexity and uncertainty are addressed in the next sections primarily. Special aspects of (shared) decision-making in older patients will be highlighted at the end.

Box 5.1: How to Adapt EBM to Your Individual Patient

ABC of how to find EBM in your individual geriatric patient

A. Look for general evidence in the literature.
B. See whether the person you care for is fitting the evidence (use NICE multimorbidity guideline).
C. Apply or change the EBM data for your individual patient, based on:
   1. Your experience as physician on the benefit your patient may have from the intervention
   2. Your experience as physician on the risks your patient may experience for adverse effects and complications from the intervention
   3. Your patient's preference of the likely outcomes of intervention and the possible adverse effects, complications and burden of the intervention.

Uncertainty is a major characteristic in geriatrics.

Time for reappraisal: Uncertainty has to be agreed on; one can have or cannot prevent clinical "failures" in geriatrics, but when the process of weighting and scenario analysis and the interprofessional and patient-guided decision-making have been carried out well, the overall quality of geriatric care is alright.

5.4.1 Complexity in Shared Decision-Making with Older Patients

Complexity is at the core of problems in geriatric patients (see also Chapter 6). At least three aspects explain the complexity of clinical problems in geriatric patients. First, their problems interact dynamically in a system of organs, in connection with the environment, diseases and drugs among others. Second, the linearity between cause and consequence is lost and replaced by non-linearity with many interactions and feedback loops between the components at several levels, from molecule to social system. Third, to influence and understand the outcomes, knowledge about the history of a patient is necessary.

5.4.1.1 The Main Step in Approaching a Patient's Complexity Is to Recognise It

However, our brain dislikes complexity and prefers simplicity. Therefore, complexity generates discomfort. Complexity makes you feel uneasy, not completely understanding what is going on and not being able to grasp the complete picture. Complexity is dynamic and also individual: what is complex for one person does not need to be complex for the other. With knowledge about patterns of expression of atypical signs in geriatrics, the latter are much easier to understand and make simpler.

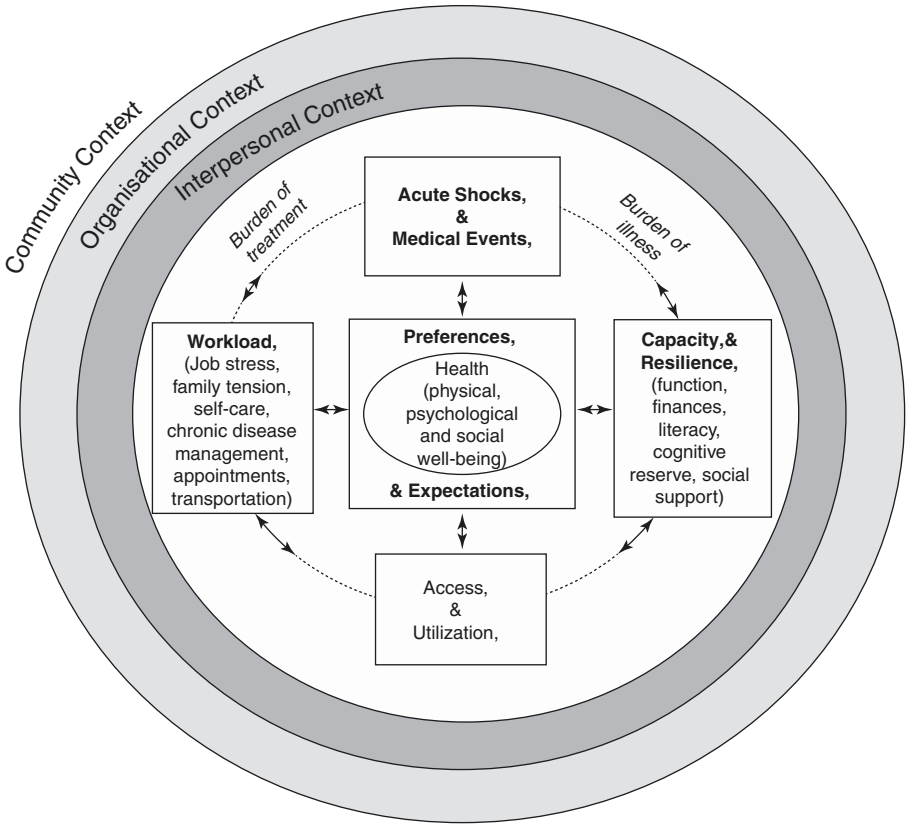


Fig. 5.3 Cycle of complexity (Zulliig et al. 2016)

Several models for complexity exist (see also Chapter 3). Zullig and collaborators developed a model that encompasses many aspects of complexity (Zullig et al. 2016). These are also the aspects that a CGA encompasses (Fig. 5.3) (see also Chapter 7).

Zullig et al. incorporated the context of the person, organisation and community and they named aspects that can add or lower the burden of complexity and health (see also Chapter 18). Positive health, the capacity to live a fruitful, worthy life and coping successfully with diseases and functional disabilities are at its core. Life can be threatened by acute shocks and events, but their impact can be eased by the capacity and resilience of that person in their individual contexts.

5.4.1.2 For All Geriatric Patients, Their Individual Background Matters

Their religious beliefs, cultural values, level of education and socio-economic situation influence their ability and willingness to be involved in SDM. Geriatric patients still have additional and specific factors that add to the complexity of clinical decision-making (see also Chapter 25). For example, cognitive impairment is

prevalent at high age and mainly problems in memory and executive functions may impair judgement of situations and treatment options (see also Chapter 7). Another factor is impaired hearing and vision (see also Chapter 18) which may hamper communication (see also Chapter 25) and therefore increases the chance of misinterpretation and misunderstanding. At older age, the history of one's life is a lot longer and previous experiences can have a large impact on current decisions. Well-being is highly important, but the exact ingredients highly vary for individual older patients.

5.4.2 Uncertainty

Uncertainty surrounds all these aspects and the best way to deal with this uncertainty is acknowledging it and asking the appropriate questions. One can get grip of uncertainty by asking about four aspects per case with four corresponding questions. These aspects encompass uncertainty about the evidence (e.g. what do the guidelines show?), about the narrative (what is the patient's story?), about case-based reasoning (what best to do in the circumstances?) and about multi-professional working (how best to communicate and collaborate?).

With the knowledge that for most problems in geriatric patients no clear-cut, scientific answer/solution exists, uncertainty should not lead to lethargy in decision-making or neglecting/bypassing the complexity. Even if more research is conducted, there will always remain uncertainty about the possible benefits and harms of certain treatment options, and the validity of evidence for the complex patients with multimorbidity, so we have to make decisions, and cannot only ask or hope for future research to escape uncertainty.

5.4.3 Challenges of SDM in Older Persons

In daily practice, older persons are not always involved in the decision-making process. One of the reasons is the belief among health professionals that older persons do not want to be involved in the decision-making process or are not able to decide. However, SDM with older persons is possible, though it is a complex process that requires complexity- and uncertainty-handling competencies. Health professionals need to both have adequate medical knowledge and establish a professional relationship with the use of good communication skills (see also Chapters 2 and 25).

In older persons with multiple morbidities there are complex problems on more levels. In this patient category, a goal-oriented approach is more suitable than the traditional disease-centred approach. Thoroughly discussing goals moves the decision-making process away from the focus on disease and technological possibilities and more towards what really matters in the "everyday" life of the patient. Discussing personal values and global health care goals is the basis of good SDM in older persons.

Figure 5.4 displays the elements ideally addressed in the SDM process in older patients. Table 5.2 shows an overview of the elements of SDM in older persons and

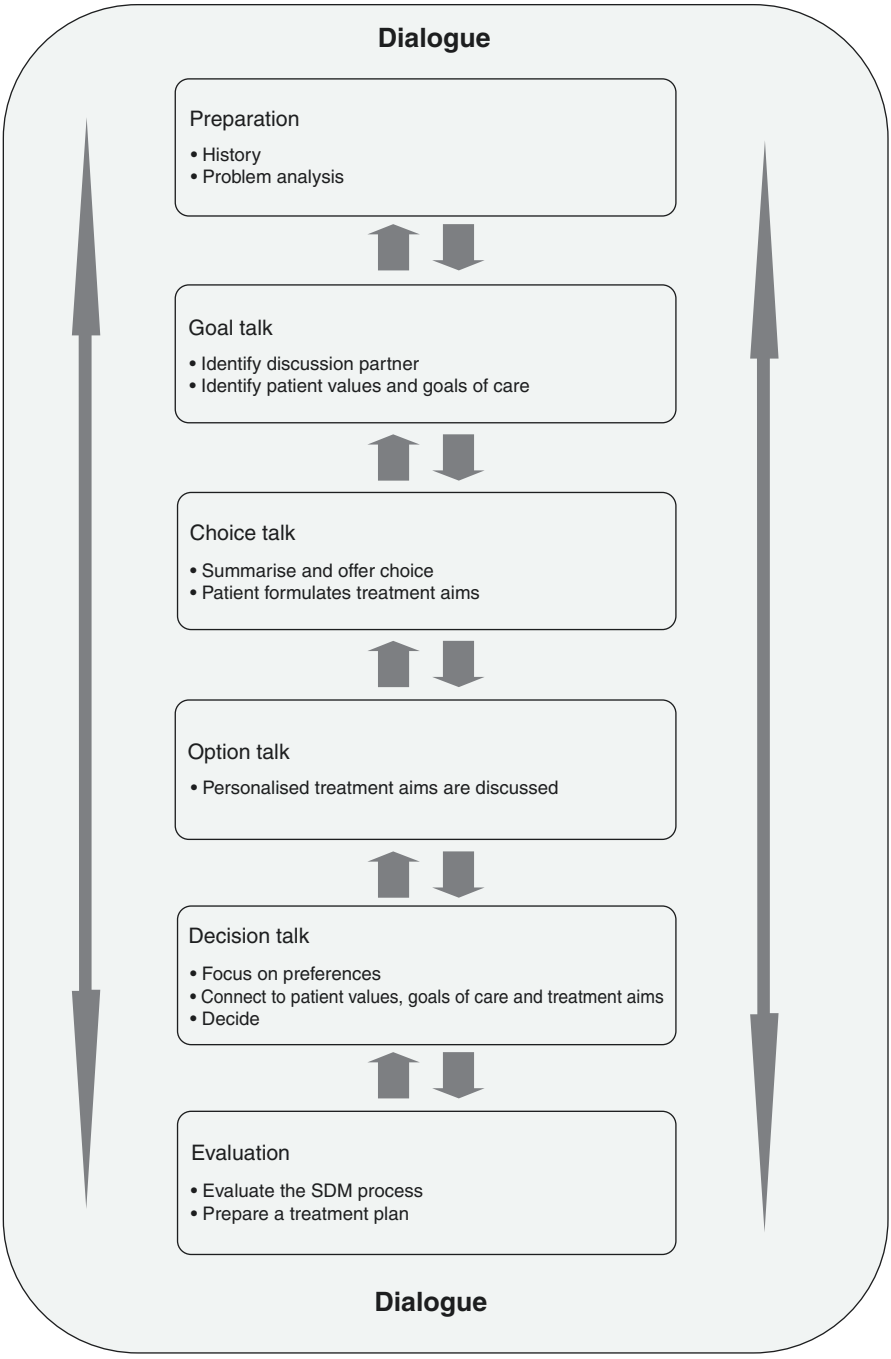


Fig. 5.4 Dynamic model for SDM in older persons with multiple morbidities

Table 5.2 Practice recommendations for SDM with frail older patients[a]

Stage of SDM	Specific actions	Examples
Before you start	Prepare	Have lots of conversations with older people "Know" background of your patient Think about your own goals and values Read about spirituality and the art of living
Preparation: History and problem analysis	Adequate recordkeeping	
	To perform and interpret relevant geriatric assessment	
Goal talk: engage patient	To empower and engage patients: *Talk with not about the patient*	"Every person feels different about what is important when facing a health problem, would you share with me what is important to you at the moment ..."
	Talk about living more and less about disease	"Could you tell me something about what is important to you?" (can give examples: physical function, longevity, retaining cognitive function, freedom from symptoms, independence, etc.)
	Provide specific instructions for patients	"Could you tell me what you know about your current problem?" "Is your current problem stopping you from doing the things you like?" "Can you help me to take good care of you by sharing your health history?"
Goal talk: identify discussion partner	To assess decision capacity (eliciting patient values and goals of care may be helpful)	Present a "vignette[a]" to a patient to test his/her decision capacity "I am going to ask you some questions to discuss if you feel comfortable in having a conversation about decisions" "Would you like someone else (proxy) to support you?"
Goal talk: identify patient values and goals of care	To elicit patient values and goals of care	"Tell me what you liked to do before you came to the hospital"
	To bridge between values and goals (advanced interpersonal and communication skills): Use concrete examples of how other patients formulated goals	"Is religion important to you?" "What is important to you? (can give examples: physical function, longevity, retaining cognitive function, freedom from symptoms, independence, etc.)" "What are you hoping for?" "What are you afraid of?" "Let us discuss how we can help you meet your goals" "Do you ever think about the end of life? Can you say something about that?"

Table 5.2 (continued)

Stage of SDM	Specific actions	Examples
Choice talk	To summarise and pause	"Let me summarise what we have discussed so far" "I can see this is difficult for you" "What is your understanding of your problem and what would you like to achieve?"
Option talk	To describe the options with benefits and trade-offs	"Based on our discussion, these are the possible options..."
		"In your situation, here's what we expect this could look like"
Decision talk	To reinforce engagement	"Are you ready to decide?"
		"Do you want more time?"
	Pause	"Do you have any questions?"
Evaluation talk	To discuss the decision-making process (summarise and pause)	"Can you tell me in your own words what we have discussed and decided?"
		"Are you satisfied with the decision?"

[a]Vignette: a short written description about a fictive patient case

gives examples and prompts to guide the dialogue. Ideally, the SDM process is integrated in the history-taking and assessment procedures. All recommendations for communication are useful to engage the older person in the decision-making process and have a discussion about what matters to the patient. Many professionals are struggling with discussing therapeutic options with their patients, for example because data on specific risks and benefits in older patients with multiple morbidities are lacking. Therefore, it is necessary to communicate this uncertainty and focus on what matters to the patient, because after thoroughly discussing patient values, global health care goals and treatment aims, the number of realistic treatment options will be relatively small.

Compared with the usual steps of choice, option and decision talk, this scheme adds extra attention to preparation, goals, values and evaluation (see also Chapter 7). Preparation is key, because often patients had already discussed issues concerning limitations or specific choices in treatment with their general physician that are not known to physicians in hospital. It also gives the opportunity to gather all the necessary information about the diseases, impairments and handicaps of that person to make a good judgement about their frailty and multimorbidity. Table 5.2 gives prompts to help you in the clinical practice to find the good questions for a fruitful interaction on SDM in geriatric patients (see also Chapter 25).

This SDM process is dynamic and can take place over multiple consultations. SDM in geriatric patients is a challenging process and represents the core of good health care for older persons, integrating personalised medical knowledge, excellent communication skills and patient engagement. It is the basis of patient-centred care, and commonly is highly rewarded by patients and families, irrespective of the decision finally made.

In conclusion, atypical presentations are typical for frail older patients and their pathophysiology is based on complex interactions between current stressors and chronic diseases and impairments on the one hand, and global resilience, body functions, psychosocial factors, patient's history and goals, and the context of family, life and disease trajectory on the other hand. Therefore, complexity and uncertainty are undeniable and unpreventable core elements in the decision-making process for our frail older patients with multimorbidity. By sufficient knowledge and skills of medicine for the aged, and with some adaptations of the SDM process, physicians can help and guide geriatric patients to the choices and decisions fitting best both process and outcome with their individual characteristics and preferences. This requires much more than just handing over data from literature. It first requires responsible, experienced and patient-related translation of the general data to the options that really fit the individual patient's resilience and preferences. This is at the heart of what can make geriatric medicine have huge added value in clinical practice. At the same time, SDM is the key for the success and sustainability of modern medicine in our ageing societies; the competences described above are therefore far too important to just reserve for geriatricians.

References

Clegg A, Young J, Ilife S, Olde Rikkert MGM, Rockwood K. Frailty in elderly people. Lancet. 2013;381:752–62.

Hilliard AA, et al. Clinical problem-solving. Occam's razor versus Saint's triad. N Engl J Med. 2004;350:599–603.

National Guideline Centre (UK). Multimorbidity: assessment, prioritisation and management of care for people with commonly occurring Multimorbidity. London: National Institute for Health and Care Excellence (UK); 2016.

Olde Rikkert MG, Rigaud AS, van Hoeyweghen RJ, de Graaf J. Geriatric syndromes: medical misnomer or progress in geriatrics? Neth J Med. 2003;61:83–7.

Olde Rikkert MGM, Dakos V, Buchman TG. Slowing down of recovery as generic risk marker for acute severity transitions in chronic diseases. Crit Care Med. 2016;44:60–6.

van de Pol MH, Fluit CR, Lagro J, Slaats Y, Olde Rikkert MG, Lagro-Janssen AL. Shared decision making with frail older patients: proposed teaching framework and practice recommendations. Gerontol Geriatr Educ. 2016;27:1–14.

Scheffer M, Carpenter TM, Lenton TM, et al. Anticipating critical transitions. Science. 2012;338:344–8.

Straus S, Richardson WS, et al. Evidence-based medicine. Toronto: Churchill Livingstone; 2000. p. 124–9.

Zullig LL, et al. A systematic review of conceptual frameworks of medical complexity and new model development. J Gen Intern Med. 2016;31:329–37.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_5.

The Complexity of the Geriatric Patient

6

Graziano Onder and Davide Liborio Vetrano

Abstract

Complexity is the result of medical, social, and psychological factors that challenge the effectiveness of the care process, making it not standard and more demanding to health professionals. Several conditions extremely common in older patients are responsible for complexity. Multimorbidity, complex medication regimens, geriatric syndromes, cognitive impairment, and low socioeconomic status are among them and limit the effectiveness of treatments and indications. What stated by guidelines might not work in complex older adults and often raises, among physicians, more doubts on potential harm than certainties. Goal-oriented care and participation of the patient in the decision-making process are warranted in the presence of complexity, in order to improve the efficacy of the treatment and preserve the quality of life. The Comprehensive Geriatric Assessment (CGA) can help in prioritizing specific intervention areas.

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_6) contains supplementary material, which is available to authorized users.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_6

G. Onder (✉)
Department of Geriatrics, Catholic University of Rome, L.go F. Vito 1, 00168 Rome, Italy
e-mail: graziano.onder@unicatt.it

D.L. Vetrano
Department of Geriatrics, Catholic University of Rome, L.go F. Vito 1, 00168 Rome, Italy

Ageing Research Center, Karolinska Institutet, Gavlegatan 16, 11330 Stockholm, Sweden
e-mail: davidevetrano@gmail.com

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_6

Learning Objectives

By the end of the chapter, the reader will be able to
- Identify multimorbidity as a key determinant of clinical complexity in older patients
- Identify other factors contributing to clinical complexity, including polypharmacy, geriatric syndromes, cognitive impairment, low socioeconomic status, and limited life expectancy
- Evaluate the impact of complexity on patient's outcomes and quality of life as well as therapeutic choices
- Recognize limitations of clinical guidelines for complex patients and understand key steps in the care of complex patients, including comprehensive assessment, shared decision making, and development of individualized care plans

6.1 Definition and Determinants of Complexity

A complex patient is defined as *one for whom clinical decision making and required care processes are not routine or standard*. Any event or condition that mines people health, including medical, social, and psychological well-being, contributes to enhance complexity, challenging physicians and health care systems that attempt to provide effective and efficient care (Weiss 2007).

Complexity is characterized by the co-occurrence of various clinical features:

- *Comorbidity and multimorbidity*: These terms are used to describe the clinical picture characterized by the coexistence of multiple diseases. *Comorbidity* is defined as *the combination of additional diseases beyond an index one*. According to this construct, the focus is an index disease with the other comorbid disorders influencing its prognosis. By contrast, *multimorbidity* is defined as *the co-occurrence of several diseases in the same person regardless of a main clinical entity*. This last construct better embodies the concept of complexity (Marengoni et al. 2011; Prados-Torres et al. 2014). Multimorbidity is a key determinant of the clinical complexity of the geriatric patient. This is currently defined as the presence of two or more diseases in the same individual, and it is the *most common condition* encountered by practitioners during their clinical activity. It has been estimated that more than 60% of persons aged 65 or older present with multimorbidity and this prevalence increases with increasing age (Calderon-Larranaga et al. 2017). This entails serious clinical and practical consequences. Older adults with multimorbidity are high demanding, in terms of health service use (*e.g.,* hospitalizations and admissions to the emergency department, ED), multiple specialist referrals, and formal and informal personal assistance. Finally, multimorbidity has been demonstrated to increase health-related expenditure and to cause disability and shorter survival (Barnett et al. 2012).

- *Polypharmacy*: The most straightforward consequence of multimorbidity is the establishment of complex pharmacological regimens, aimed at treating all the co-occurring conditions (Onder et al. 2014). This status, referred to as polypharmacy, dramatically increases the occurrence of adverse drug reactions, one of the most common causes of hospitalization in the older population. Also use of multiple drugs recommended by guidelines for treatment of individual disease might lead in patients with multimorbidity to drug-drug and drug-disease interactions. Therefore, clinical guidelines should be applied with caution in patients with multimorbidity.
  Finally, the lack of guidelines tailored on complex older people increases the chance of inappropriate medication prescription (IMP): medications whose benefit has not been proven in this specific population and whose harms exceed sometimes benefits (Marengoni and Onder 2015) (see also Part V, Chapter 23).
- *Geriatric syndromes*: The term *geriatric syndrome* refers to one symptom or a complexity of symptoms with high prevalence in older patients resulting from multiple diseases and multiple risk factors. Geriatric syndromes are multifactorial conditions attributable to the transversal involvement of several organs and systems by morbid processes. They include a limited number of clinical pictures (e.g., falls, syncope, pain, delirium), which causes are numerous, concurrent, and never fully identified. They are frequently responsible for hospitalization, disability, and death and their management becomes challenging in the presence of the above-mentioned contextual factors, such as socioeconomic disadvantages or poor adherence to physician's recommendations (Vetrano et al. 2016) (see also Part III).
- *Cognitive impairment*: Cognitive impairment is a common condition among older adults and it is associated with other diseases commonly observed in older people, including hypertension, cardiovascular disease, diabetes, and osteoporosis. Memory loss, decline in intellectual function, and impaired judgment and language, commonly seen in patients with cognitive impairment, have obvious effects on decision-making capacity, alter benefits and burdens, impact treatment adherence, and may cause communication difficulties, including decreased ability to report adverse effects, requiring an external support in managing prescribed treatments (Dolansky et al. 2016) (see also Chapter 7).
- *Socioeconomic issues*: Economic deprivation, loneliness, and/or lack of formal and informal assistance have a strong impact on the quality of life and health-related outcomes. The presence of these factors might strongly limit the ability of patients to access care, adhere to prescribed treatments, and follow the process of care itself (Toporowski et al. 2012) (see also Chapter 3).
- *Life expectancy*: Pharmacological treatment for primary or secondary prevention may require years of continuous treatment before their possible benefit is evident, and their use may be considered as inappropriate in the context of a limited life expectancy. Therefore, the treatment of complex patients with limited life expectancy may not be of any clinical benefit, but it might raise the risk of adverse events, ultimately leading to poor quality of life and even shorter survival (Holmes et al. 2014).

Beyond the above-mentioned clinical issues, several contextual factors make it a complex case (Grant et al. 2011):

- *Medical decision making*. Defined as *the ability of the patient of evaluating and understanding the clinical paths in order to take appropriate decisions*. The presence of mental/cognitive problems or substance abuse can strongly limit people's medical decision making (see also shared decision making, SDM, Chapter 5).
- *Personal attitudes.* Patient's scarce propensity and inadequate behavior that mine the efficacy of the care process (e.g., poor adherence to treatments or to medical appointments) (see also Part VII).

6.2 How to Approach Complexity?

Complexity represents a major concern for the delivery of an effective and efficient care to older patients. Healthcare systems, physicians, and health professionals in general strive to design and apply adequate care paths for complex patients. Old-fashioned constructs and proper the practice of a disease-centered medicine are not anymore serving the cause of an epidemic of complexity which is invading the places of care. The epidemiological transition we are withstanding, characterized by the dramatic growing in the number of older people and the epidemics of chronic diseases, imposes the search for more adequate models of care (Grant et al. 2011).

Complexity, in its various shapes, strongly influences the success of medical interventions, both pharmacological and non-pharmacological. Several complexity determinants make the outcome of a specific treatment unpredictable. The huge heterogeneity and variability of clinical pictures we find in older people impose the application of goal-oriented strategies, taking into consideration both conventional and unconventional patient's characteristics (Petrovic et al. 2016; Onder et al. 2017).

6.3 A Quick Guide to the Management of Complexity in Older Patients

Step 1. Assess complexity—The comprehensive geriatric assessment (CGA)

Complexity is a multifaceted, transversal, and multi-etiological condition whose negative implications have already been mentioned. However, even if this is a status easily recognized by the expert eye of a physician, it remains difficult to be objectified in a univocal way. To date, several models have been proposed to assess and stage complexity, but none resulted as the definitive tool. The assessment methods used in the estimation of severity of single diseases or conditions may not work in the presence of complex clinical pictures (Boyd et al.). Based on this background, it seems clear that a global assessment of patient's characteristics, including comorbidities, geriatric syndromes, cognitive status, social function, and life expectancy, is necessary to have a full figure of complexity. The traditional approach to patient's

diseases and needs does not provide information on these problematic areas. In the past decades, the CGA has been proposed as a methodology to provide a more global approach and assessment of older adults and their problems, allowing a more specific and sensible care plan for each single patient (see also Chapter 26). CGA is considered the "technology" of geriatrics and its application results in a better quality of care, as a result of the evaluation of various problematic areas (Bernabei et al.). An extensive literature has documented that use of CGA in association with an integrated team of geriatricians, nurses, social workers, and other professionals (the so-called geriatric team, see also Chapter 27) assessing and managing the healthcare problems identified by the CGA, and developing individualized care plans, has resulted in more detailed evaluation, improved care planning, and overall better quality of care. The application of CGA to complex patients has clear advantages:

1. It supports the identification of factors contributing to complexity.
2. It facilitates care planning by identification of health priorities.

Step 2. Assess patient priorities—Goal-oriented care

The traditional medical approach is focused on achievement on outcomes represented by condition-specific indicators (e.g., HbA1c, low density lipid (LDL) cholesterol level, and hypertension control) or mortality. These outcomes might be appropriate for adults with single diseases, but they might not work well for complex patients with the conditions mentioned above. For such patients, the overall quality of care depends on more than just disease-specific care processes. An alternative approach to providing better care would be to focus on a patient's individual health priorities within or across a variety of dimensions (e.g., symptoms; physical functional status, including mobility; and social and role functions). For example, an old person with diabetes might set as a priority the improvement of the neuropathic pain that limits his ability to perform basic activities rather than obtaining an optimal control of HbA1c. Similarly, dyspnea control might be a more desirable outcome for an old person with postischemic heart failure rather than LDL cholesterol control. An approach focused on patient's priorities has clear advantages:

1. It focuses on individually desired rather than universally applied health states.
2. It simplifies decision making for patients with multiple conditions by focusing on outcomes that span conditions and aligning treatments toward common goals.
3. It prompts patients to articulate which health states are important to them and their relative priority.
4. It might result in lower care-related costs by simplifying the process of care.

Step 3. Agree on treatment priorities and develop an individualized care plan.

Patients and physicians can agree on care plan and strategies to achieve their desired outcomes. This process is the basis of the so-called SDM process. Of course,

not all patient goals may be realistic or attainable. The clinician needs to explain what is possible and negotiate potentially achievable outcomes with the patient. This process is certainly time consuming but it is necessary to provide patient-centered care and it will ultimately lead to the development of individualized care plans based on the needs and priorities of the patients (Holmes et al. 2013). The definition of a care plan should involve not only the geriatrician but also other health professionals involved in the care of the patient (i.e., nurse, social worker, medical specialists) and the patient. The development of individualized care plans has relevant advantages:

1. It focuses on needs and priorities of the individual patient.
2. It is developed by multiple health specialists.

If complexity acts as a barrier for an effective care, the simplification of the processes is proposed as a potential solution. Noticeably, the British National Institute for Health and Care Excellence (NICE) issued the guidelines for the clinical assessment and management of multimorbidity. They provide for the first time indications on how to optimize care for multimorbid people, acting on treatment burden (i.e., reducing polypharmacy and avoiding frequent medical appointments) and unplanned care accesses. Shared decision and prioritizations of the patient's goals are cornerstones of the proposed approach (NICE 2016).

In conclusion, complexity of geriatric patients is due to coexistence of impairments in multiple domains, including clinical, cognitive, social, and functional ones. A key clinical aspect of complexity is represented by multimorbidity (the presence of two or more chronic conditions) with a relevant impact on patient's outcomes and quality of life, also because it might influence therapeutic choices. Complex geriatric patients need an individualized approach. The application of clinical guidelines in these patients might be unrewarding and should be therefore carefully considered in the decision-making process.

Conditions causing complexity, problems raised in the care process, and possible solutions

Condition	Problems raised in the care process	Possible solution
Comorbidity/ multimorbidity	– Identification of all possible diseases – Identification of diseases with the most relevant impact on patient's quality of life and outcomes – Need of multiple specialists for the care of multimorbidity	– Perform a comprehensive assessment – Prioritize diseases with the highest impact on negative outcomes and quality of life – Work in team with other health professionals and medical specialists

Condition	Problems raised in the care process	Possible solution
Polypharmacy	– Risk of drug-drug and drug-disease interactions – Straight application of clinical guidelines might bring to negative effects – Risk of inappropriate drug use	– Use software to identify interactions and inappropriate drug use – Prioritize treatments based on patient's needs
Geriatric syndromes	– Challenges in the identification of multiple and concomitant causes underlying these conditions – Problems in the management of chronic diseases (i.e., falls or orthostatic hypotension might influence treatment of hypertension and require a reduction in the number of drugs used)	– Always assess presence of geriatric syndromes and their impact on quality of life – Consider possible factors involved in their development – Consider possible interactions with drugs used for treatment of chronic diseases
Cognitive impairment	– Difficulties in reporting signs and symptoms of a disease – Problems in adhering to a given treatment and reporting side effects of a given treatment – Often treatments for comorbidities not tested and validated in patients with cognitive impairment	– Assess adherence – Assess presence of social support – Establish treatment priorities – Simplify treatment regimens
Socioeconomical issues	– Access to care – Problems in adhering to treatment and care process	– Facilitate and simplify access to care
Limited life expectancy	– Assessment of life expectancy (in particular in nononcologic patients) – Evaluation of benefits of preventive treatments (i.e., use of statins, antihypertensive, or antiosteoporotic agents)	– Use algorithms to assess life expectancy – Simplify treatment regimens and reconsider "preventive treatments" – Assess time until benefit of any given treatment

References

Barnett K, Mercer SW, Norbury M, Watt G, Wyke S, Guthrie B. Epidemiology of multimorbidity and implications for health care, research, and medical education: a cross-sectional study. Lancet. 2012;380:37–43.

Calderon-Larranaga A, Vetrano DL, Onder G, Gimeno-Feliu LA, Coscollar-Santaliestra C, Carfi A, Pisciotta MS, Angleman S, Melis RJ, Santoni G, Mangialasche F, Rizzuto D, Welmer AK, Bernabei R, Prados-Torres A, Marengoni A, Fratiglioni L. Assessing and measuring chronic multimorbidity in the older population: a proposal for its operationalization. J Gerontol A Biol Sci Med Sci. 2017;72:1417–23.

Dolansky MA, Hawkins MA, Schaefer JT, Sattar A, Gunstad J, Redle JD, Josephson R, Moore SM, Hughes JW. Association between poorer cognitive function and reduced objectively monitored medication adherence in patients with heart failure. Circ Heart Fail. 2016;9(12) pii: e002475

Grant RW, Ashburner JM, Hong CS, Chang Y, Barry MJ, Atlas SJ. Defining patient complexity from the primary care physician's perspective: a cohort study. Ann Intern Med. 2011;155:797–804.

Holmes HM, Min LC, Yee M, Varadhan R, Basran J, Dale W, Boyd CM. Rationalizing prescribing for older patients with multimorbidity: considering time to benefit. Drugs Aging. 2013;30(9):655–66.

Holmes HM, Min L, Boyd C. Lag time to benefit for preventive therapies. JAMA. 2014; 311(15):1567.

Marengoni A, Angleman S, Melis R, Mangialasche F, Karp A, Garmen A, Meinow B, Fratiglioni L. Aging with multimorbidity: a systematic review of the literature. Ageing Res Rev. 2011;10:430–9.

Marengoni A, Onder G. Guidelines, polypharmacy, and drug-drug interactions in patients with multimorbidity. BMJ (Clin Res Ed). 2015;350:h1059.

National institute for health and care excellence (NICE). Multimorbidity: clinical assessment and management. 2016.

Onder G, Vetrano DL, Cherubini A, Fini M, Mannucci PM, Marengoni A, Monaco A, Nobili A, Pecorelli S, Russo P, Vitale C, Bernabei R. Prescription drug use among older adults in Italy: a country-wide perspective. J Am Med Dir Assoc. 2014;15(7):e531–5.

Onder G, Cesari M, Maggio M, Palmer K. Defining a care pathway for patients with multimorbidity or frailty. Eur J Intern Med. 2017;38:1–2.

Prados-Torres A, Calderon-Larranaga A, Hancco-Saavedra J, Poblador-Plou B, van den Akker M. Multimorbidity patterns: a systematic review. J Clin Epidemiol. 2014;67:254–66.

Petrovic M, Somers A, Onder G. Optimization of geriatric pharmacotherapy: role of multifaceted cooperation in the hospital setting. Drugs Aging. 2016;33:179–88.

Toporowski A, Harper S, Fuhrer R, Buffler PA, Detels R, Krieger N, Franco EL. Burden of disease, health indicators and challenges for epidemiology in North America. Int J Epidemiol. 2012;41(2):540–56.

Vetrano DL, Foebel AD, Marengoni A, Brandi V, Collamati A, Heckman GA, Hirdes J, Bernabei R, Onder G. Chronic diseases and geriatric syndromes: the different weight of comorbidity. Eur J Intern Med. 2016;27:62–7.

Weiss KB. Managing complexity in chronic care: an overview of the va state-of-the-art (sota) conference. J Gen Intern Med. 2007;22(Suppl 3):374–8.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_6

Part III

Geriatric Syndromes

Cognitive Decline

7

Maria Cristina Polidori, Gereon Nelles, Umberto Senin, and Patrizia Mecocci

Abstract

Cognitive decline is a very common condition in advanced age with an enormous impact on health outcomes and patient's trajectories. Despite this, cognitive performance is not systematically evaluated in older community dwellers and hospitalized patients, with the consequence of late diagnosis. This delay in diagnosis is particularly deleterious because cognitive impairment progresses to dementia which is not curable but associated to a number of geriatric syndromes and conditions associated with disability and mortality—falls, delirium, dysphagia, poor compliance, and adherence to treatment plans. The comprehensive geriatric assessment helps both for the early identification of cognitive impairment if not yet diagnosed and for improved clinical decision making in patients with advanced decline and dementia.

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_7) contains supplementary material, which is available to authorized users.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_7

M.C. Polidori (✉)
Ageing Clinical Research, Department Medicine II, University Hospital of Cologne, Cologne, Germany
e-mail: maria.polidori-nelles@uk-koeln.de

G. Nelles
Neurology Clinic NeuroMedCampus Hohenlind, Werthmann Str. 1c, 50935 Cologne, Germany
e-mail: gereon.nelles@uni-due.de

U. Senin • P. Mecocci
Institute of Gerontology and Geriatrics, Perugia University Hospital, Perugia, Italy
e-mail: umberto.senin@unipg.it; patrizia.mecocci@unipg.it

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*, Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_7

Learning Objectives

By the end of the chapter, the reader will be able to

- Define characteristics and burden of cognitive impairment in advanced age and recognize the multifactorial, *continuum*-like nature of cognitive impairment to dementia in advanced age as well as the challenges to the use of biomarkers and psychometric tests
- Acknowledge the factors associated with adverse outcomes and clinical decision making in older patients with cognitive impairment and dementia
- Provide the rationale for routine cognitive examination in older adults seeking for medical help due to other reasons than dementia
- Extrapolate the impact of dementia and cognitive decline on diseases and different geriatric syndromes

7.1 Demographics, Definition, and Pathophysiology of Cognitive Decline

Cognitive decline—displaying as diminished orientation and/or ability to remember, judge, understand, and reason among several other cognitive abilities—is frequent in advanced age. Cognitive decline represents the phenotypical expression of age-related changes occurring in the "aging brain" within the process of senescence. In other words, age-related cognitive decline represents the expression of increased neuronal vulnerability due to senescence in the postmitotic structure of the brain (Drachman 1997; Drachman 2006). As for severe cognitive impairment the term dementia (from the Latin *de*, "out of", and *mens*, "mind") is used, this clinical entity is presented here in its main diagnostic and therapeutic features for didactic purposes. While the detailed description of each set of criteria is provided in the correspondent literature (extensively reviewed in Winblad et al. 2016), its presentation goes beyond the scope of this chapter. Diagnostic terms from dementia to what is considered its most common form, Alzheimer's disease (AD), are based upon criteria (Table 7.1) currently under careful consideration for reliability and representativeness in old and very old age. These are difficult to apply in advanced age due to the heterogeneity of the aging process (see also Chapter 3) and the *continuum* from organ integrity to severe pathology typically evident along with aging.

Table 7.1 Diagnostic criteria for dementia and relative terminology

Classification system	Terminology	Criteria and role of biomarkers	References
NINCDS-ADRDA National Institute of Neurological and Communicative Disorders and Stroke and the Alzheimer's Disease and Related Disorders Association	Probable Alzheimer's disease	Probable AD: Dementia has been established by clinical and neuropsychological examination. Cognitive impairments also have to be progressive and be present in two or more areas of cognition. The onset of the deficits has been between the ages of 40 and 90 years and finally there must be an absence of other diseases capable of producing a dementia syndrome	McKhann et al. (1984)
	Possible Alzheimer's disease	Possible AD: There is a dementia syndrome with an atypical onset, presentation, or progression; and without a known etiology; but no comorbid diseases capable of producing dementia are believed to be in the origin of it	
National Institute on Aging-Alzheimer's Association, NIA-AA	All-cause dementia	Cognitive and/or neuropsychiatric symptoms (1) interfering with the ability to function at work or at usual activities, (2) representing a decline from previous functioning level, (3) not being explained by delirium or major psychiatric disorder	McKhann et al. (2011)
National Institute on Aging-Alzheimer's Association, NIA-AA	Dementia due to Alzheimer's disease	Probable: Meets the criteria of all-cause dementia plus, (1) insidious inset; (2) clear-cut history of worsening of cognition by report or observation; (3) initial and most prominent cognitive deficits as amnestic presentation or non-amnestic presentation; and (4) absence of evidence of stroke and major cerebrovascular disease Possible: Meets the criteria of probable dementia due to Alzheimer's disease but has either atypical course or etiologically mixed presentation Biomarkers: validation needed	McKhann et al. (2011)

(continued)

Table 7.1 (continued)

Classification system	Terminology	Criteria and role of biomarkers	References
International Statistical Classification of Diseases and Related Health Problems (ICD) by the World Health Organization (WHO)	Alzheimer's disease, unspecified	A disabling degenerative disease of the nervous system occurring in middle-aged or older persons and characterized by insidious onset of dementia and failure of memory for recent events, followed by total incapacitation and death	2017 international classification of diseases, version 10 (ICD-10) Diagnosis code
Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5)	Major and mild neurocognitive disorder (NCD)	Major NCD: A set of existing mental disorder diagnoses from the DSM-5, including dementia and amnestic disorder (according to the American Psychiatry Association, you can still use the term dementia to refer to the condition). Criteria include significant cognitive decline, interference with independence, not due to delirium, not due to other mental disorder. CAVE: A major NCD can be single domain with the exception of major NCD due to Alzheimer's disease Mild NCD: Moderate cognitive decline not interfering with independence, not due to delirium, not due to other mental disorder	DSM-5 American Psychiatry Association (APA)
International Working Group	Alzheimer's disease	Presence of an appropriate clinical AD phenotype (typical or atypical) and a pathophysiological biomarker consistent with the presence of Alzheimer's pathology such as volumetric MRI and fluorodeoxyglucose positron emission tomography (PET)	Dubois et al. (2014)

Cognitive impairment due to age-related cognitive decline, from mild impairment to overt dementia, encompasses a range of neurological disorders characterized primarily, but not only, by loss of memory and orientation. For the diagnosis of dementia, presence of cognitive impairment in multiple domains and functional loss are required (Table 7.1); AD is considered the leading cause of dementia and its primary risk factor is advanced age. Once dementia is diagnosed in its mild and

moderate stages, patients are overtly forgetful and disoriented, neglect their disorder, and are not able to judge its consequences. Later on, during the course of the disease, patients lose their ability to communicate, fail to recognize loved ones, become bedridden, and require continuous care, with 12–17 years' living with disability (WHO 2016). Dementia is indeed known to increase mortality, but contributing factors are not well established, although some variables, such as being male, neuropsychiatric symptoms, comorbidity, and development of functional disability during follow-up, have been associated with a decrease in survival (http://www.who.int/mediacentre/factsheets/fs362/en/. Latest access August 15th, 2017).

As global life expectancy has reached 71.4 years (WHO 2016), the socioeconomic burden of cognitive impairment due to age-related decline will dramatically hit developing countries in the next years. Dementia alone is expected to reach over 130 million persons worldwide by 2050 (Winblad et al. 2016) with one-third of the oldest-old population being affected by mild cognitive impairment (MCI), considered to precede dementia (Petersen et al. 2015, Drachman 2006). Most importantly, this already impressive demographic burden is largely underestimated (Winblad et al. 2016) and cure against age-related cognitive decline including dementia is beyond our grasp. The extremely complex multifactorial pathophysiology of age-related cognitive impairment and dementia (Fig. 7.1) includes molecular biology of aging (Drachman 1997; Drachman 2006), mechanisms in part distinct from

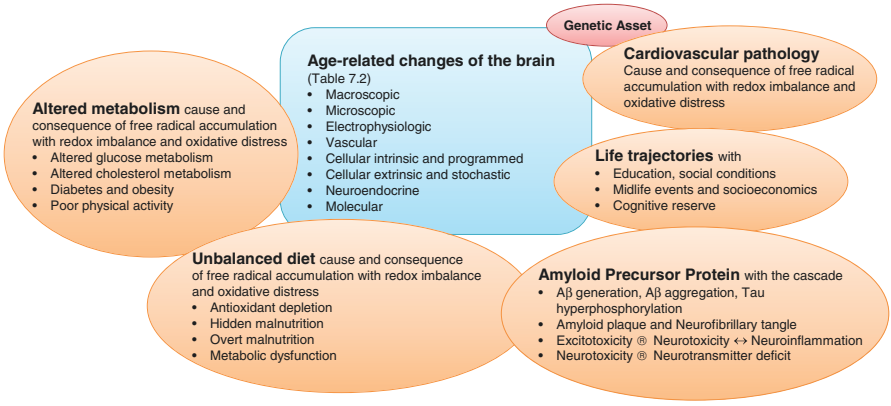


Fig. 7.1 The multifactoriality of age-related cognitive decline. Different changes occur in a structurally and biomolecularly heterogeneous way from person to person. The consequence is a *continuum* from brain aging to dementia (Fig. 7.2) difficult to diagnose and treat according to standard diagnosis and therapy. Personalized, multidimensional management is necessary

Table 7.2 Age-related changes of the brain

• Macroscopic changes:
Diminished brain weight and hippocampal volume decrease
Increased white matter hyperintensities
• Microscopic changes:
Diminished number of neurons
Diminished number of synapses
Increased deposition of "senile" β-amyloid plaques, neurofibrillary tangles, and neuropil threads
Increased glial proliferation
Increased vulnerability of brainstem monoaminergic systems
Increased vulnerability of basal forebrain nuclei
Increased vulnerability of myelinated nerve fibers
• Electrophysiologic changes:
Decreased α-wave rhythm at electroencephalography (EEG)
• Vascular modifications:
Decreased cerebral perfusion
Amyloid angiopathy
Impaired trophic influence of microvascular endothelium
Vascular atherosclerotic burden
• Cellular intrinsic and programmed changes:
Replicative senescence
Telomere shortening
Sirtuin dysregulation
Apoptosis
• Cellular extrinsic and stochastic changes:
Error catastrophe and somatic mutation
Deoxyribonucleic acid (DNA) mutation accumulation
• Cellular extrinsic and intrinsic modifications:
Wear and tear
• Neuroendocrine changes
• Molecular changes:
Chaperone dysfunction and misfolded protein accumulation
Free radical production and oxidative stress
Mitochondrial dysfunction and altered energy production
Protein glycation
Inflammation
Metabolic dysregulation
Codon restriction
Genetic dysregulation
Neurotransmitter and modulator imbalance

AD-related accepted ones (Pavlopoulos et al. 2013), and irreversible age-related changes of the postmitotic brain (Table 7.2).

Figure 7.1 displays the interconnectivity between the multiple features of the *continuum* from aging brain to dementia presented in Fig. 7.2 as well as the extreme complexity of this continuum's context. The main age-related characteristics of the brain include structural, cellular, molecular, biochemical, and vascular changes reflecting impressively the known theories of the aging process itself—intrinsic and extrinsic—and are associated to cognition correlates (reviewed in detail in Drachman 2006): with advanced age, memory and fluid intelligence (the mixture of reaction time, channel capacity, and creativity) decrease, while crystallized intelligence (or wisdom, including vocabulary, past knowledge, and previously acquired skills) remains stable.

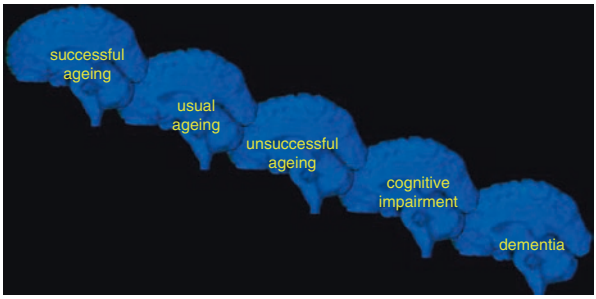


Fig. 7.2 The geriatric continuum in age-related cognitive decline

Physiological changes associated with the aging of the brain explain not only memory loss but also impairment of other cognitive domains and neurological and neuropsychiatric systems. These cause motoric alterations, posture, balance and gait disorders, sleep disturbances, sensory decrements, personality changes, and mood disorders (Förstl et al. 2009). Furthermore, the characteristics of the aging brain are shared by those known to be typical of dementia in general and of AD in particular (Fig. 7.1). Despite this overlap, it is commonly accepted that AD is a distinct condition whose multiple pathophysiologic mechanisms are those displayed in the upper right section of Fig. 7.1 and include β-amyloid accumulation and neurotransmitter deficits, particularly deficits of cholinergic transmission. Both of the latter are the major targets of current drug treatments and clinical studies exploring new drug options; misfolded protein deposition in some regions of the brain is still considered the main histopathological marker of AD (Alzheimer et al 1995). To date, however, no cure exists against AD.

7.2 Geriatric Correlates of Cognitive Decline and Dementia: Underestimation, Risk Factors, Consequences

Beyond the traditional neurologic diagnostic algorithm and therapy of AD, this chapter aims at describing the approach to cognitive decline as a geriatric syndrome, highly challenging and with profound impact on the older ill adult.

First of all, cognitive impairment and dementia are not only underestimated but also diagnosed very late considering that the neurodegenerative changes associated with dementia (upper right corner of Fig. 7.1) may begin up to 30 years prior to symptom onset. Late diagnosis occurs because older patients tend to minimize their complaints, considering them part of "normal" aging, and also in part due to the concerns associated to a diagnosis of dementia—fear of limited own independence, management of finances, inheritance issues within the family, withdrawl of driving license, etc.

Factors hindering prompt diagnosis of cognitive decline in advanced age:

- Understanding of memory impairment as normal in advanced age
- Lack of neurogeriatric education
- Ageism
- Fear of losing independence

Indeed, there are studies showing that cognitive decline is not systematically addressed in hospitalized patients, although it represents a major risk factor for geriatric syndrome development. From a geriatric perspective, the use of a Comprehensive Geriatric Assessment (CGA) foresees that the older person undergoes cognitive evaluation together with clinical, functional, and social examinations (Rubenstein 1984) (see also Chapter 26). By systematically including cognition among the domains explored in an older adult, problems related to poor detection of cognitive impairment and late diagnosis of dementia are overcome (Ellis 2011). Within the CGA, usually the Mini-Mental State Examination (MMSE) is used to screen multidomain cognitive performance (Folstein et al. 1975). However, as the MMSE is not easy to perform at general pactitioner (GP) settings (Folstein et al. 1975), many other tests are being implemented and validated including the clock-drawing test (Shulman et al. 2000). The evaluation of cognition can disclose a beginning deterioration and, even in the case of MCI diagnosis, it can pave the way to appropriate diagnosis. In case of suspected cognitive impairment at the CGA, comanagement with neurologist and performance of a broader test battery are highly recommended. However, the focus of the geriatric intervention will be on identification of all those factors able to influence and precipitate patient trajectories in advanced age (Tables 7.3 and 7.4).

Table 7.3 Frequent risk factors for cognitive deterioration in advanced age

Condition	CGA methodology used and intervention
Inappropriate medication and polypharmacy (e.g., anticholinergics, certain antipsychotics, sedatives, proton pump inhibitors, diuretics, and aggressive antihypertensive treatment in frailty)	Pharmacologic history collection as part of CGA; medication reconciliation in comanagement
Isolation and withdrawal	History collection and psychosocial assessment as part of CGA; care plan in comanagement
Depression	Geriatric Depression Scale (GDS) and psychosocial assessment as part of CGA; treatment in comanagement
Parkinsonism	Neurogeriatric examination as part of CGA and intervention in comanagement
Cardiovascular comorbidity and heart-brain syndrome	Clinical diagnosis and electrocardiography (ECG) as part of CGA; echocardiography and ejection fraction evaluation; treatment in comanagement
Secondary reversible causes of dementia	Clinical diagnosis, laboratory values, and treatment
Sensory impairment, mainly hearing disorders	Clinical diagnosis and whisper test as part of CGA; intervention
Dehydration and electrolyte disorders	Clinical diagnosis, laboratory values, and treatment (in comanagement if necessary)

Table 7.4 Frequent consequences of or factors frequently associated with poor health outcomes in older patients with (undetected) cognitive decline

Condition	Relative geriatric syndrome
Falls	Instability and immobility
Social withdrawal	Isolation and impoverishment
Depression and malnutrition	Inanition and immobility
Poor adherence to treatment plans	Drug-drug and drug-disease interactions and instability
System deterioration and inadequate drug prescription	Incontinence, dysphagia, iatrogenic complications, malnutrition, and instability
Institutional long-term care	Inanition and immobility
Delirium	Irritability and altered consciousness
Pressure sores	Immobility
Chronic pain	Irritability with agitation and aggression

Despite the fact that cognition is frequently negatively affected by inadequate clinical decisions and treatment plans (Campbell et al. 2016; Boccardi et al. 2017; Nørgaard et al. 2016; Ekdahl et al. 2016), it is not systematically addressed in hospitals (Mecocci et al. 2017) and up to 89% of older patients with a MMSE <24 might have been not diagnosed with cognitive impairment at the hospital admission occurred during the previous 12 months. However, proactive care targeting cognitive impairment might be extremely effective in very vulnerable multimorbid older patients, not only with respect to health outcomes, but also regarding quality of life and well-being. In addition, when progression of cognitive impairment and dementia is ascertained, patients and caregivers—the latter usually providing the largest part of the care to the cognitively impaired person—should be systematically allowed to be central authors of important decisions regarding prognosis of dementia, advanced care planning, and palliative, legal, and ethical issues (see Part VII and Part VIII).

For these reasons, and also for the socioeconomic impact of early recognizing cognitive decline up to very advanced age, cognition should be carefully considered when visiting older persons, especially those referring to the physicians for other reasons than cognitive impairment. In fact, while the sets of criteria to make a clinical diagnosis of dementia are under systematization since years (Table 7.1), diagnosis of MCI as the recognized prodromal stage of dementia (Albert et al. 2011) and its preceding phase, subjective cognitive impairment (SCI; Reisberg et al. 2008, "when the patient knows but the doctor does not know"), are highly challenging in older adults (the doctor does not ask, the patient does not complain and is not clearly ill). The *continuum* between cognitive integrity and dementia in advanced age (Fig. 7.2) is particularly challenging for the diagnosis of clinically significant cognitive impairment, since cutoff values, biomarkers, and neuropsychological assessments have limited significance and applicability in old-age subjects, particularly in the oldest old (Mattson et al. 2012).

7.3 Therapeutic and Management Challenges

As mentioned above, no cure is available against dementia, AD, MCI, and cognitive decline, as the latter occurs physiologically with increasing age, and the multifactoriality by nature of both conditions has impeded so far the identification of a single pathophysiological mechanism of dementia to be effectively targeted with drugs.

Nevertheless, symptomatic antidementia drugs such as acetylcholinesterase inhibitors (AChEIs) (donepezil, galantamine, and rivastigmine) and the N-methyl-D-aspartate (NMDA) receptor antagonist memantine have been developed in the last few decades; their use as well as the use of antipsychotics and sedatives need to occur in a very calibrated way (Boccardi et al. 2014). While antidementia drugs may delay nursing home placement alone or in combination and may reduce mortality for patients living in nursing homes and in the community (Gillette-Guyonnet et al. 2011; Rountree et al. 2013), decision making for therapeutical, including non-pharmacological options in older patients with dementia, is a major challenge for health practitioners, particularly in frail older patients with comorbidity and high mortality risk. There is a huge debate on the use of antidementia dugs (donepezil, galantamine, rivastigmine, and/or memantine) with respect to increase of survival in older community-dweller subjects with dementia and who are particularly frail (Riverol et al. 2011; Norstrom et al. 2011; Meguro et al. 2014; Gillette-Guyonnet et al. 2011; Schneider et al. 2014).

From a geriatric perspective, it is not surprising that data on effectiveness of antidementia drugs is conflicting. Antidementia drugs have been tested in randomized controlled trials (RCTs) typically excluding older multimorbid patients; however, these real-life patients are those who indeed are prescribed with drugs tested in the above-cited RCTs: in clinical experience, patients in need of antidementia treatment are very old, mostly women, suffering often from vascular comorbidities. Antidementia RCTs, in contrast, usually exclude very old, frail, multimorbid patients and include patients with dementia which might be not representative of the general population. In addition, the ameliorations shown in patients receiving treatment with respect to placebo in RCTs are based on non/patient-centered outcomes, such as prolongation of life (i.e., survival rather than disability-free life expectancy or healthy life expectancy) or mild score improvements at neuropsychological tests which clinical relevance might be questionable. In other words, there are no studies showing an undebated positive effect of a disease-modifying drug against AD neither using patient-centered endpoints such as quality of life and functionality. However, current antidementia remains a therapeutic option against dementia; research is urgently needed on the effect of therapeutic interventions—pharmacologic and non-pharmacologic—against dementia in oldest-old multimorbid patients, as these are the segments of the population most rapidly expanding (Boccardi et al. 2017; EU 2017).

In summary, the treatment of dementia is highly challenging because dementia among older community dwellers and hospitalized patients is underdiagnosed and undertreated; furthermore, treatment options available are symptomatic and have been or are being tested in patients: old-old male more than female, without substantial vascular morbidity—substantially different from those receiving prescription of antidementia in real life—oldest-old female with major cardiovascular comorbidity.

Age-Related Cognitive Decline and Dementia: A Synthetic Guide for Undergraduates and Residents in Geriatrics—Part I, General Considerations

- The number of patients in general and acute wards who also have some form of cognitive impairment is high and rising. Around a quarter of hospital beds accommodate someone with dementia, with the percentage rising to around 40% for patients over the age of 80, which share will rise to 12% of the European population by 2050 (EU Report 2017).
- Old-old and oldest-old adults are likely to suffer from some sort of cognitive decline, but due to the (1) heterogeneity and complexity of aging, (2) the *continuum* between aging and pathology in advanced age, and (3) the fact that mildly cognitively impaired older adults don't complain and doctors don't ask, cognitive impairment is poorly diagnosed, prevented, and treated.
- Old-old and oldest-old adults with and without cognitive impairment suffer from multimorbidity often including vascular pathology and disability and are at high risk of delirium, falls, and poor compliance with treatment and institutionalization. Investigation targeted the geriatric instability syndrome.
- Expect older adults with cognitive impairment. Ask targeted for forgetfulness. If the patient is cooperative, take your time to perform a screening such as the Short Portable Mental Status Questionnaire (see also Part VI, Chapter 1) or the Mini-Mental State Examination (http://www.dementiatoday.com/wp-content/uploads/2012/06/MiniMentalStateExamination.pdf). Although cutoffs for psychometric screenings must be used carefully especially in advanced age, do consider further assessments by a MMSE score of 24/30 for persons with lower and of 27/30 for persons with higher education. Do consider to perform the clock-drawing test or the Montreal Cognitive Assessment (MoCA) (www.mocatest.org). Train on the performance of both. If the older patient scores poorly, (1) do refer to broader neuropsychology and comanage with neurologist; (2) take your time for adequate history collection with the caregiver; (3) investigate on medication, comorbidities, and other potentially reversible causes; (4) inform patients and/or caregivers on ethical issues, prognosis, power of lifestyle, and vascular preventive strategies; and (5) comanage with the neurologist and carefully consider the indication for medication with antidementia.
- If you are not sure why your newly admitted hospitalized older patient is confused, do target the differential diagnosis between delirium and dementia: talk to accompanying person or caregiver and screen for delirium using for instance the 4 'A' test (MacLullich, www.the4at.com). Do consider, respectively, for delirium and dementia (1) subacute vs. the insidious symptomatic; (2) changing vs. clear consciousness; and (3) frequent vs. stage-dependent presence of hallucinations and alteration of concentration, orientation, sleep, and psychomotor activity.

Age-Related Cognitive Decline and Dementia: A Synthetic Guide for Undergraduates and Residents in Geriatrics—Part II, the ABC of Clinical Decision Making Regarding Cognition in Older Patients

A. Is the patient cognitively impaired?

Address orientation for person and situation by asking name, birthdate, address, and reason for seeking medical advice (rather than abruptly examining spatial and temporal orientation or recall of three objects). Encourage caregiver presence, and, if the visit takes place under caregiver's initiative, interview separately. Ask patient respectfully about presence of forgetfulness. Ask politely to perform some evaluation. Ensure that patient has his/her eyeglasses, slept, and ate/drank well before the test. Perform the clock-drawing test after training and performing under supervision. Avoid pressure of time. If you are trained enough and have time for appropriate examination, consider MMSE or MoCA performance. Encourage the patient to give his/her best, without providing feedback. When scoring the neuropsychological tests, do acknowledge your level of experience and run-in effect. Ask for advice. Do score upon consideration of social background, years of education, therapeutic drug plan, presence of current stress factors (disease, loss of a family member, fatigue), depressive symptoms, extrapyramidal signs, sensory (patient does not hear and see well, suboptimal hearing, and visual correction) and motor impairment (tremor, rigidity), absence of cutoff values with advancing age, loss of predictive value of biomarkers, and assessments with advancing age. Mark on your protocols if some of the domains could not be tested and score consequently (i.e., MMSE score achieved on a total of 28 points, instead of 30 if the patient could not write the sentence and redraw the figure).

B. If the patient is cognitively impaired, do consider severity according to *functions* and comanage with neurologist, neurogeriatrician, speech therapist, physiotherapist, and other specialists and health practitioners according to disease type (AD, vascular dementia, frontotemporal dementia, mixed dementia, AD-Parkinson dementia, pseudodementia, etc.) and severity (MCI and mild dementia vs. moderate and severe dementia). Focus on judgment abilities, multimorbidity, multidimensional prognosis, and shared decision making. Upon severity—the continuum from brain aging to MCI to severe dementia—shift your decisions from primary to secondary prevention strategies using a combination of the following:
   1. Lifestyle strategies including balanced nutrition (encourage adherence to Mediterranean-like diets), regular physical training, structured cognitive exercise, leisure activities, and hobbies supporting well-being and quality of life
   2. Medication reconciliation targeting polypharmacy, aggressive antihypertensive treatment, anticholinergics, and sedatives

3. Management of comorbidities such as depression; Parkinson's disease; and cardiovascular disease to prevent heart-brain syndrome
4. Drug strategies against dementia to maintain functional level and slower progression considering that in advanced age common side effects of these drugs (vertigo, somnolence, gastrointestinal symptoms) might overcome the benefits
5. Drug strategies against neuropsychiatric symptoms, preferably citalopram as antidepressant and risperidone/quetiapine as neuroleptics, considering that side effects like extrapyramidal symptoms and hypokinesia can be extremely impairing in advanced age
6. Music, dance therapy, reality orientation therapy, and organized arts activities for cognitively impaired older subjects
7. Addressing of caregiver burden including information on supporting associations, daycare options, etc.
8. Information on ethic, legal issues, advanced care planning, and palliative options including adapted management of chronic pain
9. Prevention of falls, immobility, decubitus, and delirium

C. Adopt multidimensional strategies but personalize them. Do consider that most of the above-cited actions are not as time expensive as usually considered but will exert extremely positive effects on patient's and caregiver's quality of life. Do not apply the same counseling to every patient in the same way. At the socioeconomic level, do consider that better care is always cheaper at the end.

References

Albert MS, DeKosky ST, Dickson D, Dubois B, Feldman HH, Fox NC, Gamst A, Holtzman DM, Jagust WJ, Petersen RC, Snyder PJ, Carrillo MC, Thies B, Phelps CH. The diagnosis of mild cognitive impairment due to Alzheimer's disease: recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease. Alzheimers Dement. 2011;7(3):270–9.

Alzheimer A, Stelzmann RA, Schnitzlein HN, Murtagh FR. An English translation of Alzheimer's 1907 paper, "Uber eine eigenartige Erkankung der Hirnrinde". Clin Anat. 1995;8(6):429–31.

Boccardi V, Baroni M, Paolacci L, Ercolani S, Longo A, Giordano M, Ruggiero C, Mecocci P. Anticholinergic burden and functional status in older people with cognitive impairment: results from the regal project. J Nutr Health Aging. 2017;21(4):389–96.

Boccardi V, Comanducci C, Baroni M, Mecocci P. Of Energy and Entropy: The Ineluctable Impact of Aging in Old Age Dementia. Int J Mol Sci. 2017;18(12).

Drachman DA. Aging and the brain: a new frontier. Ann Neurol. 1997;42:819–28.

Drachman DA. Aging of the brain, entropy, and Alzheimer disease. Neurology. 2006;67(8):1340–52.

Drachman DA. Rethinking Alzheimer's disease: the role of age-related changes. Curr Neurol Neurosci Rep. 2007;7(4):265–8.

Drachman DA. Nature or nurture: education and the trajectory of declining brain function with age and Alzheimer disease. Neurology. 2008;70(19 Pt 2):1725–7.

Ekdahl AW, Odzakovic E, Hellström I. Living unnoticed: cognitive impairment in older people with multimorbidity. J Nutr Health Aging. 2016;20(3):275–9.
Ellis G, Whitehead MA, Robinson D, O'Neill D, Langhorne P. Comprehensive geriatric assessment for older adults admitted to hospital: meta-analysis of randomised controlled trials. BMJ. 2011;343:d6553.
Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res. 1975;12(3):189–98.
Förstl H, Perneczky R, Karenberg A, Diehl-Schmid J, Lautenschlager NT. Personality in old age. Nervenarzt. 2009;80(11):1275–82.
Gillette-Guyonnet S, Andrieu S, Nourhashemi F, Gardette V, Coley N, Cantet C, Gauthier S, Ousset PJ, Vellas B, REAL.FR Study Group. Long-term progression of Alzheimer's disease in patients under antidementia drugs. Alzheimers Dement. 2011;7(6):579–92.
Knopman DS, Beiser A, Machulda MM, Fields J, Roberts RO, Pankratz VS, Aakre J, Cha RH, Rocca WA, Mielke MM, Boeve BF, Devine S, Ivnik RJ, Au R, Auerbach S, Wolf PA, Seshadri S, Petersen RC. Spectrum of cognition short of dementia: Framingham Heart Study and Mayo Clinic Study of Aging. Neurology. 2015;85(19):1712–21.
Mattsson N, Rosén E, Hansson O, Andreasen N, Parnetti L, Jonsson M, Herukka SK, van der Flier WM, Blankenstein MA, Ewers M, Rich K, Kaiser E, Verbeek MM, Olde Rikkert M, Tsolaki M, Mulugeta E, Aarsland D, Visser PJ, Schröder J, Marcusson J, de Leon M, Hampel H, Scheltens P, Wallin A, Eriksdotter-Jönhagen M, Minthon L, Winblad B, Blennow K, Zetterberg H. Age and diagnostic performance of Alzheimer disease CSF biomarkers. Neurology. 2012;78(7):468–76.
McKhann G, Drachman D, Folstein M, Katzman R, Price D, Stadlan EM. Clinical diagnosis of Alzheimer's disease: report of the NINCDS-ADRDA Work Group under the auspices of Department of Health and Human Services Task Force on Alzheimer's Disease. Neurology. 1984;34(7):939–44.
Meguro K, Ouchi Y, Akanuma K, Meguro M, Kasai M. Donepezil can improve daily activities and promote rehabilitation for severe Alzheimer's patients in long-term care health facilities. BMC Neurol. 2014;14:243.
Nørgaard A, Jensen-Dahm C, Gasse C, Hansen HV, Waldemar G. Time trends in antipsychotic drug use in patients with dementia: a nationwide study. J Alzheimers Dis. 2016;49(1):211–20.
Pavlopoulos E, Jones S, Kosmidis S, Close M, Kim C, Kovalerchik O, Small SA, Kandel ER. Molecular mechanism for age-related memory loss: the histone-binding protein RbAp48. Sci Transl Med. 2013;5(200):200ra115.
Polidori MC, Schulz RJ. Nutritional contributions to dementia prevention: main issues on antioxidant micronutrients. Genes Nutr. 2014;9(2):382.
Reisberg B, Prichep L, Mosconi L, John ER, Glodzik-Sobanska L, Boksay I, Monteiro I, Torossian C, Vedvyas A, Ashraf N, Jamil IA, de Leon MJ. The pre-mild cognitive impairment, subjective cognitive impairment stage of Alzheimer's disease. Alzheimers Dement. 2008;4(1 Suppl 1):S98–S108.
Riverol M, López OL. Biomarkers in Alzheimer's disease. Front Neurol. 2011;2:46.
Rountree SD, Atri A, Lopez OL, Doody RS. Effectiveness of antidementia drugs in delaying Alzheimer's disease progression. Alzheimers Dement. 2013;9(3):338–45.
Rubenstein LZ. Geriatric imperative: geriatric assessment programs. J Med Soc N J. 1984;81(8):651–4.
Shulman KI. Clock-drawing: is it the ideal cognitive screening test? Int J Geriatr Psychiatry. 2000;15(6):548–61.
Winblad B, Amouyel P, Andrieu S, Ballard C, Brayne C, Brodaty H, Cedazo-Minguez A, Dubois B, Edvardsson D, Feldman H, Fratiglioni L, Frisoni GB, Gauthier S, Georges J, Graff C, Iqbal K, Jessen F, Johansson G, Jönsson L, Kivipelto M, Knapp M, Mangialasche F, Melis R, Nordberg A, Rikkert MO, Qiu C, Sakmar TP, Scheltens P, Schneider LS, Sperling R, Tjernberg LO, Waldemar G, Wimo A, Zetterberg H. Defeating Alzheimer's disease and other dementias: a priority for European science and society. Lancet Neurol. 2016;15(5):455–532.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_7

Delirium

8

Alasdair M.J. MacLullich

Abstract

Delirium is an acute (hours, days), severe deterioration in mental functioning mostly occurring in the context of medical illness, trauma, drugs, or surgery. It affects at least one in five hospitalised older patients. Delirium is linked with multiple adverse outcomes including increased length of stay, new institutionalisation, falls, medical complications, and higher mortality. It also causes considerable patient and carer distress. Detection involves bedside assessment of mental status, and informant history. Tools such as the 4AT can assist this. Treatment involves first checking for life-threatening illness, then treating possible causes, optimising conditions for brain recovery, treating distress, preventing or reducing complications, communicating the diagnosis to patients and carers, rehabilitating with mobilising and cognitive engagement, and ensuring appropriate follow-up. The risk of delirium can be reduced through avoiding physiological derangement, constipation, psychological distress, and sleep deprivation.

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_8) contains supplementary material, which is available to authorized users.

A.M.J. MacLullich
Edinburgh Delirium Research Group, Geriatric Medicine, University of Edinburgh, Edinburgh, Scotland
e-mail: a.maclullich@ed.ac.uk

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*, Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_8

Learning Objectives

By the end of the chapter, the reader will be able to

- Be aware of the fact that delirium is a common, serious, and often undetected syndrome
- Know that delirium care is complex, involving first checking for threat to life, then finding and treating acute causes, optimising brain function, treating distress, and avoiding complications
- Make a formal diagnosis and communicate this to the patient and families
- Address background modifiable predisposing factors and avoid in-hospital risks such as dehydration in order to reduce the risk of delirium

8.1 Definition and Epidemiology of Delirium

Delirium is an acute, severe deterioration in mental functioning, mostly triggered by acute medical illness, trauma, drugs, or surgery. People with delirium show multiple cognitive abnormalities, particularly attentional deficits. There are also non-cognitive features, such as altered level of arousal (drowsiness or agitation), psychosis including hallucinations and delusions, and changes in mood. Delirium often causes distress because of disorientation and psychosis. The onset of delirium is typically hours to days. Delirium can fluctuate in severity, meaning that the clinical picture can change over the course of a day or even during the bedside assessment. Normal cognitive functioning on a single assessment does not rule out delirium.

Delirium affects at least 15% of hospital patients. Older people have a higher prevalence (20–25%). Rates following trauma, in intensive care units, and in dying patients are 30–70%. Most delirium lasts for a small number of days, but in around 20% episodes persist for weeks or months. *Persistent delirium* must not be missed because it can be mistaken for dementia, yet unlike most dementia it can resolve.

Delirium is mostly triggered by factors outside of the central nervous system. These include acute medical illness, trauma (e.g. hip fracture), drugs, drug withdrawal, and surgery. Drugs commonly implicated in delirium include

- Anticholinergics
- Opioids
- Benzodiazepines
- Antibiotics

Primary brain disorders such as stroke and traumatic brain injury can also cause delirium. In 20% of cases no acute causes can be identified. Several predisposing factors increase the risk of delirium (Table 8.1).

The pathophysiology of delirium is not well understood. There are likely many possible mechanisms. In some circumstances, such as with significant physiological change (hypoxia, hypercapnia, hypoglycaemia), or drug intoxication, there is a clear causal link. However, it is not yet known how other common precipitants such as urinary tract infection lead to delirium.

8.2 Diagnosis of Delirium

Making a diagnosis of delirium depends on (a) presence of certain mental status abnormalities, and (b) determining that these abnormalities have an acute onset.

Features of delirium:

- Acute onset, with features arising over hours or a small number of days
- Fluctuations occurring over varying time scales from a few seconds to several hours
- Inattention (ranging from being barely responsive to milder forms such as being unable to maintain concentration during conversation or cognitive tests over periods more than of 10–20 seconds)
- Altered arousal (drowsiness or hypervigilance, or a mixture)
- Other cognitive deficits, e.g. in memory (these deficits also occur commonly in dementia)
- Hallucinations (usually visual, present in around 15% of patients)
- Delusions (often paranoid, present in around 15% of patients)
- Altered mood (usually anxiety or low mood)
- Altered sleep-wake cycle

The sources of information used are bedside assessment and, when available, informant history. Bedside assessment involves a combination of *observation*, *interview*, and *cognitive testing*. The first step is to determine the level of arousal. Start by introducing yourself and then ask the patient to state their name and address. If the patient has reduced level of arousal (but is not in a coma) this is virtually diagnostic of delirium; this lack of responsiveness is considered as "severe inattention" according to DSM-5. Reduced arousal is nearly always acute, and so is suggestive of delirium. If the patient can speak, then a brief interview covering how they are feeling and their understanding of what is happening to them allows basic assessment of attention, orientation and awareness, mood, and distress.

After interview, proceed to cognitive testing with simple orientation questions and a test of attention such as asking the patient to state the months of the year in backwards order. There are no agreed thresholds for these tests in making a diagnosis. Rather, the tests help to assess possible inattention; also, recording of responses allows assessment of change.

The next stage is to ask questions to elicit psychotic features. Ask specifically about hallucinations, and attempt to uncover delusions by asking if the patient is concerned or frightened about anything. It is essential to ask explicitly about psychotic features because mostly patients do not spontaneously speak about these.

Determining if any abnormalities are of acute onset may be done in several ways, including the patient's own account, staff or carers, case notes, or one's own knowledge of the patient. Note that an informant history is often not available, especially at initial presentation. Certain mental status abnormalities, namely reduced level of arousal, marked inattention, agitation, and psychosis (especially with visual hallucinations), are strong indicators of delirium. If these features are present but no informant history is available, it is safer to make a provisional diagnosis of delirium in advance of obtaining the informant history.

The brief delirium assessment tool, the 4 "A"s test or 4AT (Fig. 8.1; see www.the4AT.com), provides a simple and structured method of delirium assessment. There are several other delirium instruments available (De and Wand 2015); these differ in purpose, duration, and level of training required (De and Wand 2015).

The differential diagnosis includes

- Depression
- Psychotic disorders
- Dementia (including sundowning)

It is mostly possible to tell these apart from delirium by paying close attention to onset, fluctuation, and time course.

Table 8.1 Predisposing factors for delirium in adults

Old age
Male sex
Cognitive impairment
Hearing impairment
Visual impairment
Depression
Malnourishment
Chronic kidney disease
Other medical comorbidities
Prior history of delirium
Alcohol misuse
Polypharmacy

8.3 Treatment of Delirium: A Challenge

Treatment is complex and involves several different elements (Table 8.2). On first presentation or if there is new deterioration, delirium should always be considered as potentially indicating a life-threatening emergency. Check for severe illness, physiological disturbance such as hypotension or hypercapnia, and drug intoxication (e.g. with opioids). Then, assess systematically for acute causes. These include infections, trauma, heart failure, acute kidney injury, drug intoxication, and drug withdrawal. Often there is more than one cause in an individual patient, for example, a patient with pneumonia, acute kidney injury, and opioid toxicity. Primary brain causes such as stroke, subdural haemorrhage, and tumours are relatively uncommon, and brain imaging is usually unrevealing; however, with a history of head injury, with focal neurological features, or with persistent delirium, imaging should be considered. Similarly, lumbar puncture or electroencephalography (EEG) may be considered if specific features of brain infection or seizures are present. In parallel with the treatment of causes, optimise conditions for brain recovery by correcting physiological and electrolyte disturbances, treating dehydration, treating constipation, providing a stable and calm environment, and stopping or reducing drugs which may be adversely affecting the brain (e.g. anticholinergics). As part of

CIRCLE

[1] ALERTNESS

This includes patients who may be markedly drowsy (eg. difficult to rouse and/or obviously sleepy during assessment) or agitated/hyperactive. Observe the patient. If asleep, attempt to wake with speech or gentle touch on shoulder. Ask the patient to state their name and address to assist rating.

Normal (fully alert, but not agitated, throughout assessment)	0
Mild sleepiness for <10 seconds after waking, then normal	0
Clearly abnormal	4

[2] AMT4

Age, date of birth, place (name of the hospital or building), current year.

No mistakes	0
1 mistake	1
2 or more mistakes/untestable	2

[3] ATTENTION

Ask the patient: "Please tell me the months of the year in backwards order, starting at December." To assist initial understanding one prompt of "what is the month before December?" is permitted.

Months of the year backwards	Achieves 7 months or more correctly	0
	Starts but scores <7 months / refuses to start	1
	Untestable (cannot start because unwell, drowsy, inattentive)	2

[4] ACUTE CHANGE OR FLUCTUATING COURSE

Evidence of significant change or fluctuation in: alertness, cognition, other mental function (eg. paranoia, hallucinations) arising over the last 2 weeks and still evident in last 24 hrs

No	0
Yes	4

4 or above: possible delirium +/- cognitive impairment
1-3: possible cognitive impairment
0: delirium or severe cognitive impairment unlikely (but delirium still possible if [4] information incomplete)

4AT SCORE ☐

Fig. 8.1 The 4AT. See www.the4AT.com for more information and for several translated versions

Table 8.2 Eight elements of delirium treatment

1. Urgent check for threat to life
2. Identify and treat the causes; optimise conditions for recovery
3. Detect and treat agitation/distress
4. Prevent/treat complications
5. Communicate diagnosis (patient, carers)
6. Monitoring progress
7. Rehabilitation during delirium
8. Consider dementia, plan appropriate follow-up

the assessment pay specific attention to distress and agitation (Partridge et al. 2013). These can be caused by pain, thirst, urinary retention, other physical causes, or psychotic or affective disturbance occurring as part of the delirium itself. Treat any causes, provide psychological support (involvement of family can be very helpful), and consider use of antipsychotic drugs such as risperidone 0.25 mg twice per day (1—2 days of treatment is usually enough) if nonpharmacological measures do not

work or if the disturbance is very severe and distressing. In a minority of patients at severe risk to themselves or others because of agitation, rapid treatment with parenteral antipsychotic such as haloperidol 0.5 mg intramuscularly is needed alongside nonpharmacological measures.

Delirium has several complications including falls and pressure sores. Specific risks should be explicitly identified for each patient, and appropriate steps taken. In all cases of delirium, communicate the diagnosis to family members and when appropriate the patient. An information leaflet can be very helpful. Rehabilitation during delirium has not been well studied, but many experts believe that general rehabilitation including promoting mobility, cognitive engagement, and so on is useful. It is important to monitor for recovery of the delirium. This can be done through tracking the patient's symptoms daily, for example altered level of arousal or delusions. Many patients with delirium also have dementia, and in some cases this has never been diagnosed. Formal diagnosis of dementia during delirium or as part of the acute episode is challenging. However, an informant questionnaire such as the Informant Questionnaire for Cognitive Decline in the Elderly (http://www.alz.org/documents_custom/shortiqcode_english.pdf) can help to identify patients who should be considered for a more formal diagnostic process for dementia in the weeks that follow resolution of the delirium (see also Chapter 7). Additionally, some patients who have experienced distress during the episode of delirium may need counselling and support.

Risk reduction: skilled and organised care of patients at high risk for delirium can substantially reduce this risk (Siddiqi et al. 2016). Much of this involves general good care such as avoiding physiological derangement including dehydration and hypoxia, avoiding unnecessary drugs, avoiding constipation, early mobilisation, reducing psychological stress by providing orientation and a calm environment, rapidly treating medical illness, correcting sensory impairments where possible, and encouraging natural sleep. Most experts do not believe that prophylactic pharmacological treatment has a role in delirium risk reduction.

Outcomes: delirium is associated with many poor outcomes. Patients are at higher risk of acute complications such as falls, aspiration pneumonia (with hypoactive delirium), immobility, dehydration, malnourishment, inadequate analgesia, and pressure sores. Behavioural disturbance in delirium can also compromise delivery of medical care (drugs, fluids, oxygen, investigations) and routine rehabilitation. Patients with delirium have longer stay, higher rates of new institutionalisation, and higher mortality. There is also a strong statistical association between episodes of delirium and risk of future dementia as well as progression of dementia, though the mechanisms of this are unclear.

Diagnosis and documentation: formal diagnosis and documentation of delirium are essential in providing adequate care. The diagnosis prompts a systematic search for acute causes (instead of assuming that "drowsiness" is due to drug side effects or even old age), allowing these to be addressed. It also allows for optimisation of modifiable risk factors, and active care of the patient including engagement

with staff and family members, tailored rehabilitation, and active measures to reduce the risk of complications such as falls. Another critical reason for making the diagnosis is to assess for distress and to take specific action. Additionally, making the diagnosis allows this to be communicated to the patient and to the family. Not providing this diagnosis to the family, who are often greatly distressed by the episode of delirium in their loved one, is a serious and unnecessary failure of care.

References

De J, Wand APF. Delirium screening: a systematic review of delirium screening tools in hospitalized patients. Gerontologist. 2015;55:1079e99.

Partridge JS, Martin FC, Harari D, Dhesi JK. The delirium experience: what is the effect on patients, relatives and staff and what can be done to modify this? Int J Geriatr Psychiatry. 2013;28:804e12. See www.europeandeliriumassociation.com

Siddiqi N, Harrison JK, Clegg A, et al. Interventions for preventing delirium in hospitalised non-ICU patients. Cochrane Database Syst rev. 2016;3:CD005563.

Suggested Reading

See www.europeandeliriumassociation.com for more information and links.

Falls

9

Reto W. Kressig and Stephanie A. Bridenbaugh

Abstract

Falls are a common occurrence among older adults and considered a symptom of frailty. The prevalence increases with age and the consequences can be devastating. Most falls have multifactorial causes; thus, fall prevention requires multifactorial fall risk assessment as well as multifactorial interventions. With the ever-increasing population of older adults, fall prevention is a crucial issue, both for the individual and the society.

Learning Objectives

By the end of the chapter, the reader will be able to

- Know the most common risk factors for falls and how to assess them
- Recognize a fall as a symptom of frailty
- Be familiar with successful interventions for fall risk/rate reduction
- Understand the consequences of a fall for the individual and the society

Electronic Supplementary Material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_9) contains supplementary material, which is available to authorized users.

R.W. Kressig (✉) • S.A. Bridenbaugh
University Center for Medicine of Ageing, Felix Platter Hospital,
Burgfelderstrasse 101, 4002 Basel, Switzerland
e-mail: RetoW.Kressig@fps-basel.ch; Stephanie.Bridenbaugh@fps-basel.ch

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_9

9.1 Introduction

Walking difficulties and falls are prevalent among older adults and the incidence of each one increases with age. Among older adults living in the community, 30% of those aged 65 and older and 50% of those aged 80 and older fall each year; 60% of care facility residents fall annually. Half of those who fall do so repeatedly. Falls are the leading cause of unintentional injury and hospitalization in people aged 65 years and older. 5–10% of falls result in a fracture or traumatic head injury. 20–30% of fallers suffer from moderate or severe injuries that reduce mobility and functional independence and increase their risk of a premature death. The 12-month risk of mortality after being hospitalized for a fall is approximately 50%. Falling without serious injury increases the risk of skilled nursing facility placement threefold after accounting for cognitive, psychological, social, functional, and medical factors; a serious fall injury increases the risk tenfold.

9.2 Etiology of Falls in Older Adults

The coordinated interplay of several organs and body systems is required for the planning, execution, and control of movement that makes safe gait possible. A pathologic alteration in one area or an imbalance in one system can have a detrimental effect on gait and lead to falls, injury, or death. Age-related changes, such as decreased muscle strength and decreased sensory input (i.e., proprioception, vision, and hearing), impair systems responsible for postural control (Fig. 9.1). These deficits reduce the functional reserve of these and of compensating systems.

In frailty, this cumulative decline of function in physiological systems is accelerated and homeostatic mechanisms start to fail (Clegg et al. 2013). Frailty is a syndrome of decreased reserves, increased vulnerability to internal and external stressors and poor resolution of homeostasis after a stressor event which increases the risk of adverse health outcomes (Clegg et al. 2013). A fall in an older adult can be an expression of physical frailty. “Spontaneous falls occur in more severe frailty when vital postural systems (vision, balance, and strength) are no longer consistent with safe navigation through undemanding environments” (Clegg et al. 2013).

Most falls in older adults have a multifactorial etiology caused by the interaction of several risk factors. The risk of falling increases with the number of risk factors present and with age. Common fall risk factors are listed in Table 9.1.

Modifications of risk factors in the home can improve functional independence, yet studies show inconsistent results regarding the efficacy in fall rate reduction. Home assessment and modifications are best performed by physical or occupational therapists; should be offered to people with a previous fall history, severe vision problems, or after discharge from hospital; and should be one aspect of a multifactorial intervention (Panel 2011).

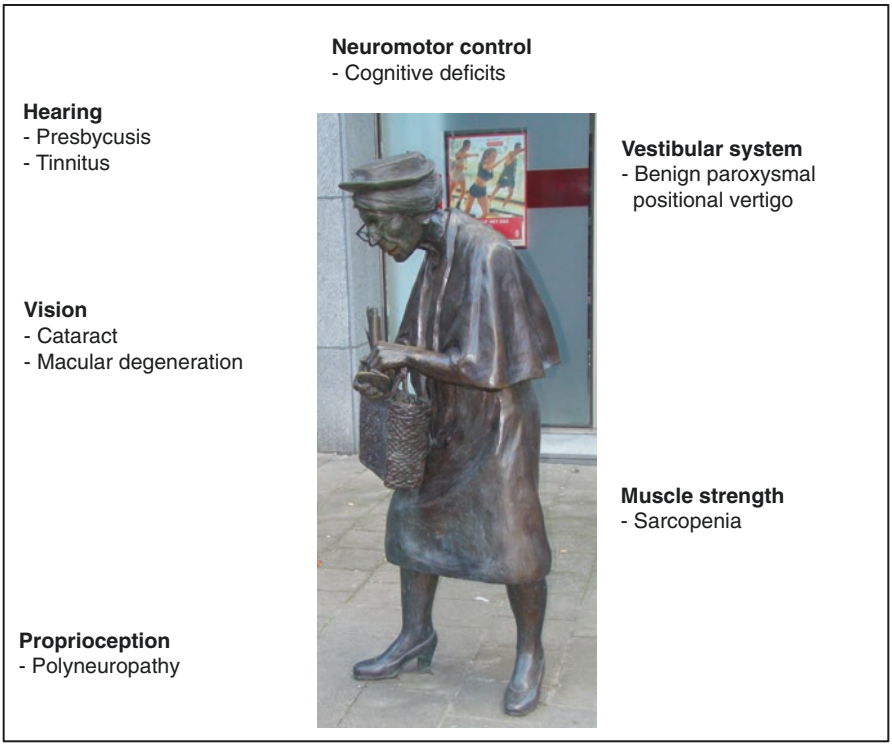


Fig. 9.1 Involved systems for postural control with common age-related deficits. Figure modified (Lord and Menz 2001). Statue of Madame Chapeau by Tom Frantzen at the Grand Place in Brussels; photo taken by the author SAB

Table 9.1 Common fall risk factors

Intrinsic	Extrinsic
Muscle weakness	Polypharmacy
Walking and/or balance difficulties	Psychotropic, antiarrhythmic, diuretic medications
Previous fall	Dim or glaring lighting
Fear of falling	Lack of stair handrails
Poor vision	Poor stair design
Medical conditions such as osteoarthritis, Parkinson's disease, paralysis due to stroke, urinary incontinence, depression, etc.	Tripping hazards such as raised thresholds, rugs, damaged flooring, or obstacles on the floor
Cognitive impairment	Lack of bathroom rails or grab bars
Advanced age	Slippery or uneven surfaces
Malnutrition	Improper use of a walking aid
Vitamin D deficiency	Ill-fitting or inappropriate footwear
Orthostatic hypotension	Eyeglasses with multifocal lenses

9.3 Multifactorial Risk Assessment

Because fall etiology is often multifactorial, a multifactorial fall risk assessment is needed. What and how much you will be able to evaluate will depend on your patient, the situation, and your resources. The information listed below is not a comprehensive checklist; rather, a listing of important points and examples.

9.3.1 History Taking

- Subjective changes in gait or balance are often accepted as a normal consequence of aging and are not spontaneously mentioned. One of the most important screening tests is to regularly ask (at least annually and after each hospital stay) adults aged 65 years or older the following questions:
  - Have you had any falls or near falls in the past year/since I last saw you?
  - Are you worried about falling?
  - Has anything changed in your walking or balance?
- If falls have occurred, ask about frequency, circumstances, symptoms, and injuries: wrist fractures often result from falling forward or backward onto an outstretched hand, hip fractures are often due to sideways falls, facial injuries may be indicative of syncope, and light-headedness upon standing may be due to postural hypotension.
- Ask about mobility and performing activities at home (Do you hold on to walls and furniture for balance? Is going up/downstairs or in/out of the bathtub difficult (banister/rails needed) for you? Do you stumble on thresholds or rugs?). A home safety assessment of extrinsic risk factors may be indicated.
- Has behavior changed because of mobility concerns, for example, not leaving home in evenings?
- Changes in vision (cataract, glaucoma, macular degeneration)? New glasses (increased fall risk associated with new multifocal glasses)?
- Ask about positional dizziness (orthostatic hypotension? benign paroxysmal positional vertigo?) or feelings of dizziness when walking in a dim or dark environment (polyneuropathy?).
- Feelings of undirected dizziness, light-headedness, or insecurity while walking often represent walking difficulties in dual- or multitask situations and may be the first clinical signs of mobility and/or cognitive disorders.
- Note the presence of fall risk factors and if there has been a change in these since the previous visit.
- Ask about unintentional weight loss, appetite, diet, and protein intake.

9.3.2 Clinical Findings

In addition to a general medical and neurological physical examination, certain clinical findings are particularly helpful in identifying mobility difficulties, a selection of which is listed here.

- Watch and listen how your patient stands up and walks.
- If a walking aid is used, check that it is properly adjusted and used correctly. If you are unsure, refer to a physical or an occupational therapist.
- Measure visual acuity.
- If falls are denied but injuries such as bruises, scrapes, and scabs are seen during the physical exam then ask how those injuries were sustained.
- Measure proprioception in the lower extremities.
- Inspect feet and footwear.
- Check teeth and the fitting of dental prosthesis. Tooth loss is associated with slow walking speed, functional decline, and falls.

9.3.3 Laboratory Values

In addition to a routine chemistry panel and complete blood count analysis, have the serum 25-hydroxyvitamin D level measured. Low serum 25-hydroxyvitamin D levels are associated with slow walking speed, falls, and fractures (Panel 2011).

9.4 Screening Instruments

- Test cognition with a standardized screening instrument that includes executive function, such as the MoCA (Montreal Cognitive Assessment). If the MMSE (Mini Mental State Examination) is used, then the clock-drawing test as a measure of executive function should be included (see also Chapter 7).
- Screen nutritional status with standardized instruments such as
  - MNA (Mini-Nutritional Assessment full form) or MNA-SF (Short Form)
  - NRS-2002 (Nutritional Risk Screening)
  - MUST (Malnutrition Universal Screening Tool) (see also Chapter 24)

9.5 Assessment Instruments

Each of the instruments briefly described below are quick and clinically feasible assessments which can be used in various clinical settings to determine which older patients may have an underlying gait disturbance and require a more in-depth functional gait assessment (see also Chapters 9, 20 and 26).

9.5.1 Timed Up and Go Test (TUG)

The real (actual) Timed Up and Go Test (TUGr) assesses general mobility in older adults. The time needed to stand up from a chair, walk 3 m at a normal, self-selected pace to a mark on the floor, walk back to the chair, and sit down is measured in seconds. Test times longer than 14 s are indicative of mobility disorders. Retrospective studies have identified a significant association between TUG test times and a past history of

falls, yet the ability of TUG test times to predict future falls remains controversial (a video of this assessment instrument can be seen in the online supplementary material).

9.5.2 Imagined Timed Up and Go Test (TUGi)

After the TUGr, it is often useful to assess the imagined Timed Up and Go Test (TUGi) time. For this test, the older adult remains seated, imagines himself/herself performing the TUGr, and says "stop" when, in his/her imagined performance, he/she sat back down. The time is measured in seconds.

Large discrepancies between TUGr and TUGi times are associated with lower scores of cognitive function and with decreased gait speeds under dual-task conditions and may represent disturbed higher level control of locomotion which can cause unsafe gait (Bridenbaugh et al. 2013) (a video of this assessment instrument can be seen in the online supplementary material).

9.5.3 Dual-Task Timed Up and Go Test (TUG-DT)

The TUG test can also be performed as a dual-task (TUG-DT) test. This can be a motor dual task, whereby a cup of water is carried while performing the TUGr, or a cognitive dual task, such as performing serial subtractions by twos or by threes out loud while executing the TUGr. Significant time differences between the TUGr and TUG-DT indicate possible cognitive impairment, which is a fall risk factor. Study results have not consistently shown that the TUG-DT can be used to predict falls in frail or in vigorous adults (a video of this assessment instrument can be seen in the online supplementary material).

9.5.4 Gait Speed

Gait speed is an important indicator of health and functional mobility. Steady-state gait (without acceleration and deceleration phases) over a straight distance of at least 4 m should be measured with a stopwatch. A safe, normal walking speed for an older adult is considered to be at least 1 m/s. Those who walk slower have an increased incidence of falls, hospitalization, disability, and being institutionalized compared to people of the same age with a normal gait speed (Bridenbaugh and Kressig 2015). In older adults, every 0.1 m/s reduction in gait speed is associated with a 12% increase in mortality.

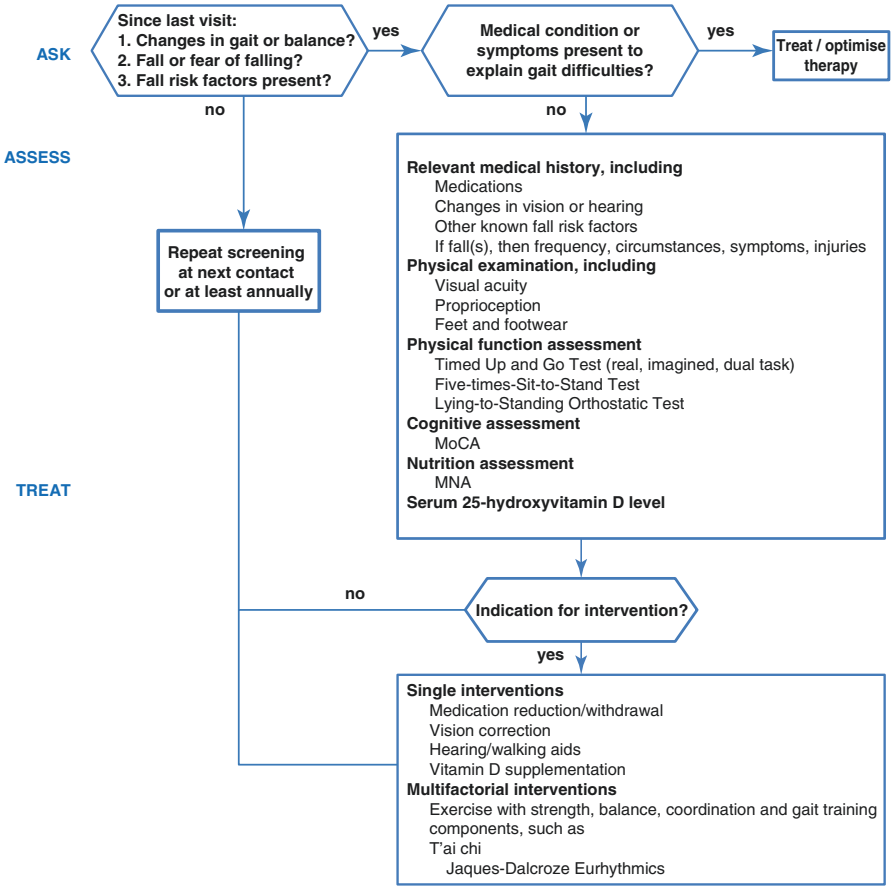
9.5.5 Five Times Sit-to-Stand Test

In this common clinical assessment of lower body strength and functional fall risk, older adults hold their arms folded across their chests and rise from a seated position in a chair to a standing position as quickly as possible for five repetitions. A test time longer than 12–15 s has been associated with a higher risk of falling.

9.5.6 Lying-to-Standing Orthostatic Test

Orthostatic hypotension (OH), also known as postural hypotension, is a fall risk factor and its prevalence increases with age. It is often a result of dehydration, concomitant medications, and/or autonomic neuropathy (Panel 2011). The commonly used lying-to-standing orthostatic test (active standing) is preferable to a tilt test (passive standing) for identifying OH. Blood pressure is measured after the patient has been lying supine in a quiet environment for at least 5 min, immediately upon standing and then repeatedly while standing for a minimum of 2 min. It is generally agreed that a systolic drop of 20 or a diastolic drop of 10 mmHg is diagnostic of OH.

9.5.7 Algorithm for How to Assess an Older Patient with Falls



9.6 Interventions

Just as fall etiology and fall risk assessment are often multifactorial, fall treatment and prevention require multifactorial measures. Although single interventions such as vision correction, vitamin D supplementation (800 international units (IU) vitamin D daily is recommended for older adults for the prevention of falls and fractures), gradual withdrawal of psychotropic medications, and home safety measures to reduce extrinsic fall risks are all important, evidence convincingly shows that interventions are most effective when applied as part of a targeted, multifactorial approach. Multifactorial exercise programs are the most effective interventions to improve mobility and reduce fall risk. Multifactorial exercise interventions should have progressive intensity, have a duration of at least 12 weeks (1–3 times per week), and consist of training components to improve muscle strength, balance, coordination, and gait (Panel 2011). Supervised training programs are more successful than unsupervised training programs. Even the best interventions are only effective when regularly practiced, so interventions need to be tailored to the needs, wants, and lifestyle of the older adult at risk of falling.

It should be noted that current data primarily support multifactorial exercise interventions for fall risk prevention and treatment in community-dwelling older adults. "Many factors, such as variation in type and severity of disability of residents, differences in structure of care and terminology used to describe facilities, lack of information about the cognitive or physical functioning of participants, and insufficient description of the interventions, complicate interpretation of the evidence from RCTs (randomised controlled trials) in the long-term care setting" (Panel 2011).

Two multifactorial interventions particularly successful in fall risk and rate reduction in community-dwelling older adults are T'ai Chi and Jaques-Dalcroze Eurhythmics.

9.6.1 T'ai Chi

T'ai Chi emphasizes slow continuous movement with a gradual narrowing of the base of support during dynamic weight shifting. It has been shown that for robust, community-dwelling seniors (mean age 76 years), weekly participation in T'ai Chi for 15 weeks delayed the onset of falls by 47.5% and significantly reduced fear of falling compared to those who participated in an educational program or in individualized computerized balance training. Participation in T'ai Chi twice weekly for 48 weeks has also been shown to reduce fear of falling in older adults transitioning to frailty.

9.6.2 Jaques-Dalcroze Eurhythmics

Regular practice of Jaques-Dalcroze Eurhythmics consisting of multitask exercises requiring high levels of attention, memory, and coordination performed to the rhythm of improvised piano music reduces fall rate by 54% in community-dwelling

older adults (Trombetti et al. 2011). Participants from that study who continued the intervention (baseline mean age 75 years) for three further years then showed not only a reduced fall risk but also significantly faster gait speed, better balance (one-legged stance time), faster TUGr test times, better five times sit-to-stand performance and stronger handgrip strengths than controls.

9.7 Summary

In conclusion, with an ever-increasing population of older adults, particularly of the oldest old, the number of falls, fall-related injuries, hospitalizations, and institutionalizations will rise accordingly. This trend will be accompanied by an ever-increasing burden for individuals, families, and the society and is a major public health concern. Direct costs from fall-related injuries account for up to 1.5% of healthcare costs in European countries (this does not include the indirect costs, such as loss of income to fallers and the caregivers). It is crucial that fall risk is identified and that interventions to treat and prevent falls are implemented as soon as possible, to keep the socioeconomic burden as low as possible while keeping the quality of life and functional independence for each older adult as high as possible.

Even when a somatic injury is not sustained after a fall, it is important to remember that a fall always has consequences. Such consequences may be fear of falling, leaving the home less often, thus increasing social isolation and feelings of loneliness. These then cause a downward spiral of being less active, which worsens frailty and increases the risk of having another fall.

Many older adults do not spontaneously mention falls or difficulties with walking and balance. They may see falls as an unavoidable consequence of aging, consider falls random events, or not recognize that they personally may be at risk. A checklist for self-assessment of fall risk (see online supplemental material) can raise older adults' awareness of their fall risk as well as initiate conversations about falls with healthcare providers, friends, and family (Center for Disease Control (CDC) 2015).

Be proactive and always ask about changes in walking and balance as well as falls. Every fall and every worsening of mobility are symptoms and not a standalone diagnosis. Those symptoms are red flags and should trigger your search for underlying pathologies. Early identification of changes in mobility, physical functional performance, and fall risk factors allows the timely implementation of individualized interventions to maintain or improve mobility and functional independence and reduce fall risk and fall rates.

References

Bridenbaugh SA, Beauchet O, Annweiler C, Allali G, Herrmann F, Kressig RW. Association between dual task-related decrease in walking speed and real versus imagined Timed Up and Go test performance. Aging Clin Exp Res. 2013;25:283–9.

Bridenbaugh SA, Kressig RW. Motor cognitive dual tasking: early detection of gait impairment, fall risk and cognitive decline. Z Gerontol Geriatr. 2015;48:15–21.

Centers for Disease Control and Prevention National Center for Injury Prevention and Control in collaboration with the VA Greater Los Angeles Healthcare System, the Geriatric Research Education & Clinical Center and the Fall Prevention Center of Excellence. Stay Independent. 2015. https://www.cdc.gov/steadi/pdf/stay_independent_brochure-a.pdf. Accessed 27 Feb 2017.

Clegg A, Young J, Iliffe S, Rikkert MO, Rockwood K. Frailty in elderly people. Lancet. 2013;381:752–62.

Lord SRSC, Menz HB. Falls in older people: risk factors and strategies for prevention. 1st ed. Cambridge: Cambridge University Press; 2001.

Panel on Prevention of Falls in Older Persons, American Geriatrics Society and British Geriatrics Society. Summary of the Updated American Geriatrics Society/British Geriatrics Society clinical practice guideline for prevention of falls in older persons. J Am Geriatr Soc. 2011;59:148–57.

Trombetti A, Hars M, Herrmann FR, Kressig RW, Ferrari S, Rizzoli R. Effect of music-based multitask training on gait, balance, and fall risk in elderly people: a randomized controlled trial. Arch Intern Med. 2011;171:525–33.

Sarcopenia

10

Alfonso J. Cruz-Jentoft and Beatriz Montero-Errasquín

Abstract

Sarcopenia (muscle insufficiency) is a geriatric syndrome characterized by progressive and generalized loss of skeletal muscle mass and function that increases the risk of adverse outcomes, including physical disability, falls, and death. It can be chronic or acute.

Pathophysiology of sarcopenia is complex, involving both the muscle and its neural and hormonal regulation.

Sarcopenia is more frequent as age advances. Case finding in clinical practice can be done by validated screening instruments or by measuring gait speed in all persons over 65 years old. The diagnosis of sarcopenia relies on documentation of low muscle mass plus either low muscle strength and/or low physical performance. Once confirmed, a comprehensive geriatric assessment (CGA) is needed to identify underlying causes.

Prevention of sarcopenia should start in adult age and relies on maintaining a high level of physical activity, resistance exercise, and proper nutrition. Treatment of sarcopenia starts with the identification and management of underlying causes. Proper nutrition (specially reaching target protein requirements of 1.2–1.5 g/kg body weight/day) and resistance exercise training are the cornerstones of treatment. No drug has yet been approved for this condition.

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_10) contains supplementary material, which is available to authorized users.

A.J. Cruz-Jentoft (✉) • B. Montero-Errasquín
Servicio de Geriatría, Hospital Universitario Ramón y Cajal (IRYCIS), Madrid, Spain
e-mail: alfonsojose.cruz@salud.madrid.org

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_10

Learning Objectives

By the end of the chapter, the reader will be able to
- Understand the concept of sarcopenia
- Choose the best tools to diagnose sarcopenia in clinical practice
- Assess the underlying causes of sarcopenia
- Plan an intervention to prevent or improve sarcopenia

10.1 What Is Sarcopenia?

The word *sarcopenia* derives from the Greek roots *sarx* for flesh and *penia* for loss and was first used in 1988 to describe a common problem in older people: a well-known but previously unnamed age-related decline in muscle mass and function affecting ambulation, mobility, nutritional status, and functional independence (Rosenberg 1997). Initially, sarcopenia was approached only as a loss in muscle mass, but since 2010 muscle function is included in the definition. Only in 2016 the International Classification of Diseases (ICD-10) coded sarcopenia as a specific disease.

Sarcopenia can be best understood as an organ failure (muscle insufficiency) (Cruz-Jentoft 2016). It emerges usually as a slowly progressive, chronic disorder, but can also develop or impair acutely (i.e., during hospital admission or immobility). Sarcopenia is closely linked to physical frailty (Morley et al. 2014) (see also Chapter 4). Sarcopenia is a major cause of physical frailty and some older people with sarcopenia are also frail (Fig. 10.1).

Sarcopenia is defined as a geriatric syndrome characterized by progressive and generalized loss of skeletal muscle mass and function that increases the risk of adverse outcomes, such as physical disability, falls, poor quality of life, and death (Cruz-Jentoft et al. 2010b). Recent studies using this comprehensive definition have found that sarcopenia is present in up to 30% of older subjects in the community, with higher prevalence in older individuals living in nursing homes. It is unclear if its prevalence is higher in males or females.

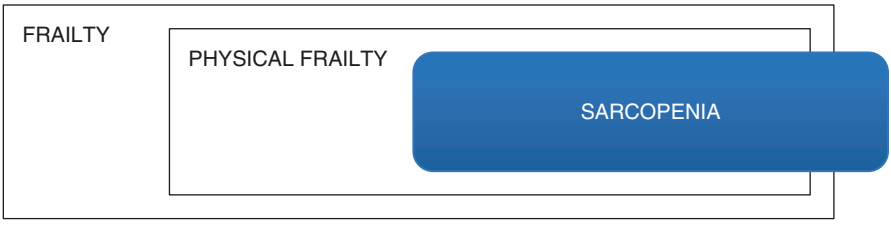


Fig. 10.1 Links between sarcopenia and frailty

10.2 How Does Sarcopenia Develop?

The pathophysiology of sarcopenia is complex. It involves both the muscle and its neural and hormonal regulation (Clark and Manini 2008).

With normal ageing, the quality of muscle fibres impairs slowly, showing a decline in peak power, shortening speed and elasticity. Muscle fibre weakness can be explained by the interaction of several age-related alterations, including the loss of anabolic stimuli due to the decline in the concentration of testosterone and other anabolic hormones, age-associated subclinical level of inflammation, and molecular changes in molecular contraction mechanisms.

There is also an age-related reduction in satellite cell number and activation in older subjects, especially those associated with type IIA fibres, which may reduce the regenerative capacity and compensation for the loss of muscle fibres. Circulating levels of myostatin—a growth factor that downregulates muscle mass—also increase with age. Some changes in the regulation of genes may explain age—related changes in the protein profile of skeletal muscles.

The neurological control of movement is probably also impaired in sarcopenia, with a special relevance of the loss of motor end plate. Metabolic and endocrine age-related changes may also be involved in the genesis of sarcopenia.

10.3 Identification of Patients with Sarcopenia

Sarcopenia is more frequent as age advances, so the older an individual is, the higher his/her risk of suffering from sarcopenia. Its high prevalence in old age probably merits screening, although the benefit of screening in improving clinically relevant outcomes is yet unproved. Screening can be done by using validated screening instruments, as the SARC-F questionnaire (SARC-F is an acronym for strength, assistance walking, rise from a chair, climb stairs, and falls) (Malmstrom and Morley 2013). Also, measuring gait speed in all patients over 65 years can identify those at high risk, i.e., those with gait speed below 1 m/s.

The prevalence of sarcopenia is higher in certain care settings. Those living in nursing homes or admitted to rehabilitation facilities and those attending geriatric clinics may be at special risk. Acute sarcopenia develops during acute hospital admission of older persons. Alternatively, only older persons with known risk factors of sarcopenia would be screened (Table 10.1) (Morley et al. 2011).

10.3.1 Diagnosis

The diagnosis of sarcopenia relies on documentation of low muscle mass plus either low muscle strength or low physical performance (Table 10.2). Table 10.2 also lists different diagnostic tools that may be used in clinical practice to measure each

Table 10.1 Sarcopenia: approaches to case finding

Screening methods	Risk groups
Questionnaires (SARC-F) Gait speed (<1 m/s)	Populations • Nursing home • Rehabilitation settings • Acute hospital admission • Geriatric outpatient clinics
	Individuals • Recurrent falls • Perception of decrease in walking speed • Recent hospital admission • Prolonged bed rest • Problems arising from a chair • Use of cane or assistive device • Malnourished

SARC-F is an acronym for strength, assistance walking, rise from a chair, climb stairs, and falls

Table 10.2 Criteria and tools for the diagnosis of sarcopenia

Diagnosis of sarcopenia is based on documentation of criterion 1 plus (criterion 2 or criterion 3).		
1. Low muscle mass 2. Low muscle strength 3. Low physical performance		
Tools to diagnose sarcopenia in clinical practice		
Muscle mass	Muscle strength	Physical performance
✓ Dual-energy X-ray absorptiometry (DXA) ✓ Bioimpedanciometry (BIA) • Anthropometry	✓ Grip strength • Isokinetic knee extensors (quadriceps) strength	✓ Gait speed ✓ Short physical performance battery (SPPB) • Timed Up and Go test • 6-min walk test • 400-m walk test

✓ Most widely used tools

parameter. Usually, cutoff points for each tool are gender specific and, in many cases, race and country specific (Mijnarends et al. 2013; Studenski et al. 2014).

Sarcopenia is only one in a list of conditions associated with prominent muscle wasting, malnutrition and cachexia being the most prevalent (see also Chapter 24). These conditions interact so deeply that defining them as different entities is a complex task, but a careful differential diagnosis helps in choosing proper management (Morley et al. 2011). Starvation causes a loss of body fat and nonfat mass due to inadequate intake of protein and energy, while in sarcopenia body fat is preserved or increased (sarcopenic obesity). Cachexia is severe muscle wasting (fat and nonfat mass) accompanying disease states such as cancer. Definitions of cachexia include the concept of inflammation as a leading mechanism into muscle wasting. Thus, most cachectic individuals are also sarcopenic, but most sarcopenic individuals are not considered cachectic. Sarcopenia, as mentioned, is also linked to frailty (see also Chapter 4).

Table 10.3 Sarcopenia categories by cause

Primary sarcopenia	Examples
Age-related sarcopenia	No other cause evident except ageing
Secondary sarcopenia	
Activity-related sarcopenia	Can result from bed rest, sedentary lifestyle, deconditioning, or zero-gravity conditions
Disease-related sarcopenia	Associated with advanced organ failure (heart, lung, liver, kidney, brain), inflammatory disease, malignancy, or endocrine disease
Nutrition-related sarcopenia	Results from inadequate dietary intake of energy and/or protein, as with malabsorption, gastrointestinal disorders, or use of medications that cause anorexia

Once sarcopenia is diagnosed, it is best approached as a geriatric syndrome (Cruz-Jentoft et al. 2010a). A CGA is useful to find the different underlying and usually complex causes of sarcopenia (see also Chapter 26) (Table 10.3).

10.4 Prevention and Treatment

Prevention of sarcopenia should start in adult age, as muscle mass and function loss start early in adulthood and are more prominent after 50 years old. Prevention relies on maintaining a high level of physical activity, resistance exercise, proper nutrition (adhering to a Mediterranean diet, especially with a high intake of proteins), and avoidance of health habits associated with bad health (smoking, alcohol) (see also Chapter 24).

Management of sarcopenia, once it is properly diagnosed, starts with the identification and management of any underlying causes found by a comprehensive geriatric assessment (Fig. 10.2). Nutrition and physical exercise are the cornerstones of treatment (Forbes et al. 2012). No drug has yet been approved for this condition (Landi et al. 2013).

Resistance exercise training increases muscle mass and function and increases protein accretion in skeletal muscles. Aerobic exercise training may also benefit ageing skeletal muscle and improve insulin sensitivity. Exercise has to be properly prescribed by a physician and is most probably beneficial when properly supervised and sustained along time.

Correction of nutritional deficits is also needed in sarcopenic patients. Caloric intake should be increased to cover increased demands posed by exercise. Protein requirements are also increased, so recommended intakes of proteins should be from 1.2 to 1.5 g of protein per kilogram of body weight and day, with the only exception of subjects with stage 4 or 5 renal failure (Bauer et al. 2013). Essential amino acid (EAA) supplements including around 2.5 g of leucine (Leenders and van Loon 2011) and β-hydroxy β-methylbutyric acid (HMB) supplements (Fitschen et al. 2013) improve muscle mass and function parameters. Correction of vitamin D deficiencies is needed for proper muscle function, but the role of vitamin D when blood levels are normal is yet to be determined. When requirements cannot be reached by modifying usual diet, oral nutritional supplements are needed to meet these needs. Supplements should be used for at least 3 months to be most effective.

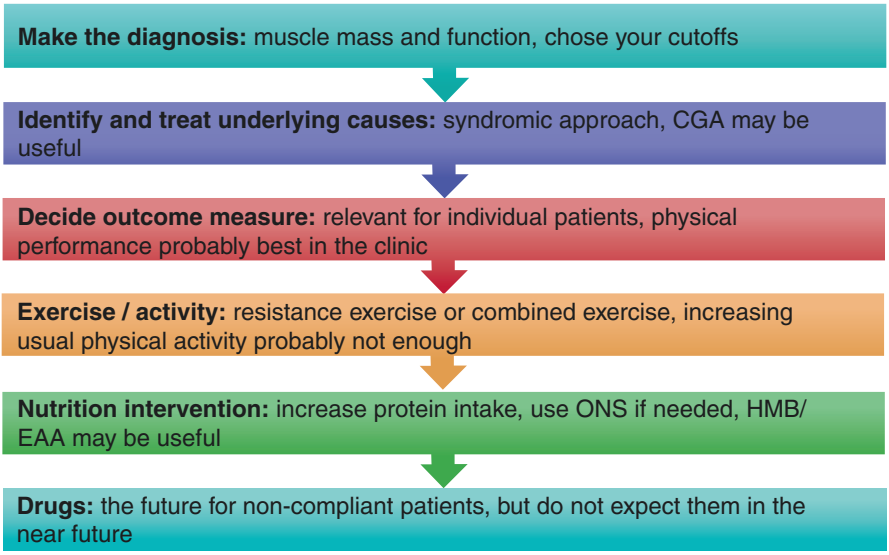


Fig. 10.2 Management of sarcopenia. *ONS*, oral nutritional supplements; *HMB*, β-hydroxy β-methylbutyric acid; *EAA,* essential amino acids

References

Bauer J, Biolo G, Cederholm T, et al. Evidence-based recommendations for optimal dietary protein intake in older people: a position paper from the PROT-AGE Study Group. J Am Med Dir Assoc. 2013;14(8):542–59.

Clark BC, Manini TM. Sarcopenia =/= dynapenia. J Gerontol A Biol Sci Med Sci. 2008;63(8):829–34.

Cruz-Jentoft AJ. Sarcopenia, the last organ insufficiency. Eur Geriatr Med. 2016;7:195–6.

Cruz-Jentoft AJ, Landi F, Topinková E, Michel JP. Understanding sarcopenia as a geriatric syndrome. Curr Opin Clin Nutr Metab Care. 2010a;13(1):1–7.

Cruz-Jentoft AJ, Baeyens JP, Bauer JM, et al. Sarcopenia: European consensus on definition and diagnosis: report of the European Working Group on Sarcopenia in Older People. Age Ageing. 2010b;39(4):412–23.

Fitschen PJ, Wilson GJ, Wilson JM, Wilund KR. Efficacy of β-hydroxy-β-methylbutyrate supplementation in elderly and clinical populations. Nutrition. 2013;29(1):29–36.

Forbes SC, Little JP, Candow DG. Exercise and nutritional interventions for improving aging muscle health. Endocrine. 2012;42(1):29–38.

Landi F, Rolland Y, Onder G. The future of drug treatments. In: Cruz-Jentoft AJ, Morley JE, editors. Sarcopenia. Chichester: John Wiley & Sons; 2013. p. 296–323.

Leenders M, van Loon LJC. Leucine as a pharmaconutrient to prevent and treat sarcopenia and type 2 diabetes. Nutr Rev. 2011;69(11):675–89.

Malmstrom TK, Morley JE. SARC-F: a simple questionnaire to rapidly diagnose sarcopenia. J Am Med Dir Assoc. 2013;14(8):531–2.

Mijnarends DM, Meijers JM, Halfens RJ, et al. Validity and reliability of tools to measure muscle mass, strength, and physical performance in community-dwelling older people: a systematic review. J Am Med Dir Assoc. 2013;14(3):170–8.

Morley JE, Abbatecola AM, Argiles JM, et al. Sarcopenia with limited mobility: an international consensus. J Am Med Dir Assoc. 2011;12(6):403–9.
Morley JE, von Haehling S, Anker SD, Vellas B. From sarcopenia to frailty: a road less traveled. J Cachex Sarcopenia Muscle. 2014;5(1):5–8.
Rosenberg IH. Sarcopenia: origins and clinical relevance. J Nutr. 1997;127:990S–1S.
Studenski SA, Peters KW, Alley DE, et al. The FNIH sarcopenia project: rationale, study description, conference recommendations, and final estimates. J Gerontol Ser A Biol Med Sci. 2014;69(5):547–58.

Incontinence

11

Yvonne Hoffmann-Weltin

Abstract

Incontinence is one of the "Big Giants" in geriatric medicine. Its aetiology is multifactorial and includes factors like physiological ageing and contributing comorbidities, mobility disorders, frailty, sarcopenia and polypharmacy.

Incontinence affects quality of life, as it results in social isolation, depression, falls, fractures, skin complications, infections, delirium and institutionalization. Incontinence, whether urinary or faecal, has been shown to be associated with an increased mortality, care problems and a major psychological burden of people affected. Therefore, it is necessary to raise awareness and draw attention to the complexity of this problem—in patients, caregivers and doctors. A comprehensive geriatric assessment (CGA), including a careful history and physical examination, is crucial to identify potential treatable conditions and start an effective and individualized treatment plan.

Learning Objectives

By the end of the chapter, the reader will be able to

- Recognize the clinical signs of incontinence, and identify comorbidities and problems related to polypharmacy
- Diagnose different types of urinary incontinence
- Initiate an individualized treatment plan

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_11) contains supplementary material, which is available to authorized users.

Y. Hoffmann-Weltin
Department of Internal Medicine, Medical University of Innsbruck, Innsbruck, Austria
e-mail: Yvonne.Hoffmann-Weltin@tirol-kliniken.at

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_11

Table 11.1 Includes types of urinary incontinence and their causes (adapted from Cook and Sobeski 2013)

Type	Definition	Common causes
Stress	Involuntary loss of urine (only small amounts) with increasing intra-abdominal pressure (e.g. coughing, laughing, jumping and others)	Weak pelvic floor muscles (childbirth, menopausal status) Bladder outlet or urethral sphincter weakness Post-urologic surgery
Urge	Leakage of urine (rather large volumes lost) because of inability to delay voiding after sensation of bladder fullness	Detrusor overactivity, either isolated or associated with one or more of the following: Local genitourinary condition (e.g. tumours, stones, diverticula, outflow obstruction) CNS disorder (e.g. stroke, Parkinson's disease, dementia, spinal cord injury)
Overflow	Leakage of urine (small amounts) caused by either mechanical forces on an overextended bladder (stress leakage) or other effects of urinary retention on bladder and sphincter function (contributing to leakage)	Anatomic obstruction by prostate, stricture, cystocele A contractile bladder associated with diabetes or spinal cord injury Neurogenic associated with multiple sclerosis or other spinal cord lesions Medication effects
Functional	Urinary accidents associated with the inability to toilet because of impairment of cognitive and/or physical functioning, psychological unwillingness or environmental barriers	Severe dementia or other CNS disorders Psychological factors such as depression and hostility

11.1 Urinary Incontinence

The prevalence of urinary incontinence (UI) increases with age and affects dependence in advanced age ranging from 30 to 60% of affected older persons (Wagg 2013). It is estimated that one-third of women older than 65 years suffer from an overactive bladder with one-third of those associated with incontinence. In older women, mixed incontinence between different types of incontinence is more common (nearly 50% of those affected, Table 11.1). Many patients and doctors consider UI to be a normal part of ageing. Therefore, the most common method of managing UI among community residents in daily practice is considered the use of absorbent products (Abrams et al. 2013).

11.1.1 Types of Urinary Incontinence

UI is either based on disturbances of storage of urine or on disturbed emptying of the urinary bladder. The classifications of incontinence are based on the underlying problem in the lower urinary tract (Table 11.1). The terms urinary urge incontinence

(UUI) and overactive bladder (OAB) are used interchangeably in daily practice. However, they describe two different conditions in terms of pathophysiology. In fact, OAB is a *symptom syndrome* that includes *frequency, urgency and nocturia* (Cook and Sobeski 2013). UUI may or may not be associated to this symptom syndrome.

11.1.2 Diagnosis of Urinary Incontinence

Many patients do not report on incontinence spontaneously by themselves. Therefore, regular screening and assessment for incontinence—when working with geriatric patients—has become a hallmark of good clinical practice. All the tools used should include following domains. All questionnaires are built upon symptom evaluation, but only few of them have been validated for sensitivity, specificity and inter-rater variability.

Following tools are on the market:

- Urogenital Distress Inventory (UDI) and the UDI-6 short form (Lemack and Zimmern 1999)
- Leicester Urinary Symptom Questionnaire (LUSQ) (Uebersax et al. 1995)

Parallel evaluation of general health-related quality of life is usually assessed using:

- Short Form Medical Outcome Study (MOS SF 36)
- Euro Quol EQ-5D.

These instruments have been validated for a geriatric population and are used in daily practice to coevaluate bio-psychosocial aspects and health-related quality of life in multimorbid patients; students and residents may access the questionnaires via the Internet. Whatever instrument is chosen, it should be tailored to patient's needs and to the setting you will be seeing and caring for geriatric patients (see Part VII) (Table 11.2).

11.1.3 How to Assess Urinary Incontinence

Geriatric patients often are not able to express their specific problem; sometimes incontinence is the first sign of a complex disease (see also Chapters 5 and 6).

The non-invasive diagnostic evaluation precedes the uridynamic testing and includes

- Medical history, physical examination, evaluation of treatment expectations/shared decision-making (Table 11.3).
- Severity of incontinence, degree of bother (pooling diary)
- CGA (see also Chapter 26)

Table 11.2 Causes and risk factors for development of incontinence are listed in Table 11.1 (DuBeau et al. 2010)

Irreversible factors (prone to optimizing concomitant treatment)	Potentially reversible risk factors
Chronic diseases: Diabetes mellitus, congestive heart failure, Parkinson's disease, dementia, depression	*Poor physical function/frailty/restricted mobility*
Changes of urinary tract system: prostatectomy, prostatic hyperplasia	*Polypharmacy*
	Constipation
	Vitamin D deficiency
	Acute illnesses: urinary tract infection (UTI), atrophic vaginitis, delirium
	Changes of urinary tract system: vaginal delivery, prostatic hyperplasia
	Environmental hazards: lack of access to the toilet, no grab rails, inappropriate height of toilet seat, inadequate lighting, inadequate toileting substitutes such as commode chairs or urinals
	Constant use of diapers
	Psychosocial stress

Table 11.3 Clinical diagnosis of UI

History	Clinical signs	Laboratory measures
Persistent urinary tract infections	Sudden loss of urine	Haematuria
Persistent back pain	Sudden change in personal behaviour	Poor renal function
Recent pelvic fracture	Acute confusion/delirium	
Recent back trauma		
Prostatic hyperplasia		

- Documentation of fluid intake, bladder diary (record of time and voided volume, incontinence episodes, pad usage, fluid intake, degree of urgency and degree of incontinence, for at least hours)
- Chemical and microscopical analysis of urine
- Measurement of post-voiding residual (ultrasound, bladder scan)
- Digital rectal examination in men/gynaecological examination in women
- Standardized questionnaire to assess UI (reliable and comparable data).

The urodynamic testing usually precedes surgical interventions and the performance and decision-making will involve the comanagement with the specialist in urology.

11.1.4 How to Treat Urinary Incontinence

As a first step always look for possible confounders leading to or supporting the development of UI and try to eliminate risk factors (Table 11.2). The integrated and inter- and multidisciplinary collaboration is a cornerstone of successful treatment of geriatric patients showing up with signs and symptoms of incontinence. Due to patient's wish and treatment goals and the overall bio-psychosocial condition usually a multistep approach is chosen to support patients with incontinence. Individual goal setting and regular reassessment of cognitive and physical functioning as well as health-related quality of life are basic standards in the daily practice of geriatricians.

Behavioural interventions need time but have the advantage of nearly no side effects when offering them to older patients. It could be shown that these interventions are very effective for individual quality of life and may also minimize caregiver burden.

The type of training programmes strongly depends on the cognitive status of the older people. Bladder training is used for cognitively and physically able adults who can regain continence by increasing the time intervals between voids. Programmes such as *voiding* ones, or *toilet training* ones, are generally used for people with cognitive and physical impairments in institutional settings. Among the latter, *prompted voiding* may increase patient's request for toileting and self-initiated toileting. Prompted voiding is encouraged by asking every 2 h if the person needs to go to the toilet. *Habit retraining*, on the other side, does not foresee attempts to alter the voiding pattern but requires prior information about incontinence and consists in encouraging toileting at fixed intervals, such as every 2 h (*timed voiding*). This is considered as a passive toileting programme without attempts at patient education or reestablishment of voiding patterns.

The above-cited interventions have to be individually tailored, and are dependent on patient's mobility, motivation and cognition and on professional, highly motivated care. In addition, they are very time consuming. Behavioural interventions are possible in all stages of UI, and success is limited with increasing severity. Behavioural interventions are not offered to patients suffering from overflow incontinence.

Physical exercises are used to optimize sphincter function and urine retention. These interventions are dependent on adherence and compliance of patients. *Pelvic floor* exercises constitute the method of choice and are recommended in the treatment of stress incontinence and mixed incontinence—dependent on patient's motivation; therapeutic instructions and evaluation of therapy success and mental and physical activation are useful. In women, gynaecological examination is needed prior to therapy to assess organic contraindications. *Biofeedback training* and Kegel exercises aim at strengthening pubococcygeus musculature and other pelvic floor muscles but require the use of additional technical equipment, good vision and good motor skills. Therefore this method is only a secondary option in older persons. Pelvic floor electrical stimulation (provided through either adhesive pads placed on the skin near vagina and anus or a tampon-shaped form placed in the vagina) finally leads to the contraction of M. levator ani and M. sphincter urethrae et ani and reflective inhibition of M. detrusor vesicae. This represents a possible treatment of urge and stress incontinence in patients that are not able to do pelvic floor exercises; however it may cause side effects such as UTI and pain.

In UI as well as faecal incontinence, the use of incontinence supplies might be taken into account and includes absorbent products (pads, diapers), bedpan, and urine bottle. Their use, however, does not exclude attention to environmental adaption/devices like appropriate extra handles, walking aids, commode chair, and adequate light.

Indwelling catheters should be applied in case of failure of any other treatment option, if alternative strategies are unsuitable, like in the case of acute urinary retention, bladder outlet obstruction, perioperative use, prolonged immobilization and end-of-life care. There is a threefold increased risk of infection in catheterized patients in nursing homes.

Drugs displayed in Table 11.4 for UI pharmacologic treatment should be used very carefully in older patients (Bettez et al. 2012) due to adverse effects and drug-drug and drug-disease interactions (see also Chapter 23). Drug treatments for UI are usually applied only together with behavioural interventions. It is obsolete to offer

Table 11.4 Pharmacological treatment options for the treatment of UI

Drug/substance	Type of incontinence	Mechanism	Side effects	Not applicable in
Anticholinergic drugs (oxybutynin, tolterodine, solifenacin, fesoterodine, darifenacin, trospium chloride)	Overactive bladder, drugs inducing detrusor hyperactivity	Block neurotransmission of choline, reduce innervation of bladder, decrease urinary frequency	In high doses cross blood–brain barrier and may worsen cognitive function (trospium chloride favourable profile compared to others)	Narrow-angle glaucoma, myasthenia gravis
Serotonin noradrenaline reuptake inhibitors (duloxetine, etc.)	Efficacy has also (among other types) been shown in incontinence after prostatectomy	Decrease UI and urinary frequency	Nausea, dry mouth, fatigue and constipation hyponatraemia, risk of suicide, suicidal ideation, anxiety	
Selective ß3-adrenoreceptor agonist (**mirabegron**, **desmopressin**, etc.)		Reduction of number of nocturnal voids and urine volume	Hypertension, tachycardia	Desmopressin can lead to fluid retention—possible decompensated congestive heart failure, hyponatraemia
Topic hormonal treatment in urinary incontinence	Atrophic vaginitis	Effects on vaginal cytology		

Table 11.5 Drugs inducing incontinence

Drugs inducing incontinence	Clinical effects
Alpha-adrenergic agonists	Increase smooth muscle tone, urinary sphincter + prostatic capsule Increase residual volume—overflow incontinence
Alpha-blocker (doxazosin, prazosin, tamsulosin)	Relax urinary sphincter and urethra, may cause stress incontinence, e.g. when coughing, lifting objects
Angiotensin-converting enzyme inhibitors	Can worsen stress incontinence by inducing repetitive coughing
Anticholinergic drugs	May cause impaired emptying, urinary retention, infection, constipation, reduce effective toileting ability, dizziness, confusion, falls, dry eyes, dry mouth and induce increased fluid intake, dose-dependent effect
Calcium channel blockers	Smooth muscle relaxants, may cause impaired emptying, urinary retention (overflow incontinence) and constipation
Cholinesterase inhibitors	Increase bladder contractility/urgency UI (dose-dependent effect)
Diuretics—furosemide, thiazide	Increase urine production—symptoms of urinary urgency increase
Gabapentin	Oedema, nocturnal polyuria
Lithium	Polyuria due to diabetes insipidus
Opioids/morphine	May cause urinary retention, constipation, confusion, immobility, all of which can contribute to UI
Sedatives, hypnotics, antipsychotics	Anticholinergic side effects: confusion, dizziness, immobility, decreasing detrusor contractility—urinary retention
Selective serotonin reuptake inhibitors	Increase cholinergic activity—and bladder contractility

pharmacological treatment for incontinence to people with cognitive deficits and those without prospective individual benefit.

Sometimes incontinence is due to pharmacological treatment ongoing for other diseases (Table 11.5). Always evaluate carefully the medication list and try to evaluate coincidence of newly developed incontinence and onset of new drug treatments in the treatment plan.

Finally, surgical management is considered to be the most efficient approach with a sustainable treatment effect of stress urinary incontinence (SUI). It is as safe and effective in older as in younger women. There are currently two treatment options for a minimal invasive sling suspension of the urethra, tension-free vaginal tape (TVT) and transobturator tape (TOT). Both treatment options have gained worldwide popularity as minimally invasive therapeutic approach in women with SUI. Persistent continence rates for women of 80% may be reached. Rare complications are bladder perforation, and pain in the thigh. In frail older men suffering from prostate hyperplasia, the transurethral resection of the prostate (TURP) for obstruction associated with urgency UI is a safe, successful intervention. The surgeon might be consulted if conservative treatment has failed—and after completing all gynaecological or urological examinations—in certain subtypes of incontinence (e.g. postural incontinence, continuous incontinence, insensible incontinence and coital incontinence).

References

Abrams P, Cardozo L, Khoury S, Wein A. Incontinence, 5th International consultation on incontinence, Paris February 2012. 5th ed. Paris: ICUD-EAU; 2013.

Bettez M, et al. 2012 update: guidelines for adult urinary incontinence, collaborative consensus document for the Canadian Urological Association. CUAJ. 2012;6(5):354–63.

Cook, K and Sobeski, LM. https://www.accp.com/docs/bookstore/psap/p13b2_m1ch.pdf. (2013). Accessed 19 May 2017.

DuBeau CE, et al. Incontinence in the frail elderly: report from the 4th International consultation on incontinence. Neurourol Urodyn. 2010;29(1):p165–78.

Lemack GE, Zimmern PE. Predictability of urodynamic findings based on the urogenital distress inventory-6 questionnaire. Urology. 1999;54(3):461–6.

Uebersax JS, Wyman JF, Shumaker SA, McClish DK, Fantl JA, The Continence Program for Women Research Group. Short forms to assess life quality and symptom distress for urinary incontinence in women: the incontinence impact questionnaire and the urogenital distress inventory. Neurourol Urodyn. 1995;14(2):131–9.

Wagg, Adrian S. Incontinence in the frail elderly, Committee 11, Incontinence. 5th ed; 2013.

Suggested Reading

International Continence society (ICS). www.ics.org

Part IV

Common Age-Related Disorders

Diabetes Mellitus

12

Stefania Maggi and Nicola Veronese

Abstract

Older people have the highest age-specific prevalence rate of diabetes; however guidelines for the appropriate treatment of diabetes in older patients are missing, particularly for the very old and frail. In this chapter, the current evidence regarding risk factors, diagnosis, complications and treatment of diabetes in older patients is summarized.

Learning Objectives

By the end of the chapter, the reader will be able to

- Quantify the magnitude of the problem in the aged population
- Understand the impact of overall prognosis in the therapeutic approach
- Identify the challenges in the application of the guidelines proposed for adults
- Deal with peculiar complications of aged patients, such as dementia

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_12) contains supplementary material, which is available to authorized users.

S. Maggi (✉) • N. Veronese
National Research Council, Neuroscience Institute, Ageing Branch, Padova, Italy
e-mail: stefania.maggi@in.cnr.it

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_12

12.1 Introduction and Context

- Diabetes is a common condition in older people reaching in this age the maximum prevalence.
- Differently from middle-aged individuals, diabetes in older people is associated with peculiar conditions, such as cognitive decline.
- Frailty is an important determinant of targets for anti-diabetic therapy.
- Medications should be used cautiously (particularly insulin) for the higher number of possible side effects.

12.2 Epidemiology, Types of Diabetes

- Recent studies suggested that more than 25% of the population aged ≥65 years have diabetes.
- Type 2 diabetes is the most common form (Table 12.1).

How to assess diabetes and its secondary complications

- Assessment of diabetes and secondary complications (history, clinical examination, further diagnostics)
  - Diabetes in older people is often undiagnosed.
  - Diabetic foot, recurrent urinary tract infections and weight loss are common presentations of diabetes in the older population.
  - Secondary complications: annual screening of retinopathy, nephropathy, cardiovascular and neurological complications (Fig. 12.1).

Table 12.1 Risk factors for diabetes in old age and primary prevention

Risk factor	Relevance in old age	Assessment of risk factor	Measure of primary prevention
Overweight and obesity	Important	Anthropometric measurements	Weight loss interventions
Unhealthy diet	Important	CGA, dietary questionnaires	Dieticians' interventions, improve adherence to healthy dietary patterns
Physical inactivity	Relevant	CGA, validated questionnaires	Promote physical activity
Impaired glucose tolerance	Strongest predictor of type 2 diabetes	Fasting plasma glucose; OGTT	Lifestyle interventions could delay the progression from IGT to diabetes; contrasting data regarding metformin

CGA, comprehensive geriatric assessment; *OGTT*, oral glucose tolerance test; *IGT*, impaired glucose tolerance (see also Chapter 26).

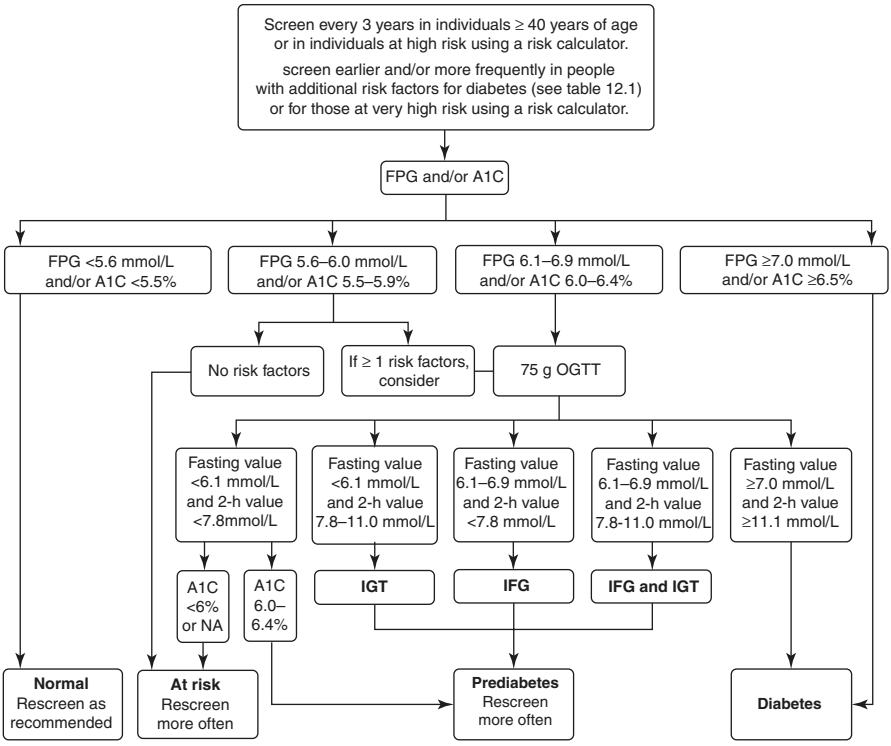


Fig. 12.1 Algorithm for diagnosis of diabetes* Reproduced with permission from Ekoé et al. 2013, page S14. The calculator risk is available at: http://www.diabetes.org/are-you-at-risk/diabetes-risk-test/

12.3 Medical History in Older Patients with Diabetes

At the first visit, if diabetes is suspected, a physician should ask (Kirkman et al. 2012):

- Symptoms:
  - Have you had increased thirst, increased urination and fatigue?
  - Has your appetite increased lately?
  - Have you recently lost or gained weight?
- Family history and comorbidities:
  - Does any of your relatives have a history of type 2 diabetes?
  - What medicines are you taking? (particular attention to glucocorticoids and diuretics)
  - Have you been diagnosed with high blood pressure, high cholesterol or both?

Table 12.2 Clinical and therapeutic goals setting in geriatric patients in comparison to younger adults

	Geriatric patients	Younger patients
HbA1c (glycosylated haemoglobin)	HbA1c ≤7% in relatively healthy adults HbA1c ≤8% for those who are frail or with life expectancy less than 5 years	<7% (ideally <6.5%)
Hypoglycaemia	Common complication during insulin or sulfonylureas treatment or in case of comorbidities	Typical of type 1 diabetes; less common in type 2 treated with oral agents
Secondary complications	Screening should be individualized in older adults. Particular attention should be paid to complications that would lead to functional impairment	At least annual screening for the secondary complications is needed

- Complications of diabetes:
  - *Eye problems*. Have you had any problems with double or blurred vision or seeing flashes of light; seeing large, floating red or black spots; or seeing large areas that look like floating hair, cotton fibres, or spiderwebs?
  - *Nerve damage*. Do you have any numbness, tingling or pain in your hands, legs or feet? (*Remember to check feet*)
  - *Blood vessel disease*. Have you had any heart or blood vessel problems in your legs? Have you had chest pain or shortness of breath? Stroke? Have you made any specific diagnostic test for cardiovascular disease? (e.g. echocardiogram, Doppler ultrasound aortic trunks).
  - *Persistent infections*. Have you had any skin, feet, vaginal or urinary tract infections lately?

Cognition (see also Chapter 7): Have you had a recent loss of memory? *Administer a validated cognitive assessment test for an early detection of cognitive impairment in diabetic patients (for further information see also* Chapters 26 and 33) (Table 12.2).

- Differential diagnoses of problems with homeostasis of blood sugar in older patients and diagnostic approach of differential diagnoses
  - Differential diagnosis with other endocrinological conditions (e.g. Cushing's syndrome), use of corticosteroids, pancreatic disorders

Treatment of diabetes in older adults (Huang et al. 2015)

– Non-pharmacological treatment

Treatment option	Level of evidences	Possible obstacles in old age
Physical activity	Moderate	Disability, osteoarthritis, cognitive impairment
Diet	Moderate	Muscle and bone loss, poor compliance

– Pharmacotherapy in diabetes mellitus (Tables 12.3 and 12.4)

Table 12.3 Oral therapy and incretin mimetics in older adults

Treatment option	Contraindications	Most common side effects	Special considerations
Metformin	GFR <30 mL/min	Gastrointestinal	Lactic acidosis
Short-acting sulfonylureas	Advanced liver or kidney disease	Hypoglycaemia, weight gain	It is advisable to avoid long-acting agents; they have proven to be efficacious in patients with intolerance to metformin
Glinides	Liver disease	Hypoglycaemia (risk is lower with respect to that in patients taking sulfonylureas), weight gain	Although more frequent administrations are needed during the day, they are efficacious in patients with moderate renal failure
DPP-4 inhibitors	None	Angioedema/urticaria and other immune-mediated dermatological effects. Low risk of pancreatitis	Low risk of hypoglycaemia Reduce dose in renal disease with some members of the class
GLP-1 receptor agonists	History of pancreatitis	Nausea, vomiting, diarrhoea and increased satiety, which can affect nutritional status in the older adult	Low risk of hypoglycaemia and formulation that can be used once weekly makes this an attractive agent to use in older people. Consider the person's cognitive abilities, dexterity and visual acuity before considering the use of any injectable medication
TZDs	Should be avoided in patients with Class III and Class IV congestive heart failure	Fluid retention and increased bone loss and risk for bone fracture	Modest glucose-lowering effect. Low risk of hypoglycaemia. Initiate at low dose and increase slowly to decrease flatulence
Alpha-glucosidase inhibitors	Chronic intestinal disorders and cirrhosis	Flatulence and diarrhoea	
SGLT-2 inhibitors	Do not use in moderate-to-severe renal disease	There is an increased risk for genital mycotic infections and for urinary tract infections. May result in dehydration	To decrease the risk of hypotension and dehydration, consider antihypertensive medication adjustment especially diuretics when starting this med class

GFR glomerular filtration rate, *DPP-4* dipeptidyl-peptidase inhibitors, *GLP-1* glucagon-like peptide, *TZDs* thiazolidinediones, *SGLT-2* sodium/glucose cotransporter
See Ekoé et al. 2013 for further details

Table 12.4 Different models of insulin therapy in older adults

Treatment option	Types	Onset (h)	Peak (h)	Duration (h)	Considerations
Ultrarapid acting	Lispro, aspart, glulisine	0.2–0.5	0.5–2	3–4	Can be administered after the meal
Intermediate acting (analogues)	Detemir	1–3	9–unknown	14–24	Usually given two times daily
Long-acting analogues	Glargine	1–3	Ideally no peak	20–24	Only one time daily
Long-acting analogues	Degludec	0.5–1.5	Ideally no peak	24–36	Useful when glargine is not efficacious

The impact of geriatric syndromes in diabetic patients (Moreno et al. 2013):

- Diabetes has peculiar complications in aged persons such as disability or higher risk of pressure sores.
- Dementia is considered a type 3 diabetes and diabetes is also a common risk factor for depression.
- Diabetes is highly associated with the onset of late-life cognitive decline (see also Chapter 7).

References

Ekoé JM, Punthakee Z, Ransom T, et al. Screening for type 1 and type 2 diabetes. Can J Diabetes. 2013;37(Suppl 1):s12–5.

Huang ES, Davis AM. Glycemic control in older adults with diabetes mellitus. JAMA. 2015;314:1509–10.

Kirkman MS, Briscoe VJ, Clark N, et al. Diabetes in older adults. Diabetes Care. 2012;35:2650–64.

Moreno G, Mangione CM, Kimbro L, Vaisberg E. Guidelines abstracted from the American Geriatrics Society guidelines for improving the care of older adults with diabetes mellitus: 2013 update. J Am Geriatr Soc. 2013;61:2020–6.

Cardiovascular Disease

13

Timo E. Strandberg and Tuomo Nieminen

Abstract

Cardiovascular diseases (CVD) are a leading cause of morbidity and mortality in older people. Pathophysiology of CVD can be divided into two large entities, vessel and heart dysfunction, which are reflected clinically mainly as hypertension, coronary artery disease (CAD), stroke, peripheral artery disease (PAD), cardiomyopathies, heart failure, pulmonary hypertension, various arrhythmias, heart valve defects, and endocarditis. Prevention, diagnosis, and optimal treatment of CVD in older patients do not necessarily differ from those in younger subjects, even though few studies have particularly focused on oldest and frailest patients. Diagnosing frailty and comprehensive geriatric assessment are recommended to individualize treatment. Palliative care is an important dimension especially in heart failure.

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_13) contains supplementary material, which is available to authorized users.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_13.

T.E. Strandberg (✉)
University of Helsinki, Clinicum, and Helsinki University Hospital, Helsinki, Finland

University of Oulu, Center for Life-Course Health Research, Oulu, Finland
e-mail: timo.strandberg@helsinki.fi

T. Nieminen
University of Helsinki, Clinicum, and Helsinki University Hospital, Helsinki, Finland

Eksote, Lappeenranta, Finland
e-mail: tuomo.nieminen@gmail.com

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_13

Learning Objectives

By the end of the chapter, the reader will be able to
- Know the importance and optimal treatment of hypertension and hypercholesterolemia in prevention of cardiovascular diseases
- Recognize the often atypical presentation of acute coronary syndromes in an older patient
- Apply proper anticoagulation in atrial fibrillation
- Reflect between preventive and palliative care in heart failure

13.1 Epidemiological Aspects of Cardiovascular Diseases in Old Age

CVD are the leading cause of morbidity and mortality in older people. Pathophysiology of CVD can be divided into two large entities:

– (1) Vessel dysfunction, such as occlusion due to atherosclerosis, thrombosis, or embolism, leading to ischemia
– (2) Heart dysfunction such as heart failure and arrhythmias

More specifically, CVDs include several important diseases, such as:
– High blood pressure (hypertension)
– Coronary artery disease (CAD)
– Stroke
– Peripheral artery disease (PAD)
– Cardiomyopathies
– Heart failure (HF)
– Pulmonary hypertension
– Various arrhythmias
– Heart valve diseases
– Endocarditis
– Venous diseases (deep vein thrombosis, pulmonary embolism)

Moreover, CVD can also be contributing to various geriatric syndromes where small vessel pathology together with vascular aging plays an important part.

CVDs become more common with aging because of cumulative effect of atherosclerotic risk factors:

– Cholesterol
– Hypertension

– Diabetes
– Smoking

and progressing age changes:

– Fibrosis
– Lipohyalinosis
– Amyloid angiopathy

which in concert impair function and structures in heart and vessel walls.

13.2 Assessment of an Older Patient for CVD

– Typically, prevention, diagnosis, and treatment of CVD are not different between older and younger adults, and when they differ, it is usually due to not chronological, but biological age.
– The latter is greatly affected by the presence of frailty.
– Comprehensive geriatric assessment (CGA) (see also Chapter 26) is always indicated in complex older patients with frailty, multimorbidity, and consequent polypharmacy.
– General outline of specific CVD assessments and tests in a stable or an unstable patient is in Table 13.1.
– This chapter concentrates on the clinically most important CVDs in geriatrics: hypertension, CAD, arrhythmias (atrial fibrillation [AF]), valve defects (aortic stenosis [AS] and mitral insufficiency [MI]), and heart failure (HF).
– Emphasis will be given to features specific to older patients (Table 13.2).

Table 13.1 General assessment of an older CVD patient

	Stable	Acute
History	CVD risk factors over the life course. Previous CVD, previous cognitive and physical function (angina pectoris, claudication). Weight changes, medications, comorbidity	Previous CVD history and present medications
Symptoms	Chest pain (typical, atypical), claudication, dyspnea, malaise, infections	Chest pain (typical, atypical), claudication, dyspnea, malaise, infections, signs of delirium
Signs	Blood pressure (BP), heart rate, heart murmurs, third heart sound (S3 sound), vascular bruits, jugular pulse, peripheral edema, pulmonary rales, frailty, cognition	BP, heart rate, heart murmurs, S3 sound, vascular bruits, jugular pulse, peripheral edema, pulmonary rales, frailty, cognition
Primary tests	ECG, chest X-ray, natriuretic peptides	ECG, chest X-ray, cardiac troponins, natriuretic peptides
Secondary tests	Ambulatory ECG recording (Holter), exercise testing, echocardiography, carotid and femoral ultrasound, ankle-brachial index, angiography electrophysiological tests	Echocardiography, carotid and femoral ultrasound, angiography

Table 13.2 General characteristics of some important CVDs and their special features in older people

Disease	Prevalence in older populations	Common symptoms in younger populations	Atypical presentation in older patients	Associated geriatric conditions	Treatment goals	Additional geriatric aspects
Hypertension	50%	Usually asymptomatic	White-coat effect is common. Systolic BP may rise >200 mmHg without being a "crisis." Pseudohypertension rare but difficult to diagnose	Orthostatic hypotension; important to check BP in standing position	Generally, systolic BP <150 mmHg; lower goals (<130–140 mmHg) may be individualized	Assessment of frailty
CAD	20%	Chest pain	May present with dyspnea, delirium, or heart failure	Heart failure, delirium	Usually similar to younger populations, coronary angiography may not be necessary	Infections often a precipitating factor; prevention and treatment of delirium
Atrial fibrillation	10%	Usually symptomatic	Often asymptomatic	Heart failure	Anticoagulation (not aspirin) is essential. Rhythm control may be tried, but rate control is often adequate	Falling tendency usually no contraindication to anticoagulation
Aortic stenosis	2–7%	Severe stenosis usually symptomatic	Often asymptomatic or atypical symptoms	Heart failure, dizziness/ syncope	TAVI increasingly used	CGA needed before invasive treatment
Heart failure	>10%	Typical form: HFrEF ("systolic" HF)	Typical form: HFpEF ("diastolic" HF)	Cardiac cachexia	General goals as in younger patients; diastolic HF still lacks effective treatments	Preventive and palliative treatment often go hand in hand; end-of-life care important in progressed cases

13.3 Hypertension

13.3.1 General

Hypertension is very common in older people and due to pathophysiology (stiffening of large arteries) it is usually **systolic** while diastolic BP decreases in old age.

- Large controlled studies have established the benefits of antihypertensive treatment also in older patients. The Hypertension in the Very Elderly Trial (HYVET) (Warwick et al. 2015) study showed that treatment is beneficial also when started over 80 years of age, and benefits apply to a large proportion of older home-dwelling individuals.
- However, there are few studies and scant data of frailest and disabled patients in nursing homes. Treating their BP can be problematic and may lead to adverse effects.

13.3.2 Diagnosis in Older Patients

- Usually similar to younger persons.
- White-coat hypertension is relatively common.
- Important to measure BP in upright position to rule out orthostatic hypotension.

13.3.3 Treatment

- Worthwhile to check lifestyle (salt consumption, physical activity), albeit modifications are of limited benefit, diets are obsolete in geriatric patients. Established hypertension usually requires drug treatment.
- Important to optimize total cardiovascular risk management (dyslipidemia, smoking, diabetes).
- If systolic BP is >160 mmHg, assessment of frailty can be used to guide treatment decisions in an octogenarian (Fig. 13.1).
- It is usually advisable to start with monotherapy, but if insufficient, it is better to use combinations with lower doses than to maximize the dose in monotherapy.
- Choice of drug is dependent on concomitant diseases and medications, usually diuretic, Angiotensin Converting Enzyme (ACE) and Angiotensin Release Blocker (ARB), calcium channel blocker, or their combinations, are recommended.
- Beta-blockers are not recommended as a first-line antihypertensive drug due to adverse drug effects (postural hypotension, falls).
- BP may rise to high levels (>200 mmHg) without being a “hypertensive crisis” (no signs of cerebral symptoms or HF). Observation and gentle reduction of BP are usually indicated.

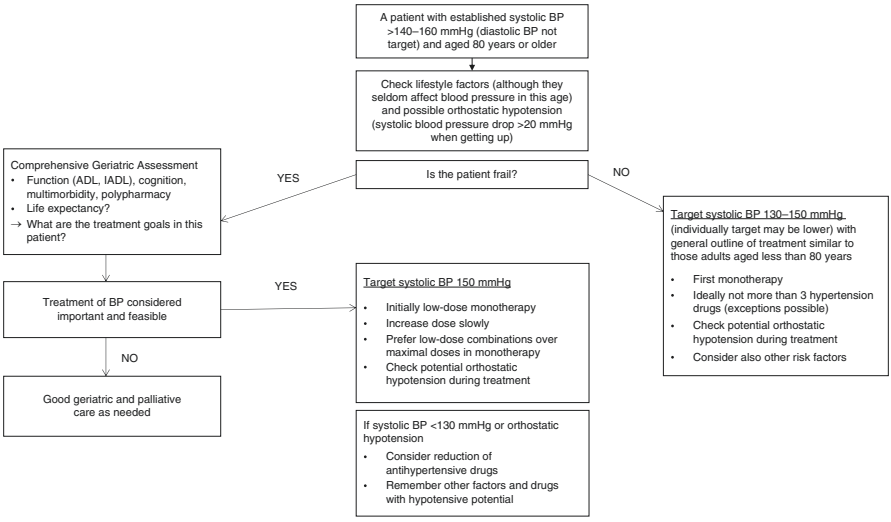


Fig. 13.1 Outline of treatment of hypertension in octogenarians. *BP* blood pressure; *ADL* activities of daily living; *IADL* instrumental ADL

13.4 Coronary Artery Disease (CAD)

13.4.1 General

– Symptomatic CAD can present in chronic form (stable angina pectoris) and acute coronary syndrome, which is further divided into unstable angina pectoris as well as non-ST-segment and ST-segment elevation myocardial infarction Non-ST Elevation Myocardial Infarction (NSTEMI) and ST Elevation Myocardial Infarction (STEMI), respectively.
– CAD is caused by atherosclerotic changes in vessel wall and their prevention is similar to younger persons with emphasis on dyslipidemia, hypertension, and smoking.
– During the last few decades, the epidemiology of acute coronary syndrome has changed with currently more than half of the patients being older than 75 years, two-thirds of them women.
– The acute presentation in older patients is often atypical (Table 13.3) (see also Chapter 5).

Table 13.3 Features of acute coronary syndrome in older patients

Typical retrosternal pain may be present in only one-third of patients
Signs of heart failure (dyspnea) and arrhythmia
Delirium
Sudden worsening of general health
Concomitant infection

Table 13.4 Management of an older patient with NSTEMI

Treatment	Recommendation
Invasive strategy	Individual evaluation based on symptoms, benefits and risks, frailty and comorbidities, quality of life, life expectancy, and patient preferences
Antiplatelet treatment	Tailored according to body weight and renal function; dual-antiplatelet therapy usually indicated
Medications	Adjusted doses as needed for statins, ACE inhibitors/ARBs, and beta-blockers

13.4.2 Treatment of Chronic State

- Treatment in chronic, stable CAD does not differ from general guidelines with emphasis on both preventive (lifestyle, statins, aspirin) and symptomatic (nitrates, beta-blockers) measures.
- Need of invasive treatment (angioplasty, bypass surgery), which seldom prolongs prognosis, depends largely on symptoms and individual characteristics, not on patient's age.
- Angioplasty can be a safe procedure also in a symptomatic frail older person, and improves functionality.

13.4.3 Treatment of Acute Coronary Syndrome

- STEMI is usually treated with primary angioplasty irrespective of patient's age, as fibrinolytic therapy may be hazardous in older patients because of bleeding complications.
- In NSTEMI, treatment strategy is individualized (Table 13.4).

13.5 Arrhythmias

13.5.1 General

- The most frequent intrinsic cause of bradyarrhythmia (<50 beats/min) is sick sinus syndrome (SSS), which is caused by degenerative changes in the sinoatrial node. Atrioventricular (AV) block (grade II or III) is another relatively common cause of bradycardia.
- The most important chronic arrhythmia in older patients is AF.
- The main predisposing factors of AF are hypertension and HF.
- AF can be paroxysmal, persistent, or permanent, all of which are associated with several important clinical endpoints (Table 13.5).

Table 13.5 Association of AF with clinical endpoints

Event	Relationship to AF
Death	Especially increased cardiovascular mortality
Stroke	20–30% of strokes related to AF; relationship also to "silent" paroxysmal AF and atrial flutter
Cognitive decline and vascular dementia	White matter lesions in the brain more common in patients with than without AF
Left ventricle (LV) function and heart failure	LV dysfunction is observed in 20–30% of AF patients, high heart rate exposes to LV dysfunction
Hospitalizations	10–40% of AF patients are hospitalized annually
Health-related quality of life	Impaired in AF patients independently of other CVD. AF is often an indication of comorbidities

13.5.2 Treatment of SSS and AV Block

- Drugs interfering with sinus and AV node are discontinued. A pacemaker may be indicated if bradycardia prevails.
- In SSS, permanent pacemaker is indicated in symptomatic cases. Temporary pacemaker is needed only exceptionally.
- As a rule, AV block grade IIb and AV block grade III indicate a pacemaker; AV block grade IIa indicates a pacemaker only if symptomatic.

13.5.3 Treatment of AF

- Cardioversion is usually always tried at least in the first episode of AF.
- Predisposing factors such as hypertension, heart failure, and hyperthyroidism (also subclinical) should be optimally treated prior to cardioversion.
- Careful oral anticoagulation (not aspirin) is essential also in an older patient.
- According to CHA_2DS_2-VASc score, age 75 years alone equals high risk of stroke in AF/flutter and is an indication to anticoagulation.
- Even multiple falls are usually not a contraindication for anticoagulation.
- The effect of observed microbleeds in Magnetic Resonance Imaging (MRI) is speculative. It has been suggested that <5 subcortical microbleeds would not cause risk, whereas higher number or cortical microbleeds would increase the risk of hemorrhage and need for individual assessment of anticoagulation.
- Non-vitamin K antagonist oral anticoagulants (NOAC) are typically preferred, but there is no need to change an ongoing and successful warfarin treatment.
- Although arrhythmic drugs and electrophysiological ablation treatments are available in the treatment of AF, rate control (usually with a beta-blocker) is usually preferred over rhythm control if cardioversion(s) is not successful.

13.6 Valvular Heart Disease

13.6.1 General

- Most important valve abnormalities in old age are AS and MI.
- AS is usually due to degenerative calcification of the valve cusps due to the presence of atherosclerotic risk factors.
- Classic signs of AS are angina pectoris, shortness of breath, heart failure, and syncope, but AS should be diagnosed before the symptoms.
- Systolic murmur is a diagnostic hint, which leads to echocardiography and cardiological assessment.
- Patients with low-flow, low-gradient AS due to decreased ejection fraction (EF) may be a diagnostic and therapeutic challenge.

13.6.2 Treatment of AS

- When invasive treatment is indicated, transcatheter aortic valve implantation (TAVI) is increasingly used in older patients, particularly among those with high risk with conventional valve surgery.
- A CGA should be a part of preoperative assessment to establish general prognosis and long-term benefit (see also Chapter 26).

13.6.3 Treatment of Mitral Insufficiency

- MI is the second most frequent valve lesion requiring surgical treatment.
- Catheter-based treatments are evolving and may be considered to patients inoperable or at high operative risk.

13.7 Heart Failure (HF)

13.7.1 General

- HF is a clinical syndrome where pump function of the heart is insufficient to keep up adequate circulation.
- HF can be caused by a variety of CVDs and conditions, but it is estimated that 90% of cases are caused by hypertension, CAD, or valve abnormalities.
- HF is increasingly common in aging populations and a major cause for hospital admissions.
- Prevention includes control of CVD risk factors, especially hypertension, dyslipidemia, and diabetes during the life course.

13.7.2 Diagnosis of HF

- HF may be suspected with history and clinical signs but usually it must be verified with imaging (echocardiography).
- Normal electrocardiogram (ECG) or normal levels of brain natriuretic peptides (BNP <35 pg/ml and/or N-terminal pro B-type natriuretic peptide (NT-proBNP) <125 pg/mL) exclude HF, but increased values can also be caused by other factors.
- Normal chest X-ray does not exclude HF.
- HF can be divided into acute or chronic, and on the basis of EF in three forms: **preserved (HFpEF), mid-range (HFmrEF),** and **reduced ejection fraction (HFrEF)**.
- Formerly, HFrEF was called systolic HF and HFpEF diastolic HF, but as the forms of dysfunction overlap, EF-based criteria are more precise.
- The criteria and some clinical features are presented in Table 13.6.

Table 13.6 Definition and clinical features of heart failure with HFpEF, HFmrEF, and HFrEF

	HF type		
	HFrEF ("systolic" HF)	HFmrEF	HFpEF ("diastolic" HF)
Diagnostic criteria			
	Symptoms and signs of HF	Symptoms and signs of HF	Symptoms and signs of HF
	Left ventricular ejection fraction (LVEF) <40%	LVEF 40–49%	LVEF ≥50%
		Elevated levels of natriuretic peptides	Elevated levels of natriuretic peptides
		At least one of the following: – Structural heart disease (left ventricular hypertrophy and/or left atrial enlargement) – Diastolic dysfunction	At least one of the following: – Structural heart disease (left ventricular hypertrophy and/or left atrial enlargement) – Diastolic dysfunction
Typical pathophysiology	Damaged left ventricle due to myocardial infarction, aortic stenosis, or cardiomyopathy	Mixed	Stiffened ventricle wall due to various reasons: aging, fibrosis, hypertension, diabetes, myocardial ischemia, or aortic stenosis
Typical patient	Previous myocardial infarction		Older woman with hypertension and AF, not necessarily clinical coronary artery disease

13.7.3 Treatment of HF

- Although the clinical studies on HF treatment have largely recruited non-geriatric patients, the data is usually applied likewise to older patients.
- In HFrEF, mortality benefit has been observed with ACE inhibitors/ARBs, beta-blockers, and mineralocorticoid receptor blockers whereas diuretics and digoxin (if AF) provide symptomatic relief.
- HFpEF still lacks specific treatments and treatment is largely symptomatic with optimal treatment of hypertension and other comorbidities.
- Cardiac resynchronization therapy improves pump function in HFrEF with wide left bundle branch block in ECG, and can be combined with implantable cardiac defibrillator.
- Invasive treatments can be used also in older patients, but defibrillation function is not appropriate in end-of-life care.
- General recommendations for the treatment of an older HF patient are listed in Table 13.7.

13.7.4 Palliative Treatment in HF

An important aspect of HF in older patients is palliative and end-of-life care. Indications are in Table 13.8.

Table 13.7 General recommendations for the treatment of an older HF patient

Frailty	Check for frailty and optimize its treatment with adequate nutrition and appropriate physical activity
Regular medication review	Optimize HF medication with frequent monitoring of clinical status and laboratory results; adjust doses slowly. Reduce polypharmacy, if possible without impairing treatment. Depending on the prognosis, reduce preventive measures and emphasize symptom relief and quality of life
Diuretic therapy	Important symptomatic therapy. Check timing and dose to prevent incontinence. Regular weight monitoring and laboratory electrolyte check help assessing the need for dose adjustments
Multidisciplinary team	Older HF patient usually has multiple problems, complete geriatric assessment is mandatory to optimize total treatment. Caregiver burden must also be assessed

Table 13.8 Indications for palliative and end-of-life care in HF

Recurrent episodes of worsening HF leading to hospitalizations despite optimal medication
Mechanical support is not indicated
Symptoms are New York Heart Association (NYHA) IV with poor quality of life
Assistance needed in activities of daily living
Poor clinical prognosis
Cardiac cachexia or low serum albumin

13.8 Drug Treatments in CVD

Common drug classes used for treatment of CVD and special considerations in older patients are presented in Table 13.9.

Table 13.9 Common oral drug classes with special considerations for older patients

Drug class	Common examples	Common indication(s) in CVD	General applicability to older patients: A = suitable, B = suitable with some reservations	Special considerations in older people
ACE inhibitors	Captopril, enalapril, lisinopril, perindopril, ramipril, trandolapril	CAD, hypertension, HF	B	Generally well tolerated also in older patients; observe renal function and lower dose as needed
Antiarrhythmics	Amiodarone, dronedarone, flecainide, sotalol	Arrhythmias in special cases	B	Cardiological consultation required
Antiplatelets	Aspirin, clopidogrel, ticagrelor	Secondary prevention of ASCVD	B	Beware of bleeding complications, consider gastric protection
ARBs	Candesartan, eprosartan, losartan, olmesartan, telmisartan, valsartan	CAD, hypertension, HF	B	Generally well tolerated also in older patients; observe renal function and lower dose as needed
ARB and neprilysin combination	Sacubitril plus valsartan	HF	B	May replace ACE inhibitor/ ARB
Beta-blockers	Atenolol, betaxolol, bisoprolol, carvedilol, metoprolol, nebivolol	Arrhythmias, angina pectoris, CAD, HF, (hypertension)	A	Beware of bradycardia, hypotension, falls
Calcium-channel blockers (dihydropyridine)	Amlodipine, felodipine, lercanidipine	Hypertension	A	Beware of hypotension, may cause peripheral edema
Calcium-channel blockers (non-dihydropyridine)	Diltiazem, verapamil	Tachycardias	A	Beware of systolic HF, bradycardia
Digitalis	Digoxin	High HR in atrial fibrillation, HF in special cases	B	Use in low doses, observe renal function, measure serum concentrations

Table 13.9 (continued)

Drug class	Common examples	Common indication(s) in CVD	General applicability to older patients: A = suitable, B = suitable with some reservations	Special considerations in older people
Diuretics				
• Thiazides	Hydrochlorothiazide, indapamide	HF, hypertension	A	Beware of dehydration
• Loop diuretics	Furosemide	HF	A	Beware of dehydration
• Potassium sparing	Eplerenone, spironolactone	HF, hypertension	B	Beware of dehydration and hyperkalemia
Nitrates	Isosorbide dinitrate	Angina pectoris	A	Beware of hypotension
Oral anticoagulants	Warfarin, apixaban, dabigatran, edoxaban, rivaroxaban	Atrial fibrillation	B	Beware of bleeding complications, observe renal/liver function with some preparations, laboratory surveillance with warfarin
Sinus node inhibitor	Ivabradine	HF, angina pectoris	B	In special cases in patients with sinus rhythm and HR over 70/min despite optimal other treatment
Statins	Atorvastatin, lovastatin, pitavastatin, pravastatin, rosuvastatin, simvastatin	Dyslipidemia prevention of ASCVD	B	Generally well tolerated also in older patients; muscle symptoms and onset of diabetes potential adverse effects; observe drug interactions with some preparations

ASCVD atherosclerotic cardiovascular disease, *CAD* coronary artery disease, *CVD* cardiovascular disease, *HF* heart failure, *HR* heart rate

Further Reading

Benetos A, Rossignol P, Cherubini A, et al. Polypharmacy in the aging patient. Management of hypertension in octogenarians. JAMA. 2015;314:170–80.

Brignole M, Auricchio A, Baron-Esquivias G, et al. 2013 ESC guidelines on cardiac pacing and cardiac resynchronization therapy: the Task Force on cardiac pacing and resynchronization therapy of the European Society of Cardiology (ESC). Developed in collaboration with the European Heart Rhythm Association (EHRA). Eur Heart J. 2013;34:2281–329.

Kirchhof P, Benussi S, Kotecha D, et al. 2016 ESC guidelines for the management of atrial fibrillation developed in collaboration with EACTS. Eur Heart J. 2016;37:2893–962.

Ponikowski P, Voors AA, Cleland JGF, et al. 2016 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure: the Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC). Developed with the special contribution of the Heart Failure Association (HFA) of the ESC. Eur Heart J. 2016;37:2129–200.

Roffi M, Patrono C, Collet JP, et al. 2015 ESC guidelines for the management of acute coronary syndromes in patients presenting without persistent ST-segment elevation: Task Force for the Management of Acute Coronary Syndromes in patients presenting without persistent ST-segment elevation of the European Society of Cardiology (ESC). Eur Heart J. 2016;37:267–315.

Steg PG, James SK, Atar D, et al. ESC guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: the Task Force on the management of ST-segment elevation acute myocardial infarction of the European Society of Cardiology (ESC). Eur Heart J. 2012;33:2569–619.

Strandberg TE, Kolehmainen L, Vuorio A. Evaluation and treatment of older patients with hypercholesterolemia: a clinical review. JAMA. 2014;312(11):1136–44.

Vahanian A, Alfieri O, Andreotti F. Guidelines on the Management of Valvular Heart Disease (version 2012): the joint Task Force on the management of Valvular heart disease of the European Society of Cardiology (ESC) and the European Association for Cardio-Thoracic Surgery (EACTS). Eur Heart J. 2012;33:2451–96.

Warwick J, Falaschetti E, Rockwood K, Mitnitski A, Thijs L, Beckett N, Bulpitt C, Peters R. No evidence that frailty modifies the positive impact of antihypertensive treatment in very elderly people: an investigation of the impact of frailty upon treatment effect in the HYpertension in the Very Elderly Trial (HYVET) study, a double-blind, placebo-controlled study of antihypertensives in people with hypertension aged 80 and over. BMC Med. 2015;13:78.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_13.

Stroke and Cerebrovascular Disease

14

Donal Fitzpatrick and Desmond O'Neill

Abstract

Stroke occurs in all age groups but is predominantly an age-related syndrome common in older people with multimorbidity and frailty. Many are left disabled with conditions central to the practice of geriatric medicine: many more are affected by chronic stroke disease. Skilled history and physical examination are needed to correctly diagnose patients with stroke. Stroke units, thrombolysis and mechanical thrombectomy help to reduce major disability and death. Patients suffer significant loss of function following stroke. We must identify this lost function and aim to restore it as much as possible through rehabilitation and support with a multidisciplinary team. Although stroke is often thought of as an acute disease, it is a chronic disease with acute events. Disorders of gait, swallow and cognition in older people are commonly attributable to chronic stroke disease.

Learning Objectives

By the end of the chapter, the reader will be able to

- Be aware that stroke is a disease predominantly of older people and usually in the context of multimorbidity
- Consider stroke to be a chronic disease with acute events
- Be aware that the foundation of stroke treatment is the stroke unit, backed up by thrombolysis and thrombectomy for a minority of patients
- Clinically diagnose stroke and appreciate a careful clinical, gerontologically attuned, assessment to be the key to assessment

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_14) contains supplementary material, which is available to authorized users.

D. Fitzpatrick • D. O'Neill (✉)
Trinity College, Dublin, Ireland
e-mail: doneill@tcd.ie

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_14

14.1 Epidemiology and Definition

Stroke is a common and potentially devastating condition. It occurs in all age groups but is more common in older people with two-thirds of patients aged 65 or over.

Stroke is a clinical diagnosis and is defined as a focal or global neurological deficit of presumed vascular origin, lasting more than 24 h, or causing death within 24 h. The majority of strokes are ischaemic, and one-sixth due to haemorrhage. Ischaemic stroke refers to infarction of the central nervous system (CNS) (brain, retina, spinal cord) caused by ischaemia. A transient ischaemic attack (TIA) is a transient episode of neurologic dysfunction caused by CNS ischaemia, usually without acute infarction. The underlying disease process is the same. Both are medical emergencies requiring urgent attention.

14.2 Aetiology of Ischaemic Stroke

Acute ischaemic stroke is caused by thrombotic or embolic occlusion of a cerebral artery (Tables 14.1 and 14.2).

14.3 Clinical Assessment

History: A comprehensive history should clarify the diagnosis. A relatively small number of conditions present like strokes or TIAs (including space-occupying lesions, subdural haemorrhage, migraine and multiple sclerosis) and distinguishing between them and true stroke is essential. Stroke can have a stuttering onset but is classically sudden and maximal in onset. Symptoms slowly spreading from one part of the body to another are more suggestive of a seizure or a migraine. Neck pain should prompt consideration of carotid/vertebral artery dissection. A collateral history is essential for patients with impairments in language or cognition.

Table 14.1 Causes of ischaemic stroke

Large artery disease (20%)	Other causes
In situ atherothrombosis Arterio-arterial embolism	Carotid/vertebral dissection Haemodynamic: hypoperfusion Vasculitis Iatrogenic, e.g. percutaneous intervention (PCI) Thrombophilia Illicit drugs: cocaine, methamphetamine Inherited conditions, e.g. Fabry disease
Cardioembolic (20%)	
Atrial fibrillation/atrial flutter (by far most common cardioembolic cause) Left atrial/atrial appendage thrombus (often associated with atrial fibrillation) Ventricular thrombus Rheumatic heart disease Prosthetic valves Patent foramen ovale with paradoxical embolus Infective endocarditis	
Lacunar stroke (25%)	
Microatheroma and lipohyalinosis of small penetrating arteries lead to small infarcts (<20 mm) in deep brain structures (subcortical), may be silent.	
Cryptogenic stroke (30%)—cause not identified	

Table 14.2 Types of ischaemic stroke (adapted from Bamford Classification) (Bamford et al. 1991)

	Occluded blood vessel	Area of brain infarcted	Clinical features
Anterior circulation	Internal carotid, middle cerebral, anterior cerebral arteries	Frontal, parietal, temporal lobes	Hemiparesis Higher cerebral dysfunction, e.g. aphasia, agnosia, apraxia Hemianopia 2/3 = Partial anterior circulation, all 3 = total anterior circulation
Posterior circulation	Basilar, vertebral, posterior cerebral arteries	Brainstem, cerebellum, occipital cortex	Cranial nerve palsy AND contralateral motor/sensory defect Bilateral motor or sensory defect Vertigo, nystagmus Cerebellar dysfunction Homonymous hemianopia
Lacunar	Deep perforators	Deep brain structures	Pure motor Pure sensory Sensorimotor Ataxic hemiparesis

Examination should include 1) overview from the end of the bed: alertness, position, gait if mobile and attention to surroundings bilaterally; 2) language and cognition; 3) cranial nerves, with attention to pupillary abnormalities, conjugated gaze paralysis, hemianopia, facial palsy and pseudobulbar palsy; 4) peripheral nervous system examination including power, tone, reflexes, sensation and co-ordination; and 5) assessment of agnosia(s), apraxia and swallow function.

Disorders in speech, perception and cognition are less obvious than a hemiparesis, but nearly always have a greater impact on the outcome for the patient.

14.3.1 Speech

Dysarthria is a problem of articulation, slurred speech, related to a degree of pseudobulbar palsy, i.e. an upper motor neuron lesion of cranial nerves IX–XII, and is often associated with dysphagia.

Aphasia is a problem with producing and understanding language. It is usually caused by infarcts occurring in the dominant cerebral cortex (left middle cerebral artery territory). The two most common types of aphasia are expressive and receptive. Patients cannot find the words, speak with difficulty and are frustrated. In receptive aphasia, the patient is unable to understand language in its written or spoken form and often speaks effortlessly but their speech lacks meaning and contains many errors including wrong words, syllables and nonsensical speech.

14.3.2 Perceptual Disorders

14.3.2.1 Agnosia

Difficulty interpreting sensory data from the environment or one's own body. Subtypes include the following:

Inattention/hemiagnosia (formerly neglect): This is a deficit in attention to and awareness of the contralateral side of their body or environment. It is more severe with infarcts of the nondominant parietal cortex. Inattention can be a significant challenge to rehabilitation.

Astereognosis: Difficulty perceiving objects through tactile stimulation (e.g. a key).

A**nosognosia:** The patient has reduced awareness of their neurological deficit. Makes rehabilitation more challenging.

14.3.2.2 Apraxia

The inability to carry out learned or purposive movement in the presence of preserved motor pathways. Examples include dressing apraxia, speech apraxia and gait apraxia.

14.3.3 Cognition

Post-stroke delirium (see also Chapter 8) and dementia (see also Chapter 7) are common. Cognitive tests such as the Mini-Mental State Examination (MMSE) can be used. A joint assessment with Occupational Therapy/Speech Language Therapy (OT/SLT) is useful if there is significant language impairment.

14.4 Investigations

Stroke is a clinical diagnosis (early CT brain commonly will not show an infarct); investigations are primarily focused on establishing the cause(s) and include basic bloods, imaging and cardiac monitoring. Investigations include CT and/or MRI brain, carotid Doppler, cardiac monitoring and transoesophageal echocardiogram.

14.5 Management

14.5.1 Stroke Units and Reperfusion Therapy

Geriatricians in some European countries manage the full spectrum of stroke care from hyperacute treatment (including thrombolysis and thrombectomy) through to community rehabilitation and support: further details of this full spectrum can be found at

https://www.rcplondon.ac.uk/guidelines-policy/stroke-guidelines. Geriatricians are universally involved in prevention, rehabilitation and support for this age-related syndrome (Table 14.3).

Table 14.3 Secondary Prevention for Ischaemic Stroke

Intervention/treatment		Special considerations in old age
Lifestyle modification	Smoking cessation and physical activity significantly reduce the risk of recurrent stroke	Ageist attitudes may deter doctors encouraging lifestyle modification in spite of proven benefit in all age groups (Mons et al. 2015)
Antiplatelets	300 mg of aspirin should be initiated as soon as haemorrhage is ruled out by CT or 24 h after thrombolysis (Intercollegiate Stroke Working Party 2016). The dose is reduced after 2 weeks, and then continued indefinitely. Clopidogrel is an alternative	Greater bleeding risk in older individuals
Anticoagulation	Patients with cardiogenic stroke secondary to atrial fibrillation should generally be anticoagulated with a direct-acting oral anticoagulant or warfarin (Intercollegiate Stroke Working Party 2016). There is no need for aspirin as well in this case. If the infarct is tiny, anticoagulation may be commenced immediately; otherwise, anticoagulation is postponed, between a few days and 2 weeks, to minimise the risk of haemorrhagic transformation	Greater bleeding risk. For older people, common relative contraindications for anticoagulation are any one or a combination of significant cognitive impairment, gait unsteadiness with a tendency to fall and moderate-to-severe chronic kidney disease
Blood pressure	In the acute phase of stroke, blood pressure should be allowed to run high to maximise collateral blood flow (Intercollegiate Stroke Working Party 2016). Once the acute phase of stroke is over, blood pressure control is one of the most effective means of secondary prevention	Orthostatic hypotension is common in older individuals, often in conjunction with hypertension. Overaggressive blood pressure control may do more harm than good
Lipids	A statin should be commenced but has less impact on secondary prevention than the above measures	Statin myopathy is more common in older patients
Carotid endarterectomy	Patients with carotid stenosis greater than 70% that is symptomatic, i.e. stroke/TIA in the distribution of the diseased carotid artery, should be considered for endarterectomy, ideally within 2 weeks	Not recommended for patients with severe disabling strokes where useful function cannot be preserved. Frail older patients may not tolerate surgery/anaesthesia as well as their younger counterparts but may also may be at highest risk of recurrent disease

14.5.2 Rehabilitation

The pharmacological and interventional radiology elements are only one part of the management of stroke. Many stroke patients require prolonged rehabilitation. The neuroplasticity of the brain allows alternative neural pathways to develop and rehabilitation can restore some lost function. Even patients with severe deficits may make functional gains significantly improving their quality of life. It can be very difficult to predict a patient's eventual functional ability in the acute phase of stroke. Rehabilitation begins immediately after the stroke in the stroke unit with a full multidisciplinary team.

14.6 Chronic Stroke Disease

Stroke is usually only considered as an acute disease. It is more accurate to consider stroke as a chronic condition with acute exacerbations like COPD or heart failure. Chronic stroke disease can develop insidiously with progressive small vessel pathology (Briggs and O'Neill 2016). The course of the disease may or may not be punctuated by major stroke events caused by large vessel pathology. The most common manifestations of chronic stroke disease are the following:

- **Vascular gait dyspraxia**: Vascular gait dyspraxia is a gait disorder not explained by deficits in the pyramidal, extrapyramidal, sensory or cerebellar systems. It is characterised by hesitancy and short, shuffling steps and disequilibrium. Gait disorders tend to respond well to gait and balance training with physiotherapy.
- **Swallow impairment**: Oropharyngeal dysphagia may present with overt signs of aspiration with coughing around meals or more subtly with poor oral intake causing weight loss, or recurrent pneumonia. Modifications for dysphagia include chin tucking, thickened diet or volume-control beakers (Briggs and O'Neill 2016).
- **Cognitive deficits**: Vascular dementia is classically characterised by cognitive deficits acquired in a stepwise fashion, linked to recurrent vascular events. Difficulties in judgement, planning and emotion are prominent. Cerebrovascular disease, cardiovascular disease and cognitive impairment commonly co-occur and are closely related to each other.

The combination of all three of the above has been referred to as Stravinsky syndrome, after the composer who suffered from the condition (O'Neill et al. 2014).

References

Bamford J, Sandercock P, Dennis M, Burn J, Warlow C. Classification and natural history of clinically identifiable subtypes of cerebral infarction. Lancet. 1991;337:1521–6.

Briggs R, O'Neill D. Chronic stroke disease. Br J Hosp Med. 2016;77:C66–9.

Goyal M, Menon BK, van Zwam WH, et al. Endovascular thrombectomy after large-vessel ischaemic stroke: a meta-analysis of individual patient data from five randomised trials. Lancet. 2016;387:1723–31.

Intercollegiate Stroke Working Party. National clinical guideline for stroke. London: Royal College of Physicians; 2016.

Mons U, Müezzinler A, Gellert C, et al. Impact of smoking and smoking cessation on cardiovascular events and mortality among older adults: meta-analysis of individual participant data from prospective cohort studies of the CHANCES consortium. BMJ. 2015;350:h1551.

O'Neill D, Macsweeney CA, Cornell IA, Moss H. Stravinsky syndrome: giving a voice to chronic stroke disease. QJM. 2014;107:489–93.

Depression

15

Sylvie Bonin-Guillaume and Michel Benoit

Abstract

Depression is the most frequent psychiatric disorder in old populations. Depression is a clinical syndrome that needs specific skills. Therefore, depression in older patients is often underdiagnosed because of misperceptions and atypical presentations. Although curable, depression is frequently undertreated. Depression leads to bad geriatric outcomes: frailty, disability, cognitive impairment, functional decline, mortality, morbidity, and increase of health costs. Above all, depression is the main risk factor of suicide in older persons.

Learning Objectives

By the end of the chapter, the reader will be able to

- Develop clinical skills to improve depression diagnosis
- Choose the right depression scale for the right patient
- Optimize treatment effectiveness and patient adherence to treatment
- Recognize factors worsening depression prognosis

"The World Health Organization predicts that by 2020, depression will be the second main cause for disability and premature death after heart disease, in established market economies" (Charney 2003).

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_15) contains supplementary material, which is available to authorized users.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_15.

S. Bonin-Guillaume (✉)
Internal Medicine and Geriatric Department, Assistance Publique Hopitaux de Marseille, Aix Marseille University, Marseille, France
e-mail: sylvie.bonin@ap-hm.fr

M. Benoit
Clinique de Psychiatrie, Pole des Neurosciences Cliniques, Nice, France
e-mail: benoit.m@chu-nice.fr

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*, Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_15

15.1 Definition, Epidemiology, and Diagnosis

Depression is an affective disorder characterized by a depressed mood, loss of interest and enjoyment, and reduced energy leading to diminished activity.

Depression is a clinical syndrome which means no biological or imaging for common diagnosis but clinical skills.

- Depression occurs in 10% of the old subjects living in the community. Prevalence is higher in hospital (25%) and nursing homes (up to 40%).

Depression is more likely to occur in the following conditions: female gender, sleep disorders, disability, recent bereavement, and past history of depression.

How to Diagnose Depression: A Step-by-Step Diagnosis Process

First step: Avoid misperceptions:

- Being old means being sad.
- Anhedonia is assimilated to wisdom.
- Hopelessness is part of normal aging.
- Loss of interest is part of normal aging.
- Vague somatic complaints overlap comorbidities.

Second step: Clinical diagnosis of depression:

(a) Report past history of depression disorders and/or other psychiatric disease; of antidepressant and/or other psychotropic drugs.
(b) Look for depressives symptoms (see misperception):
    - Symptoms which are common to adults and old persons
    - Specific symptoms of depression in old subjects
(c) Ask for suicidal ideations and assess the suicidal risk.

Third step: Define the type of depressive disorder in particular:

(a) Major depressive disorder (Alamo et al. 2014)
(b) Depression with congruent psychosis symptoms (guilty, ruin, harm, persecution)
(c) Melancholia (severe and with poor prognosis due to the high risk of dependency)
(d) Depression without sadness characterized by the denial of any sadness or depression but presence of different symptoms that belong to depression: hopelessness and helplessness, anhedonia, psychomotor retardation, irritability, memory complaints, carelessness, poor compliance to treatments
(e) Masked depression where moral suffering is replaced by physical suffering (i.e.: painful conditions with no or lack of effect or analgesics, dyspnea, tachycardia or palpitations, dizziness or vertigo, constipation memory complaints)

Fourth step: Which assessment tool is the most appropriate (Table 15.1):

For usual screening and depression detection refer to the geriatric depression scale 15 items. Be aware that the GDS is not valid in case of moderate-to-severe dementia and/or Mini-Mental State Examination (MMSE) <15. GDS is insufficient for diagnosis purpose.

For depression diagnosis or evaluation of sensitivity to change after treatment, refer to the Montgomery and Asberg depression scale (MADRS).

In case of patient with dementia refer to the Cornell Scale for Depression in Dementia (CSDD).

Fifth step: Hospitalization must be considered when:

(a) High risk of suicidal attempt (see the RED assessment from Pocket Card)
(b) Melancholia because of the high and quick risk of functional decline and death
(c) Severe depressive episode
(d) Severe agitation or prostration
(e) Important disability and/or severe chronic disease
(f) Isolation or lack of social network or precariousness

Table 15.1 Main instruments to assess depression in old populations (Bonin-Guillaume 2010; Engedal et al. 2012)

Recommended instrument	GDS 15 items	MADRS	CSDD
Type	Self-rating scale	Observer scale	Observer scale
Purpose	screening	Diagnosis Sensitivity to change under treatment	Diagnosis Sensitivity to change under treatment
Target population	No or mild cognitive impairment (MMSE >15)	All patients	Patients with mild-to-severe dementia
Items and scoring	15 items Yes or no Total score 15	10 items 6-point Likert scale Total score 60	17 items
Cutoff score	5/6	20/60	5/6
Pros	Subjective assessment (what the patient feels) Short, easy to use	Objective scoring: Observer score according to the patient behavior or speaking	Specifically designed for patients with dementia
Cons	Over- or underscoring Patient compliance needed Items and instruction must be understood by the patient (socio-educational level)	Observer training needed to correctly complete the scale Time consuming (20–60 min) Some behaviors may overlap other diseases or criteria	Requires monitoring over time Requires input from an informant

GDS Geriatric Depression Scale, *MADRS* Montgomery-Asberg Depression Rating Scale, *CSDD* Cornell Scale for Depression and Dementia

15.2 Treatment

15.2.1 Pharmacological Treatment: Basic Principles

Antidepressants are effective in late-life depression. There is no difference between classes in term of efficacy (Kok et al. 2012).

Efficacy is lower for male gender, old age, and long duration of the current episode of depression.

15.2.2 Recommendations for a Better Treatment Efficiency

1. Discuss the choice of antidepressant with the patient (Table 15.2):
   - First choice: selective serotonin reuptake inhibitors (SSRI)
   - Efficacy and tolerability of any antidepressants previously taken
2. Inform the patient about
   - Gradual development of the full antidepressant effect
   - Importance of taking medication as prescribed and the need to continue beyond remission
   - Potential side effects and drug interactions
3. Monitor antidepressant response regularly and side effects carefully:
   - Do not prescribe subtherapeutic doses of antidepressants.
   - Evaluate improvement or remission (a delayed response up to 12 weeks is usual in older patients).
   - Monitor carefully for side effects.
4. Check treatment duration and adherence:
   - 6 months after complete remission for the first episode (optimally 1 year after complete remission), longer if past history of depression episode
   - A step-by-step withdrawal (at least 1 month, optimally 3 months)
5. Avoid psychotropic drug co-prescription unless
   - Congruent psychosis symptoms present (antipsychotic should be proposed)
   - Severe anxiety (benzodiazepines might be associated to a short length of time; 12 weeks maximum)

15.2.3 Nonpharmacological Treatments

- Cognitive behavioral therapy is effective when dispensed by trained therapist to limit the risk of relapse.
- Electroconvulsive therapy has shown a high efficacy in older patients (up to 75%) in case of severe depression, depression with psychosis, or resistant to treatment. Indication has to be discussed with psychiatrists.
- Patient-centered management (i.e., IMPACT project).

Table 15.2 Antidepressant drugs (American Psychiatric Association 2013; Bonin-Guillaume 2010)

Drug class	Contraindication	Common side effects	Comments
Selective serotoninergic reuptake inhibitors	Association with other serotoninergic drugs (i.e., tramadol)	Hyponatremia, parkinsonism, serotonin syndrome	First choice Monitor drug–drug interactions
Selective serotonin noradrenaline (norepinephrine) reuptake inhibitor (SNRI)	Association with other serotoninergic drugs	Hypotension Nausea, vomiting Anticholinergic effects for some drugs	Second choice Monitor drug–drug interaction
Selective inhibitors of monoamine oxidase (IMO) A	Hypertension, other IMO and antidepressants	Hypertension or hypotension, tremor, dry mouth	Only occasionally Need specific diet Monitor hepatic enzymes
Conventional tricyclic agents	Glaucoma, Enlarged prostate Heart failure Association with monoamine oxidase inhibitors	Urinary retention, visual disturbance, tachycardia, constipation, dry mouth, delusion, sedative effects	Never the first choice Monitor carefully side effects, avoid when cognitive impairments
Other antidepressants Mianserin, mirtazapine, tianeptine	According to the drug	According to the drug	Not a first choice

The burden of depression (Bonin-Guillaume 2010; Bonin-Guillaume and Fajula 2011)

- Depression leads to bad geriatric outcomes: frailty, disability, cognitive impairment, functional decline, mortality, morbidity, and increase of health costs.
- Depression is still undertreated although curable.

(a) Depression has poor prognosis:
  - Nearly half of the depressed old patients not treated
  - High risk of chronicity (up to 30%)
  - High risk of relapse (up to 30%): Disability, cognitive impairment, caregiving, and psychomotor retardation are independent predictors of relapse in old age
  - Low adherence to antidepressant treatment (20–30% of the patients stop their treatment after 1 month, 50% after 6 months)

(b) Depression is worsening patient outcome:
  - Depression is independently associated with high-cost use of health services; relative risk (RR) = 2.04, [95% confidence interval (CI): 1.43–2.9] at 2-year follow-up.
  - Depression is an independent factor of malnutrition; odds ratio (OR) = 4.38 [95% CI: 2.23–8.64].

- Depression (international classification of diseases (ICD) 10 criteria) is a predictive factor of functional disability; PR: 3.0 [95% CI: 2.1–4.3].
- Depression is an early risk factor for dementia hazard ratio (HR), 2.90 [95% CI 1.61–5.21], in particular when there are melancholic features: HR = 3.64; [95% CI 1.78–11.26].

(c) Depression is the main risk factor of suicide:

- Suicide rates are 6–10 times more common in older persons compared to younger ones (i.e., in France, in 2010 incident suicide rates for 100,000 inhabitants were 39.5 for those aged 85–94 years compared to 6.5 for those aged 15–24 years).
- Males aged 75 years and older are overrepresented.
- 90% of the patients who committed suicide were previously depressed.
- An old person who contemplates suicide is more likely to complete the act considering the high lethality of the operation method (hanging, firearms, poisoning, etc.).

References

Alamo C, Lopez-Munoz F, Garcia-Garcia P, Garcia-Ramoz S. Risk–benefit analysis of antidepressant drug treatment in the elderly. Psychogeriatrics. 2014;14:261–8.

American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 5th ed. Washington DC: American Psychiatric Association; 2013.

Bonin-Guillaume S. Depression. In: Textbook of geriatric medicine international. Korea: Argos; 2010. p. 215–30.

Bonin-Guillaume S, Fajula C. Dépression. In: Boddaert J, Rey P, editors. Traité de médecine d'urgence de la personne âgée. France: Wolters Kluwer; 2011. p. 1045–52.

Engedal K, Kvaal K, Korsnes M, et al. The validity of the Montgomery–Aasberg depression rating scale as a screening tool for depression in later life. J Affect Disord. 2012;141:227–32.

Kok RM, Nolen WA, Heeren TJ. Efficacy of treatment in older depressed patients: a systematic review and meta-analysis of double-blind randomized controlled trials with antidepressants. J Affect Disord. 2012;141:103–15.

National Institute for health & Care Excellence. Depression in adults: recognition and management. 2009. www.nice.org.uk.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_15.

Kidney Disease in Old Age

16

Gerhard Wirnsberger

Abstract

In older people important causes of chronic kidney diseases (CKD) are diabetes and hypertension, which are responsible for up to two-thirds of the cases. Other risk factors are urinary infections, abuse of pain relieving medications (NSAIDs), different types of primary glomerulonephritis, and some inherited disease. An acute renal failure (ARF) is common caused by an event that leads to a sudden kidney malfunction, such as dehydration, nephrotoxic medicines, e.g., NSAIDs and contrast agents, or postrenal obstruction. Kidney sonography may help to determine whether kidney problems are acute or chronic. The treatment of acute kidney injury includes correcting the cause and supporting the kidneys with fluid. Only in some cases dialysis is indicated when severe hyperkalemia, metabolic acidosis, or volume overload cannot be managed. Progression to end-stage renal disease (ESRD) is typically characterized by the loss of a number of biological functions, including fluid and electrolyte balance, and endocrine, neurological, hematological, and cardiovascular dysfunctions. Elderly patients often develop complications like anemia, poor nutritional health, and nerve damage very early. Disturbances in calcium homeostasis chronic also increase the risk of an arterial and systemic calcifications. For these reasons, identification and management of CKD patients are of paramount importance to implement interventions aimed at slowing the progression of kidney disease and delaying the onset of its complications.

G. Wirnsberger
Department of Internal Medicine, Division of Nephrology, Medical University of Graz, Graz, Austria
e-mail: gerhard.wirnsberger@medunigraz.at

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_16

Learning Objectives

By the end of the chapter, the reader will be able to

- Discuss risk factors for chronic and acute renal failure, including prerenal, renal, and postrenal causes
- Recognize the utility of diagnostic modalities used in the evaluation of chronic and acute renal failure, including ultrasonography and renal scans
- Recognize the utility of the fractional urine excretion of sodium in the differential diagnosis of acute renal failure
- Apply a diagnostic and treatment program appropriate to the management of older patients with chronic and acute renal failure

Key Messages

- Chronic kidney disease (CKD) is highly prevalent in older people, and is associated with multimorbidity
- Definition of kidney function in old age with usually applied test systems using creatinine in serum is not specific for older subjects.
- Acute renal failure (ARF) is common caused by an event that leads to a sudden kidney malfunction, such as dehydration; nephrotoxic medicines, e.g., Nonsteroidal antiinflammatory drugs (NSAIDs), antibiotics, and contrast agents used in X-ray; or postrenal obstruction.
- Symptoms of decreased kidney function, such as fluid buildup or electrolyte imbalance, are more likely to develop with an acute renal injury.
- An ultrasound of the kidneys may also help to determine whether kidney problems are acute or chronic: when both kidneys are smaller than normal, CKD is usually the problem.
- The treatment of acute kidney injury includes correcting the cause and supporting the kidneys with fluid. Only in some cases dialysis is indicated when severe hyperkalemia, metabolic acidosis, or volume overload cannot be managed.

16.1 Acute Renal Failure

By definition ARF is an abrupt (= within hours or days) disability of the kidney to excrete nitrogenous waste, resulting in decreased urine output and/or azotemia. It may be prerenal, parenchymal, or postrenal in origin (Goldberg and Dennen 2008; Liangos et al. 2006).

16.1.1 Etiology of Acute Renal Failure

(a) Prerenal (Table 16.1)

Prerenal azotemia represents a rapidly and potential reversible glomerular filtration rate (GFR) due to a renal hypoperfusion. It is responsible for the most cases of ARF in hospitalized older patients (Lindeman and Goldman 1986; Ronco et al. 2008).

(b) Parenchymal = acute tubular necrosis (ATN)

An acute (parenchymal) renal failure is an abrupt decrease in GFR due to tubular cell damage as a consequence of intrarenal hypoperfusion, direct nephrotoxic injury, or severe tubulointerstitial nephritis. Renal hypoperfusion leading to intrarenal ischemia accounts for 50% of all cases of ATN, followed by nephrotoxic injury from either exogenous (25%) or endogenous (20%) toxins (Table 16.2). In some cases severe allergic tubulointerstitial nephritis may lead to ATN (e.g., NSAIDs, sulfonamides, penicillins and cephalosporins, fluoroquinolones, allopurinol, proton-pump-inhibitors (PPIs), rifampicin).

The hallmark of ATN is the acute onset usually accompanied by oliguria (urine output <500 mL per day), which is not immediately reversible after withdrawal of the causative agent or fluid replacement (Pannu et al. 2011).

Table 16.1 Common causes of prerenal azotemia

Intravascular volume depletion
• Hemorrhagic
• Uncontrolled renal or gastrointestinal losses (diarrhea)
• Sequestration in third space, e.g., burns, cirrhosis
• Inadequate fluid replacement
Systemic vasodilatation
• Anaphylaxis
• Overdose of hypertensive drugs
• Sepsis
Reduced cardiac output
• Cardiogenic shock/pericardial tamponade
• Congestive heart failure
• Pulmonary embolism
Hyperviscosity syndromes
• Macroglobulinemia
• Multiple myeloma
Vascular diseases
• Embolism (thrombus, cholesterol)
• Renal vein thrombosis
• Renal artery dissection (trauma, postangioplasty)

Table 16.2 Some toxic causes of ATN

Exogenous
• Antibiotics (e.g., aminoglycosides, tetracyclines, amphotericin B)
• Radiographic contrast materials
• Chemotherapeutic agents (e.g., cisplatin, methotrexate, mitomycin)
• Immunosuppressive agents (e.g., calcineurin inhibitors)
• Others (e.g., NSAIDs, ACE inhibitors)
Endogenous
• Myoglobin/haemoglobin
• Uric acid
• Calcium phosphate precipitation

Table 16.3 Most notable causes of postrenal (= obstructive) ARF

• Urinary tract obstruction (e.g., reflux nephropathy, benign prostatic hyperplasia (BPH))
• Bladder outflow obstruction (e.g., neurogenic bladder)
• Renal stones in both ureters or in patients with one kidney
• Pelvic or retroperitoneal diseases

(c) Postrenal

Postrenal ARF is caused by an acute obstruction that affects the normal flow of urine out of both kidneys (Table 16.3). The degree of renal failure corresponds directly with the degree of obstruction. Postrenal ARF is seen most often in old men with enlarged prostate that obstructs the normal flow of urine (Feest et al. 1993, Schrier et al. 2004).

16.1.2 Clinical Presentation

Symptoms depend on the cause of the problem and can include:

- Decreased urine output (in some cases urine output remains normal)
- Dizziness upon standing
- Swelling, especially of the legs and feet
- Loss of appetite, nausea, and vomiting
- Feeling confused, anxious and restless, or sleepy
- Pain in the flank, which is felt just below the rib cage and above the waist on one or both sides of the back

Some patients may have no symptoms, at least in the early stages. The symptoms may be very subtle.

16.1.3 Evaluation

Once chronic renal failure has been excluded, the next step is to identify the possible causes of the renal injury. The diagnostic steps included a history of fluid losses (vomiting, diarrhea, polyuria, burns), review of the medication list (e.g., NSAIDs, inhibitors), renal ultrasonography, and in case of oliguric patients catheterization of the bladder and determination of postvoid residual volume. In selected cases renal biopsy can be performed (Ali et al. 2007).

16.1.4 Laboratory Investigations

Most patients will have marked electrolyte disturbances consisting of severe azotemia, hyperkalemia, high anion gap, metabolic acidosis, and hypernatremia. A more rapid increase in serum creatinine suggests a hypercatabolic state or massive muscle destruction (Bellomo et al. 2004).

16.1.5 Laboratory Tests

- Serum blood urea nitrogen (BUN)/creatinine (Cr) > 20 (Cave increased protein catabolism, in case of steroid therapy, sepsis, surgery, or gastrointestinal bleeding)
- Urine specific gravity >1.030
- Urine osmolality <500 mOsm/kg H_2O
- Urinary sodium <20 mEq/L
- Fractional excretion of sodium (FE_{Na}) < 1%

If patient is not on diuretics, you can determine FE_{Na} as follows:

$$FE_{Na} = \frac{urine_{Na} / plasma_{Na}}{urine_{Cr} / plasma_{Cr}} \times 100$$

In the setting of oliguria and acute azotemia, and in the absence of recent diuretic therapy, an FE_{Na} > 2%, a urine osmolality less than 50 mOsm/kg H_2O, and a urine sodium concentration > 40 mEq/L characterized ATN. FE_{Na} < 1% indicates prerenal causes, and FE_{Na} 1–2% is nondiagnostic.

If patient is receiving diuretics, you should determine fractional excretion of urea (FE_{Urea}) as follows:

$$FE_{Urea} = \frac{Urine_{urea\ nitrogen} / BUN}{urine_{Cr} / plasma_{Cr}} \times 100$$

$FE_{Urea} \leq 35\%$ indicates prerenal azotemia, FE_{Urea} 36–50% is nondiagnostic, and $FE_{Urea} > 50\%$ indicates ATN.

16.1.6 Urinary Cytology

In case of ATN careful cytological examination of the urine reveals an active sediment with renal tubular epithelial cells, epithelial cell and granular casts, and cellular debris. Acanthocytes and red blood cell casts are rare. White blood cells, esp. lymphocytes and eosinophils, suggest acute interstitial nephritis.

16.1.7 Management/Treatment

- Avoid X-ray investigations with contrast dyes, and nephrotoxic medication.
- If prerenal pattern, rapid and aggressive volume replacement is essential to prevent acute renal injury. The fluid challenge may be repeated once or twice at hourly intervals while urine output and cardiopulmonary status are monitored closely. You can start with fluid challenge 500–max. 1000 mL over 1 h iv. A more gradual infusion of 100–150 mL per hour is required when the cardiorespiratory status is tenuous. If no response in causes other than volume depletion the underlying disorder should be corrected (Chertow et al. 2005).

- If renal, monitor weight daily, better than recording fluid intake and output, and monitor electrolytes in serum and urine. Most important is a fluid replacement equal to urinary output plus other drainage plus approx. 500 mL per day for insensible loss. Conversion of oliguric to nonoliguric may be achieved with loop diuretics such as furosemide 80–400 mg iv. Complications can be prevented by close monitoring of fluid and electrolyte balance. In case of acute tubulointerstitial nephritis high dose of glucocorticoids (e.g., prednisone 1 mg/kg per day) can be given for 2–3 weeks, gradually tapered for a total duration of 2–3 months.
- If obstructed, leave urinary catheter in place and consult the urologist.
- Dialysis therapy is only indicated when severe hyperkalemia, metabolic acidosis, or volume overload cannot be managed, or when uremic symptoms are present.

16.2 Chronic Kidney Disease

CKD has a relevant public health burden in the older population, resulting in an increased risk of end-stage renal disease (ESRD), morbidity, and mortality (Stevens et al. 2007a, b). In developed countries the two main causes of CKD in older persons are diabetes and hypertension, which are responsible for up to two-thirds of the cases. Diabetes happens when the blood sugar is too high, causing damage to many organs, including the glomeruli, kidney's filtering units as an important part of the cardiovascular system. Uncontrolled or poorly controlled high blood pressure can be a leading cause of heart attacks, strokes, and CKD. Other conditions that affect the kidneys are different types of primary glomerulonephritis, a group of diseases that cause inflammation and damage to the glomeruli, and some inherited diseases such as polycystic kidney disease, which causes large cysts to form in the kidneys and damage the surrounding tissue. CKD also includes conditions that destroy kidneys by obstructions caused by problems like kidney stones, tumors, or an enlarged prostate gland in men. Finally, repeated urinary infections and an excessive use of pain-relieving medications (NSAIDs) are important risk factors.

Comprehensive methodologies for CKD screening among older adults, taking into account the numerous functional dimensions that CKD is able to impair, do not currently exist. Currently available creatinine-based measures of kidney function are plagued by some degree of inaccuracy and may provide discrepant estimates (Foley et al. 2007). Several studies showed the existence of a U-shaped relationship between creatinine-based estimated glomerular filtration rate (eGFR) and mortality in frail and older people (Shlipak et al. 2004). Accordingly, higher eGFR partly reflects inflammation, frailty, and/or muscle loss rather than normal kidney function (Astor et al. 2011). Additionally, creatinine-based eGFR may systematically underestimate measured GFR at higher levels of kidney function, leading to increased risk of CKD over-diagnosis (Levey et al. 2009). This evidence underlines the importance of testing screening methods for estimating kidney function with better accuracy in predicting outcomes (Schaeffner et al. 2012). Current evidence suggests that other filtration markers not affected by muscle loss (i.e., cystatin C, beta-trace protein and beta 2 microglobulin) may better predict negative outcomes (Foster et al.

2013). However, the usefulness and cost-effectiveness of these filtration markers in screening older people for CKD have not been investigated (Lattanzio et al. 2012).

Besides increasing the risk of ESRD, morbidity, and mortality, CKD also affects outcomes relevant to older people. Indeed, reduced eGFR was found to be associated with lower scores in subjective physical function and physical activity scales (Levey et al. 2011). As in Fig. 16.1, colors reflect the ranking of adjusted relative risk. The ranks assigned were averaged across all five outcomes for GFR and albuminuria stages (International Society of Nephrology 2013).

Early identification and management of CKD patients are of paramount importance to implement interventions aimed at slowing the progression of kidney disease and delaying the onset of its complications (Stevens et al. 2007a, b). Progression to ESRD is typically characterized by the loss of a number of biological functions, including fluid and electrolyte balance, and endocrine, neurological, hematological, and cardiovascular dysfunctions. Patients may develop complications like high blood pressure, anemia, weak bones, poor nutritional health, and nerve damage very early (Walker et al. 2013). Because of disturbances in the calcium homeostasis CKD increases the risk of having heart and blood vessel diseases like atherosclerosis and arterial or systemic calcification (Disthabanchong 2012).

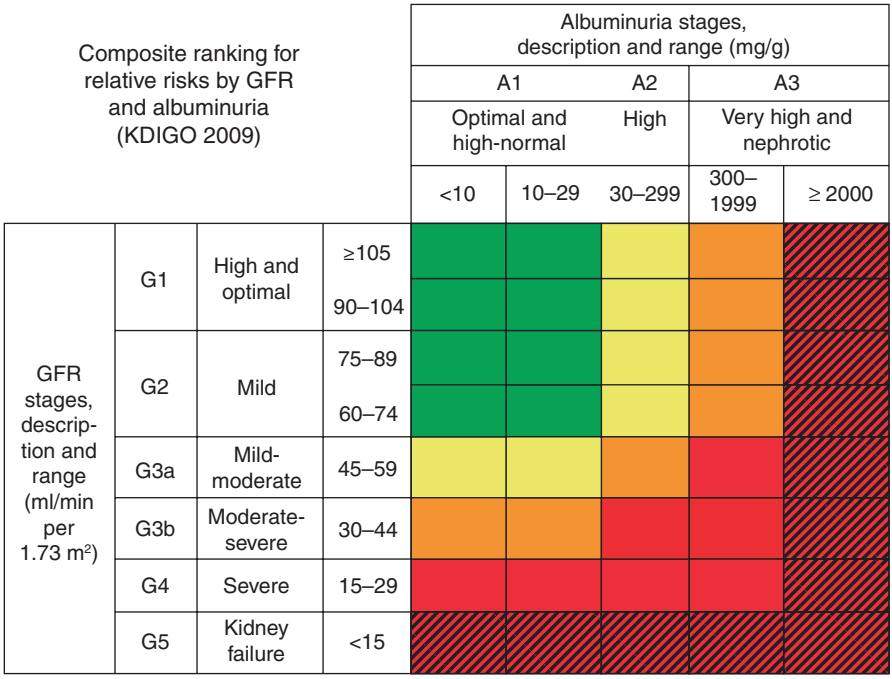


Fig. 16.1 Composite ranking for relative risks by GFR and albuminuria according to the KDIGO (Kidney Disease: Improving Global Outcomes guidelines) 2009. The categories with low risk are green, intermediate-risk categories are yellow and orange, and high-risk categories are *red*. The highest level of albuminuria is termed "nephrotic" to correspond with nephrotic range albuminuria and is expressed here as ≥2000 mg/g (according to Levey et al. 2011)

CKD increases the risk of adverse drug reactions (ADRs). When renal function declines, many drugs or their active metabolites that depend on renal excretion may accumulate. For this reason, patients with CKD may be more vulnerable to a given drug effect and may be potentially exposed to an increased risk of toxicity (Doogue and Polasek 2011). Dosage adjustments are required in order to prevent ADRs, and this is especially important in older people, who are more vulnerable to adverse drug reactions due to comorbidity and polypharmacy. Finally, it is worth noting that reduced eGFR is associated with increased risk of ADRs from water-soluble drugs even when serum creatinine levels are within the normal range (Naranjo et al. 1981). For this reason, early detection of CKD also represents a major step toward reducing risk of ADRs and increasing safety in older complex patients with multimorbidity and polypharmacy.

References

Ali T, Khan I, Simpson W, et al. Incidence and outcomes in acute kidney injury: a comprehensive population-based study. J Am Soc Nephrol. 2007;18:1292–8.

Astor BC, Matsushita K, Gansevoort RT, et al. Lower estimated glomerular filtration rate and higher albuminuria are associated with mortality and end-stage renal disease. A collaborative meta-analysis of kidney disease population cohorts. Kidney Int. 2011;79:1331–40.

Bellomo R, Ronco C, Kellum JA, Mehta RL, Palevsky P. Acute renal failure - definition, outcome measures, animal models, fluid therapy and information technology needs: the second International consensus conference of the acute dialysis quality initiative (ADQI) group. Crit Care. 2004;8:R204–12.

Chertow GM, Burdick E, Honour M, Bonventre JV, Bates DW. Acute kidney injury, mortality, length of stay, and costs in hospitalized patients. J Am Soc Nephrol. 2005;16:3365–70.

Disthabanchong S. Vascular calcification in chronic kidney disease: pathogenesis and clinical implication. World J Nephrol. 2012;1:43–53.

Doogue MP, Polasek TM. Drug dosing in renal disease. Clin Biochem Rev. 2011;32:69–73.

Feest TG, Round A, Hamad S. Incidence of severe acute renal failure in adults: results of a community based study. BMJ. 1993;306:481–3.

Foley RN, Wang C, Ishani A, Collins AJ, Murray AM. Kidney function and sarcopenia in the United States general population: NHANES III. Am J Nephrol. 2007;27:279–86.

Foster MC, Inker LA, Levey AS, et al. Novel filtration markers as predictors of all-cause and cardiovascular mortality in US adults. Am J Kidney Dis. 2013;62:42–51.

Goldberg R, Dennen P. Long-term outcomes of acute kidney injury. Adv Chronic Kidney Dis. 2008;15:297–307.

International Society of Nephrology. Chapter 1: definition and classification of CKD. Kidney Int Suppl (2011). 2013;3:19–62.

Lattanzio F, Abbatecola AM, Volpato S, Pedone C, Pranno L, Laino I, Garasto S, Corica F, Passarino G, Antonelli Incalzi R. Relationship between renal function and physical performance in elderly hospitalized patients. Rejuvenation Res. 2012;15:545–52.

Levey AS, de Jong PE, Coresh J, Nahas MEI, Astor BC, Matsushita K, Gansevoort RT, Kasiske BL, Eckardt KU. The definition, classification, and prognosis of chronic kidney disease: a KDIGO controversies conference report. Kidney Int. 2011;80(1):17–28.

Levey AS, Stevens LA, Schmid CH, et al. A new equation to estimate glomerular filtration rate. Ann Intern Med. 2009;150:604–12.

Liangos O, Wald R, O'Bell JW, Price L, Pereira BJ, Jaber BL. Epidemiology and outcomes of acute renal failure in hospitalized patients: a national survey. Clin J Am Soc Nephrol. 2006;1:43–51.

Lindeman RD, Goldman R. Anatomic and physiologic age changes in the kidney. Exp Gerontol. 1986;21:379–406.
Naranjo CA, Busto U, Sellers EM, et al. A method for estimating the probability of adverse drug reactions. Clin Pharmacol Ther. 1981;30:239–45.
Pannu N, James M, Hemmelgarn BR, Dong J, Tonelli M, Klarenbach S. Modification of outcomes after acute kidney injury by the presence of CKD. Am J Kidney Dis. 2011;58:206–13.
Ronco C, Haapio M, House AA, Anavekar N, Bellomo R. Cardiorenal syndrome. J Am Coll Cardiol. 2008;52:1527–39.
Schaeffner ES, Ebert N, Delanaye P, et al. Two novel equations to estimate kidney function in persons aged 70 years or older. Ann Intern Med. 2012;157:471–81.
Schrier RW, Wang W, Poole B, Mitra A. Acute renal failure: definitions, diagnosis, pathogenesis, and therapy. J Clin Invest. 2004;114:5–14.
Shlipak MG, Stehman-Breen C, Fried LF, et al. The presence of frailty in elderly persons with chronic renal insufficiency. Am J Kidney Dis. 2004;43:861–7.
Stevens LA, Coresh J, Feldman HI, et al. Evaluation of the modification of diet in renal disease study equation in a large diverse population. J Am Soc Nephrol. 2007b;18:2749–57.
Stevens PE, O'Donoghue DJ, de Lusignan S, et al. Chronic kidney disease management in the United Kingdom: NEOERICA project results. Kidney Int. 2007a;72:92–9.
Walker SR, Gill K, Macdonald K, et al. Association of frailty and physical function in patients with non-dialysis CKD: a systematic review. BMC Nephrol. 2013;14:228.

Disorders of Fluid Balance

17

Gerhard Wirnsberger

Abstract

Characteristic of the normal aging process is a decline in physiologic reserve in many body regulatory systems, including those involved in the maintenance of fluid balance. Clinicians who are involved in the care of the older person recognize that disturbances of water and electrolyte balance are common in this age group, especially when older persons are challenged by disease, drugs, or extrinsic factors such as access to fluids or control of diet composition.

Learning Objectives

By the end of the chapter, the reader will be able to

- Understand the functional changes in the kidney with aging and their role in fluid disturbances and electrolyte abnormalities observed in the older person
- Describe disturbances of fluid balance and dysnatremia with their resultant clinical consequences
- Understand that the severity of these abnormalities is dependent on many factors including underlying infirmities, cognitive ability, medications, and kidney function
- Be familiar with common therapeutic interventions in case of electrolyte disorders

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_17) contains supplementary material, which is available to authorized users.

G. Wirnsberger
Department of Internal Medicine, Division of Nephrology, Medical University of Graz, Graz, Austria
e-mail: Gerhard.Wirnsberger@medunigraz.at

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_17

Key Messages

- Dehydration is defined as loss of sodium and water that may be isotonic or hypotonic.
- Disorders of serum sodium are the most common electrolyte disorders in hospitalized patients.
- It is important to be aware of the potential electrolyte abnormalities in older persons that can arise under various conditions in order to prevent adverse outcomes.

17.1 Introduction

The normal regulation of water and electrolyte balance involves the interplay of many homeostatic systems that operate to maintain the composition of fluid and electrolyte compartments within a narrow range (Halperin et al. 2009). The key regulatory components of fluid balance include

- Thirst perception, which governs fluid intake
- The kidney, which is governed by hemodynamic forces
- Hormonal influences of arginine vasopressin (AVP), antidiuretic hormone (ADH), and the renin-angiotensin-aldosterone system (RAAS), which control renal water and electrolyte excretion (Bauer 1993)

Older persons are more prone to the development of dehydration (Weiss et al. 1998). This dehydration is due to a combination of three factors (Miller 1999). There is an inability of the kidney to conserve sodium when challenged by inadequate intake or excessive losses elsewhere. There is also an inability to concentrate the urine as well when similarly challenged by fluid loss, and finally and most importantly the older person loses normal thirst. Whereas a young person becomes acutely thirsty when dehydrated and drinks to correct for the water loss, an older person often is not similarly motivated. If this becomes severe enough, especially in those with cerebrovascular disease, ingestion of a prescribed amount of water (generally 1–2 quarts) each day may become necessary to prevent recurrent dehydration.

17.2 Dehydration

An extracellular fluid volume deficit (ECFVD), commonly called as dehydration, is a decrease in intravascular and interstitial fluids, which can result in cellular fluid loss if it is sudden or severe. Dehydration is most likely to occur after hospital admission for acute illness, for example, infection or emergency surgery, when fluid replacement is often insufficient (Table 17.1).

There are three types: (1) the hyperosmolar fluid volume deficit, where water loss is greater than the electrolyte loss; (2) the isosmolar fluid volume deficit, where the proportion of fluid and electrolyte loss is equal; and (3) the hypotonic fluid volume deficit, where the electrolyte loss is greater than the fluid loss (Tables 17.2 and 17.3).

Table 17.1 Etiology and risk factors for dehydration

• Severe vomiting
• Traumatic injuries
• Fever
• Gastrointestinal suction
• Ileostomy
• Fistulas
• Burns
• Hyperventilation
• Decreased antidiuretic hormone (ADH) secretions
• Diabetes insipidus
• Addison's disease or adrenal crisis
• Diuretic phase of acute renal failure
• Use of diuretics

Table 17.2 Clinical presentation of an ECFVD

• Thirst
• Muscle weakness
• Dry mucous membrane; dry cracked lips or furrowed tongue
• Eyeballs soft and sunken (severe deficit)
• Apprehension, restlessness, headache, confusion, coma in severe deficit
• Elevated temperature
• Tachycardia, weak thready pulse
• Peripheral vein filling >5 s
• Postural systolic blood pressure (BP) falls >25 mmHg and diastolic BP falls >20 mmHg with pulse increase >30 bpm
• Flattened neck veins in supine position
• Weight loss
• Oliguria (<30 ml per hour)
• Decreased number and moisture in stools

Table 17.3 Important laboratory findings in case of an ECFVD

• Increased osmolality (>295 mOsm/kg)
• Increased or normal serum sodium level (>145 mEq/L)
• Increase blood urea nitrogen (BUN) (>25 mg/L)
• Hypeglycaemia (>120 mg/dL)
• Elevated haematocrit (>55%)
• Increased specific gravity (> 1.030)

17.2.1 Treatment

Mild fluid volume loss can be corrected with oral fluid replacement. If the patient tolerates solid food advice, then take 1200–1500 ml oral fluids, and if the patient takes only fluids, increase the total intake to 2500 ml in 24 h. In case of hyperosmolar fluid volume deficit hypotonic intravenous (IV) solutions, such as 5% dextrose in 0.2% saline, are administered. If the deficit has existed for more than 24 h, avoid rapid correction of fluid/sodium solution to be infused at the rate of 0.5–0.1 mEq/L/hr.

If a hemorrhage is the cause for ECFVD, then packed red cells followed by hypotonic IV fluids are administered. In situations where the blood loss is less than 1 L, normal saline or ringer lactate may be used. Patients with severe ECFVD accompanied by severe heart, liver, or kidney disease cannot tolerate large volumes of fluid or sodium.

17.3 Overhydration

The extracellular fluid volume excess (ECFVE) or overhydration is an increased fluid retention in the intravascular and interstitial spaces (Table 17.4). Overhydration occurs when an individual retains too much salt and water. This results in edema that can be identified by applying pressure over the shin and creating an indentation that does not quickly return to normal. Usually salt and water are retained in proportionate amounts so serum sodium concentration remains normal (Table 17.5).

17.3.1 Treatment

Initial patients should receive diuretics (in combination of potassium-sparing and potassium-depleting diuretics). In people with congestive heart failure (CHF), angiotensin converting enzyme (ACE) inhibitors and low dose of beta-blockers are used. It is also important to describe a strict low-sodium diet.

Table 17.4 Etiology and risk factors for an ECFVE (= overhydration)

• Heart failure
• Renal disorders
• Cirrhosis of liver
• Increased ingestion of high-sodium foods
• Excessive amount of IV fluids containing sodium
• Electrolyte-free IV fluids
• SIADH, sepsis
• Decreased colloid osmotic pressure
• Lymphatic and venous obstruction
• Cushing's syndrome and glucocorticoids

Table 17.5 Clinical presentation of overhydration

• Constant irritating cough
• Dyspnea and crackles in lungs
• Cyanosis, pleural effusion
• Neck vein obstruction
• Bounding pulse and elevated BP
• S3 gallop
• Pitting and sacral edema
• Weight gain
• Change in level of consciousness

17.4 Hyponatremia

Disorders of serum sodium are the most common electrolyte disorders in hospitalized older persons (Lien and Shapiro 2007). Depending on the definition of hyponatremia, which is usually a serum sodium concentration below 135 mmol/L, the prevalence varies significantly somewhere from 5% to as high as 40%. Unlike hypernatremia, which is always associated with hyperosmolality, hyponatremia can be present in hypoosmolality, isoosmolality, or even hyperosmolality (Rose 2001). hyponatremia was shown to be an independent predictor for mortality in patients with heart failure and patients after ST-segment elevation myocardial infarction, as well as in patients with cirrhosis of the liver (Kovesdy et al. 2012).

17.4.1 Causes of Hyponatremia

17.4.1.1 Effective Circulating Volume Depletion

The effective circulating volume is defined as the fluid which is perfusing the tissues. A reduction of effective circulating volume can be present with reduced extracellular volume as well as with extracellular volume expansion (Milionis et al. 2002). True volume depletion might be caused via the extrarenal or the renal route. Extrarenal losses may occur through the gastrointestinal tract as in diarrhea or vomiting or through the skin as in burns for example. Renal losses may be caused by diuretic therapy, osmotic diuresis (e.g., glucose and urea), salt-losing nephropathies, or an impaired urine concentration ability as in renal insufficiency. Heart failure and cirrhosis of the liver are other prominent causes of hyponatremia triggered by a reduced effective circulating volume.

17.4.1.2 Syndrome of Inappropriate Vasopressin Secretion (SIADH)

SIADH is a common cause of hyponatremia which is associated with a wide variety of underlying conditions and medications, most of which were only described in few case reports questioning the validity of the associations. SIADH is characterized by a non-physiologic release of vasopressin, an impaired excretion of free water, and a normal sodium excretion (Ouslander et al. 1998; Miller 2000).

17.4.1.3 Cerebral Salt Wasting

Cerebral salt wasting usually occurs after head injury or neurosurgical procedures. It is characterized by hypovolemic hyponatremia caused by natriuresis and diuresis.

17.4.1.4 Adrenal Insufficiency

Although volume depletion due to gastrointestinal losses plays a role in the generation of hyponatremia in adrenal insufficiency the main mechanism is probably deficiency of cortisol since the rate of water excretion was shown to increase after cortisol substitution.

17.4.1.5 Reset Osmostat

Patients with reset osmostat are described to have a normal response to changes in osmolality; only the threshold for release of vasopressin is lowered with the consequence of a lower but stable serum sodium concentration.

17.4.1.6 Pseudohyponatremia

Pseudohyponatremia is a form of hyponatremia that should be clearly separated from hyponatremia which is caused by a shift of free water from the intra- to the extracellular compartment as it is the case during hyperglycemia. Pseudohyponatremia is a laboratory phenomenon, which occurs in patients with severe hyperlipidemia or hyperproteinemia.

17.4.2 Symptoms of Hyponatremia

While patients who develop hyponatremia slowly might be comparably asymptomatic, acute onset of hyponatremia may result in severe symptomatic cases and even death. When hyponatremia develops slowly, brain cells are able to perform adaptive mechanisms such as releasing intracellular potassium and other solutes in order to maintain their cell volume. Unspecific symptoms such as nausea, vomiting, and confusion were described to occur with serum sodium values of less than 129 mmol/L in the setting of exercise-associated hyponatremia (Waikar et al. 2009). With a progression of hyponatremia more severe symptoms like focal neurologic deficits, seizures, somnolence, or coma and ultimately tentorial herniation due to severe brain edema may occur. Patients with chronic hyponatremia were found to be more likely to suffer from osteoporosis (Wald et al. 2010).

17.4.3 Treatment of Hyponatremia

Based on the cellular compensation mechanisms (shift of osmolytes from the intra- to the extracellular compartment) discussed above, correction rates differ between acute (documented onset of hyponatremia <48 h) and chronic (onset of hyponatremia >48 h or unknown). Acute hyponatremia should be corrected by >3–4 mmol/L/24 h, although this is based on small evidence only (Barsoum and Levine 2002). For chronic hyponatremia a limit of <10 mmol/L/24 h or <18 mmol/L/48 h is recommended (Verbalis et al. 2007).

17.4.3.1 Hypovolemic Hyponatremia

The key to the correction of hypovolemic hyponatremia is fluid resuscitation. Once this happened, the relative excess of free water will correct itself by a suppressed vasopressin release. Initial fluid resuscitation should be started on an isoosmotic crystalloid, preferably a balanced solution (e.g., lactated Ringer's). Hypertonic saline is seldom indicated in the correction of hypovolemic hyponatremia.

17.4.3.2 Euvolemic Hyponatremia

If patients are symptomatic a prompt elevation of serum sodium should be performed since these patients are at risk of developing neurologic complications. Asymptomatic patients and those with a documented onset of hyponatremia >48 h should be corrected slowly since they are at increased risk of osmotic demyelination.

17.4.3.3 SIADH

As for all patients who present with symptoms due to hyponatremia, a rapid correction of serum sodium concentration by 4–5 mmol/L should be aimed at. Hypertonic saline is the infusate of choice since patients with SIADH do not respond to isotonic saline. Fluid restriction is probably the most recommended treatment option for chronic SIADH, maybe due to its low toxicity. At the start of fluid restriction, drugs known to cause SIADH should be stopped. However, fluid restriction is associated with thirst, lack of patient compliance, and slow increases in serum sodium. Classic pharmacologic options for the treatment of SIADH include demeclocycline and lithium. Urea is another treatment option for SIADH which came more and more into the spotlight with the upcoming of the vasopressin antagonists (Schrier et al. 2006). Urea can be applied orally or intravenously.

17.4.3.4 Hypervolemic Hyponatremia

For all with edema formation, mainstays of therapy are dietary sodium restriction and diuretics. In case of hyponatremia, fluid restriction should be performed, although this is hard to achieve in most cases due to thirst and a dry mouth.

17.5 Hypernatremia

Hypernatremia (serum sodium level >145 mEq/L) is a common problem among hospitalized patients who are 65 years or older (Snyder et al. 1987). Most studies report mortality in excess of 50% in older persons with hypernatremia (Adrogue and Madias 2000). Some investigators have noted that mortality increases with increased rates of fluid replacement, while other investigators have stressed the need for greater awareness of the importance of active maintenance of hydration in susceptible patients (Bhatnagar and Weinkove 1988). The exact causes of high mortality in hypernatremic patients have not yet been fully elucidated (Kovesdy et al. 2012). Slight or no information is available regarding the relationship between the severity of the clinical picture (symptoms and signs) and high mortality in hypernatremic patients.

17.5.1 Etiology of Hypernatremia

Hypernatremia can be readily classified according to the total body sodium content and the state of hydration.

(a) *Decreased total body sodium* (loss of hypotonic body fluids results in extracellular volume (ECV) depletion and hypernatremia)
   - Extrarenal sources (skin or gastrointestinal losses, e.g., vomiting, nasogastric suction, or osmotic diarrhea)
   - Renal sources = hypotonic polyuria (e.g., diuretics, osmotic diuresis caused by glucose, or non-oliguric acute tubular necrosis)

(b) *Normal total body sodium* (losses of free water result in hypernatremia)
   - Extrarenal water loss (e.g., cutaneous or pulmonary losses)
   - Renal water loss (e.g., cerebral or nephrogenic diabetes insipidus)

(c) *Increased total body sodium* (usually an iatrogenic complication resulting from administration of sodium-containing solutions or from inappropriate repletion of hypotonic insensible fluid losses with 0.9% saline solutions)

17.5.2 Clinical Presentation

Signs and symptoms of hypernatremia include lethargy, restlessness, hyperreflexia, spasticity, and seizures, which may progress to coma and death. Patients with central or nephrogenic diabetes insipidus may progress to coma and death. Cerebral dehydration leads to capillary and venous congestion, venous sinus thrombosis, and typical subcortical hemorrhages. Older persons with hypernatremia have mortality rates as high as 60–80%.

17.5.3 Treatment

In case of a decreased total body sodium patients should initially receive isotonic NaCl until ECV has been restored. Thereafter hypotonic solutions can be used. In patients with a normal total body sodium pure water loss should be replaced with sodium-free iv solutions. In case of an increased total body sodium hypertonic sodium-containing solutions should be discontinued and diuretics administered to promote excretion of the excess salt and water.

References

Adrogue HJ, Madias NE. Hypernatremia. N Engl J Med. 2000;342:1493–9.

Barsoum NR, Levine BS. Current prescriptions for the correction of hyponatraemia and hypernatraemia: are they too simple? Nephrol Dial Transplant. 2002;17:1176–80.

Bauer JH. Age-related changes in the renin-aldosterone system: physiological effects and clinical implications. Drugs Ageing. 1993;3:238–45.

Bhatnagar D, Weinkove C. Serious hypernatremia in a hospital population. Postgrad Med J. 1988;64:441–3.

Halperin ML, Kamel KS, Goldstein MB. Fluid, electrolyte, and acid-base physiology: a problem based approach. 4th ed. Philadelphia: Saunders Elsevier; 2009.

Kovesdy CP, Lott EH, JL L, et al. Hyponatremia, hypernatremia, and mortality in patients with chronic kidney disease with and without congestive heart failure. Circulation. 2012;125:677–84.
Lien YH, Shapiro JI. Hyponatremia: clinical diagnosis and management. Am J Med. 2007;120:653–8.
Milionis HJ, Liamis GL, Elisaf MS. The hyponatremic patient: a systematic approach to laboratory diagnosis. CMAJ. 2002;166:1056–62.
Miller M. Water balance in older persons. In: Morley JE, van den Berg L, Totowa NJ, editors. Contemporary endocrinology: endocrinology of aging. New York: Humana Press; 1999. p. 31–41.
Miller M. Nocturnal polyuria in the elderly: pathophysiology and clinical implications. J Am Geriatr Soc. 2000;48:1321–9.
Ouslander JG, Nasr SZ, Miller M, Withington W, Lee CS, Wiltshire-Clement M, Cruise P, Schnelle JF. Arginine vasopressin levels in nursing home residents with nighttime urinary incontinence. J Am Geriatr Soc. 1998;46:1274–9.
Rose BD. Clinical physiology of acid-base and electrolyte disorders. 5th ed. New York: Mcgraw-Hill; 2001.
Schrier RW, Gross P, Gheorghiade M, et al. Tolvaptan, a selective oral vasopressin V2-receptor antagonist, for hyponatremia. N Engl J Med. 2006;355:2099–112.
Snyder NA, Feigal DW, Al A. Hypernatremia in elderly patients. Ann Intern Med. 1987;107:309–19.
Verbalis JG, Goldsmith SR, Greenberg A, Schrier RW, Sterns RH. Hyponatremia treatment guidelines 2007: expert panel recommendations. Am J Med. 2007;120:S1–21.
Waikar SS, Mount DB, Curhan GC. Mortality after hospitalization with mild, moderate, and severe hyponatremia. Am J Med. 2009;122:857–65.
Wald R, Jaber BL, Price LL, Upadhyay A, Madias NE. Impact of hospital-associated hyponatremia on selected outcomes. Arch Intern Med. 2010;170:294–302.
Weiss JP, Blaivas JG, Stember DS, Brooks MM. Nocturia in adults: etiology and classification. Neurourol Urodyn. 1998;17:467–72.

Hearing and Vision Disorders

18

Karen Andersen-Ranberg

Abstract

Some of the most important features of ageing are hearing and vision impairments. Unrecognized these impairments have detrimental effects on the older individual's welfare by interfering with communication, activities of daily life, and social engagement. They also increase the risk of severe, potentially fatal, injuries, and may precipitate delirium in the acute setting. It is crucial to always assess vision and hearing ability during clinical examination. Hearing and vision impairments may be treated, with the aim of cure or mitigation. Aids may increase well-being and independent living, thereby reducing health care utilization and costs.

Learning Objectives

By the end of the chapter, the reader will be able to

- Understand the importance of recognizing vision and hearing impairment
- Apply simple clinical tests for vision and hearing assessment
- Recognize the impact of uncorrected hearing and vision impairment on health
- Recognize that treatment and corrective and assistive devices may alleviate and improve well-being

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_18) contains supplementary material, which is available to authorized users.

K. Andersen-Ranberg
Department of Geriatrics, Odense University Hospital, Odense, Denmark

Department of Clinical Research, University of Southern Denmark, Odense, Denmark
e-mail: Karanberg@health.sdu.dk

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_18

18.1 Hearing Impairment

The WHO defines disabling hearing impairment in adults as a hearing threshold (better ear) of 41 dB or greater (audiometry; frequencies 500–4000 Hz) (WHO 2013a). Self-reported hearing impairment affects 20% of 65+-year-olds and 72% in 85+-year-olds (Roth et al. 2011; Pacala and Yueh 2012).

Most common is ageing related hearing loss (ARHL) (presbycusis) characterized by a gradual loss of bilateral high-frequency sensorineural hearing of the inner ear. Hearing impairments may also relate to the outer or the middle ear (see Table 18.1).

Table 18.1 Ageing-associated hearing impairment

Condition	Diagnostics	Treatment
Ageing-related hearing loss	Audiometry	Hearing aid
Hearing aid doesn't function	No battery/flat battery	Fresh battery
Most common ear and hearing diseases in old age External otitis • Infection – Bacterial – Fungal • Contact allergy	• Rapid onset (generally <48 h) • Otoscopy • Inflammation • Otorrhoea • Debris	*Intact tympanic membrane*: • Pain alleviation • Cleaning up debris • Topical medication – Antibiotics-Antimycotics – Glucocorticoids (Kaushik et al. 2010) *Disrupted tympanic membrane*: • Pain alleviation • Specialist treatment
Foreign body	Otoscopy	Removal of foreign body
Cerumen	Otoscopy	Removal only when causing symptoms by • Irrigation (Risk of perforation, pain, vertigo) • Manual removal (Special skills required) • Topical preparations (Risk of otitis ext. (Schwartz et al. 2017))
(Middle ear) • Tympanic membrane perforation • Cholesteatoma	Otoscopy	Specialist treatment
(Inner ear) • Noise exposure • Otosclerosis • Ménière's disease • acoustic neuroma	Otoscopy – to exclude other treatable condition	Specialist treatment

18.2 The Impact of Screening for Hearing Impairment in Geriatric Patients

- Screening—self-report
  - "Do you have difficulty with your hearing?"
  - Sudden or gradual loss of hearing ability?
  - Symmetric? Worse in a noisy environment?
  - Tinnitus?
  - Cognitive impairment?
  - Occupational noise exposure?
  - Genetics? (Walling and Dickson 2012)
- Screening—family report (patient denying hearing problems)
  - Is the patient speaking more loudly?
  - Is repetition needed?
- Screening—clinically
  - Can the patient hear rubbing fingers over each ear?
  - Screening—whisper test
  - Standing behind the patient (60 cm), the doctor fully exhales and whispers at least two different combinations of three numbers/letters. Naming 3 out of 6 passes the test
- Otoscopy—inspection of outer and middle ear
  - Cerumen
  - Foreign body
  - Otitis
  - Debris
  - Tenderness
  - Inflammation
  - Tympanic membrane defect
- Pure tone audiometry handheld device
  - Assessment of hearing deficit (in a clean auditory canal)

(Fig. 18.1) (see also Chapter 26).

18.3 Management of Patients with Hearing Impairment

- Most common differential diagnosis are the other hearing impairment conditions.
- In all cases of hearing impairment the patient should be referred to an otolaryngologist ear nose throat (ENT).
- Very important to assess as impaired hearing may be corrected and treated, and further adverse outcomes prevented.

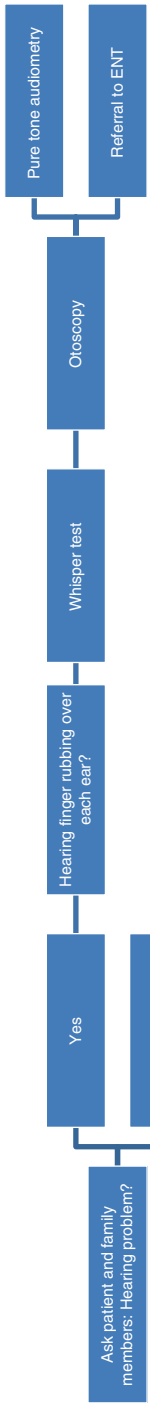


Fig. 18.1 Algorithm for hearing assessment

- Poor hearing has multiple consequences, e.g. depression, isolation, loneliness, pseudo-dementia, caregiver burden, and increased health care utilization.
- In the acute setting delirium may be precipitated by poor hearing and other sensory impairments under acute conditions (see also Chapter 8).
- Normal but clear speech in front of the patient. Do not shout! Use handheld amplifier with headphones.

18.4 Vision Impairment

Visual impairment is defined as visual acuity according to a Snellen chart. WHO defines visual impairment as a presenting visual acuity (presenting = obtained with currently available refractive correction, if any) (Resnikoff et al. 2008; WHO 2013b):

- Blindness: worse than 3/60 in the better eye
- Severe visual impairment: worse than 6/60 to equal or better than 3/60
- Moderate visual impairment: from worse than 6/18 to 6/60

Worldwide prevalence of blindness in 70+-year-olds is 5.3% and 4.2%, in men and women, respectively. Correspondingly the prevalence of moderate and severe visual impairment is 20.9% and 18.8% (Stevens et al. 2013). Ageing-associated vision impairment may be superimposed by ageing-associated eye diseases (Table 18.2).

18.5 The Impact of Screening for Vision Impairment in Geriatric Patients

- Screening—self-report
  - "Do you have difficulties with your vision, when reading newspaper, watching television, recognising faces?"
  - "Do you need more bright light when reading?"
  - "Do you experience sensitivity to light and glare?"
  - Sudden or gradually?
  - Specks in the visual field (retinal detachment)?
  - Flashes in the eye (retinal detachment)?
- Clinical examination
  - Snellen chart—6 m distance, numbered line, lowest readable line
  - Read the number of the examiner's fingers held close to the patient's face
  - Direction of a light source?
  - Ophthalmoscopy

(Fig. 18.2) (see also Chapter 26)

Table 18.2 Ageing-associated vision impairment

Condition	Symptoms	Treatment
Refractive power of the lens deteriorates (=presbyopia)	Difficulties focusing on ear objects; reading	Correction by glasses
Reduced contrast sensitivity for spatial information	Difficulties in perceiving grey tones, e.g. curb stones	
Decreased dark adaptation (Gopinath et al. 2016)	Delayed pupil dilation in darkness; driving at night difficult	
Dry eyes	Burning, watering eyes	Lubricating eye drops
Loss of eye lid tone	Ptosis/entropion/ectropion	Surgery
Most common vision and eye diseases in old age		
Cataract	Glare-related vision loss Reduced contrast sensitivity Reduced visual acuity Changed colour perception	Specialist treatment (cataract surgery)
Age-related macular degeneration (AMD) • Dry AMD (most common) • Wet AMD	Related to central vision loss: blurred vision, inability to read, drive, identify faces. Peripheral vision usually spared	All AMDs Specialist treatment Dry AMD: none Wet AMD (angiostatic treatment)
Diabetic retinopathy	Reduced contrast sensitivity Reduced visual acuity Reduced dark adaptation Blue-yellow colour perception	Specialist treatment
Glaucoma – primary open angle glaucoma (POAG) (90%) – primary closed angle glaucoma (PCAG) (10%)	Symptoms don't appear before severe optic nerve damage occurs, blurred vision POAG: halos around light, reduced dark adaptation. PCAG: headache, nausea, vomiting, corneal oedema	Specialist treatment Cannot be cured or reversed, but progression may be slowed. Various eye drops. Be aware of side effects!
Retinal detachment	Specks in the visual field flashes in the eye	Specialist treatment
Herpes zoster N. Ophthalmicus	Unilateral affection of the 1. trigeminal branch; pain, reddening, blepharospasms, blurred vision, watery eye	Specialist treatment, antiviral eye drops
Giant cell arteritis with affection of a. temporalis	Headache, diplopia, blurred vision,	High-dose oral corticosteroid and acute specialist treatment

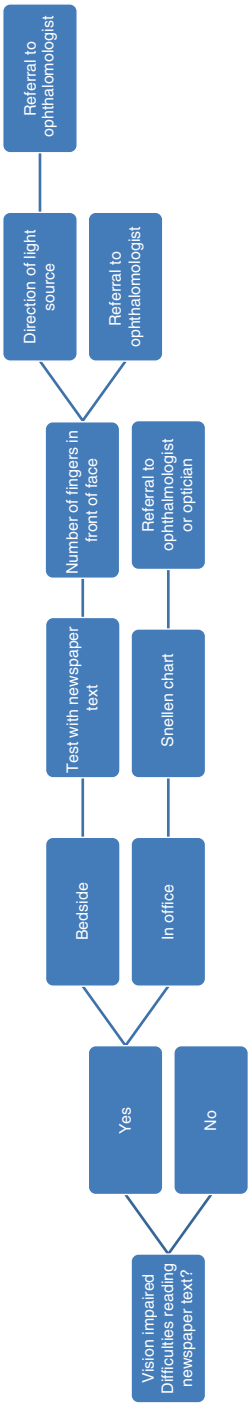


Fig. 18.2 Algorithm for vision assessment

18.6 Management of Patients with Vision Impairment

- Most common differential diagnosis are the other eye conditions.
- In all cases of vision impairment the patient should be referred to an ophthalmologist.
- Very important to assess loss of vision acuity as it may be corrected and treated, and further aggravation into blindness prevented.
- Poor vision has multiple consequences, e.g. falls and increased fracture risk, depression, functional limitations, caregiver burden, and increased health care utilization (Horowitz 2004).
- In the acute setting delirium may be precipitated by poor vision and other sensory impairments under acute conditions.
- Optimal corrective glasses, bright light, and contrasting colours in the environment enhance visual capacity.

References

Gopinath B, McMahon CM, Burlutsky G, Mitchell P. Hearing and vision impairment and the 5-year incidence of falls in older adults. Age Ageing. 2016;45(3):409–14.

Horowitz A. The prevalence and consequences of vision impairment in later life. Top Geriatr Rehabil. 2004;20(3):185–95.

Kaushik V, Malik T, Saeed SR. Interventions for acute otitis externa. Cochrane Database Syst Rev. 2010;1:CD004740.

Pacala JT, Yueh B. Hearing deficits in the older patient: "I didn't notice anything". JAMA. 2012;307(11):1185–94.

Resnikoff S, Pascolini D, Mariotti SP, Pokharel GP. Global magnitude of visual impairment caused by uncorrected refractive errors in 2004. Geneva: WHO; 2008. Contract No.: 1

Roth TN, Hanebuth D, Probst R. Prevalence of age-related hearing loss in Europe: a review. Eur Arch Otorhinolaryngol. 2011;268(8):1101–7.

Schwartz SR, Magit AE, Rosenfeld RM, Ballachanda BB, Hackell JM, Krouse HJ, et al. Clinical practice guideline (update): earwax (Cerumen impaction) executive summary. Otolaryngol Head Neck Surg. 2017;156(1):14–29.

Stevens GA, White RA, Flaxman SR, Price H, Jonas JB, Keeffe J, et al. Global prevalence of vision impairment and blindness: magnitude and temporal trends, 1990–2010. Ophthalmology. 2013;120(12):2377–84.

Walling AD, Dickson GM. Hearing loss in older adults. Am Fam Physician. 2012;85(12):1150–6.

WHO. Hearing loss in persons 65 years and older based on WHO global estimates on prevalence of hearing loss. Geneva: WHO; 2013a.

WHO. Universal eye health: a global action plan 2014-2019. Geneva: WHO; 2013b.

Pressure Ulcers

19

Dimitri Beeckman, Nele Van Damme, Dorien De Meyer, and Karen Van den Bussche

Abstract

Pressure ulcers are internationally accepted as an important quality indicator and are considered to be a preventable adverse event. Superficial pressure ulcers develop at the level of the skin and may progress downward, whereas deep pressure ulcers arise in muscle layers covering bony prominences and are mainly caused by sustained compression due to pressure and/or shear. A structured risk assessment approach should include the application of a risk assessment scale, combined with a comprehensive skin assessment and clinical judgement (based on knowledge of key risk factors). Prevention of pressure ulcers includes the use of adequate support surfaces (bed and chair), preventive skin care, and systematic repositioning with consideration of the individual's condition.

Learning Objectives

By the end of the chapter, the reader will be able to

- Describe the aetiology and pathophysiology of pressure ulcer development
- Explain the impact of pressure ulcers on patients, carers, organisations, and the society
- Diagnose and classify pressure ulcers
- Recommend effective interventions to prevent pressure ulcers and adapt the interventions to specific patient populations and contexts

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_19) contains supplementary material, which is available to authorized users.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_19.

D. Beeckman (✉) • N. Van Damme • D. De Meyer • K. Van den Bussche
Skin Integrity Research Group, University Center for Nursing and Midwifery, Department of Public Health, Ghent University, Ghent, Belgium
e-mail: Dimitri.Beeckman@UGent.be; Nele.VanDamme@UGent.be; Dorien.DeMeyer@UGent.be; Karen.VandenBussche@UGent.be

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*, Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_19

19.1 Definition, Aetiology and Impact

A pressure ulcer is a localised injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear (Fig. 19.1). A number of contributing or confounding factors are associated with pressure ulcers; the significance of these factors is yet to be elucidated. The development of pressure ulcers is related to a complex interplay of several factors.

Mobility and activity, perfusion, and skin status are independent risk factors. In addition, skin moisture, age, haematological status, nutrition, general health status, body temperature, and immunity are important factors for pressure ulcer development.

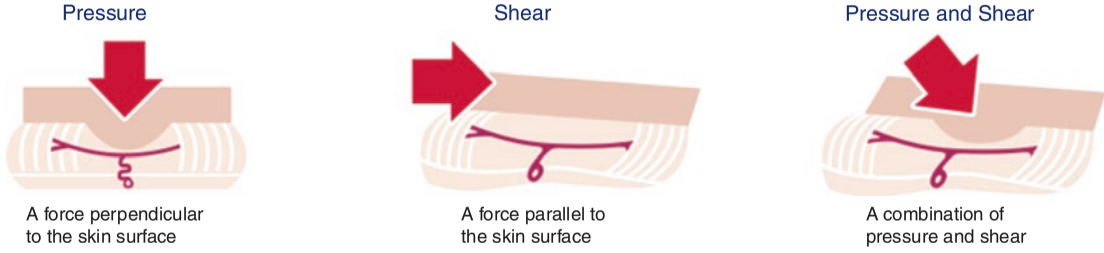
The aetiology of different types of pressure ulcers is not fully understood. Prolonged mechanical loading of soft tissues covering bony prominences, as present when individuals are bedridden or wheelchair bound, is supposed to lead to degeneration of skeletal muscle tissue. This external mechanical load can be a force perpendicular to the skin surface (pressure), a force parallel to the skin surface (shear) or a combination of pressure, and shear.

- Pressure is considered an important aetiological factor and occurs when soft tissues are compressed between bony prominences and contact surfaces for prolonged periods of time.
- Shearing forces result from forces that tend to cause two opposing surfaces to slide and displace against each other.

Also other damage pathways are involved, such as impaired lymphatic drainage, ischaemia/reperfusion injury, and sustained tissue deformation. Stekelenburg et al. (2007) have demonstrated that a 2-h period of compressive loading leads to irreversible damage to the muscle tissue, whereas ischaemic loading results in reversible tissue changes. This implies that large deformation, in conjunction with ischaemia, provides the main trigger for irreversible muscle damage.

Pressure ulcers are internationally recognised as an adverse outcome of the admission to a healthcare facility. They are internationally accepted as key clinical indicators of the quality of care and are considered to be a preventable adverse event. Pressure ulcers have a significant impact on patients, their families, caregivers, and healthcare organisations (Gorecki et al. 2009). Pressure ulcer development is associated with pain, infections, prolonged and expensive hospitalisations, increased risk of death, and reduced health-related quality of life (Demarre et al. 2015, Gorecki et al. 2009).

Unrelieved pressure and shear on bony prominences, skin, and soft tissue lead to the development of pressure ulcers



Pressure and shear lead to:

- Ischaemia
- Tissue reperfusion damage
- Direct cell and tissue deformation
- Impaired lymphatic drainage

The role of microclimate should be further explored

Fig. 19.1 Pressure ulcer development

19.2 Classification and Differential Diagnosis

Pressure ulcers can start superficially or deep within the tissues, depending on the nature of the surface loading and the tissue integrity. Superficial pressure ulcers form within the skin and may progress downward, whereas deep pressure ulcers arise in muscle layers covering bony prominences and are mainly caused by sustained compression of the tissues. The severity of pressure ulcers varies from non-blanchable erythema of the intact skin to tissue destruction involving skin, subcutaneous fat, muscle, and bone.

In the United States, the National Pressure Ulcer Advisory Panel (NPUAP) developed a classification using four stages in 1989. In Europe, this classification system was adopted by the European Pressure Ulcer Advisory Panel (EPUAP) in 1999 with some minor textual changes. From 2009 onwards, NPUAP and EPUAP developed a common international classification system for pressure ulcers. The purpose of the classification system is to standardise record-keeping and provide a common description of pressure ulcer severity for the purposes of clinical practice, audit and research. Table 19.1 presents the 2014 NPUAP/EPUAP classification system.

Pressure ulcer prevalence and incidence figures vary by setting, pressure ulcer severity and length of follow-up. National pressure ulcer prevalence surveys revealed a prevalence (Cat. I–IV) of 12.1% in Belgian hospitals and 8.9% in French hospitals. Prevalence rates of 31.4% and 6.4% in nursing homes and 18.1% and 9% in hospitals were found in the Netherlands and Germany, respectively. Prevalence figures in aged care settings vary from 2.8 to 5% in Spanish young-old patients admitted to internal medicine departments, 9% in older Irish long-term care settings (Moore and Cowman 2012), 6 to 14.5% in Swedish hospitals and nursing homes, and 4.1 to 32.2% in US long-term care and nursing homes (Pieper 2012).

Pressure ulcers can be related to incontinence-associated dermatitis (IAD) due to their similar clinical presentations (see Pocket Card). Misclassification has significant implications for prevention, treatment, and reporting and benchmarking on quality of care. Therefore it is important to correctly diagnose pressure ulcers and to differentiate it from other skin lesions that occur in the same areas on the skin.

19.3 How to Prevent Pressure Ulcers?

The aim of pressure ulcer prevention is to reduce the duration and/or the amount of pressure and shear. Since preventive measures are expensive and labour intensive, patients with a clear risk of developing pressure ulcers should be identified through a structured risk assessment.

Table 19.1 Pressure Ulcer Classification (NPUAP et al. 2014)

	Category/Stage I Non-blanchable erythema	Intact skin with non-blanchable redness* of a localised area usually over a bony prominence. Darkly pigmented skin may not have visible blanching; its colour may differ from the surrounding area. The area may be painful, firm, soft, warmer or cooler as compared to adjacent tissue. Category/Stage I may be difficult to detect in individuals with dark skin tones. May indicate 'at-risk' individuals (a heralding sign of risk). **Non-blanchable erythema can be detected using the diascopy method (see* Table 19.3).
	Category/Stage II Partial thickness skin loss	Partial thickness loss of dermis presenting as a shallow open ulcer with a red pink wound bed, without slough. May also present as an intact or open/ruptured serum-filled blister. Presents as a shiny or dry shallow ulcer without slough or bruising.* This category/stage should not be used to describe skin tears, tape burns, incontinence-associated dermatitis, maceration or excoriation. **Bruising indicates suspected deep tissue injury.*

(continued)

Table 19.1 (continued)

	Category/Stage III Full thickness skin loss	Full thickness skin loss. Subcutaneous fat may be visible but bone, tendon or muscle are not exposed. Slough may be present but does not obscure the depth of tissue loss. May include undermining and tunnelling. The depth of a Category/Stage III pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have subcutaneous tissue and Category/Stage III ulcers can be shallow. In contrast, areas of significant adiposity can develop extremely deep Category/Stage III pressure ulcers. Bone/tendon is not visible or directly palpable.
	Category/Stage IV Full thickness tissue loss	Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present on some parts of the wound bed. Often include undermining and tunnelling. The depth of a Category/Stage IV pressure ulcer varies by anatomical location. The bridge of the nose, ear, occiput and malleolus do not have subcutaneous tissue and these ulcers can be shallow. Category/Stage IV ulcers can extend into muscle and/or supporting structures (e.g. fascia, tendon or joint capsule) making osteomyelitis possible. Exposed bone/muscle is visible or directly palpable.

	Unstageable: Depth unknown	Full thickness tissue loss in which the base of the ulcer is covered by slough (yellow, tan, grey, green or brown) and/or eschar (tan, brown or black) in the wound bed. Until enough slough and/or eschar is removed to expose the base of the wound, the true depth, and therefore Category/Stage, cannot be determined. Stable (dry, adherent, intact without erythema or fluctuance) eschar on the heels serves as 'the body's natural (biological) cover' and should not be removed.
	Suspected deep tissue injury: depth unknown	Purple or maroon localised area of discoloured intact skin or blood-filled blister due to damage of underlying soft tissue from pressure and/or shear. The area may be preceded by tissue that is painful, firm, mushy, boggy, warmer or cooler as compared to adjacent tissue. Deep tissue injury may be difficult to detect in individuals with dark skin tones. Evolution may include a thin blister over a dark wound bed. The wound may further evolve and become covered by thin eschar. Evolution may be rapid exposing additional layers of tissue even with optimal treatment.

The prevention of pressure ulcers comprises:

1. The use of adequate support surfaces (bed and chair) to redistribute pressure/shear and to manage tissue load and microclimate (NICE 2014)
2. Preventive skin care including cleansing the skin and protecting it from exposure to moisture
3. Systematic repositioning of the patient with consideration of the individual's situation (NICE 2014)

A support surface is a specialised device for pressure redistribution designed for the management of tissue loads, microclimate, and/or other therapeutic functions, e.g. mattresses, integrated bed systems, mattress replacement, overlay, seat cushion or seat cushion overlay. Patient repositioning must take into account the condition of the patient and the support surface in use (NICE 2014). Specific devices should be placed to elevate the heel (offload them) as to distribute the weight of the leg along the calf without putting pressure on the Achilles tendon. The knee should be in slight flexion. An overview of pressure ulcer risk assessment and prevention interventions is presented in Tables 19.2 and 19.4.

Table 19.2 Overview of pressure ulcer risk assessment and prevention in bed and when seated

Risk assessment
• A structured approach to skin assessment as a part of the risk assessment policy should be used in all healthcare settings.
• A structured approach to risk assessment should include the use of a risk assessment scale, combined with a comprehensive skin assessment and clinical judgement (based on knowledge of key risk factors).
• The use of the transparent disk method to assess non-blanchable erythema is preferable to the finger method.
• Education of professionals should include techniques for identifying blanching response, localised heat, oedema, and induration.
Preventive strategies in bed
• Prevention in bed should focus on the reduction of the amount and/or duration of pressure and shear.
• Pressure ulcer prevention in bed includes the application of an appropriate support surface combined with correct repositioning on a continuing basis.
• The condition of the patient and the specification of the support surface should be considered to determine the frequency and technique for repositioning.
• Repositioning should be undertaken using the 30° tilted side-lying position (alternately right side, back, left side) or the prone position if the patient can tolerate this and if the medical condition allows for it.
• Postures that increase pressure (such as the 90° side-lying position or semi-recumbent position) should be avoided.
• Heels should be free of all pressure permanently.
Preventive strategies when seated
• Prevention when seated should focus on the reduction of the amount and/or duration of pressure and shear.
• The time an individual spends seated in a chair without pressure relief should be limited.
• If sitting back in an armchair, the lower legs should be placed on a footstool or footrest.
• A posture that is acceptable for the individual and minimises the pressure and shear exerted on the skin and soft tissues should be selected.

Table 19.3 Diascopy method to detect non-blanchable erythema

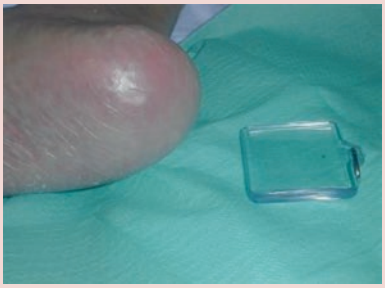
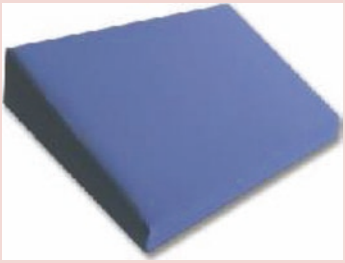
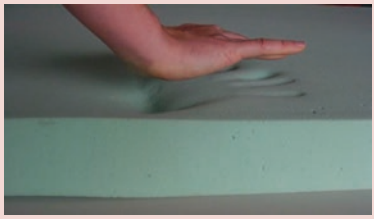
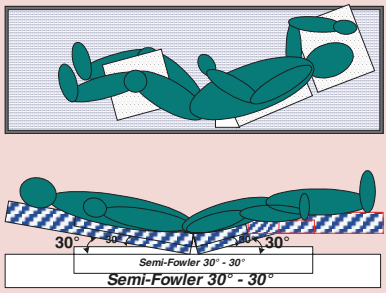
Suspected non-blanchable erythema	Diascopy method using a transparent disk
	

Table 19.4 Devices to offload pressure/shear

Heel offloading	 Wedge-shaped cushion to offload the heel and to redistribute the weight of the leg along the calf without putting pressure on the Achilles tendon	 Pillow used for heel offloading

Support surfaces	 *Viscoelastic foam mattress to redistribute pressure/shear over a larger contact area. This is a non-powered (not electrically driven) support surface that reacts to body weight/temperature to change shape and to cause pressure redistribution*	 *Static air mattress to redistribute pressure/shear over a larger contact area. This is a non-powered (not electrically driven) support surface that reacts to body weight and weight shifting to change shape and to cause pressure redistribution*
	 *Alternating pressure air mattress to relieve pressure at bony prominences. This is a powered (electrically driven) support surface that uses inflation/deflation of air-filled compartments to offload pressure at bony prominences*	
Repositioning	 *Repositioning using the 30° tilted side-lying position (alternately right side, back, left side) or the semi-Fowler 30°–30° position*	

References

Gorecki C, Brown JM, Nelson EA, Briggs M, Schoonhoven L, Dealey C, et al. Impact of pressure ulcers on quality of life in older patients: a systematic review. J Am Geriatr Soc. 2009;57(7):1175–83.

Demarre L, Verhaeghe S, Annemans L, Van Hecke A, Grypdonck M, Beeckman D. The cost of pressure ulcer prevention and treatment in hospitals and nursing homes in Flanders: a cost-of-illness study. Int J Nurs Stud. 2015;52(7):1166–79.

Moore Z, Cowman S. Pressure ulcer prevalence and prevention practices in care of the older person in the Republic of Ireland. J Clin Nurs. 2012;21(3–4):362–71.

NICE. Pressure ulcers: prevention and management. 2014. nice.org.uk/guidance/cg179.

NPUAP, EPUAP, PPPIA. Prevention and treatment of pressure ulcers: clinical practice guideline. Perth, Australia: Cambridge Media; 2014.

Pieper B. Long term care/nursing home. In: Pieper B, The National Pressure Ulcer Advisory Panel, editors. Pressure ulcers: prevalence, incidence and implications for the future. 2nd ed. Washington, DC: National Pressure Ulcer Advisory Panel; 2012. p. 65–96.

Stekelenburg A., Strijkers G., Parusel H., Bader D., Nicolay K., Oomens C. (2007). Role of ischemia and deformation in the onset of compression-induced deep tissue injury: MRI-based studies in a rat model. Journal of Applied Physiology, 102(5), 2002–11.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_19.

Movement Disorders

20

Stephanie A. Bridenbaugh and Reto W. Kressig

Abstract

Movement disorders are impaired voluntary movements due to basal ganglia dysfunction. This chapter provides a brief overview of movement disorders and focuses on common hyperkinetic movement disorders, common tremors, Parkinson's disease, and restless legs syndrome. Ataxia and cerebellar disorders are beyond the scope of this chapter.

Learning Objectives

By the end of the chapter, the reader will be able to

- Describe and classify common movement disorders
- Describe and classify common tremors
- List the cardinal and common features of Parkinson's disease
- Describe symptoms and treatment of restless legs syndrome

20.1 Movement Disorders

Movement disorders refer to the impaired regulation of voluntary movements without directly affecting muscle strength or sensation. The term "extrapyramidal symptoms" was coined in 1912 to distinguish these disorders from those of the pyramidal system. Although several systems and anatomic regions are involved, the terms movement disorders (MoDi) and extrapyramidal symptoms are traditionally synonymous with dysfunction of the basal ganglia (Deuschl et al. 1998, Abdo et al. 2010).

S.A. Bridenbaugh (✉) • R.W. Kressig
Felix Platter Hospital, University Center for Medicine of Ageing,
Basel, Switzerland
e-mail: Stephanie.Bridenbaugh@fps-basel.ch; RetoW.Kressig@fps-basel.ch

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_20

For many MoDi, biomarkers are not available and diagnostic test results are ambiguous. Therefore, a MoDi is often diagnosed clinically. Phenomenological classification is an important step toward diagnosis.

MoDi can be categorized as hypokinetic (less movement than normal) or hyperkinetic (more movement than normal).

Hypokinetic MoDi include:
- Hypomimia (masked face, reduced facial expressions)
- Micrographia (handwriting gets progressively smaller while writing)
- Bradykinesia (movements diminished in speed, frequency, or amplitude)
- Reduced blinking frequency
- Reduced arm swing when walking

Common hyperkinetic MoDi are described in Table 20.1. Hyperkinetic MoDi can be classified according to their rhythmicity, speed, and suppressibility (Fig. 20.1). For many MoDi, symptoms are enhanced by stress and/or voluntary movement and are not present during sleep. Tics can be temporarily suppressed, although this causes increasing feelings of anxiety and tension, which dissipate when the person allows the tics to occur (IPMDS 2017).

Table 20.1 Common hyperkinetic movement disorders

Movement disorder[a]	Description	Clinical examples[a]
Asterixis	A negative myoclonus with sudden loss of muscle contraction; long pauses resemble flapping, shorter pauses look like irregular tremor	Encephalopathy due to liver or renal failure
Athetosis	Slow, writhing, twisting, snake-like movements usually of distal muscles	Wilson's disease, following cerebral anoxia
Ballismus	Sudden, explosive, flinging, flailing movements, usually of proximal limb muscles. Can cause injuries and/or falls. Often unilateral (hemiballismus)	Stroke in contralateral subthalamic nucleus
Chorea	"Dance" in Greek. Continuous flow of rapid, irregular muscle jerks in unpredictably different parts of the body; oropharyngeal area ("chameleon tongue") and distal extremities particularly affected. Voluntary movements may be distorted by superimposed involuntary movements. Can cause "dancing gait" with sudden dipping and lurching to one side	Huntington disease, medication-induced (neuroleptics, L-Dopa, dopaminergic medications, anticonvulsants), Wilson's disease, systemic lupus erythematodes, Creutzfeldt–Jakob disease, hyperthyroidism, hypoparathyroidism
Dyskinesia	Technically means disorder of movement, yet commonly refers to tardive dyskinesia, which describes iatrogenic repetitive movements, usually of facial, buccal, oral, and cervical muscles (e.g., grimacing, lip smacking or puckering, tongue protrusion, rapid blinking) but may affect the trunk or extremities	Side effect of some neuroleptics or antipsychotic drugs; symptoms may persist after withdrawal of the medication

Table 20.1 (continued)

Movement disorder[a]	Description	Clinical examples[a]
Dystonia	Sustained abnormal posture, e.g., blepharospasm (intermittent strong closure of eyelids); oromandibular dystonia with "cramping" of jaw, tongue, and mouth muscles; cervical dystonia such as torticollis. Can be focal, segmental, or generalized	Reaction to antiemetic or neuroleptic drug
Myoclonus	Sudden, rapid, shock-like jerks. Can be focal, segmental, or generalized	Physiological (hiccups, leg jerks when falling asleep), Parkinson's disease, Huntington disease, Lewy body disease, progressive supranuclear palsy, metabolic or hypoxic encephalopathy, paraneoplastic, drug toxicity
Tics	Sudden, fast, coordinated, repetitive movements that occur predominately in the face, neck, and upper arms; stereotyped character allows easy mimicking; simple (e.g., blinking, shoulder shrugging) or complex (e.g., wrist shaking, uttering words)	Primary: Tourette's syndrome (coprolalia is not an essential feature); Secondary: Huntington disease, infections, stroke, medications
Tremor	Rhythmic oscillating movements of one or more body parts; often have fixed frequency and variable amplitude	Physiological, Parkinson's disease, cerebellar disorder, Wilson's disease, medication or drug toxicity

[a]Not comprehensive

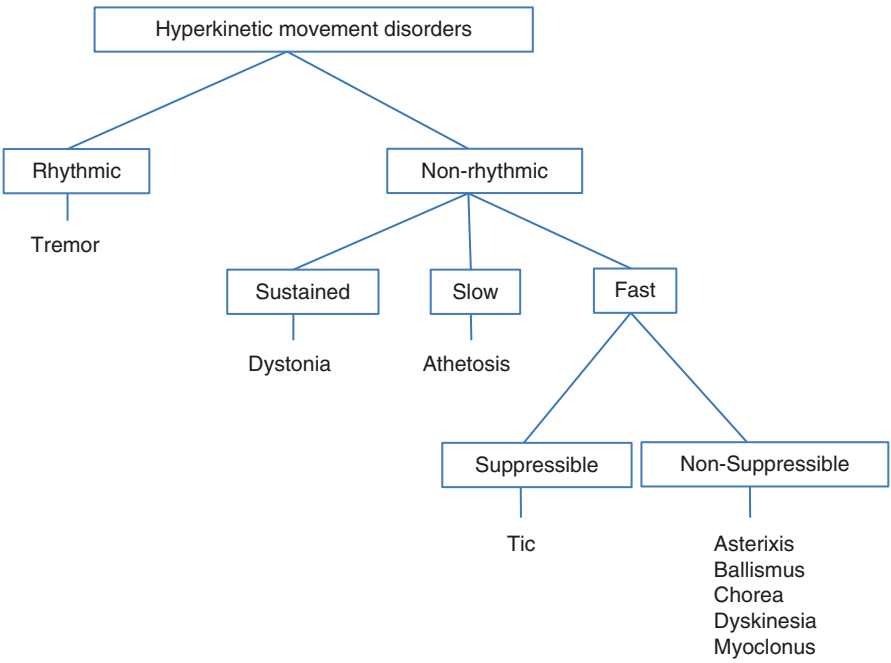


Fig. 20.1 Classification of hyperkinetic movement disorders

Table 20.2 Common tremors

Tremor	Features	Examples
• Rest tremor	Occurs when body part is at rest but not during movement; exaggerated by movement on contralateral side of body; best examined when body part is fully supported against gravity	Parkinson's disease
• Action tremor	Occurs during movement and can be present at rest	
– Postural	Occurs in body part that maintains a posture against gravity (e.g., trembling of outstretched hands); movement does not increase severity	Physiological tremor; essential tremor; enhanced with adrenergic stimulation (stress, caffeine), endocrine disorders, intoxications
– Kinetic	Occurs during movement but not at rest	
Simple	Occurs during entire movement trajectory	Essential tremor (often familial)
Intention	Amplitude increases progressively with movement toward intended target (finger-to-nose and/or heel-to-shin test)	Cerebellar ataxia
Task specific	Occurs during specific activities	Dystonic writing tremor
– Isometric	Occurs during voluntary muscle contractions against a stationary resistance	Physiological; associated with other types of tremor
• Combinations	Various	Severe essential tremor; atypical parkinsonism

20.1.1 Tremors

Tremors are often classified based on the situation in which they occur (Table 20.2) (Louis 1997).

To detect tremors, examine your patient
- At rest
- Distracted (e.g., counting backwards)
- With outstretched hands
- During movement (e.g., finger-to-nose test, writing, walking)

20.2 Assessment of Movement Disorders

In addition to the medical history and physical exam, you should observe, describe, classify, and clinically diagnose the MoDi before further diagnostic procedures are performed (Simon et al. 1999).

- **Look**—If possible, accompany the patient from the waiting room to the examination room. How does the patient turn toward you (head and neck or turning with upper body as well?), gather his or her belongings (smooth, fluid, symmetric, appropriate movements?), stand up (chair armrests used? With one or both hands? steady immediately after standing? short pause before begins walking?), turn (shorter steps? Pauses?), walk (steady or unsteady? Regular, symmetric movements?), and stop (immediate or with some small, quick steps?).
- **Listen**—Clothes rustling or rubbing due to tremor; repeated sounds, sniffs, or throat clearing of a tic; irregular, choppy speech; shuffling gait; slight tremors can be heard with a stethoscope placed on the affected body part (sounds like thumping of helicopter blades).
- **Describe**—Depict what you have observed without giving labels, e.g., rapid shrugging movement of left shoulder about once a minute.
- **Classify**—Rhythmic or nonrhythmic; sustained, slow, or fast; suppressible or nonsuppressible; hypo- or hyperkinetic. Some patients may have both a hypo- and a hyperkinetic MoDi, for example, tremor and bradykinesia in Parkinson's disease (PD).
- **Diagnose**—Name the movement disorder(s) you have observed, examined, and classified.

20.3 Parkinson's Disease and Parkinsonism

PD is the second most common neurodegenerative disorder after Alzheimer's disease. Peak onset of PD is in the seventh decade but may occur as early as the age of 40. The prevalence is approximately 3% in people aged 65 or older and up to 10% in those 80 years or older. Up to about 60% of people with PD develop depression and about 30% develop dementia.

PD is a synucleinopathy—the neuronal protein synuclein aggregates into insoluble fibers which are deposited in Lewy bodies in the nigrostriatal system. This causes death of neurons in the substantia nigra which leads to a dopamine deficiency in the striatum. Symptomatic treatment aims to restore dopaminergic function in the brain with carbidopa-levodopa and/or other drugs such as dopamine agonists, mono amino oxydase inhibitor-B (MAO-B) inhibitors, or amantadine.

Cardinal features:
- **T**remor
- **R**igidity
- **A**kinesia/bradykinesia
- **P**ostural instability

The tremor is an asymmetric rest tremor that usually begins with a hand (characteristic "pill-rolling") or foot. Rigidity is increased muscle tone that you can feel as a constant resistance throughout flexion and extension while passively moving the affected limb (distinct from spasticity). When rigor and tremor are both present, you

can feel "cogwheeling" while passively flexing and extending the limb (feels like when you use a ratchet tool or the step-by-step clicking sensation of pulling a car handbrake).

Other features:
- Hypokinetic MoDi (see beginning of chapter)
- Stooped upper body, flexed elbows, flexed knees, and shuffling gait
- Festination (quickening and shortening of steps), particularly when turning, dual tasking, or stopping
- Freezing (sudden stop of voluntary movement, including walking)
- Autonomic dysfunction (e.g., orthostatic hypotension, hypersalivation, bowel dysmotility)

In early stages it can be difficult to distinguish PD from normal pressure hydrocephalus. Other mimics of PD can be essential tremor, depression, and frozen shoulder.

Secondary parkinsonism is due to a dopaminergic blockade in the basal ganglia with similar symptoms to PD but has an identifiable cause other than PD (e.g., drugs, cerebrovascular disease, trauma, postencephalitic changes).

Atypical parkinsonism describes neurodegenerative disorders that have some features of PD, generally a worse prognosis, a mild or no response to levodopa, and a different pathology. Examples include progressive supranuclear palsy, multiple system atrophy, dementia with Lewy bodies, and corticobasal degeneration.

20.4 Restless Legs Syndrome

Restless legs syndrome (RLS) is characterized by uncomfortable sensations of tightness, pulling, electric tingling, and/or bugs crawling in legs and an overwhelming urge to move the legs. Myoclonic leg jerks may occur. Symptoms appear or increase during rest and inactivity, are worse in the evenings and nights, and can profoundly disturb sleep. Moving the legs, usually by walking around, partially or completely removes the symptoms temporarily. Despite being the most common MoDi, affecting 5–10% of the general population, RLS is often un- or misdiagnosed. RLS more commonly affects women and the prevalence increases with age. RLS can be idiopathic or secondary to conditions such as iron deficiency, renal failure, and neuropathy. Although the etiology is still unknown, current evidence suggests that symptoms may result from central dopaminergic dysfunction. Some treatments for RLS are anticonvulsants such as gabapentin, dopamine agonists, benzodiazepines, and opioids.

20.5 Summary

In conclusion, movement disorders are common but because of their variable presentation can be difficult to diagnose. Since diagnosis is largely clinical, is it important to be able to recognize, describe, and classify MoDi. Clinical astuteness will lead to the correct diagnosis and the proper treatment for your patient.

References

Abdo WF, van de Warrenburg BP, Burn DJ, Quinn NP, Bloem BR. The clinical approach to movement disorders. Nat Rev Neurol. 2010;6(1):29–37.

Deuschl G, Bain P, Brin M. Consensus statement of the Movement Disorder Society on tremor. Ad hoc scientific committee. Mov Disord. 1998;13(Suppl 3):2–23.

Flaherty A. The Massachusetts General Hospital handbook of neurology. 1st ed. Philadelphia: Lippincott Williams & Wilkins; 2000.

International Parkinson and Movement Disorder Society (IPMDS): http://www.movementdisorders.org/MDS/About/Movement-Disorder-Overviews.htm (2017). Accessed 23 Apr 2017.

Louis ED. Movement disorders. In: Marshall RS, Mayer SA, editors. On call neurology. Philadelphia: W.V. Saunders Company; 1997.

Simon RP, Aminoff MJ, Greenberg DA. Clinical neurology. 4th ed: Lange Medical Books/McGraw Hill; 1999.

Pain

21

Nele Van Den Noortgate

Abstract

Chronic pain is common in older people affecting up to 60% of older community dwelling older persons with and without dementia. There are no neurophysiological arguments that pain perception and tolerance are affected by the ageing process or cognitive impairment. Chronic pain has a significant impact on the functionality and quality of life of older people. Systematic screening with appropriate tools for the target population followed by a clinical assessment is recommended. A holistic, multidisciplinary approach through a comprehensive geriatric assessment (CGA) (see also Chapter 26) can offer meaningful support. It is possible to safely use non-pharmacological and pharmacological treatments, provided the clinician has a good knowledge of the adverse events of the treatments. In patients with advanced dementia and patients at the end of life, alternative routes of administration of analgesics should be considered.

Learning Objectives

By the end of the chapter, the reader will be able to

- Know the prevalence, common types and consequences of chronic pain
- Screen and assess the older patient with chronic pain
- Know how to manage non-pharmacological treatment of chronic pain
- Initiate a pharmacological treatment for chronic pain and monitor the possible adverse events

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_21) contains supplementary material, which is available to authorized users.

N. Van Den Noortgate
Department of Geriatric Medicine, Ghent University Hospital, Ghent, Belgium
e-mail: nele.vandennoortgate@UGent.be

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_21

21.1 Introduction and Context

The commonly used International Association for the Study of Pain (IASP) definition states that *pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage*. Although ageing and especially neurocognitive disorders are associated with structural, biochemical and functional changes in the nervous system, there are no arguments that these changes have a clear and important influence on the perception of pain in the older patient population (Gibson and Farrell 2004; Scherder 2013).

Chronic pain, *pain present for more than three to six months*, affects 25–76% of home-dwelling people over 65 years and up to 93% of older people in nursing homes (AGS panel 2002; British Geriatrics Society 2013). These figures are comparable with those of older patients with cognitive impairment. Epidemiological studies show that the most common causes are musculoskeletal pain (up to 83% of patients) as joint pain and low back pain due to osteoarthritis, as pain from previous fractures, and peripheral neuropathies. In most studies about 60% of pain is pure nociceptive pain resulting from actual or threatened damage to non-neural tissue and due to the activation of nociceptors located in somatic (e.g. skin, musculoskeletal tissues) or visceral tissues. Secondly, pain can be caused by a lesion or disease of the nervous system which is called neuropathic pain. Pure neuropathic pain is present in about 10%, while combined nociceptive and neuropathic pain is present in about 1 out of 3 older persons.

Persistent pain has a significant impact on all levels of functioning and quality of life of older people (Fig. 21.1). This decline in functioning increases the risk of developing chronic pain and leads to a vicious circle which is associated with high utilisation of healthcare resources in advanced age. Therefore, an adequate assessment and management of pain are important especially in the older population.

Chronic pain is often underrecognised in older adults. Symptoms of different underlying chronic pathology can manifest with pain. Moreover, older people may be reluctant to consult due to the prevailing idea that pain is inevitably associated with ageing, or they may also fear for invasive tests and treatments. As functional decline is one of the major symptoms of chronic pain, pain should be assessed and considered as the "fifth vital" sign to check in an older person whose function is deteriorating.

21.2 Screening and Assessment of Pain

21.2.1 Screening for Chronic Pain

Screening should always start with direct enquiry about whether pain is present. In persons where communication is possible, just ask the question and realise it is important to use alternative words and phrases for pain, for example, "Are you in pain?", "Does it hurt?", "Is it sore?", "Do you have an ache?" (AGS panel 2002). Some older persons can have difficulties to report pain due to cognitive impairment in case of dementia or delirium, but also due to strokes,

Parkinson's disease or limited abilities with verbal communication as result of cultural or language differences. These group of people should be screened for behaviour (all changes) during rest of movements using behavioural indicators of pain (AGS panel 2002) (Table 21.1). It is also crucial to seek collateral history from a relative or caregiver and detailed review of the medical and nursing notes may also reveal potential sources of pain. A multidisciplinary approach involving the assistance of speech and language therapist or psychologist can be very helpful. However, despite widely held beliefs to the contrary, many patients with moderate to severe dementia can report pain reliably (AGS panel 2002).

Many screening and/or assessment tools are available, the most recommended tools in recent systematic reviews and guidelines are mentioned in Fig. 21.1.

21.2.2 Clinical Assessment

Once the presence of pain is documented, further assessments should follow through, on the one hand, further questions regarding the three key dimensions of pain (Royal College of Physicians, British Geriatrics Society, British Pain Society 2007). These include the *sensory dimension,* relating to the intensity of pain and evaluated by a standardised pain self-assessment scale examining the character or nature of the pain

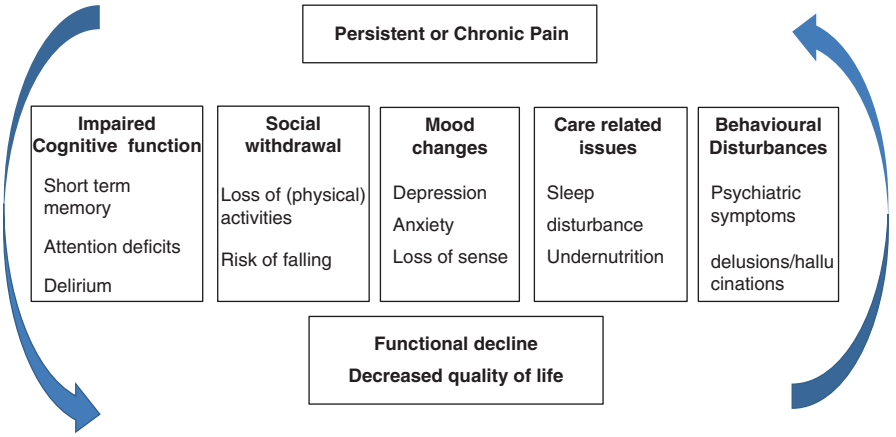


Fig. 21.1 Consequences of chronic pain in older persons

Table 21.1 Behavioural indicators of pain (American Geriatrics Society)

	Domain	Example of behaviour
1	Facial expressions	Frowning, rapid blinking
2	Verbalisations and vocalisations	Moaning, grunting
3	Body movements	Protecting sore areas, pacing
4	Changes in interpersonal interactions	Disruptive behaviour, withdrawal
5	Changes in activity patterns or routines	Changes in sleep or appetite
6	Mental status changes	Increased confusion, crying

(e.g. sharp, dull, burning), and the location and radiation of the pain. The latter can be assessed by direct pointing to the pain location by the patient or by using a pain map. The *affective dimension* in terms of the person's emotional response to pain and how they perceive this, for example, fear, anxiety or depression should be evaluated. The third dimension relates to the *impact* of pain on the person's function and activities of daily living: the ability of patients to participate in social activities and relationships should be addressed. The latter two dimensions can be evaluated through a CGA (see also Chapter 26).

On the other hand, further clinical examination should be performed, followed by technical investigations to detect the underlying aetiology of the pain in order to treat the causative pathology. An algorithm summarising the process of screening and assessment is provided in Fig. 21.2.

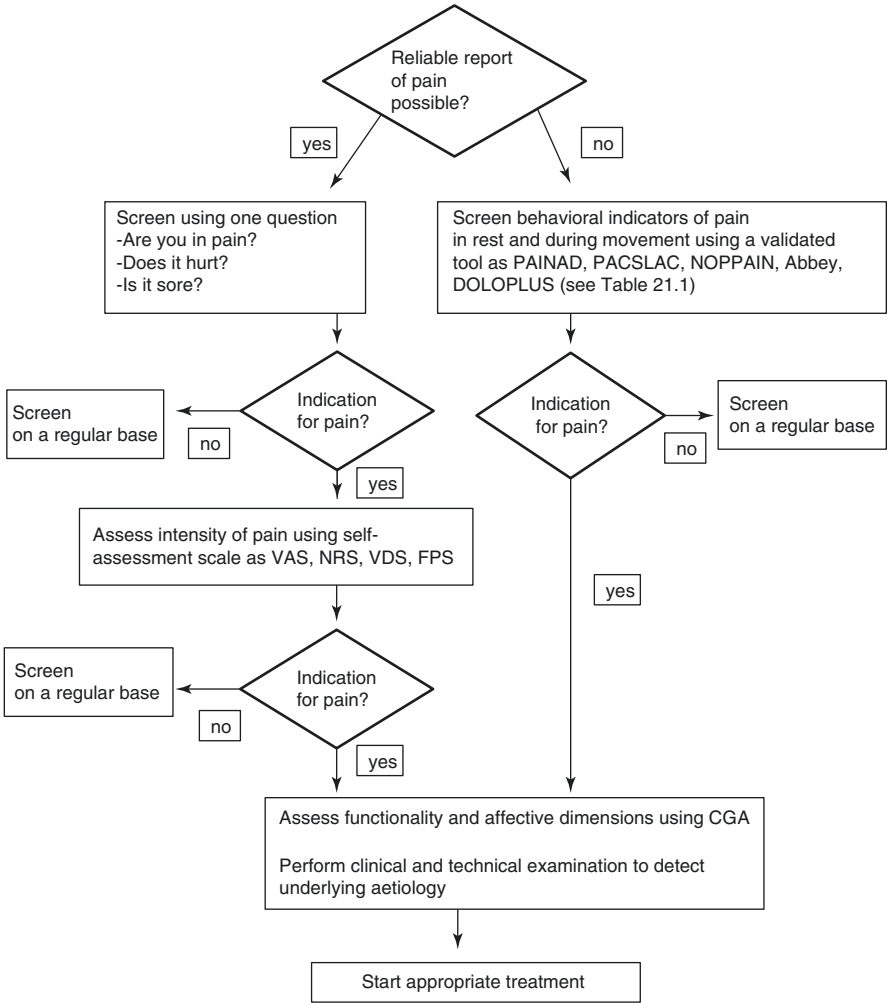


Fig. 21.2 Algorithm Screening and Assessment of chronic pain in older persons

21.3 Treatment of Chronic Pain

Since only few randomised controlled trials are available on the treatment of pain in a geriatric patient population, we will synthesise evidence and expert based guidelines from national organisations (British Geriatrics Society 2013; American Geriatrics Society Panel 2009).

Following steps have to be considered: non-pharmacological management, topical preparations, local (minimal) invasive treatment and systematic analgesics following the WHO pain relief ladder (see also Pocket Card).

21.3.1 Non-pharmacological Management

Non-pharmacological treatment includes education in self-management techniques for both the patient and their caregiver. Other non-pharmacological options are broadly discussed in the guidelines of the British Geriatrics Society. These, in summary, suggest considering ways of increasing activity using exercise adapted to the preferences of the patient or the use of assisted devices such as walking aids, which may reduce pain intensity. There is limited to weak evidence for the use of therapies such as mindfulness, meditation, biofeedback training and complementary therapies (Transcutaneous Electrical Nerve Stimulation (TENS), acupuncture, massage, aromatherapy, reflexology).

21.3.2 Topical Preparations

There is some evidence that short-term treatment local non-steroidal anti-inflammatory drug (NSAID) therapy can be helpful especially when pain is localised. There is less evidence available for the use of local lidocaine patches, although NICE guidelines recommend their use for localised treatment of neuropathic pain when patients are unable to take oral medication.

21.3.3 Minimally Invasive Local Therapy

For osteoarthritis of the knee in patients intolerant to systemic therapy, intra-articular (IA) corticosteroid injections could be considered. There may be also a benefit for epidural steroid injections to treat spinal stenosis in older patients, but there is no strong evidence for its use in radicular pain syndromes. For patients with post-herpetic neuralgia, nerve block and botulinum toxin may be effective. There is weak evidence for the use of sympathectomy in neuropathic pain in older persons.

21.3.4 Systemic Analgesic Treatment

Safe and efficient pharmacological treatment of pain in older people is a challenge. Normal ageing causes well-characterised changes in the pharmacokinetics and pharmacodynamics of analgesic drugs (see also Chapter 23). Due to the increased likelihood of polypharmacy together with a decrease in body water and lower concentration of plasma protein,

the risk of drug interactions and iatrogenic effects is increased. Moreover, a decrease in glomerular filtration rate (GFR) leads to a decreased excretion of drugs and their metabolites (see also Chapter 5, part VI). This results in higher plasma concentrations of most drugs and higher toxicity. On the other hand, free fatty mass increases 15–20% during ageing, causing lipid soluble drugs (fentanyl) to have a higher distribution volume, needing more time to achieve a stable plasma concentration and more time to be eliminated. Changing receptor-level responses (pharmacodynamics) are reflected in a higher sensitivity at the μ-, δ- and κ-receptor, inducing an increased response to opioids with ageing.

To diminish the risk of adverse events in treating older people some general recommendations have been made by national geriatrics societies in the United Kingdom and the USA (Fig. 21.2) (British Geriatrics Society 2013; American Geriatrics Society Panel 2009).

A comprehensive review concerning dose, adverse side effects and specific recommendations for different available analgesics can be found in Table 21.2.

Table 21.2 Recommended dose, adverse side effects and specific recommendations for use of systematic analgesics

Medication	Recommended dose Start	Max	Comments[a]
Non-opioids			
Paracetamol	500 mg every 6–8 h	3 g every 24 h in three gifts	Little evidence, recommended as safe and effective analgesic for nociceptive pain Liver failure in malnourished older people
Non-steroidal anti-inflammatory drugs *Naproxen* *Ibuprofen* *Diclofenac* *Celecoxib* Others not recommended	Low dose—short time 220 mg every 12 h 200 mg every 8 h 50 mg every 12 h 100 mg once daily	 500 mg every 12 h 600 mg every 8 h 75 mg every 12 h 200 mg once daily	To avoid, only to consider for musculoskeletal inflammatory pain when paracetamol or topic preparation have insufficient effect High risk of adverse events Gastrointestinal bleeding (association of proton pump inhibitor (PPI) recommended) Arterial hypertension and heart failure Acute kidney failure
Opioids[b]			Little evidence available regarding short-term efficacy for nociceptive and neuropathic pain Recent Cochrane review shows that the small mean benefit of non-tramadol opioids for osteoarthritis of knee and hip are contrasted by significant increases in risk of adverse events

Table 21.2 (continued)

Medication	Recommended dose Start	Max	Comments[a]
Hydrocodone/codeine	2.5–5 mg every 4–6 h	60 mg every 24 h	Often in association with paracetamol
Tramadol	IR: 25–50 mg every 6 h ER: 50 mg every 12 h	75 mg every 6 h 150 mg every 12 h	Often in association with paracetamol Reduce the seizure threshold Risk of serotonergic syndrome in combination with other serotonergic drugs
Morphine	IR: 2.5–5 mg every 4–6 h ER: 10 mg every 12 h	NA	Enterohepatic circulation results in Morphine-6-glucuronide (M6G) and morphine-3-glucuronide (M3G) being excreted several days after the last dose has been taken. M6G contributes to the overall analgesic effect; M3G passes the blood brain barrier and may cause neurotoxic effects. Decreased glomerular filtration rate causes accumulation of those metabolites causing even more severe side effects
Oxycodone	IR: 2.5–5 mg every 4–6 h ER: 5–10 mg every 12 h	NA	
Fentanyl	12 mcg/h patch every 72 h	NA	Avoid starting in opioid naïve patients
Buprenorphine	17.5 mcg/h patch every 72–96 h	NA	Avoid starting in opioid naïve patients No dose adaptations necessary in renal failure patients
Hydromorphone	IR: 1–2 mg every 4–6 h ER: 4 mg every 12 h	NA	Avoid starting in opioid naïve patients No studies in an older population
Methadone			Not recommended as first-line agent
Tapentadol	IR: 25 mg every 4–6 h ER: 50 mg every 12 h	NA	Low potential for drug interactions, and significantly reduced adverse event profile. Because of a lack of evidence, not recommended in frail older people

IR Immediate release, *ER* Extended or sustained release, *NA* Not applicable as there is no maximal dose for strong opioids; however careful titration is recommended and overdose should be avoided as this can cause hyperalgesia

[a]Side effects of opioids are discussed in Table 21.3

[b]Not every medication is available (in the same dose) in all European Countries—please check local availability and doses

Table 21.3 Pitfalls using the WHO ladder in older persons

Medication	Pitfalls	Recommendation
Non-opioid agent		
Paracetamol	Liver failure in malnourished	Low dose; max 3 g/24 h
NSAID	Gastrointestinal bleeding Fluid retention	Associate Proton Pump Inhibitor Monitor arterial tension and weight-stop treatment if there is a substantial increase
	Acute kidney failure	Monitor serum creatinine after three days
Opioid agent[a]		
Tramadol	Renal clearance Diminish seizure threshold Bind to serotonin receptors	Reduce dose in CKD[b] Avoid use in seizure patients Monitor serotonergic syndrome
Morphine	Higher plasma concentrations Renal clearance	Start low dose (2.5 mg orally (OR); 1 mg intravenous (IV)) Reduce dose in CKD stage 3 Avoid in CKD stage 4 and 5
Fentanyl Buprenorphine	Take 2–3 patches to achieve stable plasma concentrations	Wait one week before increasing dose—foresee IR morphine for breakthrough pain (1/10 of equivalent dose)
Adjuvant analgesia		
Tricyclic antidepressant	Anticholinergic side effects	Monitor urinary retention, glaucoma, worsening cognition
	Cardiac arrhythmias	Avoid in patients with cardiac arrhythmias
SNRI	Syndrome of Inappropriate antidiuretic hormone (ADH)	Monitor sodium chloride
Anticonvulsant therapy	Renal clearance	Dose reduction
		CKD stage 3: give 50% of dose
		CKD stage 4: give 25% of dose
		Avoid in CKD stage 5
	Takes 2–3 weeks before clinical effect	Inform patient/family

[a]Opioid agent: for adverse events and recommendations see Table 21.2
[b]Chronic Kidney Disease (stage 3: GFR 30–60 mL/min; stage 4: GFR 15–30 mL/min; stage 5: GFR < 15 mL/min)

An overview of the pitfalls using systemic analgesics recommended in the WHO pain relief ladder and how to address them in older people is displayed in Table 21.3.

21.3.5 Practical Recommendations in Managing the Side Effects of Opioids

It is important that patients and caregivers are counselled regarding potential side effects. As opioids have similar mechanisms of action, side effects of different weak and strong opioids may be very similar. Some side effects mainly occur during the first days of treatment and disappear spontaneously. Other side effects are more persistent and should be continuously anticipated. The most common side effects and some practical considerations are discussed in Table 21.4.

Table 21.4 Common side effects of opioids in the older person

Symptoms	Consider
Temporally side effects—disappear normally after a few days	
Sedation/sleepiness	Dose reduction of concomitant medication as Anxiolytics
Hallucinations/delirium	Dose reduction of concomitant medication as Gabapentin, Pregabalin, Amitriptyline Association of low dose haloperidol
Nausea/vomiting	Association of gastro-kineticum Domperidone, Metoclopramide, Alizapride If persistent: association of low dose haloperidol
Urinary retention	Intermittent catheterisation
Persistent side effects	
Constipation	Non-pharmacological therapy (fluid, exercise, fibres) To start laxatives together with the initiation of opioid therapy Macrogol, Osmotic laxatives If persistent: associate stimulating laxatives or enemas Bisacodyl, Picosulphate If persistent: Methylnaltrexone or Naloxone in combination with opioid
Risk of falling/fracture	Fall assessment and prevention Adding walking aids

To the current knowledge, no specific recommendations to evaluate driving ability in older people taking weak or strong opioids are available. If an older person is considered capable of driving, the same recommendations as in a younger population taking opioids could be followed. This means that a stable dose of opioid intake should be achieved before driving is allowed.

21.3.6 Adjuvant Drugs and Treatment of Neuropathic Pain

Co-analgesics such as antidepressants and anticonvulsants are often recommended and especially beneficial for neuropathic pain in older people. If acute rescue therapy is needed, the addition of a weak (tramadol) or strong opioid can be considered (Pickering et al, 2016). A comprehensive review concerning dose, adverse side effects and specific recommendations for adjuvant drugs can be found in Table 21.5.

21.3.7 Treatment of Older Patients with Dementia

The basic principles of pain treatment in older people are also applicable for the older person with dementia. However, pharmacological treatment is often complicated by swallowing disorders in older persons with advanced dementia (see also Chapter 7), so alternative methods of administration of drugs should be considered. Patches may be helpful for patients with an expected survival of longer than a few weeks and relatively constant level of pain. However, as fentanyl or buprenorphine take roughly one week to reach stable plasma levels, treatment with morphine

Table 21.5 Adjuvant drugs and treatment of neuropathic pain

Medication[a]	Recommended dose	Comments
Tricyclic antidepressants therapy		Side effects: postural hypotension, cardiac arrhythmias, urinary retention, glaucoma and worsening cognitive functioning in people with dementia Fewer anticholinergic side effects
Amitriptyline	ER: 10–25 mg once daily—bedtime	
Nortriptyline	ER: 10 mg once daily—bedtime	
Serotonin and noradrenaline reuptake inhibitors (SNRI)		Side effects: nausea, hyponatraemia, dizziness and sedation Dose-related increases in blood pressure and heart rate Has multiple drug–drug interactions
Venlafaxine	37.5–150 mg every 12 h	
Duloxetine	30–60 mg once daily	
Anticonvulsant therapy		Not recommended—complex pharmacokinetics and the high number of drug interactions
Carbamazepine	NA	
Oxcarbazepine	150–600 mg every 12 h	Dose reduction in renal insufficiency
Gabapentin	100–300 mg every 8–12 h	Side effects: dizziness, anxiolytic and sedative effect, difficulties in concentrating and visual disturbances
Pregabalin	50–300 mg every 12 h	Dose reduction in renal insufficiency Bioavailability: 90% for pregabalin and 60% for gabapentin

ER Extended release

[a]Not every medication is available (in the same dose) in all European Countries—please check local availability and doses

(via syringe driver) is often first choice during the last days of life or during a period of unstable pain experience. Pain treatment should be evaluated and adapted at least every 24 h until pain relief is obtained.

References

AGS Panel on Persistent Pain in Older Persons. The management of persistent pain in older persons. J Am Geriatr Soc. 2002;50:S205–24.

American Geriatrics Society Panel on Pharmacological Management of Persistent Pain in Older Persons. Pharmacological management of persistent pain in older persons. J Am Geriatr Soc. 2009;57:1331–46.

Abdulla A, Adams N, Bone M, Elliott AM, Gaffin J, Jones D, Knaggs R, Martin D, Sampson L, Schofield P, British Geriatric Society. Guidance on the management of pain in older people. Age Ageing. 2013;42:i1–57.

Gibson SJ, Farrell M. A review of age differences in the neurophysiology of nociception and the perceptual experience of pain. Clin J Pain. 2004;20:227–39.

Pickering G, Marcoux M, Chapiro S, David L, Rat P, Michel M, Bertrand I, Voute M, Wary B. An algorithm for neuropathic pain management in older people. Drugs Aging. 2016;33:575–83.

Royal College of Physicians, British Geriatrics Society and British Pain Society. The assessment of pain in older people: National Guidelines. Concise guidance to good practice series, No. 8, London: RCP, 2007. https://www.rcplondon.ac.uk/guidelines-policy/pain-assessment-pain-older-people. Accessed 27 Feb 2017.

Scherder E. Pain in dementia. In: Scherder EJA, editor. Aging and dementia. Neuropsychology, motor skills and pain. Amsterdam: VU University Press; 2013. p. 169–89.

Osteoporosis

22

Hubert Blain, Tahir Masud, Finbarr C. Martin, and Stefania Maggi

Abstract

Osteoporosis is defined by the WHO as bone densitometry derived T-scores being ≤2.5 at the lumbar spine or the hip. Osteoporosis should be ascertained by DXA in individuals with a risk factor of osteoporosis including a history of fracture, low body weight, parental history of hip fracture, use of glucocorticoids, in conditions with bone adverse effects (hypogonadism, hyperthyroidism, hyperparathyroidism, chronic inflammatory diseases, hypopituitarism, use of Gonadotropin-releasing hormon (GnRH) agonists and aromatase inhibitors), and in older patients at high risk of falling. Osteoporosis drugs should be considered after a careful assessment of the benefit/risk ratio in patients at high risk of fracture, i.e., with a fragility fracture or a densitometry confirmed osteoporosis. Oral bisphosphonates are initial agents in older people. Subcutaneous denosumab, teriparatide, or intravenous zoledronic acid may be considered as second-line therapy.

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_22) contains supplementary material, which is available to authorized users.

H. Blain (✉)
Department of Internal Medicine and Geriatrics, Montpellier University hospital, Montpellier University, MacVia France, Euromov, Montpellier, France
e-mail: h-blain@chu-montpellier.fr

T. Masud
Department of Geriatric Medicine, Nottingham University Hospitals, NHS Trust, Nottingham, UK

F.C. Martin
Guy's and St. Thomas' NHS Foundation Trust, London, UK

S. Maggi
Institute of Neuroscience , National Research Council, Ageing Branch, Padua, Italy

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*, Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_22

Learning Objectives

By the end of the chapter, the reader will be able to
- Define osteoporosis and fragility fracture
- Define situations in which DXA should be performed and differential diagnoses of osteoporosis in old age
- Define older people who should be proposed an osteoporosis drug
- Mention main characteristics of bisphosphonates, denosumab, teriparatide, and raloxifene

22.1 Background on Osteoporosis and Osteopenia

22.1.1 Definition

- Osteoporosis is defined by the WHO by a bone mineral density (BMD), measured by dual energy X-ray absorptiometry (DXA), being 2.5 standard deviation (SD) or more below that of the mean level for a young-adult reference population (T-score ≤ 2.5) at the lumbar spine or the hip.
- In older people the accuracy of measurements in the lumbar spine may be impaired by aortic calcification, osteoarthritis, and vertebral deformity. The femoral neck is therefore the reference site for diagnosis (Kanis et al. 2008).
- The diagnostic criterion for men uses the same threshold for BMD as that for women.
- Osteoporosis is manifested by fragility fractures, defined as the result of a minimal trauma, such as a fall from a standing height or less, that occur at a site that can be affected by osteoporosis (all sites excluding cervical vertebrae, hands, feet, digits, skull, and face which are not classified as fragility fractures).
- Fractures of the hip, spine, pelvis, distal femur, proximal tibia, and proximal humerus are major fractures, given that they are associated with excess morbidity and mortality, and decreased quality of life without specific treatment.
- Osteoporosis is also characterized by disruption of bone architecture and impairment of bone quality that reduce bone strength independently of BMD. This explains in part why a significant part of fragility fractures occur in men and women with osteopenia ($-1 \leq$ T-score < 2.5).

22.1.2 **Epidemiology** (Hernlund et al. 2013)

- The prevalence in the European Union (EU) of densitometry confirmed osteoporosis is estimated at 22% for women and 7% for men aged >65 and 47% and 16%, respectively, after 80.
- Women have about twice as high a risk of sustaining any fracture than men but men have higher rates of fracture-related mortality than women, possibly related to higher rates of comorbidity.

- The incidence of fragility fractures increases markedly with age, especially for hip fractures (median age of 80 years in the EU). Every year 3.5 million new fragility fractures are sustained in the EU, comprising 610,000 hip fractures, 520,000 vertebral fractures, 560,000 forearm fractures, and 1,800,000 other fragility fractures.
- The economic burden of fragility fractures is estimated at € 37 billion/year in the EU. As the population ages in the EU, the number of fractures and costs are expected to increase by 25% in 2025.

22.2 Risk Factors for Osteoporosis and Primary Prevention

Clinical risk factors of osteoporosis and fracture and measures of primary and secondary prevention are displayed in Table 22.1.

Table 22.1 Clinical risk factors of osteoporosis and fracture and measures of primary and secondary prevention

Risk factor	Measure of primary/secondary prevention
Age	
Sex (female gender)	
Low Body Mass Index (<19 kg/m^2)	Malnutrition prevention (balanced diet, including calcium intake). DXA assessment is recommended.
Parental history of hip fracture	DXA assessment is recommended
Personal history of fracture	DXA assessment is recommended when fracture is perhaps not a fragility fracture (when trauma is not minimal, especially). In case of fragility fracture, DXA is useful to manage osteoporosis treatment and to evoke another diagnosis that osteoporosis when T-score > −1
Glucocorticoid treatment (≥5 mg oral prednisone daily for 3 months or more)	Use of bisphosphonates to reduce the risk of vertebral fractures and prevent treatment of steroid-induced bone loss
Current smoking	Avoid
Alcohol intake 3 or more units	Avoid
Rheumatoid arthritis and other chronical inflammatory diseases (rheumatological, digestive, etc.); prolonged hypogonadism (premature menopause, bilateral oophorectomy or orchidectomy, anorexia nervosa), hypopituitarism, untreated hyperthyroidism or overtreated hypothyroidism; chemotherapy for breast or prostate cancer (GnRH agonists and aromatase inhibitors, androgen-deprivation therapy)	Optimal management; DXA assessment is recommended.
Antiepileptic, selective serotonin reuptake inhibitors, proton pump inhibitors	Should be avoided in patients with osteoporosis;
Prolonged immobility	Regular weight-bearing exercises

22.3 Pitfalls in Detection of Fragility Fractures

If most fractures are easily recognized, not all vertebral compression fractures come to clinical attention in older people. Spine X-ray examination should therefore be more systematically performed in older patients

- With back pain or with significant height loss (e.g., 4 cm or more).
- With significant incident kyphosis.
- In conditions associated with increased risk of spine fracture (use of glucocorticoids, androgen, estrogen deprivation, aromatase inhibitors) (Blain et al. 2016).

22.4 Pitfalls in Detection of Density Osteoporosis

Osteoporosis should be ascertained by DXA, at best combined with vertebral fracture assessment (VFA), in individuals with at least one fracture risk factor including:

- Personal history of fracture
- Low body weight (body mass index (BMI) < 19 kg/m^2)
- Parental history of hip fracture
- Use of glucocorticoids (≥5 mg oral prednisone daily for 3 months or more)
- In conditions with bone adverse effects (hypogonadism, hyperthyroidism, hyperparathyroidism, chronic inflammatory diseases, hypopituitarism, use of GnRH agonists and aromatase inhibitors)
- A high risk of falling (aged 75 or older, who have fallen during the previous 12 months, or who have fear of falling or significant gait, muscle strength, or balance problems)

In most European countries, DXA is totally or partially reimbursed in these indications (Hernlund et al. 2013; Blain et al. 2016).

22.5 Differential Diagnoses of Osteoporosis in Old Age

- Osteoporosis is categorized as primary when no specific disorder known to cause osteoporosis is found. Secondary osteoporosis is estimated to occur in up to 60% of men with fractures and about 30% in women.
- A reasonable evaluation for a woman or a man with osteoporosis should include the following tests:
  - Complete blood count
  - Serum chemistry (including calcium, phosphate, estimated glomerular filtration rate (GFR), C Reactive Protein)
  - 25-Hydroxyvitamin D level, and measurement of urinary calcium

- Depending on the history and physical examination, other laboratory assessments can be indicated:
  - Parathyroid hormone (PTH) (in case of hypophosphatemia, hypercalcaemia)
  - Thyroid-stimulating hormone (TSH)
  - Testosterone (in men)
  - Liver function tests (in case of history of alcohol >3 drinks/day)
  - Specific tests for multiple myeloma or celiac disease

22.6 Treatment Options of Osteoporosis in Older Adults

- Osteoporosis drugs should be considered after assessment of the benefit/risk ratio in patients at high risk of fracture (Fig. 22.1), i.e.,
  - With a fragility fracture, especially in case of major fracture
  - In those with densitometry confirmed osteoporosis
- Treatment with osteoporosis drugs can also be considered in those without a history of fragility fracture, when T-score is between −1.0 and −2.5 and when then fracture risk meets or exceeds the treatment threshold using the World Health Organization fracture risk assessment FRAX® tool (www.shef.ac.uk.FRAX) or other scores such as the Garvan fracture risk calculator (www.garvan.org.au/bone-fracture) or the Q-fracture risk calculator (www.qfracture.Org).

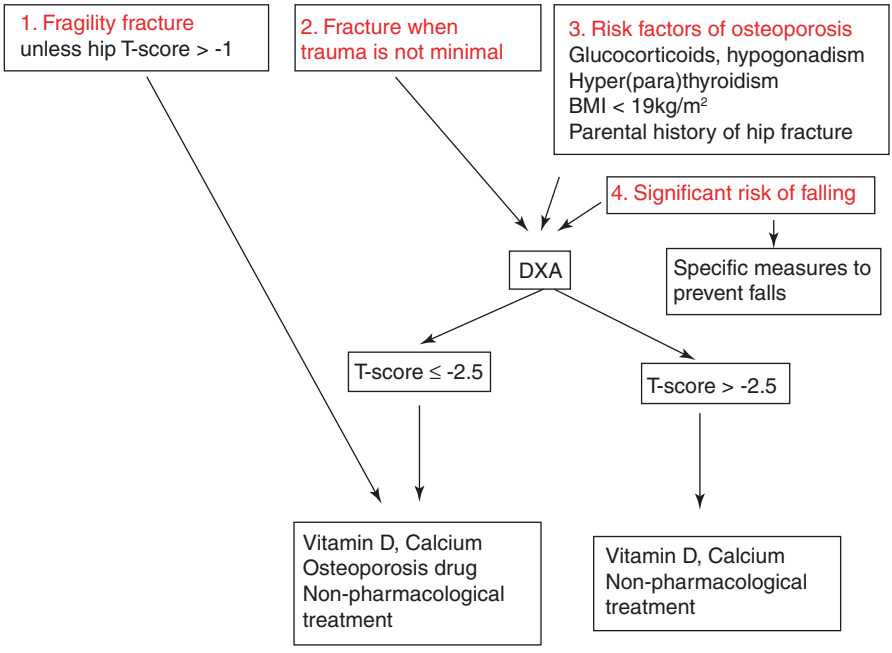


Fig. 22.1 Algorithm of treatment of osteoporosis in old age

Table 22.2 Table of pharmacological treatment of osteoporosis

Treatment option	Contraindications	Common/ important side effects	Special considerations
Bisphosphonates	Renal insufficiency (GFR < 35 mL/min)	Osteonecrosis of the jaw	Recommended break of treatment
		Atypical femoral fracture	Recommended break of treatment
			Zoledronic acid (1 infusion/ year) is effective to prevent fracture and reduce mortality after a hip fracture
Denosumab	Hypocalcemia	Osteonecrosis of the jaw Atypical femoral fracture	Recommended break of treatment
Teriparatide	Renal insufficiency (GFR < 35 mL/min) Hypercalcemia Bone tumor or metabolic disease		Daily subcutaneous injection After a cycle of 18–24 months, teriparatide has to be followed by bisphosphonates or denosumab
Raloxifene	Renal insufficiency (GFR < 35 mL/min) History of venous thrombosis or pulmonary embolism	Climacteric syndrome Venous thrombosis	Indicated in women with low risk of nonvertebral fractures (<70 years) and low risk of venous thrombosis Effective in reducing invasive breast cancer risk in postmenopausal women

22.6.1 Non-pharmacological Treatment

Lifestyle measures (regular weight-bearing exercises, balanced diet, including calcium intake, avoiding smoking and excessive alcohol consumption) and measures aimed at reducing adverse effects on bone of drugs and diseases, including renal diseases (Table 22.1), have to be recommended throughout life in everyone, especially in older people with osteoporosis.

22.6.2 Pharmacological Treatment Options

- Deficiency of vitamin D or calcium when detected during the workup should be corrected. Daily recommended intake of calcium and vitamin D are 1–1.2 g and 800–1000 international units (IU), respectively.
- Agents used to prevent or treat osteoporosis belong to two main drug classes:
  - Antiresorptive agents including bisphosphonates [alendronate, risedronate, ibandronate, zoledronic acid (no proven efficacy for ibandronate to reduce hip

fractures)], a Receptor Activator of NF-κB Ligand (RANKL) inhibitor (denosumab), a selective estrogen receptor modulator (raloxifene: in women only and no proven efficacy to reduce hip fractures).
  - A bone-forming agent (teriparatide).
- Oral bisphosphonates are initial agents in older people. They reduce vertebral and nonvertebral fracture in women and men with osteoporosis and high risk of fracture after 12 months.
- Teriparatide, denosumab, or zoledronic acid are second-line treatments for older patients who are unable to tolerate oral bisphosphonates or in case of incident fracture while taking oral bisphosphonates.
- Patients who remain at high fracture risk after 3–5 years of therapy (T-score ≤ 2.5 at the spine or the hip) should be treated 3–5 more years before a new fracture risk assessment (Camacho et al. 2016).
- For monitoring of treatment, investigations may include urinary-N-terminal telopeptide (NTX) (target of 21 nmol bone collagen equivalents (BCE)/mmol s) or serum Beta CrossLaps (CTX) (target of 250 ng/L) in those undergoing antiresorptive therapy to assess efficacy and compliance of treatment, and to help guide whether a change of agent (injectable) or class of agent is required (Vasikaran and Chubb 2016). Monitoring for rare side effects of antiresorptive treatment such as atypical femoral fractures and osteonecrosis of the jaw is also advisable.

22.6.3 Promises of New Treatment Options

As the diagnosis of fragility fracture and the assessment of benefit/risk ratio of the above measures is complex, patients aged 65 years or older with vertebral or nonvertebral fractures should be referred to a fracture liaison service (FLS), which should be linked to or have strong input from geriatric medicine services (combined fall and FLS) (Javaid et al. 2015).

Romosozumab is a humanized monoclonal antibody inhibiting sclerostin, increasing bone formation and inhibiting bone resorption. It offers great promise for the treatment of many forms of osteoporosis and disorders of impaired bone formation.

References

Blain H, Masud T, Dargent-Molina P, Martin FC, Rosendahl E, van der Velde N, EUGMS Falls and Fracture Interest Group, European Society for Clinical and Economic Aspects of Osteoporosis and Osteoarthritis (ESCEO), Osteoporosis Research and Information Group (GRIO), International osteoporosis Foundation (IOF), et al. A comprehensive fracture prevention strategy in older adults: the European Union Geriatric Medicine Society (EUGMS) statement. Eur Geriatr Med. 2016;7:519–25.

Camacho PM, Petak SM, Binkley N, Clarke BL, Harris ST, Hurley DL, et al. American association of clinical Endocrinologists and American College of Endocrinology Clinical Practice Guidelines for the diagnosis and treatment of postmenopausal osteoporosis 2016. Endocr Pract. 2016;22(Suppl 4):1–42.

Hernlund E, Svedbom A, Ivergård M, Compston J, Cooper C, Stenmark J, et al. Osteoporosis in the European Union: medical management, epidemiology and economic burden. A report prepared in collaboration with the international osteoporosis foundation (IOF) and the European Federation of Pharmaceutical Industry Associations (EFPIA). Arch Osteoporos. 2013;8:136.

Javaid MK, Kyer C, Mitchell PJ, Chana J, Moss C, Edwards MH, et al. Effective secondary fracture prevention: implementation of a global benchmarking of clinical quality using the IOF capture the Fracture® best practice framework tool. Osteoporos Int. 2015;26:2573–8.

Kanis JA, McCloskey EV, Johansson H, Oden A, Melton LJ III, Khaltaev N. A reference standard for the description of osteoporosis. Bone. 2008;42:467–75.

Vasikaran SD, Chubb SA. The use of biochemical markers of bone turnover in the clinical management of primary and secondary osteoporosis. Endocrine. 2016;52:222–5.

Part V

Challenges of Diagnosis and Management in Older Adults

Pharmacotherapy

23

Mirko Petrovic, Danijela Gnjidic, Eline Tommelein, and Koen Boussery

Abstract

The number of octogenarians is growing which results in increasing number of people with multimorbidity. Multimorbidity creates polypharmacy, which, consequently, is the most consistent predictor of inappropriate prescribing and drug-related problems (DRPs) in older people. In this chapter, the main characteristics of polypharmacy and the risks for DRPs, with focus on prescribing cascade and drug interactions, are described. Subsequently, steps to be considered during prescribing for older persons, methods for detecting DRPs and optimisation of polypharmacy are elaborated on. This chapter provides insights on assessment of pharmacotherapy in older patients, detection of potential DRPs, optimal solutions for the detected problems and tailoring pharmacotherapy to the profile, the needs and the goals of care in older patients.

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_23) contains supplementary material, which is available to authorized users.

M. Petrovic (✉)
Department of Internal Medicine (Geriatrics), Faculty of Medicine and Health Sciences, Belgium, Ghent University, Ghent, Belgium
e-mail: mirko.petrovic@ugent.be

D. Gnjidic
Faculty of Pharmacy and Charles Perkins Centre, University of Sydney, NSW, Australia
e-mail: danijela.gnjidic@sydney.edu.au

E. Tommelein
Department of Bioanalysis, Pharmaceutical Care Unit, Faculty of Pharmaceutical Sciences, Ghent University, Ghent, Belgium
e-mail: eline.tommelein@ugent.be

K. Boussery
Department of Bioanalysis, Pharmaceutical Care Unit, Faculty of Pharmaceutical Sciences, Ghent University, Ghent, Belgium
e-mail: koen.boussery@ugent.be

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_23

Learning Objectives

By the end of the chapter, the reader will be able to
- Assess pharmacotherapy in older patients
- Detect potential DRPs
- Derive the optimal solutions for the detected problems
- Tailor pharmacotherapy for the individual older patients

23.1 Polypharmacy

23.1.1 Definition and Prevalence

Polypharmacy is usually defined as the concurrent use of multiple medications. There is a high variability in the exact number of medications that is used as a threshold for polypharmacy, but a threshold of five and more has shown to be useful in identifying those patients that may benefit from an assessment of the potential inappropriateness of their polypharmacy (Gnjidic et al. 2012a). Polypharmacy is increasingly common and the prevalence varies according to the setting and population studied. Up to 40% of people aged 65 years and older in the community setting take five or more drugs (Kantor et al. 2015). In particular, exposure to central nervous system (CNS) polypharmacy is common and has increased over the last decade among adults over 75 years of age reaching more than 35% (Maust et al. 2017). Polypharmacy is more common in older frail compared to robust adults. In community-dwelling older men, polypharmacy was reported in 65% of frail men compared to 27% of robust men (Gnjidic et al. 2012b). Over the last 20 years, measures for polypharmacy have moved from merely counting medications to the use of instruments that assess medication burden and that focus on the optimisation of rational prescribing in older people. Explicit and implicit instruments, such as the Beers Criteria, Screening Tool of Older Persons' Prescriptions and Screening Tool to Alert doctors to Right Treatment (STOPP/START) criteria and Medication Appropriateness Index (MAI), can be used to identify high-risk medications that are no longer appropriate. The prevalence of potentially inappropriate medication use defined using STOPP criteria was 51% across six European hospitals (Gallagher et al. 2011). Polypharmacy in older people can also be assessed using tools that consider pharmacological principles (i.e. dose response, cumulative effects) and target specific medications such as those with clinically significant anticholinergic effects and sedative effects (i.e. Anticholinergic Drug Score, Anticholinergic Risk Scale, Drug Burden Index) (Kouladjian et al. 2014). However, comparing medication burden exposure using these tools is challenging, for example, because of a lack of consensus on what medications exactly constitute 'anticholinergic medication'. This is illustrated by the fact that the prevalence of anticholinergic medication use in the literature ranges from 18% to 23%, depending on the tool used (Kashyap et al. 2014).

23.1.2 Clinical Consequences of Polypharmacy

While polypharmacy might lead to positive outcomes for some older people with multimorbidity (see also Chapter 6), there is strong evidence that it is associated with increased risks of adverse events. Evidence from systematic review of observational studies suggests that polypharmacy is linked to a range of clinically relevant outcomes including drug–drug interactions (DDI), medication non-adherence, inappropriate prescribing, adverse drug events (ADEs), adverse drug reactions (ADRs), hospitalisation, falls, functional decline and mortality (Fried et al. 2014). Among older people, polypharmacy is often considered to be among the most important risk factors for ADRs (Hilmer et al. 2009). Therefore, rational withdrawal of medications may be the appropriate clinical decision and may result in significant clinical and functional benefits in some older people with polypharmacy. Evidence also suggests that polypharmacy is linked with frailty in older people (Gnjidic et al. 2012b; Saum et al. 2017). Frailty is commonly defined as a multifactorial syndrome that is associated with functional impairment and increased susceptibility to disease, disability and mortality in older people. Among community-dwelling older men, increasing medication load is associated with transitioning from the pre-frail to frail status and subsequent death (Jamsen et al. 2016). Each additional drug was associated with a 22% higher risk of death in men who were initially defined as robust. However, it remains unclear how causality fits into this relation. An important issue to take into account when discussing clinical consequences of polypharmacy is that there is a need for more research into the relevance of polypharmacy thresholds within the clinical context of the patient. For example, a post hoc analysis of the apixaban for reduction in stroke and other thromboembolic events in atrial fibrillation (ARISTOTLE) trial showed that patients with atrial fibrillation treated with apixaban had consistently lower major bleeding rates compared to warfarin treatment, but the magnitude of benefit decreased with the increasing polypharmacy exposure (Focks et al. 2016).

As this clearly demonstrates that it is essential to consider polypharmacy within the context of multimorbidity, and that this consideration should guide clinical practice. National Institute for Health and Care Excellence (NICE) guidelines provide excellent recommendations for management of polypharmacy among people with multimorbidity (Farmer et al. 2016).

23.1.3 Strategies to Reduce Inappropriate Polypharmacy

Recent efforts have been focused towards providing an evidence base on medication withdrawal or deprescribing. Deprescribing can be referred to as a process of withdrawing inappropriate medications, supervised by a healthcare professional with the goal of managing polypharmacy and improving patient outcomes (Reeve et al. 2015). To date, the success of deprescribing interventions to reduce the medication burden is mixed. The reported effects of deprescribing on clinical outcomes are inconsistent and vary by setting and by the nature of the intervention that is

evaluated. A Cochrane review of interventions aiming to improve the use of appropriate polypharmacy found beneficial effects in reducing inappropriate prescribing and medication-related problems. However, no benefits were observed in terms of clinical outcomes (Patterson et al. 2014). A structured, multidisciplinary approach including medication reconciliation, medication review conducted by a pharmacist or use of assessment tools to identify medications known to increase the risk of adverse events may minimise potentially inappropriate prescribing (PIP) and improve patient-centred and clinical outcomes. Moreover, an integrated approach taking into account patient perspectives may result in more successful deprescribing interventions.

23.2 Drug-Related Problems

23.2.1 Definition

DRPs are defined as events or circumstances that interfere with a patient experiencing the optimal outcome of medical care (Hepler et al. 1990). *Inappropriate prescribing*, on its turn, is defined as prescribing in which risks outweigh benefits or as the prescribing of medications that have no clear evidence-based indication, carry a high risk of adverse side effects or are not cost-effective (Gallagher et al. 2007) (Table 23.1). The risk factors associated with DRPs include polypharmacy, multimorbidity, poor functional status, depression and impaired renal function (Tommelein et al. 2015). Research on prevalence of DRPs is mainly focused on potentially inappropriate prescribing or on DRPs leading to hospital admissions. It was estimated that around 5–10% of hospital admissions were due to DRPs, of which 50% are avoidable (Al Hamid et al. 2014; Nivya et al. 2015). A systematic review showed that pharmacotherapy can be optimised in at least 20% of older community-dwelling patients (Maust et al. 2017). Additionally, the consequences of DRPs comprise a reduced quality of life and an increased social and economic burden through increased morbidity and mortality.

23.2.2 Why Are Older Patients More at Risk for DRPs

Different factors can explain the high incidence of DRPs in older people compared to their younger counterparts (van den Bemt et al. 2000; Hajjar et al. 2003; Field et al. 2001, 2004; Lund et al. 2010; Steinman et al. 2006; Page et al. 2010). First, older people often have multiple diseases and are consequently treated with many drugs. This increases the risk for both DDI and drug–disease interactions (DDisI). Second, changes in pharmacokinetics (Table 23.2) and pharmacodynamics make older people, and particularly those with frailty, more vulnerable to DRPs, also because of reduced resilience. Pharmacodynamic changes in older age, however scarcely evidenced, include alterations in the end-organ responsiveness to drugs and reduced homeostatic mechanisms that results in usually increased sensitivity to several classes of drugs, such as anticoagulants, cardiovascular and psychotropic drugs

Table 23.1 Overview of different types of DRPs (Spinewine et al. 2007, Mallet et al. 2007)

	Some examples
Inappropriate prescribing	
Overuse	
Therapy for an indication which is no (longer) present Combination therapy where monotherapy is sufficient Pharmacotherapy for treatment of side effects of other drugs ('prescribing cascade')	Antidepressants in case of a normal grief reaction; antibiotics in case of a common cold
Underuse	
Not treating present medical condition Omission of prophylactic therapy	No anticoagulation in case of atrial fibrillation; no osteoporosis prophylaxis during long-term corticosteroid treatment
Misuse	
Wrong choice of drug (formulation) *Drug with better effectiveness or with lower risk available* – *Functional capacity of the patient does not allow use of the drug* – *Suboptimal formulation* Dosing problem – *Dose too high or too low* – *Suboptimal dosing scheme* Presence of or higher risk for adverse drug events – *Adverse drug events (type 1 or 2)* – *Contra-indicated drug ('Drug–Disease Interaction' (DDisI))* – *Interaction with other drug ('Drug–Drug Interaction' (DDI))* – *Interaction with food*	First instead of second generation antihistamines with less sedating effects; a screw cap container instead of an easy opening blister in patients with osteoarthritis; tablets prescribed in case of swallowing difficulties; doses not adjusted to impaired renal function; myopathy due to statins, benzodiazepines in case of increased risk of falls; concomitant use of psychotropic drugs; vitamin K-rich food (i.e. leafy greens) with warfarin
Inappropriate dispensing	
Wrong drug dispensed Insufficient or inadequate information provided during drug dispensing Overlooking of practical problems (opening package, swallowing problems, etc.)	Not offering a practical advice for inhalation devices
Inappropriate patient behaviour	
Not following user instructions Medication non-adherence	Patient is intentionally non-adherent to diuretics because of social inconvenience
Inappropriate monitoring and reporting	
Insufficient or no follow-up of medication adherence Insufficient or no follow-up of lab values or clinical effect after start of some drugs Not discussing or reporting side effect with/to the treating physician	Thyroid function tests not timely evaluated; never asking about constipation in patients on opioid analgesics

(Klotz et al. 1975, Wang 2005). Third, older people are often treated by multiple prescribing physicians. Therefore, it can be difficult to keep an overview of the different drugs prescribed in terms of indications, duration of therapy, monitoring of adverse reactions and follow-up of the effectiveness of the drugs for the different medical problems. Fourth, decreased capability to handle medications can lead to decreased adherence and inappropriate drug therapy.

Table 23.2 Differences in pharmacokinetics in older vs. younger adults

Pharmacokinetic changes
Absorption
– Decreased active transport decreases bioavailability for some drugs – Possibility of reduced hepatic metabolism in older age: Reduced first-pass metabolism (reduced liver mass and blood flow) increases bioavailability of some drugs—necessitates initiation at lower doses with extended administration intervals (Page et al. 2010, Kinirons et al. 1997)
Distribution
– Decreased body water increases serum concentration of water-soluble drugs (Klotz et al. 1975) – Increased body fat prolongs half-life of fat-soluble drugs
Metabolism
– Possibility of reduced hepatic metabolism in older age: hepatic disease or reduced hepatic volume and blood flow results in reduced oxidative metabolism (reduced metabolism through CYP450) and higher steady-state concentrations of some drugs (Page et al. 2010, Kinirons et al. 1997)
Excretion
– Decreased cardiac output results in less perfusion of kidneys and liver, which reduces elimination of high extraction ratio drugs – Reduced kidney function reduces elimination of renally excreted drugs or metabolites (Kwan et al. 2014)

CYP450 = cytochrome P450

23.2.3 Focus on the Prescribing Cascade

The 'prescribing cascade' begins when an ADR is misinterpreted as a new medical condition for which another drug is then prescribed, and the patient is placed at risk of developing additional adverse effects relating to this potentially unnecessary treatment (Rochon et al. 1997) (Table 23.3). In case of polypharmacy, it sometimes becomes difficult to recognise which medications were prescribed to treat underlying disease rather than drug-related adverse effects. To prevent the prescribing cascade, physicians should therefore always consider any new sign and symptom as a possible consequence of current drug treatment. Timely recognising and managing prescribing cascades requires detailed history, including the timing of new symptom onset in relation to drug initiation or modification.

23.2.4 Focus on Drug–Drug Interactions

DDI occur when there is a modification of the effect of a drug when it is administered together with another drug. Drug interactions may present as increased efficacy, lack of efficacy or increased toxicity. In a recent observational study on potentially inappropriate prescribing (PIP) in older community-dwelling patients with polypharmacy, it was observed that 51% of 1016 included patients had at least one interaction with specific relevance for this population (Tommelein et al. 2016a). Most DDI are either pharmacodynamic (i.e. two drugs have additive or antagonistic effects) or pharmacokinetic (i.e. one drug affects the other's absorption, distribution,

Table 23.3 Examples of frequent prescribing cascades

Initial therapy (=Drug 1)	Side effect for Drug 1	Therapy for side effect (=Drug 2)	Side effect from drug 2	Therapy for side effect (=Drug 3)
Metoclopramide	Parkinsonism	Levodopa	Confusion and behavioural disturbances	Sedative or atypical antipsychotic
Levofloxacin	Delirium	Antipsychotic		
Calcium channel antagonist Gabapentin	Oedema	Loop diuretic		
Lithium	Tremor	Beta blocking agent	Depression	Antidepressant
ACE inhibitors	Cough	Cough suppressants		
NSAID	Hypertension	Antihypertensives		
NSAID	Heartburn	PPI	Low vitamin B_{12}	B_{12} supplement
Donepezil	Urinary incontinence	Oxybutynin	Dry eyes or constipation	Artificial tears/ laxatives
Tricyclic antidepressant	Decreased cognition	Donepezil		
Thiazide diuretics	Hyperuricaemia	Treatment for gout		

ACE angiotensin-converting enzyme, *NSAID* non-steroid anti-inflammatory drug, *PPI* proton pump inhibitor

metabolism, or excretion) in nature. Sometimes, it is however not possible to avoid an interaction, e.g. the combination of calcium for osteoporosis prophylaxis and levothyroxine for hypothyroidism. Then, its impact should be minimised by modifying the dose, way, or sequence of the drug administration. In this specific example, intake can be kept 6 h apart. It is important to anticipate the onset and maximum effect and monitor the patient at all times (Björkman et al. 2002, Ogu et al. 2000, Lynch et al. 2007, Marengoni et al. 2008). Authors of the recently developed Ghent Older People's Prescriptions community Pharmacy Screening (GheOP^{3}S) tool to detect potentially inappropriate prescribing in community-dwelling older patients established a list of DDI with specific relevance for older patients (Tommelein et al. 2016b). They considered a DDI having specific relevance for this population when it was often associated with an unplanned hospital admission. Table 23.4 presents the interactions that have shown the highest prevalence in observational research studies (Tommelein et al. 2016a).

Table 23.4 DDI of specific relevance in older patients and alternative therapeutic options

VKA + antiplatelet drugs (esp. ASA), not prescribed by cardiologist	1st Check if combination is appropriate (artificial valve, up to 3 months after acute coronary syndrome and for rheumatic mitral valve stenosis) 2nd When combination is not appropriate: stop ASA and monitor INR

(continued)

Table 23.4 (continued)

VKA + oral NSAIDs	1st Consider need for NSAID. If possible: paracetamol or stronger non-NSAID is safer choice 2nd If NSAID is unavoidable, prefer low dose ibuprofen 3rd Always add gastroprotection (most evidence for PPI in standard dose) 4th Also keep in mind to closely monitor renal function or blood pressure depending on present diagnoses
VKA + TMP/SMX	1st Preferably switch to other antibiotic based on indication 2nd If combination is unavoidable: monitor INR
RAAS-inhibitor + potassium sparing diuretic/potassium supplements/potassium containing drugs[a]	1st Preferably change to non-potassium sparing diuretic/switch to non-potassium containing drug equivalent 2nd If combination is unavoidable: monitor renal function and serum potassium 3rd Always inform patient about symptoms of hyperkalaemia
RAAS-inhibitor + TMP/SMX	1st Preferably switch to other antibiotic based on indication 2nd If combination is unavoidable: monitor renal function and potassium level
RAAS-inhibitor + oral NSAID	1st Consider need for NSAID. If possible: paracetamol or stronger non-NSAID is safer choice. 2nd If NSAID is unavoidable: monitor renal function, blood pressure and serum potassium
Oral NSAID + oral corticosteroids	1st Consider need for NSAID. If possible: paracetamol or stronger non-NSAID is safer choice 2nd If NSAID is unavoidable, prefer low dose ibuprofen 3rd Always add gastroprotection (most evidence for PPI in standard dose) 4th Also keep in mind to closely monitor renal function or blood pressure depending on present diagnoses
Oral NSAID + diuretic	1st Consider need for NSAID. If possible: paracetamol or stronger non-NSAID is safer choice 2nd If NSAID is unavoidable: monitor renal function, blood pressure and serum potassium
Oral NSAID + SSRI/SNRI	1st Consider need for NSAID. If possible: paracetamol or stronger non-NSAID is safer choice 2nd If NSAID is unavoidable, prefer low dose ibuprofen 3rd Always add gastroprotection (most evidence for PPI in standard dose) 4th Also keep in mind to closely monitor renal function or blood pressure depending on present diagnoses

Table 23.4 (continued)

Oral NSAID + antiplatelet drugs	1st Consider need for NSAID. If possible: paracetamol or stronger non-NSAID is safer choice 2nd If NSAID is unavoidable, prefer low dose ibuprofen 3rd Always add gastroprotection (most evidence for PPI in standard dose) 4th Also keep in mind to closely monitor renal function or blood pressure depending on present diagnoses
Oral antidiabetics/insulin + (non-)selective β-blocker	1st Consider need for beta-blocker + check glycaemic control 2nd Always change to cardio selective beta-blocker (also relevant for eye drops) 3rd Inform patient about possible changes in awareness of hypoglycaemia
Ca^{2+} + quinolones/tetracyclines	1st Use Ca^{2+} min 2 h after quinolone/tetracycline or take quinolone/tetracycline 6 h after intake of Ca^{2+} 2nd If not possible: Stop calcium
Ca^{2+} + levothyroxine	1st Use Ca^{2+} min 2 h after levothyroxine drug or take levothyroxine 6 h after intake of Ca^{2+} 2nd If not possible: Stop calcium
Bisphosphonate + Ca^{2+}, Mg^{2+}, Zn^{2+}, Fe^{2+}, Al^{3+}	1st Use complexing agent min 2 h after bisphosphonate 2nd If not possible: Switch to equivalent drug without complexing activity
Any combination of anticholinergic drug	1st Replace 1 or more of the drugs by an equivalent with less or without anticholinergic activity 2nd Always advise patients to report anticholinergic side effects

ASA acetylsalicylic acid, *NSAID* non-steroidal anti-inflammatory drug, *TMP/SMX* trimethoprim/sulphamethoxazole, *CCB* calcium channel blocker, *RAAS-inhibitor* renin-angiotensin-aldosterone system inhibitors, *SNRI* selective serotonin norepinephrine reuptake inhibitor, *SSRI* selective serotonin reuptake inhibitor, *VKA* vitamin K antagonist

[a]Some drugs contain considerable potassium amounts: Glucosamine in potassium salt (up to 300 mg/tablet), oral nutritional supplements (up to 200 mg/unit) (Recommended Daily Dose: 3000 mg/day for ≥60-year-old patients)

[b]Some supplements contain considerable vitamin K amounts: oral nutritional supplements (up to 13 μg/unit) (Recommended Daily Dose: 50–70 μg/day for ≥60-year-old patients)

23.3 Detecting Drug-Related Problems and Optimising Polypharmacy

23.3.1 Definition

A first step in detection of potential DRPs is *medication reconciliation*, defined as 'a process of obtaining and verifying a complete and accurate list of all patient's current medications – including the name, dosage, frequency and route' (Agency for Healthcare Research and Quality U.S. Department of Health and Human Services 2012, https://www.ahrq.gov/sites/default/files/publications/files/match.pdf). Medication reconciliation

could also be the first step of a clinical medication review. Strategies to optimise drug use include *medication review* defined as 'a structured, critical examination of a patient's medicines with the objective of reaching an agreement with the patient about treatment, optimising the impact of medicines, minimising the number of medication related problems and reducing waste' (NHS Cumbria Medicines Management Team 2013, http://www.cumbria.nhs.uk/ProfessionalZone/MedicinesManagement/Guidelines/MedicationReview-PracticeGuide2011.pdf); *criteria to avoid use of inappropriate medications* (which are discussed more in detail here below); *computer based prescribing systems* and *comprehensive geriatric assessment* (CGA) and management. Most of the available evidence is focused on a single intervention targeting either clinical or pharmacological factors causing DRPs. However, when these approaches were combined, for example, in studies assessing the efficacy of an intervention based on experienced pharmacists performing medication review in the context of a multidisciplinary team, positive effects on patient's health-related outcomes were found. Integration of skills from different healthcare professionals is therefore necessary to address medical complexity of older people. The challenge for future research is to integrate valuable information obtained by existing methods in a complete and global approach targeting all potential factors involved in the onset of DRPs (Onder et al. 2013) (Boxes 23.1 and 23.2).

Box 23.1 Multistep Assessment of Pharmacotherapy

Screening: Detection of subjects at risk of drug-related problems (DRP)

Strategies to prevent DRPs:

- Medication review: 1. identification of all the medications that the patient is taking; 2. drug scheme is screened for DRPs; 3. possible solutions to the DRPs are then discussed with the treating physician and, if possible, with the patient him/herself
- Criteria to avoid use of inappropriate medications
- Computer-based prescribing systems
- Comprehensive geriatric assessment and management (Onder et al. 2013)

Box 23.2 List of Items that Need to Be Checked

- Indication
- Right choice
- Dosage
- Directions
- Drug–drug interactions
- Drug–disease interactions
- Duration
- Adverse drug reactions (Somers et al. 2012)

23.3.2 Prescribing Rules in Older People

When prescribing a drug, there are a number of points to take into account (Box 23.3). Prescribe only where necessary, and consider benefits versus risks. Involve the patient in decisions about their care and respect patient autonomy. Note the patient's age, medical history (especially of any hepatic or renal dysfunction) and any concurrent medication. Think about dosage carefully; manufacturers' recommended doses are based on population studies and assume 'one dose fits all'. However, there are genetic differences (Engen et al. 2006). New drugs are often marketed at the highest therapeutic level to demonstrate effectiveness in large numbers of patients but companies are not required to provide data on lowest effective dose.

Box 23.3 Aspects to Be Taken into Consideration Before Prescribing New Medication

- *Primum non nocere*—First, do no harm.
- *Multimorbidity* and/or frailty.
- Prescribing within limits of competence.
- Evidence-based prescribing.
- Interaction with other drugs.
- Concordance, tolerability and formulation.
- Adverse effects.
- Checking dosages.
- Using prescribing formularies.
- Keeping up to date and following clinical guidelines, where available, from the National Institute for Health and Care Excellence (NICE) or Scottish Intercollegiate Guidelines Network (SIGN).
- Using electronic systems where available that can enhance the safety of prescribing.
- Responsible delegation of prescribing administration and dispensing (General Medical Council 2013, http://www.gmc-uk.org/guidance/ethical_guidance/14316.asp).

23.3.3 Criteria to Avoid Use of Inappropriate Medications

A systematic review by Kaufmann C et al. identified 46 tools to assess appropriateness of prescribing which were published between 1991 and 2013 (Kaufmann et al. 2014). Since the publication of that review in 2014 until now, the updates of some of these tools have been published in addition to several new tools (Tommelein et al. 2016b; O'Mahony et al. 2015, American Geriatrics Society Beers Criteria Update Expert Panel 2015; Renom Guiteras et al. 2015). These tools are categorised as explicit (criterion-based) or implicit (judgement-based) tools.

23.3.3.1 Explicit Tools

Explicit tools or criteria used with prescribing data only or with clinical data are often used to detect inappropriate prescribing. The medication-to-avoid criteria have been the most often used. They are based on lists of potentially inappropriate medications (PIMs), i.e. medications that should be avoided in older people because the risks outweigh the benefits (Spinewine et al. 2007). Various explicit tools are available, although only the Beers criteria and the STOPP/START criteria have been evaluated for predictive validity. Beers criteria, last updated in 2015, identify a list of 53 PIMs or medication classes divided into three categories: PIMs to avoid independent of co-morbidities, PIMs to avoid in older people with certain diseases and syndromes, and medications to be used with caution (Beers et al. 1991, the American Geriatrics Society Beers Criteria Update Expert Panel 2012).

The STOPP criteria for screening PIMs, as well as the START criteria for the detection of potential prescribing omissions of indicated, potentially beneficial drugs medications, updated in 2015, are organised according to physiological systems and include both PIP (80 criteria) and omission of potentially beneficial pharmacotherapy (34 criteria) (Gallagher et al. 2008, O'Mahony et al. 2015). Explicit criteria can be applied with little or no clinical judgement but do not address individual differences between patients. The fact that prevalence of PIMs detected with these criteria has not been consistently associated with poor outcomes in older people might indicate the general limitations of all drug-oriented geriatric prescription tools. Given the fact that older people are a heterogeneous group with regard to drug response, PIM might be needed and well tolerated in some, while others might experience harmful side effects. Accordingly, general lists of drugs to be avoided might classify appropriate drugs as inappropriate. However, based on analysis of the international classification of diseases and consequently the presence of a strong indication, the use of medications in such circumstances cannot explain the high rates of inappropriate medication administration. With regard to their relevance in everyday practice, these criteria generally neither address co-morbidities frequently found in older patients, nor do they take into consideration patient's preferences or previous treatments. Although use of explicit criteria should demonstrate an impact on patient-related outcomes in order to be clinically relevant, no criteria so far have demonstrated their impact on the incidence of ADEs. Explicit criteria have limited transferability between countries due to variations in national prescribing patterns and drug availability. Also, they should be regularly updated in accordance with growing clinical evidence (Spinewine et al. 2007).

23.3.3.2 Implicit Tools

Implicit tools take into account clinical information of the individual patient to judge appropriateness of prescribing. The MAI represents a comprehensive and validated implicit tool (Hanlon et al. 1992). It is a judgement-based process measure of prescribing appropriateness that assesses ten elements of prescribing: indication, effectiveness, dose, correct directions, practical directions, DDI, DDisI, duplication, duration and cost. These elements are assessed based on clinical judgement rather than on objective measures, and the ratings generate a weighted score that serves as a summary measure of prescribing appropriateness. Recently, an adapted version has been published in which the original MAI was changed to cover more

aspects of drug therapy and to reduce the number of questions by grouping certain aspects (Somers et al. 2012). Implicit criteria are time-consuming and more dependent on the user. No single ideal tool exists so far. The choice of a tool may depend on the purpose of use and availability of data. Implementation of such a tool requires that the tool should not only be well designed and comprehensive but also still practical in everyday practice. Integration of assessment tools in electronic decision support systems could be a promising approach. These tools are useful for identifying potentially inappropriate prescribing, although they cannot substitute good clinical decision when treating older patients.

23.3.4 Comprehensive Geriatric Assessment

One of the main challenges regarding therapeutic goals setting in older patients is to assess whether the expected benefits of treatment are superior to the risks in a population with decreased life expectancy and decreased tolerance to stress (Vander Walde et al. 2016). In accordance with the differences in life expectancy, CGA and assessment of multimorbidity is assumed to discriminate between three groups of patients, i.e. fit, unfit and frail (Stauder 2012; Balducci et al. 2000) (Box 23.4) (see also Chapter 26).

Box 23.4 Fit vs. Frail Patients.
Fit patients are functionally independent patients without medically relevant comorbidity (consider full therapy in order to achieve outcomes similar to that of younger patients).
Unfit patients represent the group in between with minor dependencies in instrumental activities of daily living (IADL) and/or one or two comorbidities in the absence of a geriatric syndrome or dependence in activities of daily living (ADL) (consider adapted/tailored therapy including deprescribing).
Frail patients are identified by the presence of at least one of the following: multiple comorbidities, the presence of one or more geriatric syndromes, or dependence in ADL. Most patients aged ≥ 85 years are attributed to this group (consider deprescribing and symptom palliation).

23.4 Clinical Example of 'Good Prescribing' in a Geriatric Patient

Mrs. Van Dyck is 87-year-old widow living in a nursing home. She suffers from Alzheimer-type dementia (Mini Mental State Examination Score, 15/30), depression, type 2 diabetes mellitus, hypertension, atrial fibrillation, osteoarthritis and osteoporosis and history of falls. She is currently on the following drugs: donepezil (10 mg, once daily), paroxetine (20 mg, once daily), metformin (850 mg, twice daily), diltiazem (300 mg, once daily), simvastatin (40 mg, once daily), warfarin (dose depending on international normalised ratio[INR]values), calcium/vitamin D

(1000 mg/880 international units (IU), once daily), alendronic acid (70 mg, once/week), lorazepam (2,5 mg, once daily).

Her blood pressure is 165/88 mmHg and her last HbA1c was 7.3% (56 mmol/mol).

23.4.1 Consider Withdrawal

Lorazepam: Gradual withdrawal should be considered because of risk of prolonged sedation, confusion, disturbed balance and consequent risk of falls.

Paroxetine: Continuation should be re-evaluated. To prevent relapse and recurrence in case of major depression, an antidepressant should be given for at least 6 months after a good initial response is seen. However, the effects of the treatment on, functional, cognitive and social outcomes in addition to the effects on co-morbidities, malnutrition and falls should be considered.

Alendronic acid: Cessation may be considered if the use has continued for 5 years or more because there is a limited benefit to continue the therapy further than 5 years.

Simvastatin: Cessation may be considered given a limited life expectancy of the patient and the balance between drug indication vs. adverse effects.

Metformin: Dose reduction or cessation may be considered since a somewhat higher goal for glycaemic control may be more appropriate for this patient. In older adults with diabetes with very complex/poor health (in this case a patient with Alzheimer-type dementia, living in a nursing home), a HbA1c < 8.5% (69 mmol/mol) is a reasonable treatment goal (American Diabetes Association 2017, http://care.diabetesjournals.org/content/diacare/suppl/2016/12/15/40.Supplement_1.DC1/DC_40_S1_final.pdf). This is in accordance with the finding that lower HbA1c levels are associated with increased hypoglycaemic events without accruing meaningful benefit (it should however be noted that in healthy older adults <7.5% (58 mmol/mol) is regarded as a reasonable treatment goal).

Donepezil: Cessation should be considered given the advanced state of dementia and the fact the patient has already been placed into a nursing home.

23.4.2 Consider Continuation After Reassessment

Calcium and vitamin D supplementation: Continuation should be considered given its safe profile and positive effects on osteoporosis and falls. However, if food intake is sufficient, cessation might be considered.

Warfarin: Continuation is recommended with the target INR between 2.0 and 2.5 for optimal stroke prevention, although the benefit/risk ratio (particularly increased risk of falls and bleeding risk associated with suboptimal INR control) should be repeatedly reassessed.

Diltiazem: Drug continuation may be recommended if needed for blood pressure and rate control. At the same time, a tight blood pressure control and bradycardia (<50 bpm) may be problematic given the high risk for falls.

References

Al Hamid A, Ghaleb M, Aljadhey H, Aslanpour Z. A systematic review of hospitalization resulting from medicine-related problems in adult patients. Br J Clin Pharmacol. 2014;78:202–17.

Agency for Healthcare Research and Quality U.S. Department of Health and Human Services. Medications at transitions and clinical handoffs (MATCH) toolkit for medication reconciliation. 2012. https://www.ahrq.gov/sites/default/files/publications/files/match.pdf. Accessed 10 Apr 2017.

American Diabetes Association. Diabetes Care 2017;40(Suppl 1):S1–S2. http://care.diabetesjournals.org/content/diacare/suppl/2016/12/15/40.Supplement_1.DC1/DC_40_S1_final.pdf. Accessed 11 Apr 2017.

American Geriatrics Society 2015 Beers Criteria Update Expert Panel. American Geriatrics Society 2015 updated beers criteria for potentially inappropriate medication use in older adults. J Am Geriatr Soc. 2015;63:2227–46.

American Geriatrics Society 2012 Beers Criteria Update Expert Panel. American Geriatrics Society updated beers criteria for potentially inappropriate medication use in older adults. J Am Geriatr Soc. 2012;60:616–31.

Balducci L, Extermann M. Management of cancer in the older person: a practical approach. Oncologist. 2000;5:224–37.

Beers M, Ouslander J, Rollingher I, Reuben D, Brooks J, Beck J. Explicit criteria for determining inappropriate medication use in nursing home residents. Arch Intern Med. 1991;151:1825–32.

Björkman I, Fastbom J, Schmidt I, Bernsten C, Pharmaceutical Care of the Elderly in Europe Research (PEER) Group. Drug-drug interactions in the elderly. Ann Pharmacother. 2002;36:1675–81.

Engen R, Marsh S, van Booven D, McLeod H. Ethnic differences in pharmacogenetically relevant genes. Curr Drug Targets. 2006;7:1641–8.

Farmer C, Fenu E, O'Flynn N, Guthrie B. Clinical assessment and management of multimorbidity: summary of NICE guidance. BMJ. 2016;354:i4843.

Field T, Gurwitz J, Avorn J, McCormick D, Jain S, Eckler M, et al. Risk factors for adverse drug events among nursing home residents. Arch Intern Med. 2001;161:1629–34.

Field T, Gurwitz J, Harrold L, Rothschild J, Debellis K, Seger A, et al. Risk factors for adverse drug events among older adults in the ambulatory setting. J Am Geriatr Soc. 2004;52:1349–54.

Focks J, Brouwer M, Wojdyla D, Thomas L, Lopes R, Washam J, et al. Polypharmacy and effects of apixaban versus warfarin in patients with atrial fibrillation: post hoc analysis of the ARISTOTLE trial. BMJ. 2016;353:i2868.

Fried T, O'Leary J, Towle V, Goldstein M, Trentalange M, Martin D. Health outcomes associated with polypharmacy in community-dwelling older adults: a systematic review. J Am Geriatr Soc. 2014;62:2261–72.

Gallagher P, Lang P, Cherubini A, Topinková E, Cruz-Jentoft A, Montero-Errasquin B, et al. Prevalence of potentially inappropriate prescribing in an acutely ill population of older patients admitted to six European hospitals. Eur J Clin Pharmacol. 2011;67:1175–88.

Gallagher P, Barry P, O'Mahony D. Inappropriate prescribing in the elderly. J Clin Pharm Ther. 2007;32:113–21.

Gallagher P, Ryan C, Byrne S, Kennedy J, O'Mahony D. STOPP (Screening Tool of Older Person's Prescriptions) and START (Screening Tool to Alert doctors to Right Treatment). Consensus validation. Int J Clin Pharmacol Ther. 2008;46:72–83.

General Medical Council. Good practice in prescribing and managing medicines and devices. 2013. http://www.gmc-uk.org/guidance/ethical_guidance/14316.asp. Accessed 10 Apr 2017.

Gnjidic D, Hilmer S, Blyth F, Naganathan V, Waite L, Seibel M, et al. Polypharmacy cutoff and outcomes: five or more medicines were used to identify community-dwelling older men at risk of different adverse outcomes. J Clin Epidemiol. 2012a;65:989–95.

Gnjidic D, Hilmer S, Blyth F, Naganathan V, Cumming R, Handelsman D, et al. High risk prescribing and incidence of frailty among older community-dwelling men. Clin Pharmacol Ther. 2012b;91:521–8.

Hajjar E, Hanlon J, Artz M, Lindblad C, Pieper C, Sloane R, et al. Adverse drug reaction risk factors in older outpatients. Am J Geriatr Pharmacother. 2003;1:82–9.
Hanlon J, Schmader K, Samsa G, Weinberger M, Uttech K, Lewis I, et al. A method for assessing drug therapy appropriateness. J Clin Epidemiol. 1992;45:1045–51.
Hepler C, Strand L. Opportunities and responsibilities in pharmaceutical care. Am J Hosp Pharm. 1990;47:533–43.
Hilmer S, Gnjidic D. The effects of polypharmacy in older adults. Clin Pharmacol Ther. 2009;85:86–8.
Jamsen K, Bell J, Hilmer S, Kirkpatrick C, Ilomäki J, Le Couteur D, et al. Effects of changes in number of medications and drug burden index exposure on transitions between frailty states and death: the Concord Health and Ageing in Men Project cohort study. J Am Geriatr Soc. 2016;64:89–95.
Kantor E, Rehm C, Haas J, Chan A, Giovannucci E. Trends in prescription drug use among older adults in United States from 1992-2012. JAMA. 2015;314:1818–31.
Kashyap M, Belleville S, Mulsant B, Hilmer S, Paquette A, Tu le M, et al. Methodological challenges in determining longitudinal associations between anticholinergic drug use and incident cognitive decline. J Am Geriatr Soc. 2014;62:336–41.
Kaufmann C, Tremp R, Hersberger K, Lampert M. Inappropriate prescribing: a systematic overview of published assessment tools. Eur J Clin Pharmacol. 2014;70:1–11.
Kinirons M, Crome P. Clinical pharmacokinetic considerations in the elderly. An update. Clin Pharmacokinet. 1997;33:302–12.
Klotz U, Avant G, Hoyumpa A, Schenker S, Wilkinson G. The effects of age and liver disease on the disposition and elimination of diazepam in adult man. J Clin Invest. 1975;55:347–59.
Kouladjian L, Gnjidic D, Chen T, Mangoni A, Hilmer S. Drug burden index in older adults: theoretical and practical issues. Clin Interv Aging. 2014;9:1503–15.
Kwan D, Farrell B. Polypharmacy: optimizing medication use in elderly patients. Can Geriatr J. 2014;4:21–7.
Lund B, Carnahan R, Egge J, Chrischilles E, Kaboli P. Inappropriate prescribing predicts adverse drug events in older adults. Ann Pharmacother. 2010;44:957–63.
Lynch T, Price A. The effect of cytochrome P450 metabolism on drug response, interactions, and adverse effects. Am Fam Physician. 2007;76:391–6.
Mallet L, Spinewine A, Huang A. Lancet. 2007;370:185–91.
Marengoni A, Winblad B, Karp A, Fratiglioni L. Prevalence of chronic diseases and multimorbidity among the elderly population in Sweden. Am J Public Health. 2008;98:1198–200.
Maust D, Gerlach L, Gibson A, Kales H, Blow F, Olfson M. Trends in central nervous system-active polypharmacy among older adults seen in outpatient care in the United States. JAMA Intern Med. 2017;177:583–5.
NHS Cumbria Medicines Management Team. Clinical medication review a practice guide. 2013. http://www.cumbria.nhs.uk/ProfessionalZone/MedicinesManagement/Guidelines/MedicationReview-PracticeGuide2011.pdf. Accessed 10 Apr 2017.
Nivya K, Sri Sai Kiran V, Ragoo N, Jayaprakash B, Sonal Sekhar M. Systemic review on drug related hospital admissions—A pubmed based search. Saudi Pharm J. 2015;23:1–8.
Ogu C, Maxa JL. Drug interactions due to cytochrome P450. Proc (Bayl Univ Med Cent). 2000;13:421–3.
O'Mahony D, O'Sullivan D, Byrne S, O'Connor M, Ryan C, Gallagher P. STOPP/START criteria for potentially inappropriate prescribing in older people: version 2. Age Ageing. 2015;44:213–8.
Onder G, van der Cammen TJ, Petrovic M, Somers A, Rajkumar C. Strategies to reduce the risk of iatrogenic illness in complex older adults. Age Ageing. 2013;42:284–91.
Page R, Linnebur S, Bryant L, Ruscin M. Inappropriate prescribing in the hospitalized elderly patient: defining the problem, evaluation tools, and possible solutions. Clin Interv Aging. 2010;5:75–87.
Patterson S, Cadogan C, Kerse N, Cardwell C, Bradley M, Ryan C, et al. Interventions to improve the appropriate use of polypharmacy for older people. Cochrane Database Syst Rev. 2014:CD008165.

Reeve E, Gnjidic D, Long J, Himer S. A systematic review of the emerging definition of 'deprescribing' with network analysis: implications for future research and clinical practice. Br J Clin Pharmacol. 2015;80:1254–68.

Renom Guiteras A, Meyer G, Thürmann PA. The EU(7)-PIM list: a list of potentially inappropriate medications for older people consented by experts from seven European countries. Eur J Clin Pharmacol. 2015;71:861–75.

Rochon P, Gurwitz J. Optimising drug treatment for elderly people: the prescribing cascade. BMJ. 1997;315:1096–9.

Saum K, Schöttker B, Meid A, Holleczek B, Haefeli W, Hauer K, et al. Is polypharmacy associated with frailty in older people? Results from the ESTHER Cohort Study. J Am Geriatr Soc. 2017;65:e27–32.

Somers A, Mallet L, van der Cammen T, Robays H, Petrovic M. Applicability of an adapted medication appropriateness index for detection of drug-related problems in geriatric inpatients. Am J Geriatr Pharmacother. 2012;10:101–9.

Spinewine A, Schmader KE, Barber N, Hughes C, Lapane K, Swine C, et al. Appropriate prescribing in elderly people: how well can it be measured and optimised? Lancet. 2007;370:173–84.

Stauder R. The challenge of individualised risk assessment and therapy planning in elderly high-risk myelodysplastic syndromes (MDS) patients. Ann Hematol. 2012;91:1333–43.

Steinman M, Landefeld C, Rosenthal G, Berthenthal D, Sen S, Kaboli P. Polypharmacy and prescribing quality in older people. J Am Geriatr Soc. 2006;54:1516–23.

Tommelein E, Mehuys E, Petrovic M, Somers A, Colin P, Boussery K. Potentially inappropriate prescribing in community-dwelling older people across Europe: a systematic literature review. Eur J Clin Pharmacol. 2015;71:1415–27.

Tommelein E, Mehuys E, van Tongelen I, Petrovic M, Somers A, Colin P, et al. Community pharmacists' evaluation of potentially inappropriate prescribing in older community-dwelling patients with polypharmacy: observational research based on the GheOP^{3}S tool. J Public Health (Oxf). 2016a.

Tommelein E, Petrovic M, Somers A, Mehuys E, van der Cammen T, Boussery K. Older patients' prescriptions screening in the community pharmacy: development of the Ghent Older People's Prescriptions community Pharmacy Screening (GheOP^{3}S) tool. J Public Health (Oxf). 2016b;38:e158–70.

van den Bemt P, Egberts A, Lenderink A, Verzijl J, Simons K, van der Pol W, et al. Risk factors for the development of adverse drug events in hospitalized patients. Pharm World Sci. 2000;22:62–6.

Vander Walde N, Jagsi R, Dotan E, Baumgartner J, Browner I, Burhenn P, et al. NCCN guidelines Insights: older adult oncology, version 2.2013. J Natl Canc Netw. 2016;14:1357–70.

Wang L. Epidemiology and prevention of adverse drug reactions in the elderly. J Geriatr Cardiol. 2005;2:248–53.

Prevention: Public Healthcare, Nutrition, Physical Activity, Vaccination

24

Cornel C. Sieber, Eva Kiesswetter, Anja Kwetkat, Hans Jürgen Heppner, Daniel Schoene, and Ellen Freiberger

Abstract

Prevention in older persons is not only aiming to the reduction of morbidity and mortality but also to the preservation of health and function as well as of quality of life. Several preventive strategies are relevant for older persons such as physical activity/exercise, vaccination, care planning, and nutrition. Most dietary recommendations for older adults don't differ from those for younger adults: supply with energy, water, protein, and vitamin D, however, requires particular attention and adaptions due to age-related physiological changes and potential underlying diseases to avoid malnutrition and obesity in advanced age. To prevent or early detect malnutrition in older adults, a screening on regular basis focusing on the current nutritional status, history, and its evolution is mandatory. In case of a positive screening result, the nutritional situation needs further assessment as base of a multidisciplinary and individualized nutritional therapy. Physical activity in general and structured exercise in particular have relevant health benefits for older adults with differing health statuses and are important in the primary, secondary, and tertiary prevention of many diseases and geriatric syndromes. Current guidelines recommend engagement in aerobic exercises on most days as well as regular training of strength and flexibility, particular of the major muscle groups in the weight-bearing extremities and challenging balance exercises for people at risk for falling.

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_24) contains supplementary material, which is available to authorized users.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_24

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_24

C.C. Sieber (✉)
Institute for Biomedicine of Ageing, Friedrich-Alexander University Erlangen-Nürnberg, Nuremberg, Germany

Department of General Internal Medicine and Geriatrics, Hospital of the Order of St. John of God, Regensburg, Germany
e-mail: cornel.sieber@fau.de

E. Kiesswetter • E. Freiberger
Institute for Biomedicine of Ageing, Friedrich-Alexander University Erlangen-Nürnberg, Nuremberg, Germany

A. Kwetkat
Department of Geriatric Medicine, Jena University Hospital, Jena, Germany

H.J. Heppner
Head of Geriatric Department, Chair of Geriatrics, University Witten/Herdecke, Witten, Germany
e-mail: hans.heppner@uni-wh.de

D. Schoene
Institute for Biomedicine of Ageing, Friedrich-Alexander University Erlangen-Nürnberg, Nuremberg, Germany

Institute of Medical Physics, Friedrich-Alexander University of Erlangen-Nürnberg, Erlangen, Germany

Learning Objectives

By the end of the chapter, the reader will be able to

- Know general dietary recommendations for older people and to screen older patients for malnutrition
- Understand the importance of physical activity and to advice older patients to engage in physical activities and exercise
- Describe the important role of immunosenescence and know the relevance of regular evaluation of vaccination status of older patients, at least once a year

24.1 Principles of Prevention in Older Persons

Historically, medicine has been dealing with the diagnosis and treatment of disease, but during the last decades there has been a shift from curative medicine to preventive medicine. Societies on preventive medicine have been installed and different healthcare systems have integrated prevention into their healthcare models and health budgets (Dans et al. 2011). In Germany, for instance, prevention is integrated into the public healthcare system and financial reimbursement for participating in preventive courses is provided to the insured individually. In the future, due to the demographic changes, the next generation of medical practitioners is expected to know about different preventive strategies for disease prevention and health promotion especially for older persons taking into account the

demographic changes (Goldberg and Chavin 1997; Pomrehn et al. 2000). Prevention in older persons does not aim only to the reduction of morbidity and mortality; preventive medicine's goal is, in fact, preservation of health and function as well as quality of life (Goldberg and Chavin 1997). In addition, a main goal of prevention is strengthening competence and resources on an individual level.

Several preventive strategies are relevant for older persons such as physical activity/exercise, vaccination, care planning, and nutrition and are therefore topics of this chapter. Furthermore, preventive medicine is characterized by health screening, lifestyle changes, counseling, and the control of environmental exposure (Dans et al. 2011; White 1975).

Several international and national societies issue guidelines for preventive strategies [e.g., US Preventive Service Task Force (USPSTF) 1996; National Institute for Health Care and Excellence (NICE)] which are critical part of medical education and training. Medical students, residents, and healthcare professionals in general should be aware of the recommendation classification system including GRADE A as good evidence of useful intervention; GRADE B with fair evidence, GRADE C with poor evidence as well as GRADE D with fair evidence to exclude intervention and GRADE E with good evidence to exclude intervention.

In general, the concept of prevention includes:

- Primary prevention with the goal of reducing the risk of an onset of disease or syndrome before it starts. Thus, primary prevention includes actions before the onset of disease by integrating the field of health promotion and health actions, e.g., screening. Evidence shows, e.g., that physical exercise does play an important role in the primary prevention of cardiovascular disease. Therefore, physicians should counsel older persons to engage in physical exercise, in nutritional counseling, and/or develop a vaccination plan (for more detail on how see below). Primary prevention can target the total population, selected groups (e.g., older persons), and the individual.
- Secondary prevention aims to modify the pathway of the already existing disease or syndrome in its early stage and reducing morbidity and mortality. Strategies of secondary prevention include stopping the chronification process before irreversible manifestations occur. Secondary prevention targets the individual level.
- Tertiary prevention has the goal to moderate the impact of a chronic condition that has lasting effects, e.g., frailty or low back pain. Preventive strategies could include helping people to manage the long-term effects. By strengthening their resources and competencies, older patients are supported to maintain their ability to function, mobility and independence, as well as their quality of life. Tertiary prevention is targeted—similar to secondary prevention—at the individual level.

24.2 Prevention and Public Healthcare Aspects

The question of what is the value of prevention for the public healthcare system is very important (see also Part VII). Already during the last century, the importance of integrating prevention as national health goal was acknowledged and four

conditions were formulated for an effective health prevention structure: (1) *Changes in the organization of health services,* (2) *Changes in professional education,* (3) *Changes in the financing of health services, and* (4) *Changes in general education* (White 1975). More than 30 years later, we are still struggling with integrating prevention into daily medical routine.

The tradition of prevention with regard to public health followed the reduction of health risks (primary prevention). Therefore, the first public health actions were directed at social and environmental determinants of public health based on the living and working conditions imposed on populations during the last centuries (Nutbeam 2000). The Ottawa declaration by the WHO (1986) and the WHO Jakarta confirmation (1997) reflect the importance of health promotion by public health actions. Different models for public health promotion included change of behavior through health education/counseling and during the last decades these models were expanded by motivational aspects and action planning (Hagger et al. 2014). Counseling for health promotion through public health actions targets the individual's control over modifiable determinants of health and includes in addition to personal behavior—e.g., lifestyles such as physical activity or nutrition—also public policy as well as living and working conditions (Nutbeam 2000). The initiative "Healthy People 2010" on health promotion under the US Department of Health and Human Services together with other initiatives have become cornerstones of the preventive medicine in the US (Dockter and Simpson 2002). The initiative was updated in 2010 to Healthy People 2020 by stating again that the framework covers individuals, institutional/organizational and political levels.

In addition to the struggle of integrating prevention into the present public healthcare systems, the question of cost savings for the public healthcare systems is all but clear. To take, e.g., the tool of screening in preventive methods one can easily understand the barriers for prevention. A screening process on population level must meet specific standards (Dockter and Simpson 2002) on the basis of specific questions: (a) *Does the condition have a significant impact on health and function,* (b) *Is a treatment available for the condition,* (c) *Are the tests safe and acceptable for patients, and* (d) *Are the tests cost-effective and reliable.* By these standards it becomes quite difficult for physicians to decide if a population screening is indeed effective if one takes, e.g., the condition of dementia with no treatment available at present. Furthermore, cost-effectiveness will decline if the screening is not conducted in a high proportion of the population, and therefore an intervention might not reach the right target group (Dockter and Simpson 2002).

The decision for public health action relies on the efficacy of the action but physicians have to consider other aspects as well. Several models are now available for the evaluation of public health promotion effects. The *RE-AIM* (Reach, Efficacy, Adoption, Implementation and Maintenance) model, e.g., by Glasgow (1999)) addresses several factors which physicians have to take into account. A health promotion action can only be successful if the right population can be reached. When providing lifestyle interventions for older adults, it is often the healthier and more motivated individuals that respond to recruitment attempts but not the individuals with unmet needs [**R**]. Thus, the intervention might not be effective [**E**]. Adoption of a public health action to a specific setting might change the aforementioned

effectiveness, e.g., if another profession (instead of a physiotherapist a community-nurse) is delivering the action or how many institutions are uptaking the intervention [**A**]. Another issue is the implementation [**I**] of the intervention into the real world, and then being maintained [**M**] over a longer period. Many effective health promotion actions are hampered especially in the adoption and implementation phase. The fact that policy makers, health professionals, and single persons do not speak the same language is a barrier hard to overcome in transferring effective randomized controlled trials (RCTs) into the real world, and they tend to underestimate the efforts for success, e.g., is the proposed setting able to adhere to the public health action. Therefore, health promotion is organized on individual AND organizational and policy level (Glasgow et al. 2006).

Unfortunately, at present most Western healthcare systems are more organized with "treating a disease" than preventing a disease with respect to economic structures. In the US the present healthcare costs have been more than three times higher than in 1990 and more than eight times higher than in 1980 (Trust for America's Health). With the increase of the proportion of older persons on the population level in the western world, the issue of sustaining public healthcare systems is of utmost interest. The health technology assessment (HTA) report by Campbell et al. (2015) analyzed the clinical effectiveness and cost-effectiveness of exercise referral schemes (ERS). In their international and national analysis, Campbell et al. (2015) investigated the cost-effectiveness of becoming more physical active in relation to the risk reduction for cardiovascular disease (CVD), diabetes Type 2, and stroke. The HTA concluded that in total, the incremental cost-effectiveness ration for ERS compared with usual care is around £76,000 per quality adjusted life years, although the cost-effectiveness of ERS is subject to considerable uncertainty (Campbell et al. 2015). This means if small changes in the ecological model come up—e.g., less persons can be reached with ERS—the savings will be much smaller and the results might significantly change.

Variables for cost-effectiveness in public healthcare prevention are on the population level—morbidity mortality—AND on the individual level—quality of life, independence, and function.

24.3 Prevention in Older Adults: The Role of Nutrition

24.3.1 General Dietary Recommendations for Older Persons

Nutrition is a main contributor to health, well-being, and quality of life in older age. A stable energy balance is the basis for a good nutritional status and consequently plays a role in the prevention of malnutrition and obesity, two common problems in the older population. Moreover, certain nutrients like proteins and certain dietary patterns like the Mediterranean diet are discussed with regard to the prevention of several geriatric syndromes such as sarcopenia, frailty, and cognitive impairment.

Most recommendations regarding the nutrient intake of older adults don't differ from those of younger adults. However, due to several physiological changes during aging, the intake of certain nutrients requires attention.

- *Energy*: Energy requirements are based on the basal metabolic rate and the activity-related energy expenditure. Generally, energy requirements are reduced in older adults due to changes in body composition (loss of muscle mass) and reduced physical activity. However, regarding the activity level, older people represent a heterogeneous group ranging from bedridden to very active persons. Moreover, certain diseases affect metabolic processes and increase energy expenditure. Accordingly, the reference values for energy intake are broadly formulated (Table 24.1).
- *Proteins*: There is increasing evidence from experimental and epidemiological studies that older adults need higher amounts of proteins than younger adults to optimally stimulate muscle protein synthesis, to preserve muscle mass, and to prevent sarcopenia. In specific diseases, the amount of protein intake needs further adaption (Table 24.1). Apart from total amount, protein quality and the distribution of protein intake across the daily meals are of importance to counteract the anabolic resistance of the older muscle. As preventive strategy, the inclusion of foods rich in whey protein and leucine such as dairy products (e.g., curd, cottage cheese) in each daily meal is recommendable.
- *Fluid*: Although fluid requirements don't increase with aging (Table 24.1), fluid intake of older people needs particular attention as these have an increased risk of dehydration due to age-related physiological changes. First, the amount of body water declines by approximately 15% in advanced age due to changes in body composition. Second, the ability of the kidney to concentrate urine is reduced and higher amounts of water are necessary to excrete urinary substances (see also Chapters 16 and 17). Third, the sensation of thirst decreases with aging.
- *Vitamin D*: For the bone and muscle metabolism vitamin D is an essential agent. As older persons are less often exposed to sun light due to physical limitations and because of a reduced capacity of the older skin to synthesize vitamin D_3 via UV light, they are also at increased risk of a vitamin D deficiency. Another

Table 24.1 Reference values for daily energy, nutrient, and fluid intake of older people (Volkert et al. 2014, Bauer 2013)

Daily intake	
Energy	
Bedridden	25 kcal/kg BW
Light/moderate activity	28–32 kcal/kg BW
Severe activity (hyperactivity)	35–40 kcal/kg BW
Malnourished	32–38 kcal/kg BW
Protein	
Healthy	1.0–1.2 g/kg BW
Specific acute/chronic disease	1.2–1.5 g/kg BW
Severe malnutrition/injury	~ 2.0 g/kg BW
Kidney disease without dialysis	0.6–0.8 g/kg BW
Kidney disease with dialysis	1.2–1.5 g/kg BW
Fluid	
Beverages	20 mL/kg BW
Total	30 mL/kg BW

BW = body weight

difficulty is that vitamin D requirements cannot be covered by regular diet as only few foods like fatty sea fish contain considerable amounts of vitamin D. Consequently, a supplementation (e.g., 800 international units (IU)) is often, particularly in homebound older adults, advisable.

- *Food intake*: As energy requirements decrease with aging, older people are recommended to eat a more nutrient-dense diet to cover their nutrient needs. The Mediterranean diet is rich in nutrient-dense foods like vegetables, fruits, legumes, grains, nuts, fish, and olive oil and showed beneficial effects regarding the prevention of different unfavorable health outcomes.

24.3.2 Overweight and Obesity

An energy intake exceeding energy expenditure causes weight gain. The surplus energy is accumulated as body fat and in the long-term overweight and obesity occur. According to the WHO overweight and obesity are defined by specific thresholds of the body mass index (BMI = body weight [kg]/(body height [m]* body height [m])):

Overweight:	25–<30 kg/m^2
Obesity:	30–<35 kg/m^2
Severe obesity:	≥35 kg/m^2

If the increase in body fat is accompanied by a decrease in muscle mass, the syndrome is called sarcopenic obesity (see also Chapter 10).

Overweight is prevalent in about half of the community-dwelling older people, while obesity is reported in about 14–36% (Gomez-Cabello et al. 2011, Gallus et al. 2015, Kiesswetter et al. 2016). The prevalence is lower in the nursing home setting (Veronese et al. 2015). As no consensus on the diagnostic criteria for sarcopenic obesity exists, prevalence rates described in the literature vary distinctly [4–94%, (Batsis et al. 2013)]. Due to changes in body composition and body height during aging the validity of the BMI is reduced in older people. Large epidemiological studies showed that overweight older people had a lower risk of mortality compared to those with normal weight (Winter et al. 2014). For older people with overweight there is generally no indication to lose weight, especially as weight loss in older age enhances the loss of muscle mass and might increase the risk of sarcopenia. Regarding obesity, the decision for or against weight loss needs to be taken on the individual level considering functional resources, metabolic risk, comorbidities, and quality of life. A reduction of body weight should be based on moderate caloric restriction, should be always accompanied by a dietitian, and if possible should be supported by physical exercise to prevent the loss of muscle mass.

24.3.3 Malnutrition

According to Allison (2000) malnutrition is defined as *a state of energy, protein or nutrient deficiency which produces a measurable change in body function, and is associated with a worse outcome from illness as well as being specifically reversible by nutritional support*. In younger ages the origin of malnutrition is

mainly disease related, while in older people malnutrition is a multifactorial phenomenon. Within the aging process, several physiological changes like chemosensory decline or changes in the regulation of hunger and satiation (anorexia of aging) predispose older adults to become malnourished. Moreover, health-related, psychological, and socioeconomic factors can compromise nutritional status (Table 24.2).

Malnutrition is prevalent in 6–22% of the community-dwelling older adults (Kaiser et al. 2010; Kiesswetter et al. 2016; Meijers et al. 2009). In hospitals and nursing homes prevalence rates are even higher (Kaiser et al. 2010; Kiesswetter et al. 2016; Meijers et al. 2009). Independent of the setting, a large proportion of older people is at risk of malnutrition (Kaiser et al. 2010). Malnutrition is associated with longer hospital stays and higher readmission rates. Moreover, malnutrition is a risk factor for functional decline, sarcopenia, pressure ulcers, and mortality.

Internationally there is no consensus on the diagnostic criteria to measure malnutrition. As two key elements, low BMI and unintentional weight loss are considered (Table 24.3).

Table 24.2 Potential causes of malnutrition and clinical examination

Domain	Underlying problem	Diagnosis	Treatment
Chewing problems	Maladaptation of dental prosthesis, pain, missing teeth	Anamnesis, check for pressure signs	Consultation of dentist, oral hygiene
Swallowing problems	Aspiration, avoidance of specific foods	Swallowing tests, videofluoroscopy, fiberoptic endoscopic evaluation	Speech therapy, nutritional therapy, e.g., texture modified food
Gastrointestinal problems	Maldigestion, malabsorption, obstipation, nausea	Anamnesis, examination	Adaption of diet, medical treatment
Functional impairment	Problems with shopping, cooking, opening packages, eating	Anamnesis, functional testing	Occupational therapy, physiotherapy, training, support with shopping, cooking, eating
Cognitive impairment	Forgets eating, hyperactivity, eating disorders	Examination, anamnesis, neuropsychological test battery	support with shopping, cooking, eating, pleasant meal ambience
Depression	No motivation to eat	Anamnesis, psychological examination	Medical and psychological treatment, pleasant meal ambience
Diseases (multimorbidity)	Loss of appetite, pain	Anamnesis, examination	Medical treatment
Polypharmacy	Adverse effects, interactions, number of pills	Checking prescriptions	Reducing/adapting medication
Social isolation	Loneliness, missing social network	History taking	Social support, meals on wheels, eating in company

Table 24.3 Important criteria to detect malnutrition in older persons

BMI <20 kg/m^2 and/or
(unintentional) weight loss >5% in past 3 months or >10% in past 6 months

24.3.4 Malnutrition: Screening

To prevent or early detect malnutrition in older patients a screening on a regular basis is elementary. Every older person staying in a hospital or a long-term care institution should be screened at admission and afterwards at regular intervals. In the long-term care setting intervals of 3 months are recommended, while in the acute care setting shorter intervals are necessary. Also in the ambulatory setting malnutrition screening in older persons should be conducted by general practitioners or ambulatory nursing staff at least once a year.

A screening tool to detect malnutrition in older patients should comprise aspects on:

Current status:	BMI
History:	(Unintentional) weight loss within the past months
Further development:	Acute stress/diseases and/or reduced dietary intake

Acute stress increases energy needs and a reduced intake can be a cause for not meeting the energy requirements, consequently both are predictors for future weight loss.

The European Society for Clinical Nutrition and Metabolism (ESPEN) recommends the Mini Nutritional Assessment (MNA, www.mna-elderly.com) as screening tool for malnutrition in older people (Kondrup et al. 2003a) as the MNA was specifically developed for older people. Its short-form comprises six questions on (a) reduced intake, (b) weight loss, (c) mobility limitations, (d) acute stress, (e) neuropsychological problems, and (f) BMI or calf circumference. According to the score (0–14 points) the patients are categorized as well nourished (12–14 points), at risk of malnutrition (8–11 points), or malnourished (<7 points) (Kaiser et al. 2009) (see also Chapter 26).

A screening alternative in the hospital setting is the Nutritional Risk Screening 2002 (NRS, http://espen.info/documents/screening.pdf) (Kondrup et al. 2003b). The tool was specifically developed for the acute care setting and can be used also in younger patients. The NRS is composed of a pre-screening with four questions on low BMI, weight loss, reduced intake, and severe disease. In case of a positive pre-screening the aforementioned aspects are quantified during the main screening. Additionally, the age of the patient (<, ≥70 years) is considered. According to the score patients are categorized as at risk of malnutrition (≥3 points) or as well nourished (<3 points).

Several other screening tools are available. The usage of a specific tool often depends on the health policies and guidelines of the respective countries.

24.3.4.1 Malnutrition: Assessment

In case of a positive screening result, the nutritional situation needs to be further assessed by clarifying potential causes, and quantifying the energy and nutrient

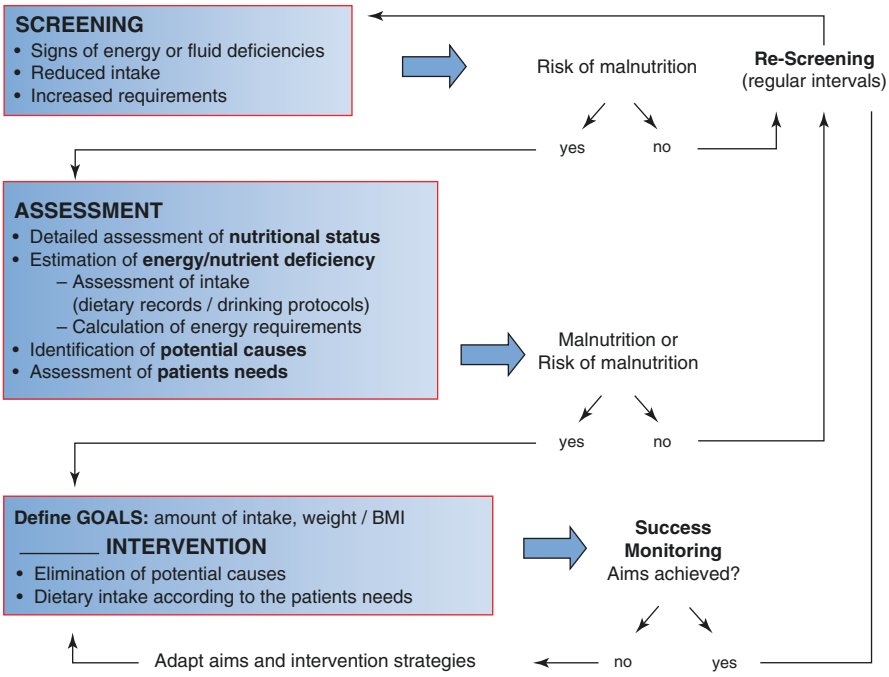


Fig. 24.1 Algorithm on quality management of nutritional care in geriatric facilities (Adapted and translated: Volkert D Z Gerontol Geriatr 2009)

deficiency (Fig. 24.1). For this purpose, dietary records and drinking protocols are required. If the diagnosis of malnutrition is confirmed by the assessment, a nutritional therapy needs to be initiated.

24.3.4.2 Malnutrition: Therapy

Based on the assessment, realistic and individualized goals for the nutritional therapy need to be established, considering potential risks and benefits as well as resources, needs, and preferences of the older patient. The basis for a successful therapy is the elimination of the causes (Table 24.2). The therapeutic approaches go beyond simple nutritional interventions also covering nursing support (e.g., patient-centered nursing, provision of adequate tools like ergonomic cutlery) and the adaption of environmental factors (e.g., avoiding disturbances during mealtimes, pleasant meal ambience). The choice of the nutritional interventions depends on the severity of the energy and nutrient deficiency and potential contraindications. Often combinations of different approaches are needed. Generally, noninvasive and oral strategies are preferable. Therapeutic options are presented in Table 24.4. More detailed information can be found in

Table 24.4 Nutritional therapy in older patients

Treatment options	Recommendations for administration, and examples	Contraindications
Adaption of diet	Texture modification, energy-dense meals, energy and nutrient (e.g., protein) fortification, elimination of dietary restrictions, snacks	Severe dysphagia, absence of intestinal function, complete intestinal obstruction
Oral nutritional supplements	If oral intake is insufficient to cover the needs, choice of products according to patient's preferences and needs (e.g., rich protein, low volume, energy dense)	Intolerance, severe dysphagia, absence of intestinal function, complete intestinal obstruction
Tube feeding	Application if oral nutrition is impossible/insufficient for >3 days, having a good prognosis, to overcome crisis with insufficient intake	Will of the patient, end-of-life situation, intolerance, severe dementia, absence of intestinal function, complete intestinal obstruction
Parenteral feeding	Application if oral and enteral nutrition are impossible/insufficient for >3 days, having a good prognosis, to overcome crisis with insufficient intake	Will of the patient, end-of-life situation

the ESPEN and DGEM (Deutsche Gesellschaft für Ernährungsmedizin, German society for Nutritional Medicine) guidelines on clinical nutrition:

http://www.espen.org/education/espen-guidelines

http://www.dgem.de/leitlinien

24.4 Prevention in Older Adults: The Role of Physical Activity and Exercise

Physical activity comprises any body movement produced by skeletal muscles that results in an increase over resting energy expenditure. Contractions of skeletal muscles are crucial for humans to move as well as to keep and adjust their posture, enabling activities of daily living, mobility and exercise, and thus are an important contributor to quality of life (see also Chapter 9).

Physical activity is an umbrella term and includes the concepts of sport, exercise, leisure-time physical activity, chores (housework, gardening), occupational work, and transport, which for some people can overlap. Hereby, exercise can be defined as structured repetitive physical activity aimed at achieving goals, such as learning skills, improved fitness, or health benefits. Many of these health benefits are caused by changes in aspects of physical fitness (Table 24.5). The structure is given by a (more or less well) defined plan that defines the content as well as the dose of an exercise program. As for other medical interventions the dose is critical and requires progression for further efficacy (Table 24.6). The concept of task specificity is

Table 24.5 Selected components of physical fitness with high relevance to older adults

Selected components of physical fitness	Definition	Subcomponent	Example for relevance	Example activity
Endurance → also Aerobic exercise	Ability to perform movements of body's large muscles in rhythmic manner for sustained periods		Determinant of exercise capacity; VO2 max indicates functional reserve	Brisk walking, running, cycling, swimming
Strength → also resistance exercise	Ability to exert force by contracting against resistance	Power: ability to exert force in short time	activities of daily living (ADLs), such as sit-to-stand transfer; regain balance by stepping	Lifting weights (external or body weight); work against resistance (resistance bands)
Flexibility	Ability to perform movements with specific/extended range of motion around a joint		ADLs, such as clothing and reaching	Stretching exercises
Precision/ coordination	Ability to integrate sensory, central nervous and motor components to correct movement	Balance/postural stability: ability to maintain the center of gravity within the base of support	Risk of falling	Tai Chi, dancing

highly relevant, and thus knowledge about the pathophysiology of medical conditions helps in choosing the correct exercise modality. As most physiological functions decline with increasing age, the peak level one had for each is critical in the risk of developing many geriatric syndromes (e.g., bone mineral density and osteoporosis). Having this said, however, due to the adaptability and plasticity of the human organism, it is nearly never too late to take up health-enhancing physical activities, including if not especially multimorbid geriatric patients. The individual precondition is the starting point of every exercise routine and the individual abilities are benchmarks for progression. To be effective, exercise requires the perturbation of one's equilibrium for the body structures and functions to adapt.

Until recently high levels of physical activity were crucial in enhancing one's chance to reproduce, to survive, and to live better. Recently, improvements in hygiene, medical care, and development of technology have made live longer and less active. Older adults are the least active population group. Strong evidence indicates that physical activity, including daily life activities, is associated with reduced mortality with a clear dose–response relationship favoring larger volumes and intensities (Samitz et al. 2011). It is now widely accepted that a sedentary or inactive lifestyle throughout lifetime facilitates the development of many medical conditions (Booth et al. 2012), regular physical activity reduces the risk of developing

Table 24.6 The dosage of exercising based on the FITT principle; Examples of activities and their according intensities can be found under: https://www.cdc.gov/nccdphp/dnpa/physical/pdf/PA_Intensity_table_2_1.pdf

Dose components	Definition	Measured how	
Frequency	Number of times an exercise/activity is performed	Sessions, episodes, or bouts per week	
Intensity	Refers to the rate at which the activity is being performed or the magnitude of the effort required to perform an activity or exercise	- Metabolic equivalents (METs) as mL/kg/min of oxygen consumed - VO2 max or VO2 R (uptake reserve) - % Heart rate (HR) max or %HRR - Rating of perceived exertion (RPE) → Borg scale - Amount of weight or resistance → 8 to 12 repetitions possible (=1 set)	**Moderate vs. vigorous**: - 3 to <6 METs vs. ≥6 METs - VO2 R 40–59% vs. 60–84% - HR max 64–76% vs. 77–93%, HRR 40–59% vs. 64–76% - RPE 5–6 vs. ≥7–8 out of 10
Time	Length of time for each bout of any specific activity	Duration (aerobic): minutes Volume (strength): 2–3 sets with 2–3 min break	
Type	Mode of exercise performed	e.g., continuous walking, functional multi-joint strength exercises	

HRR heart rate at rest

a large number of chronic diseases and conditions (Chodzko-Zajko et al. 2009) and is effective when PRESCRIBED as medicine for numerous conditions (Pedersen and Saltin 2015). This includes cardiovascular (e.g., coronary heart disease (CHD)), pulmonary (e.g., chronic obstructive pulmonary disease (COPD)), metabolic (e.g., Diabetes), neurological (e.g., Dementia), psychiatric diseases (e.g., Depression), cancer (e.g., Breast), and musculoskeletal disorders (e.g., Osteoarthritis) and makes physical activity an important component of successful aging and in the compression of morbidity.

Based on the current evidence, general physical activity recommendations for healthy people aged 65 years and older exist to guide optimal prevention (Table 24.7) (Chodzko-Zajko et al. 2009; WHO 2010). Prolonged periods of sitting are associated with poor health outcomes. Active breaks, accumulating activity in short bouts

Table 24.7 Recommendations based on American College of Sports Medicine (Chodzko-Zajko et al. 2009), World Health Organization, and (McDermott and Mernitz 2006) for physical activity in older adults

	Endurance exercise	Resistance exercise	Flexibility exercise	Balance exercise for older people at risk of falling or with mobility problems
Frequency	Moderate intensity activities, accumulate at least 30 or up to 60 (for greater benefit) min/day in bouts of at least 10 min each to total 150–300 min/week, OR at least 20–30 min/day or more of vigorous-intensity activities to total 75–150 min/week, OR an equivalent combination of moderate and vigorous activity	At least 2 day/week	At least 2 day/week	At least 3 day/week
Intensity	Moderate or vigorous	Moderate to vigorous	Moderate	
Time	Accumulation in bouts of at least 10 min each moderate intensity: at least 30 min/day vigorous-intensity: at least 20 min/day			

Type	- Continuous activity - Any modality that does not impose excessive orthopedic stress; - Walking is the most common type of activity. - Aquatic exercise and stationary cycle exercise may be advantageous for those with limited tolerance for weight-bearing activity	Progressive weight training program or weight-bearing calisthenics (8–10 exercises involving the major muscle groups of 8–12 repetitions each), stair climbing, and other strengthening activities that use major muscle groups.	Any activities that maintain or increase flexibility using sustained stretches for each major muscle group and static rather than ballistic movements	Activities that include the following: (1) Progressively difficult postures that gradually reduce the base of support (e.g., two-legged stand, semitandem stand, tandem stand, one-legged stand), (2) Dynamic movements that perturb the center of gravity (e.g., tandem walk, circle turns), (3) Stressing postural muscle groups (e.g., heel stands, toe stands), or (4) Reducing sensory input (e.g., standing with eyes closed)
Progression	1. Increase time of exercise session every few weeks without altering intensity. 2. Maintain session time but increase intensity intermittently for brief time (e.g., increase the pace for 20 steps, then return to a comfortable pace for 3 min, repeat).	When 12 repetitions are possible with RPE of 5–6 increase weight for next session	- Add new stretches to routine, - Progress from static poses to dynamic moves, - Reduce reliance on balance support	- Reduce base of support - Progress from static poses to dynamic moves - Sensory perturbation (e.g., eyes closed, soft surface) - Add secondary task (cognitive or manual)

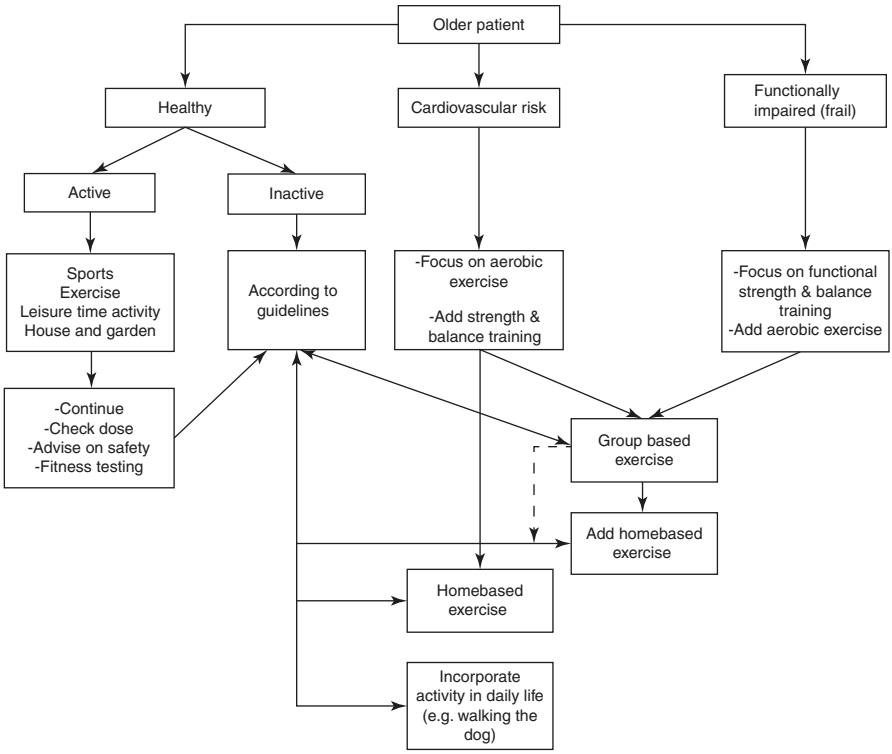


Fig. 24.2 Simplistic clinical pathway for exercise prescription in older patients

are hence useful and can be implemented into daily life routine without following a structured program. Generally, some physical activity is better than none, even when not meeting the recommended levels, but higher levels of physical activity provide greater health benefits. The combination of aerobic exercise, strength training, and flexibility exercises is favorable. For many older people at risk of falling, balance exercises should be included. Although higher intensities tend to show larger effects, an optimum can be obtained with moderate intensity activities. Physical activity should be/become a habit as soon after stopping an activity detraining begins (Vogler et al. 2012). Depending on personal preferences and supply structures, physical activity can be delivered at home, be incorporated into daily life (e.g., stair climbing), or be administered in group settings (Fig. 24.2).

Exercise offers many health benefits but certain points should be considered to enable safety and well-being of the patient. A pre-exercise evaluation should be conducted to ensure safety and find the correct starting level. This is vital in patients with cardiovascular risk factors, specific medical conditions, and those that try to initialize an exercise routine after a period of inactivity. There are just few absolute contraindications to exercise for which the risk of exercise (e.g., death due to cardiac event) outweighs the benefits. Apart from acute illness, fever,

acute inflammations, dehydration, and uncorrected medical conditions (e.g., diabetes) if any of the following conditions is present, no exercise should be prescribed:

- Acute myocardial infarction, within 2 days
- Ongoing unstable angina
- Uncontrolled cardiac arrhythmia with hemodynamic compromise
- Active endocarditis
- Symptomatic severe aortic stenosis
- Decompensated heart failure
- Acute pulmonary embolism, pulmonary infarction, or deep vein thrombosis
- Acute myocarditis or pericarditis
- Acute aortic dissection

Some others, relative contraindications, come with an increased risk and warrant attention on a case-to-case basis. Patients may exercise but should do this supervised and at lower intensities. Water-based exercise may be an option for people that have pain in the weight-bearing joints.

Following the principle of overload exercise may lead to acute post exercise central or peripheral fatigue, especially when trained at higher intensities. This leads to a brief deterioration of performance, e.g., reduced balance, muscle weakness following exercise and may put the older (frail) individual at risk of falling. While especially moderate intensity long-term physical activity participation improves immune function and reduces the risk of infection in relatively healthy older people, there is evidence from young people that training at high intensities increases the risk of infection (Senchina and Kohut 2007).

It is important that patients understand to stop exercising and seek medical attention when feeling chest pain, palpitations or lightheadedness!

Older patients whose physicians advise them to exercise are more likely to participate in supervised exercise classes as well as to do home exercises. The physician is thus important in helping older adults make the first steps into taking up and adopting exercise routines. Realistic goal setting, monitoring, positive reinforcement, and support networks within the family and community are key to long-term exercise compliance and should be discussed together with major barriers such as transport and costs. For the initialization phase it is more important to ensure adherence even though this means that the recommended levels are not met until the patient has adopted a routine. To help older patients to start and adhere to exercise regimens the 5A's model can help (Table 24.8) (McDermott and Mernitz 2006):

For frail older adults with increased vulnerability and decreased reserves, aim should be to train as recommended by the guidelines. However, many of these individuals are sedentary or insufficiently active and hence at risk of deconditioning and adverse health outcomes. Structured exercise should prioritize the functional status and avoidance of falls and injuries through functional strength and balance

Table 24.8 5A's model for adhering and adopting a health-enhancing exercise program

1. Assess
• Current fitness level
• Willingness to begin exercise program
2. Advise
• Importance of physical activity
• Introduce recommendations
• Discuss exercise options according to patient's preferences
• Provide take-home information
3. Agree
• Patient and physician should collaboratively select long- and short-term fitness goals, including how the patient will meet the goals
4. Assist
• Counsel patients on performing some form of activity every day, problem solving, and gradual incorporation of additional exercise to meet patient-specific goals
• Patient can keep a log, including questions and barriers to exercise, that can be discussed at follow-up visits
• Short-term support can include a brief phone call one week after the program begins
• Provide referrals for physical therapy or special assistance, if needed
5. Arrange
• Arrange/advise on appropriate program considering social preferences, cultural norms, exercise history, instructional needs, readiness, motivation, self-discipline, short- and long-term goals, and logistics

training. Avoiding mobility disabilities and the loss of independence are most important to older people. In addition, these people should be encouraged to increase their walking time and intensity during daily life to increase cardiovascular fitness and exercise capacity among others. An example for an evidence-based intervention targeting these individuals is the Otago Exercise Programme (Thomas et al. 2010).

Additional Information:

Best practice program for older adults: http://www.firststeptoactivehealth.com/

ACSM position stand: http://www.acsm.org/public-information/position-stands/position-stands/lists/position-stands/exercise-and-physical-activity-for-older-adults

Centers for Disease Control and Prevention information for healthcare staff and older individuals: https://www.cdc.gov/physicalactivity/basics/pa-health/index.htm

Booklet and folder for health care providers on exercise prescription and programming: http://file.lacounty.gov/SDSInter/dmh/216745_ExerciseforOlderAdultsHealthCareProviderManual.pdf

WHO recommendation on physical activity in older adults: http://www.who.int/dietphysicalactivity/factsheet_olderadults/en/

Information on how to get older people motivated to be more active: http://www.eunaapa.org/wp-content/uploads/2015/02/EUNAAPA-Training-Curriculum-2014-s.pdf

The full Otago Exercise Programme: http://www.acc.co.nz/PRD_EXT_CSMP/groups/external_providers/documents/publications_promotion/prd_ctrb118334.pdf).

24.5 Prevention in Older Adults: The Role of Vaccination

Taking into account the aging society, the higher susceptibility to infections of older persons becomes more important. Even in industrial developed countries such as Germany, infections count for 5% of deaths.

The aging of the immune system, so-called immunosenescence, is well documented as the cause of increased infection rates in the older person with increased morbidity and mortality. Immunosenescence is multifactorial and incompletely understood. It comprises malfunctioning of innate and adaptive immune system on a cellular and molecular level. It can lead to change of typical symptoms, oligosymptomatic courses of disease, increased susceptibility to cancer and autoimmune diseases as well as diseases associated with chronic stimulation of innate immune system (inflammation) such as atherosclerosis. The oligo-symptomatic courses of infections may hamper their timely recognition. Therefore, older patients often suffer from complicated and more severe courses of infections. Thus, the group of patients 60 years of age and older represents 90% of deaths caused by an influenza infection. Furthermore, influenza infection in nursing home residents can cause large decline in activities of daily living, significant weight loss, and new or worsening pressure ulcers (Gozalo 2012). A review of European data on community-acquired pneumonia (CAP) shows that *Streptococcus pneumoniae* was the most common agent isolated (Welte et al. 2002) and is preventable by pneumococcal vaccination. Mortality varied from <1 to 48% and was associated with advanced age, comorbid conditions, and CAP severity (Welte et al. 2002). Therefore, vaccinations represent the most cost-effective medical procedure for preventing morbidity and mortality caused by infections in the older person, but they are still insufficiently used.

24.5.1 Basic Definitions

Passive immunization

- Administration of antibodies against specific pathogens affords protection for about 3 months, depending on the half-life period of the antibodies

Active immunization

- Stimulation of the body's immune system by administration of specific antigens induces a long-lasting protection after a few days or weeks

Table 24.9 Basic rules of vaccination

Inactivated vaccines (i.e., influenza, pneumococci, hepatitis, pertussis)	– Can be administered simultaneously without any time interval – No time intervals necessary to other inactivated or attenuated vaccines
Live, attenuated vaccines (i.e., yellow fever, measles, mumps, rubella, varicella (chicken pox), typhus (→ oral vaccination)	– Can be administered simultaneously – If it is not done simultaneously, a time interval of at least 4 weeks is necessary to another attenuated vaccine – No time interval necessary to inactivated vaccines – More detailed information under http://www.dtg.org/138.html

The number of simultaneously administered vaccines is uncomplicated, but it should be no more than 7 at one day as you need to change the site of injection
In case of anticoagulation therapy, alternative application routes should be clarified—e.g., intradermal or subcutaneous application

Live, attenuated vaccines

- Containing live, but weakened, attenuated pathogens
- Inducing a strong immune response because they are quite close to natural infection
- Live, attenuated vaccines can mutate to virulent forms again as they are still alive microbes and cause disease
- Immunocompromised patients are on greater risk to develop the disease despite attenuation

Inactivated vaccines

- Containing killed pathogens or pathogens' particles (i.e., subunit vaccines, toxoid vaccines, conjugate vaccines, deoxyribonucleic acid (DNA) vaccines, or recombinant vector vaccines)
- Are usually less immunogenic and induce a weaker immune response
- Cannot cause the disease (Table 24.9)

As the various vaccinations induce protection of different duration, it is necessary to check the vaccination status of patients regularly, at least once a year, to avoid lack of immunization (Michel et al. 2010). In Europe, there are different immunization schedules. You can clarify actual local recommendations under http://vaccine-schedule.ecdc.europa.eu/pages/scheduler.aspx. Immunosenescence as described before can cause decreased efficacy of vaccination. Therefore, it is important to improve the immunogenicity of vaccines to amplify the response to vaccination of older patients.

24.5.2 Approaches to Amplify Immune Response to Vaccination

- Optimization of vaccination schedules
- Increasing doses of antigens

- Using adjuvants
- Developing new routes of administration, e.g., the epi- or intradermal route.

Furthermore, multimorbidity, malnutrition, and geriatric syndromes like frailty and functional impairment showed a negative influence on immune response to vaccination in the older person (Hamza 2012; Yao 2011). Therefore, regular evaluation of geriatric syndromes by geriatric assessment may be helpful to assess the immune competence of seniors and identify those with need for more immunogenic vaccines. Lifelong adherence to vaccination schedules seem to protect against immunosenescence (Michel et al. 2010). Thus, it is another reason to assess regularly the vaccination status of each patient.

24.5.3 Indications and Contraindications

24.5.3.1 Vaccination Schedules

All over Europe, there are different recommendations for vaccination. For each country, the special organizations, which determine the recommendations, should be consulted (e.g., Ständige Impfkommission (STIKO) in Germany; see also http://www.eugms.org/research-cooperation/task-finish-groups/vaccines.html).

24.5.3.2 General Indications

The indications for immunization in general and for particular target groups are given by the regional vaccination schedule (see http://vaccine-schedule.ecdc.europa.eu/pages/scheduler.aspx.).

Particularly chronically ill and older persons benefit from regular vaccination according the immunization schedule as severe and complicated disease course are preventable by vaccination.

24.5.3.3 General Contraindications

- Acute diseases requiring treatment
- Adverse drug reactions in association to previous vaccinations with the same vaccine
- Allergies to components of vaccines
- (Pregnancy: only urgently indicated vaccinations should be administered)
- Immunodeficiency: careful indication for live vaccinations

Examples for False Contraindications:

- Banal infections even in case of subfebrile temperature
- Possible contact of vaccinees with persons with infectious diseases
- Family history of seizures
- Vaccines with history of febrile convulsion
- Antibiotic therapy or low dose steroid therapy
- Immunodeficiency and vaccination with inactivated vaccine
- Chronic diseases

Age as Possible Contraindication:
Yellow fever vaccination is a typical example for a traveler vaccination. The age of 60 years and above is a relative contraindication as the risk for severe and lethal adverse drug reactions increases with increasing age. Possible complications are YEL-AND (yellow fever vaccine-associated neurotropic disease) and YEL-AVD (yellow fever vaccine-associated viscerotropic disease). According to recommendations of the World Health Organization (WHO) in 2013, the booster vaccination after 10 years is no longer required. A carefully benefit risk assessment is crucial.

24.5.4 Selected Vaccination Recommendations

24.5.4.1 Tetanus, Pertussis, Diphtheria Vaccination

The tetanus-diphtheria-acellular pertussis (Tdap) vaccine is administered as a single-shot vaccination once when the tetanus vaccination becomes due in adults. For diphtheria there is a low rate of clinical disease because immunization of the population has minimized the transmission of toxigenic strains (CDC—Vaccination Coverage in the U.S. http://www.cdc.gov/vaccines/imz-managers/coverage/imz-coverage.html). However, unvaccinated travelers to endemic areas are at risk for acquiring this infection, so there is a strong recommendation for this vaccination. Known as children's disease, pertussis is not so rare in adults. The paroxysmal cough of pertussis can be severe and it is the main cause of associated morbidity. Older adults should be vaccinated if the last vaccination dates back more than 10 years.

24.5.4.2 Influenza Vaccination

The mostly used influenza vaccine is an inactivated virus that requires annual injection due to antigenic drift. A live-attenuated virus vaccine is available, but there are no data in subjects over the age of 60 and it is not recommended for use in older adults. A high-dose inactivated influenza vaccine is also available for persons 65 years and older (see above). As seniors are less affected by influenza B strains, the also available quadrivalent vaccine with two A and two B strains is not as effective as adjuvanted trivalent vaccines are. A recent study shows that vaccination of persons aged 65 years with an adjuvanted trivalent inactivated vaccine has the potential to provide clinical and economic benefit relative to quadrivalent or trivalent inactivated vaccine (Mullikin 2015).

24.5.4.3 Pneumococcal Vaccination

Pneumococcal vaccine is recommended for older persons in most European countries. Two vaccines are available for this indication: the 23-valent polysaccharide vaccine (PPSV23) and the 13-valent pneumococcal conjugate vaccine (PCV13). There are different recommendations for these vaccines. Please check therefore the current local recommendations (http://vaccine-schedule.ecdc.europa.eu/Pages/Scheduler.aspx).

24.6 Care Planning

The older patient most often presents with multimorbidity due to different chronic illnesses. The focus of prevention therefore lies in secondary and tertiary preventive treatment goals as detailed below. In addition, these preventive strategies have as an aim not survival as the primary endpoint, but much more the preservation or restoration of functionality and thus an adequate independence to remain in the desired social environment. Within this context, care planning is a cornerstone of activities as a Geriatrician and his multidisciplinary Geriatric team (Boult and Wieland 2010) (Fig. 24.3).

The different structures within the (health) system taking care of older patients with multimorbidity are given in Fig. 24.3. As can be seen, preventive strategies encompass much more than public health and preventive services in the stricter sense, often sufficient in younger adults with more resilience and less frailty.

In the population, 80% of all older persons have at least one chronic condition and in 50% at least two chronic conditions are stated (Chen et al. 2015) (see also Chapter 6). In states of multimorbidity, secondary and tertiary preventive strategies at an individual level are the main target for care planning. Secondary and tertiary prevention in older persons therefore are of high importance with secondary prevention involving promptly and effectively intervention, and tertiary prevention aiming to reduce the severity of potentially disabling sequelae of disease as well as complications of disease once established (Stucki and Melvin 2007). Care structures have to focus on stopping or at least modifying disease progression to ensure functionality besides reducing morbidity and mortality. Within the physio-psychosocial paradigm when treating older adults (WHO 2001), this means incorporation of the

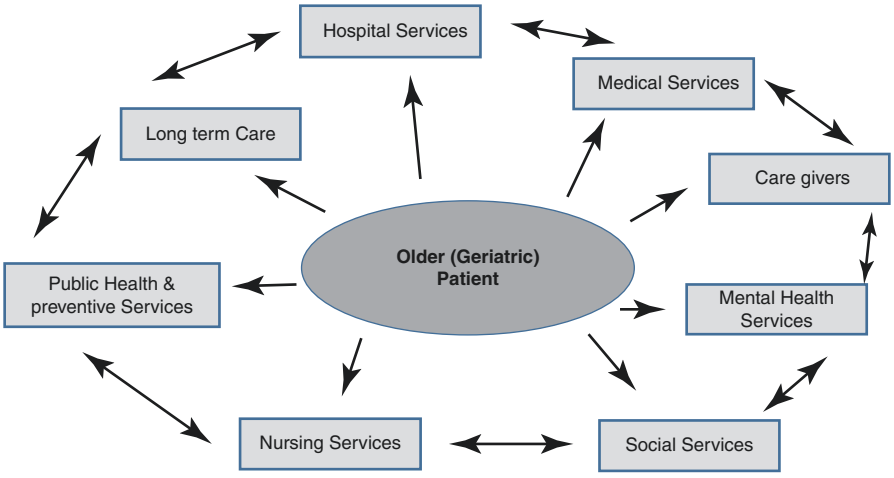


Fig. 24.3 Network of services for older patients for care planning and preventive strategies

different stakeholders mentioned in Fig. 24.3. In tertiary prevention, the care planning also makes use of even more technical aids including the fast developing possibilities of ambient assisted living. In tertiary prevention care planning should be accompanied/supported by disease-specific guidelines as well as protocols which can be found at the National Guideline Clearinghouse (NGO; https://www.guideline.gov).

Steps for priority setting and care planning of (preventive) treatment goals in geriatric patients are:

- Broad diagnostics, preparing "problem list," check for deficits and resources
- Determination of overall patient preferences and individual goals
- Setting overarching treatment goals
- Estimate patient's survival time
- Definition of preventive measures to tackle the problem list (see above)
- Establishing (preventive) treatment plan
- Discuss treatment plan with patient and care providers—take decision

It is to be expected that in the future, also eHealth Services will help to guarantee care planning such as preventive telemedicine services and interactive consulting. Goals are as follow:

- Reduce number of visits in emergency rooms
- Reducing unnecessary visits to physician office and other health providers
- Providing education of patient and care-giver in early symptom management
- Monitoring vital signs on a 24-h basis

In summary, care planning for preventive strategies in multimorbid older adults should be targeted at preservation of functionality and thereby independence as treatment goal (Stucki and Melvin 2007). Thus, it focuses less at the summing up of diseases (ICD = International Classification of Diseases), but more on functionality as detailed in the International Classification of Functioning, Disability and Health: the ICF by the WHO (2001) (see also Chapter 3).

In conclusion, for a successful *primary prevention* in the older person, clinicians have to consider several aspects. If they are looking at population level with preventive programs they have to take the requested percentage of the target population, use the right screening tool for identification, and take the acceptability of the program for the older person into account. An intervention will be rated as effective when it saves costs in the public healthcare system and improve health on the individual level.

In secondary and tertiary prevention, barriers on individual level arise, e.g., accessibility or time of the program as well as the financial burden, which have to be considered by the clinicians. Nevertheless, in older geriatric persons secondary and tertiary prevention should be an important aspect next to the rehabilitation process. This includes a careful care planning by all stakeholders involved in ensuring preventive strategies in older adults.

References

Allison SP. Malnutrition, disease, and outcome. Nutrition. 2000;16(7–8):590–3.

Batsis JA, Barre LK, Mackenzie TA, Pratt SI, Lopez-Jimenez F, Bartels SJ. Variation in the prevalence of sarcopenia and sarcopenic obesity in older adults associated with different research definitions: dual-energy X-ray absorptiometry data from the National Health and Nutrition Examination Survey 1999–2004. J Am Geriatr Soc. 2013;61(6):974–80.

Bauer J, et al. Evidence-based recommendations for optimal dietary protein intake in older people: a position paper from the PROT-AGE Study Group. J Am Med Dir Assoc. 2013;14(8):542–59.

Booth FW, Roberts CK, Laye MJ. Lack of exercise is a major cause of chronic diseases. Compr Physiol. 2012;2:1143–211.

Boult C, Wieland GD. Comprehensive primary care for older patients with multiple chronic conditions: "Nobody rushes you through". JAMA. 2010;304(17):1936–43.

Campbell F, et al. A systematic review and economic evaluation of exercise referral schemes in primary care: a short report. Health Technol Assess. 2015;19(60):1–110.

Chen CY, et al. Health care outcomes and advance care planning in older adults who receive home-based palliative care: a pilot cohort study. J Palliat Med. 2015;18(1):38–44.

Chodzko-Zajko WJ, Proctor DN, Fiatarone Singh MA, et al. American College of Sports Medicine position stand. Exercise and physical activity for older adults. Med Sci Sports Exerc. 2009;41:1510–30.

Dans LF, Silvestre MA, Dans AL. Trade-off between benefit and harm is crucial in health screening recommendations. Part I: General principles. J Clin Epidemiol. 2011;64(3):231–9.

Dockter L, Simpson DA. "Preventative Medicine Guidelines for the Geriatric Population," Marquette Elder's Advisor. Article. 2002;3(3):8.

Gallus S, Lugo A, Murisic B, Bosetti C, Boffetta P, La Vecchia C. Overweight and obesity in 16 European countries. Eur J Nutr. 2015;54(5):679–89.

Glasgow R, Klesges LM, Dzewaltowski DA, Estabrooks PA, Vogt TM. Evaluating the impact of health promotion programs: using the RE-AIM framework to form summary measures for decision making involving complex issues. Health Educ Res. 2006;**21**(5):688–94.

Glasgow R, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. Am J Public Health. 1999;**89**(9):1322–7.

Goldberg TH, Chavin SI. Preventive medicine and screening in older adults. J Am Geriatr Soc. 1997;45(3):344–54.

Gomez-Cabello A, Pedrero-Chamizo R, Olivares PR Luzardo L, Juez-Bengoechea A, Mata E, Albers U, Aznar S, Villa G, Espino L, Gusi N, Gonzalez-Gross M, Casajus JA, Ara I. Prevalence of overweight and obesity in non-institutionalized people aged 65 or over from Spain: the elderly EXERNET multi-centre study. Obes Rev. 2011;12(8):583–92.

Gozalo PL, Pop-Vicas A, Feng Z, Gravenstein S, Mor V. Effect of influenza on functional decline. J Am Geriatr Soc. 2012;60(7):1260–7.

Hagger MS, Luszczynska A. Implementation intention and action planning interventions in health contexts: state of the research and proposals for the way forward. Appl Psychol Health Well Being. 2014;6(1):1–47.

Hamza SA, Mousa SM, Taha SE, Adel LA, Samaha HE, Hussein DA. Immune response of 23-valent pneumococcal polysaccharide vaccinated elderly and its relation to frailty indices, nutritional status, and serum zinc levels. Geriatr Gerontol Int. 2012;12(2):223–9.

Kaiser MJ, Bauer JM, Ramsch C, Uter W, Guigoz Y, Cederholm T, Thomas DR, Anthony P, Charlton KE, Maggio M, Tsai AC, Grathwohl D, Vellas B, Sieber CC. Validation of the Mini Nutritional Assessment short-form (MNA-SF): a practical tool for identification of nutritional status. J Nutr Health Aging. 2009;13(9):782–8.

Kaiser MJ, Bauer JM, Rämsch C, Uter W, Guigoz Y, Cederholm T, Thomas DR, Anthony PS, Charlton KE, Maggio M, Tsai AC, Vellas B, Sieber CC. Frequency of malnutrition in older adults: a multinational perspective using the mini nutritional assessment. J Am Geriatr Soc. 2010;58(9):1734–8.

Kiesswetter E, Sieber CC, Volkert D. Nutritional situation of older adults living in German speaking countries. Aktuel Ernahrungsmed. 2016;41(6):362–9.
Kondrup J, Allison SP, Elia M, Vellas B, Plauth M. ESPEN guidelines for nutrition screening 2002. Clin Nutr. 2003a;22(4):415–21.
Kondrup J, Rasmussen HH, Hamberg O, Stanga Z. Nutritional risk screening (NRS 2002): a new method based on an analysis of controlled clinical trials. Clin Nutr. 2003b;22(3):321–36.
McDermott AY, Mernitz H. Exercise and older patients: prescribing guidelines. Am Fam Physician. 2006;74:437–44.
Meijers JM, Schols JM, van Bokhorst-de van der Schueren MA, Dassen T, Janssen MA, Halfens RJ. Malnutrition prevalence in The Netherlands: results of the annual dutch national prevalence measurement of care problems. Br J Nutr. 2009;101(3):417–23.
Michel JP, Gusmano M, Blank PR, Philp I. Vaccination and healthy ageing: how to make life-course vaccination a successful public health strategy. Eur Geriatr Med. 2010;1(3):155–65.
Mullikin M, Tan L, Jansen JP, Van Ranst M, Farkas N, Petri E. A novel dynamic model for health economic analysis of influenza vaccination in the elderly. Infect Dis Ther. 2015;4:459–87.
Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. Health Promot Int. 2000;15(3):259–67.
Pedersen BK, Saltin B. Exercise as medicine - evidence for prescribing exercise as therapy in 26 different chronic diseases. Scand J Med Sci Sports. 2015;25(Suppl. 3):1–72.
Prevention for a Healthier America: investments in disease prevention yield significant savings, stronger communities. Washington, DC: Trust for America's Health. http://healthyamericans.org/reports/prevention08/. Access 15 Feb 2017
Pomrehn PR, et al. Prevention for the 21st century: setting the context through undergraduate medical education. Acad Med. 2000;75(7 Suppl):S5–13.
Samitz G, Egger M, Zwahlen M. Domains of physical activity and all-cause mortality: systematic review and dose-response meta-analysis of cohort studies. Int J Epidemiol. 2011;40:1382–400.
Senchina DS, Kohut ML. Immunological outcomes of exercise in older adults. Clin Interv Aging. 2007;2:3–16.
Stucki G, Cieza A, Melvin J. The International Classification of Functioning, Disability and Health: a unifying model for the conceptual description of physical and rehabilitation medicine. J Rehabil Med. 2007;39(4):279–85.
Veronese N, Cereda E, Solmi M, et al. Inverse relationship between body mass index and mortality in older nursing home residents: a meta-analysis of 19,538 elderly subjects. Obes Rev. 2015;16(11):1001–15.
Thomas S, Mackintosh S, Halbert J. Does the 'Otago exercise programme' reduce mortality and falls in older adults? A systematic review and meta-analysis. Age Ageing. 2010;39:681–7.
Vogler CM, Menant JC, Sherrington C, et al. Evidence of detraining after 12-week home-based exercise programs designed to reduce fall-risk factors in older people recently discharged from hospital. Arch Phys Med Rehabil. 2012;93:1685–91.
Volkert D. Practical guideline for nutritional care in geriatric institutions. Z Gerontol Geriatr. 2009;42(2):77–87.
Vokert D, et al. [Mangelernährung], In: Pantel et al., editors. [Praxishandbuch der Altersmedizin] Kohlhammer GmbH Stuttgart. 2014; S217–41.
Welte T, Torres A, Nathwani D. Clinical and economic burden of community-acquired pneumonia among adults in Europe. Thorax. 2012;67(1):71–9.
WHO, International Classification of Functioning, Disability and Health. 2001 (resolution WHA 54.21).
WHO. Global recommendations on physical activity for health. Geneva: World Health Organization; 2010. p. 58.
White KL. Prevention as a national health goal. Prev Med. 1975;4(3):247–51.
Winter JE, MacInnis RJ, Wattanapenpaiboon N, Nowson CA. BMI and all-cause mortality in older adults: a meta-analysis. Am J Clin Nutr. 2014;99(4):875–90.
Yao X, Hamilton RG, Weng NP, Xue QL, Bream JH, Li H, et al. Frailty is associated with impairment of vaccine-induced antibody response and increase in post-vaccination influenza infection in community-dwelling older adults. Vaccine. 2011;29(31):5015–21.

Communication and Evaluation

25

Marjolein H.J. van de Pol and Marianne B. van Iersel

Abstract

Older people form a very diverse group with large differences in their preferred communication styles. Respect for the older person, his choices, and autonomy is the fundamental attitude underlying person-centered communication. Communication often starts with history taking. It depends largely on the patient characteristics and circumstances how to obtain a medical history. Discussing patient goals and wishes should be an integral part of history taking and assessment and form the root of person-centered communication.

Learning Objectives

By the end of the chapter, the reader will be able to

- Apply person-centered communication taking age-related problems into account
- Recognize the elements in communication that deserve extra attention in older persons
- Obtain a medical history from an older person taking specific age-related concerns into account
- Discuss personal values and life goals with older persons

M.H.J. van de Pol (✉)
Primary and Community Care, Radboud University Medical Center, Nijmegen, The Netherlands
e-mail: marjolein.vandepol@radboudumc.nl

M.B. van Iersel
Geriatrics Department, Radboud University Medical center, Nijmegen, The Netherlands

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*, Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_25

25.1 Introduction and Context

Every person is unique and with aging differences between persons in number of diseases, function, and well-being increase. Therefore older people form a very diverse group with also large differences in their preferred communication styles. Most older adults have at least one chronic medical condition, partially explaining why older people make nearly twice as many physician office visits. All persons want a physician who listens to them; however, expectations and stereotypes often influence the interactions between older persons and health care professionals.

Professionals tend to spend less time with older patients and take a more authoritarian role and often fail to address important psychosocial and preventive factors. Older persons differ largely in their communication wishes; however, most older persons want to be autonomous as long as possible, to be involved in decision-making processes, to participate in society, and to be treated with respect even if communication takes more time due to complexity.

The normal aging process itself also interferes with communication, such as visual and hearing impairments. On the other hand, language ability and verbal comprehension remain intact and vocabulary and experience and education acquired knowledge may even improve with age.

25.2 Effective Communication

Because of the age-related changes and diseases, effective communication with older persons requires additional attention next to the common aspects (America, TGSO 2012), see Table 25.1. Important aspects are attitude, hearing, and time/cognitive processing speed. Respect for the older person, his choices, and autonomy is the fundamental attitude underlying person-centered communication.

Stereotypes about aging and old age may influence communication of both the older person and the professional. Professionals may dismiss treatable symptoms as an inevitable part of aging. It helps to encourage older persons to voice their concerns and to let them know that you welcome their questions and participation. Avoid "elderspeak" (endearing or diminutive terms), which may lead to actual physical health consequences by making older persons feel disrespected and powerless. The same holds true for the "still syndrome," asking an older person repeatedly if he is still able to, for example, drive, bike, shop, etc. It helps to start a conversation with open-ended questions. When the patient starts talking, focus on active listening. Maintain eye contact and listen to how the message is being expressed. Paraphrases demonstrate that you are truly listening. Many older persons experience anxiety, uncertainty, and frustration with regard to their own aging process. Showing genuine interest in how a person feels and explore his emotions may reduce distress.

Successful communication involves mutual understanding of the information. Older persons may be reluctant to interrupt a conversation, especially when talking to a health professional. Therefore verifying listener comprehension is essential.

Table 25.1 General considerations and recommendations for communicating with older persons

General tips for improving interactions	
• Introduce yourself and draft the agenda	
• Recognize the tendency to stereotype; avoid ageism assumptions	
• Avoid speech that might be seen as patronizing ("elderspeak") and avoid the "still" syndrome	
• Sit down with the older person and avoid hurrying	
• Genuinely listen and avoid interrupting; observe	
• Demonstrate empathy	
• Avoid jargon	
• Include older person in conversation, avoid speaking solely to their companion or caregiver	
• Verify listener comprehension	
• Use humor and a direct communication style with caution when communicating with non-Western older persons	
General tips for improving face-to-face communication	
• Monitor and control nonverbal behavior	
• Minimize background noise	
• Face the older person to allow lipreading	
• Use direct, concrete actionable language especially when giving critical information	
• Avoid two or more questions in one sentence	
• Use visual aids such as pictures and diagrams	
• Ask open-ended questions	
Communication tips for older persons with specific impairments	
Hearing impairment	Check if hearing device is switched on and inserted correctly
	Never raise your voice, but speak calm, loud and clear in short sentences with a higher pitch
	Face the older person and articulate extra to allow lipreading
	Consider using a microphone and speaker
Vision impairment	Provide reading glasses
Cognitive impairment	Take extra time to ensure contact and trust
	Ensure that a companion or informal caregiver is present to support
	Avoid speaking slowly
	Simplify sentences
	Pose different types of questions according to conversational goals
	Use verbatim repetition and paraphrasing to facilitate comprehension

A way to verify comprehension is to ask the older person to retell the given information in their own words.

Age-related hearing loss and vision problems are common, influencing information transfer (see also Chapter 18). In older persons with hearing loss you should talk slowly in a normal tone and face the person to allow lipreading. Avoid spaces with loud background noises. Check if your information is heard and understood. Older persons with visual disorders may recognize your voice, but are less aware of nonverbal communication like facial expression and gestures. Check if eyeglasses are available.

Although many aspects of cognitive function are well preserved, cognitive aging does influence short-term memory and therefore information processing time increases (see also Chapter 7). Long and complex sentences challenge

memory. It is therefore advisable to chunk individual pieces of information in separate short sentences and use visual aids like pictures and diagrams to help clarify your key points. Keep in mind that emotional information, bad news or prognosis, influences the ability to memorize information. Sometimes it takes an older person a bit longer to find a word or formulate an answer. Take time and allow silence and pause.

25.3 History Taking and Assessment

In the medical setting communication often starts with history taking, reason for encounter, specific anamnesis, and medical and family history. Especially when patients are older, information on social circumstances and lifestyle should be included. Due to specific age-related problems history taking and assessment may be complicated.

It depends largely on the patient characteristics and circumstances how to obtain a medical history. A complete geriatric assessment may take around one hour and a half, which may be too tiring for the older patient. Therefore, make sure the patient has a comfortable seat. Moreover it may be helpful to gather preliminary data before the session (previous medical records or forms that the patient or family member can complete at home) (see also Chapter 26).

25.3.1 Structuring History Taking

In older patients, often the reason for encounter is not a specific complaint, but a complex problem like failure to thrive or tiredness. Presentation may be atypical and vague (see also Chapter 5). Asking patients about their current concerns and giving uninterrupted time to express these concerns may be helpful to unravel the problem. Older persons often take multiple medications (including over-the-counter medications) prescribed by several different doctors. Asking patients about their current medications—which can lead to complaints and major complications—gives invaluable information. The levels of functioning highly differ between individuals and the functional status influences which treatment or therapy is suitable for the patient. Sudden changes in (i) activities of daily living (ADL) are valuable diagnostic clues for an emerging new problem (Robinson et al. 2006).

A life history or biography is an excellent investment when providing long-term care. Knowing something about the life of your patient provides information about his relationships with others, responses to stress, and attitudes toward aging and death. Furthermore, information about the social situation of the patient is crucial. Basic information about living arrangements, safety, nutrition, habits, education, and financial situation enable realistic interventions for this specific patient. Family members or informal caregivers can provide invaluable extra information if the patient is unable to express himself, does not recognize his problems, or tends to downplay or on the other hand exaggerate problems (Table 25.2).

Table 25.2 Tips for executing and structuring the medical history

	Example
• Apply general considerations and recommendations for communicating with older persons	See Table 25.1
• Elicit current concerns	*What is bothering you most?*
• Give uninterrupted time to express concerns	
• Probe and encourage to ask questions	*Is there anything else?* Encourage the patient to bring a written list of concerns and questions
• Ask about medications	Ask patient to bring all medications (prescription and over-the-counter)
• Ask about functional status	*For example Bathing, dressing, cooking, shopping, managing finances*
• Consider a life history/ biography	Learn about life of patient: relationships, thoughts about family members, typical responses to stress, attitudes toward aging, illness, and death
• Obtain a social history	Living arrangements, access to transportation, safety, nutrition, drugs and alcohol use, typical daily activities, education, (previous) work, financial situation, social contacts, and well-being
• Involve family member of informal caregiver (hetero anamnesis)	Probe for downplay or concealment Probe for changes in daily life and functional status
• Clarify goals and wishes	
• Customize care by seeking information about cultural beliefs and values	
• Engage older person in shared decision-making	

25.4 Specific Communication Situations

25.4.1 Talking with Older Persons with Dementia

Older persons with cognitive impairment or dementia retain their ability to process the tone of the communication. Gain the persons attention by sitting in front of him and maintain eye contact. Speak in a soft tone and at a natural rate of speed. Do not deliberately slow down, which causes monotonous sound. Use simple, direct wording and make clear that the conversation is not a test, but a search for information to help the person. If possible, meet in a room familiar to the patient and consider having a family member present for support (see also Chapter 7).

25.4.2 Family and Informal Caregivers

Family and informal caregivers play an important role in the lives of older persons and may be important "informants" and can help to transfer information. In many cases family and informal caregivers can be a facilitator, but always check with the older person if he wants them around during a conversation. When a companion is present try to address both persons face to face. Always pose a question first to the older person, then ask the companion to complement if necessary.

Sometimes a family member or informal caregiver is named the health care agent or proxy and have the legal authority to make care decisions about their loved one. This often causes stress and anxiety for this person. Always emphasize that this person should voice what their loved one would have considered important in this particular situation, not their own wishes.

25.4.3 Talking About Sensitive Subjects

Many older persons and their health professionals avoid discussing sensitive subjects such as driving, urinary incontinence, sexuality, and safety. Addressing issues such as memory loss or depression are a challenge for health professionals. A technique for broaching sensitive subjects is to introduce a sensitive topic with a common concern approach: "*Many older persons of your age experience …*" or "*Some people taking this medication have trouble with.*" Another technique for bringing up sensitive topics is to place informative brochures on an obvious place in your consulting room.

Many older persons have a "living will"; however, this is often not discussed with a health professional. For many patients it is a relief as their health professional raises the topic of advance directives or "living will." You can start this conversation by using the common concern approach and talk about the importance of making plans for their future.

25.4.4 Cultural Diversity

People are culturally bound and every culture has its own ways of dealing with relationships, nature, life, and death. Therefore people from different cultures may have different perceptions of standard Western health care. Although you cannot become an expert in every culture, being sensitive to general differences may be helpful. Each culture has its own rules for body language. Direct eye contact is sometimes considered disrespectful. The use of alternative herbal treatments or folk remedies is common in many cultures. Use a professional medical interpreter in non-native speakers and provide written materials in mother tongue. In many cultures (especially Muslim and Hindu) disease is considered a family problem. Involving family members in the communication process is extra important. And last but not least, be careful when using humor in your communication. Although humor may ease tension, it can easily be perceived as condescending and disrespectful for culture or religion (see also Chapter 3).

25.5 Patient Goals and Wishes

In younger adults conversations about wishes and goals regarding diagnostics and treatment are often focused on cure and life prolongation or survival. In older persons well-being, staying independent, and quality of life are becoming increasingly

important. During history taking and assessment you should discuss with the older person what is important for him. What are important values and motivations and what goals does the person have for the short and longer term. These values and goals guide the complex decision-making process and are part of shared decision-making (SDM). SDM is an approach in which clinicians and patients communicate together using the best available evidence when faced with the task of making decisions. SDM is a dynamic process that takes place throughout consultations. In a continuous counseling dialogue the perspectives of both patient and health professional are linked. Ideally, the SDM process is integrated in the history taking and assessment procedures (Marcus-Varwijk et al. 2016).

Thus, older patients often require extra attention to make communication effective. However, this is certainly worthwhile because it is at the root of patient engagement and patient-centered care in complex situations (see also Chapters 25 and 33).

References

America, T. G. S. o. Communicating with older adults; an evidence based review of what really works. GSA; 2012.

Canada, T. R. C. O. P. A. S. O. CanMEDS competencies, from http://www.royalcollege.ca/portal/page/portal/rc/canmeds.

Marcus-Varwijk AE, et al. Optimising tailored health promotion for older adults: understanding their perspectives on healthy living. Gerontol Geriatr Med. 2016;2:2333721415625293.

Robinson TE 2nd, et al. Improving communication with older patients: tips from the literature. Fam Pract Manag. 2006;13(8):73–8.

Part VI

Instruments of Geriatric Methodology

The Comprehensive Geriatric Assessment: Goal-Oriented, Patient-Centered Care

26

Alberto Pilotto and Maria Cristina Polidori

Abstract

The comprehensive geriatric assessment (CGA) is available to health professionals since three decades and it can be considered the cornerstone of geriatric medicine. The CGA evaluates physical health while emphasizing other critical dimensions of the older person, including functional status, psychological health, and socioenvironmental parameters. If appropriately utilized, the CGA improves diagnosis, prevents geriatric syndromes, ameliorates discharge trajectories, and increases the chance to living at home after hospitalization. Moreover CGA-based predictive tools may give information on prognosis and life expectancy of the older subject. Thus CGA may help physicians and health professionals in clinical decision on diagnostic and treatment procedures in older subjects. The present chapter highlights the structure of CGA as well as its successful implementation in different settings.

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_26) contains supplementary material, which is available to authorized users.

A. Pilotto (✉)
Department of Geriatric Care, Orthogeriatrics and Rehabilitation, E.O. Galliera Hospital National Relevance and High Specialization Hospital, Genova, Italy
e-mail: alberto.pilotto@galliera.it

M.C. Polidori
Ageing Clinical Research, Department Medicine II, University Hospital of Cologne, Cologne, Germany
e-mail: maria.polidori-nelles@uk-koeln.de

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*, Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_26

Learning Objectives

By the end of the chapter, the reader will be able to
- Define the term CGA
- Describe the core-and additional measurable dimensions of the CGA
- Describe common assessments for each of the CGA domains
- Recognize the role of CGA as diagnostic and therapeutic tool of geriatric medicine

26.1 Introduction and Context

The CGA is a multidimensional diagnostic process based upon the pioneer approach of early British geriatricians who, in the 1930s, had observed high rates of long-term institutionalization among functionally impaired older patients, poorly evaluated from a functional, social, and psychological perspective. As a consequence, a methodology was initiated and improved with older persons aimed at evaluating not only medical aspects but also psychosocial status and functioning to establish clinical priorities and needs. In its initial structured implementation by an interdisciplinary team within the *Sepulveda Geriatric Evaluation Unit*, the CGA conduction showed large improvements in outcomes of older vulnerable patients, including increasing survival, improved functioning, and decreased nursing home placement (Rubenstein et al. 1984). Recent meta-analyses and systematic reviews confirm the therapeutic importance of the CGA (Ellis et al. 2011; Pilotto et al. 2017) and strongly support the need of overriding the barriers to its application (Gladman et al. 2016). Several years after its structured definition and description, however, the CGA is still being used in a very heterogeneous way across countries, methodologies and settings; therefore its ability to uncover the very individual manifestations of heterogeneity of aging and favor positive outcomes is underestimated. The purpose of this chapter is to ease the understanding and applicability of the CGA, as the cornerstone of geriatric methodology, for the generation of health practitioners in geriatrics which, in the third phase of the epidemiologic transition, will be at outmost need of adequate care for older subjects.

26.1.1 Relevant Terminology for the Understanding of the CGA

Goal-Oriented Care

It is patient-centered and anchors on patient's preferences, healthy life expectancy, prognosis, and skilled clinical decision-making. The instrument to achieve goal-oriented, patient-centered care is the cornerstone of geriatric medicine, the CGA.

Assessment and Screening

The Cambridge dictionary defines assessment as *the act of judging or deciding the amount, value, quality or importance of something or the judgment or decision that is made*. The Cambridge dictionary defines screening as *a test or examination to discover if there is anything wrong with someone*.

To formulate both descriptions in a geriatrics-attuned way, a **geriatric screening** aims to qualitatively identify, in the quickest possible way, conditions typical of advanced age able to significantly influence disease outcome and/or therapy, especially if ignored. Among these conditions are recognized polypharmacy, mild cognitive impairment, dizziness, dehydration, malnutrition, dysphagia, sensorial impairment, and foot abnormalities. Screening tools are mainly based upon yes/no questions. Therefore, due to the complex nature of age-related changes and to slow patient-physician communication speed, screenings often fail to identify the real needs of the older patient. For their feature of prompt performance, geriatric screenings still tend to be utilized in settings where geriatricians are usually not present, like the outpatient clinic of GPs and family physicians or the emergency room of the hospital. Screening tools vary from essential ones like the ISAR (Identification of Seniors At Risk) (McCusker et al. 1999) score to extended ones like the Lachs screening (Lachs et al. 1990). A recent systematic review of screening instruments with a meta-analysis of three of them revealed limited ability to stratify geriatric adults in the emergency department due to lack of accuracy and reliability (Carpenter et al. 2015); despite this limit, the authors suggest to keep using some common screening instruments while awaiting for more studies on this topic.

Geriatric Assessment

It is an instrument designed to quantitatively evaluate a specific subdomain (gait, daily functions, multimorbidity, cognition, cohabitation status, polypharmacy, etc.) of the CGA-related dimensions of the older person (see Section "the CGA," physical, psychic, social, and functional).

Geriatric assessment tools, like screenings, also vary largely, being used in some European countries in their basic form as part of DRGs up to more comprehensive forms for use in Geriatric Evaluation and Management Units (GEMUs) (Rubenstein et al. 1984) or those on the basis of which prognosis can be calculated by a mathematical algorithm (Pilotto et al. 2008). Due to the lack of evidence for the efficacy of screening instruments to identify vulnerable older adults in emergency departments (Carpenter et al. 2015), much attention is currently focused on the use of assessment tools conciliating reliable evaluation of complexity with feasibility in nonspecialized geriatric settings. There are several barriers to the adequate implementation of CGA programs to achieve better care (Gladman et al. 2016), of which the most important is likely the lack of geriatricians (https://www.nytimes.com/2016/01/26/health/where-are-the-geriatricians.html?_r=0), but innovative policy making, several EU actions and country-specific initiatives are focused on overcoming these difficulties.

Multidimensional

As opposed to the traditional clinical approach—usually expressing at the level of the single dimension "organ" and related physiology, pathophysiological mechanisms, diagnosis, and cure—the geriatric approach is defined multidimensional as it emphasizes, together with the medical diagnosis, the person's dimensions psyche, functioning, and socioeconomic status. For this reason, the typical geriatric examination is an assessment rather than a screening and is multidimensional, i.e., comprehensive, by nature—it is known as CGA. The multidimensional approach reflects the need of considering multifactoriality and syndrome features which, in turn, are related to the individuality and heterogeneity which characterize the nature of the aging process (see also Chapter 3). The multidimensional approach shows large acceptance at every age from patients and caregivers; in advanced age, the multidimensional approach is not only welcome by patients and caregivers but also mandatory from the medical point of view, because cure of disease is challenged, care must be personalized and response to therapeutic and rehabilitative approaches strongly depends upon functional independence and social support. Furthermore, causes of hospitalization and rehospitalization in older adults are often independent from main diagnosis. The CGA explores all the determinants of well-being identified and targeted by the EU programs, including health, education, marital status, living arrangement in addition to personal financial situation.

26.2 The CGA Definition

- The CGA is a multidimensional, interdisciplinary diagnostic process to determine the medical, psychological, and functional capabilities of a frail older person in order to develop a coordinated and integrated plan for treatment and long-term follow-up (Fig. 26.1).

The CGA:
- Integrates standard medical diagnostic evaluation
  But emphasizes:
- Quality of life, prognosis, and functional status
- Social resources
- Psycho-behavioral condition

Hallmarks of CGA are
- The employment of interdisciplinary teams (see also Chapter 27 on geriatric team)
- The use of any number of standardized instruments to evaluate aspects of patient functioning, impairments, and social supports

Frail older subjects are in focus of the more extensive forms of CGA, i.e., subjects at risk of loss of homeostasis and disability or functionally impaired or both. The performance of CGA has shown particular benefit for orthogeriatric patients and older patients undergoing surgery as well as for older patients with cancer, organ failure, and cognitive impairment (Fig. 26.2) (see also Chapter 7).

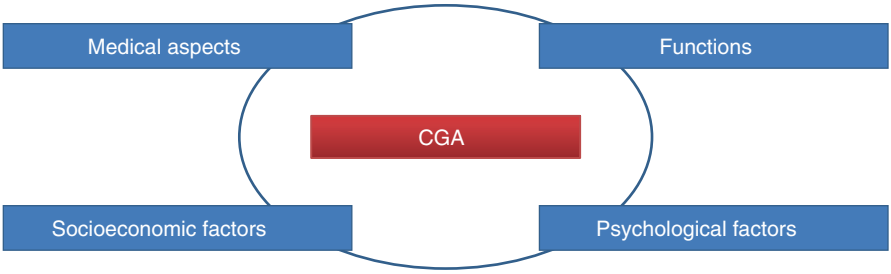


Fig. 26.1 CGA at a glance

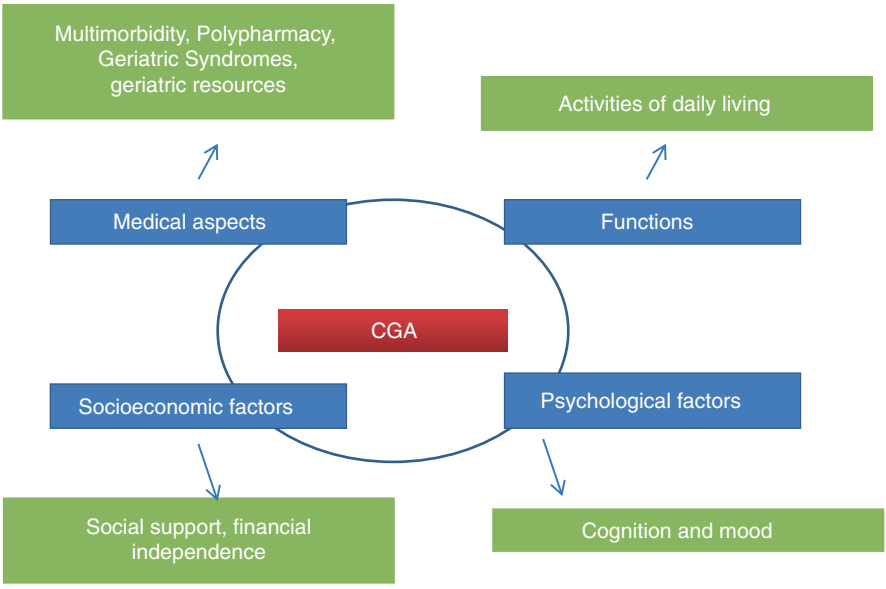


Fig. 26.2 The domains of the CGA

The CGA identifies geriatric syndromes, the risk of adverse outcomes and therefore patients benefiting from geriatric care according to their individuality (see also Chapter 3), complexity (see also Chapter 6), and priorities (see also Chapter 5); it paves the way to improved diagnostic accuracy, function, and quality of life (Table 26.1).

- The ultimate goal of a well-conducted CGA is to reduce the use of unnecessary services, ultimately allowing the implementation of integrated care pathways.
- The healthcare settings where the CGA shows effects are hospital, long-term care, community, and outpatient clinics (See Part VII).
- The interdisciplinary profile of the CGA warrants the employment of a multidisciplinary team of healthcare providers who use validated geriatric scales to identify needs and resources in each domain an establish an individualized geriatric intervention plan.

Table 26.1 Assessing older adults: CGA approach and assessments. All dimensions displayed are described in the relative chapters in detail

Dimension (in bold the 4 CGA domains)	Screening Example	Example of Assessment if screening positive	Geriatric team expertise and comment
Physical			
Medical Illness	Awareness?	Multimorbidity scale, example: CIRS*	Geriatrician; specialist referral if needed; For the collection of history family members and caregivers are critical; *Cumulative Illness Rating Scale
	Drug number and indication	Complete check with assessment of need for medication reconciliation	Geriatrician, specialized nurse, and pharmacist, computerized drug interaction lists; family members and caregivers are critical for proper collection of drug history
	Have you lost weight in the past months without trying? *BMI	MNA*, either short form or complete	Geriatrician, specialized nurse, and dietitian; *Mini Nutritional Assessment; *Body Mass Index. Family and caregivers critical to collect nutritional habits
Dentition	Physical examination; use of dental prosthesis? Problems or pain with prosthesis?	Check of prosthesis adequacy	Geriatrician, specialized nurse, and dentist if needed
Dysphagia	Swallowing problems?	Daniels test*	Geriatrician, specialized nurse, and logopedist / comanagement with dentist if needed; *validated for stroke
Hearing	*Whisper test; use of hearing aid;	W-A audioscope @ 40db (fail if unable to hear 1000hz or 2000hz tones); HHIE*	Geriatrician, specialised nurse, and audiologist if needed *Hearing Handicap Inventory for the Elderly. Family members and caregivers critical to collect information about sensorial impairment
Vision	Difficulty with driving, TV, reading, daily activities due to eyesight, even while wearing glasses?	Snellen chart (far vision)* and *Jaeger chart (near vision)*	Geriatrician, specialized nurse, and optician if needed, ophthalmologist if other age-related eye problems suspected (macular degeneration, cataract, retinopathy, excessive lacrimation, dry eye, etc.). Family members and caregivers critical to collect information about sensorial impairment
Pain	Do you feel pain? Where? Check for signs of pain in patients unable to communicate	Chronic Pain Scores	Geriatrician, specialized nurse, and anesthesiologist if needed; there is a multitude of scales and specialists should decide which test to use in each individual case

Table 26.1 (continued)

Dimension (in bold the 4 CGA domains)	Screening Example	Example of Assessment if screening positive	Geriatric team expertise and comment
Osteoporosis	History	DXA Assessments	Geriatrician, Orthopedic
Incontinence	Question as part of *ADLs, Lachs screening, Barthel Index	If screening positive, identification of reversible causes (DRIP*)	Geriatrician, specialized nurse with urologist and other specialists according to cause; *Delirium, Restricted mobility, Infection and Inflammation, Psychogenic polyuria
Pressure ulcers	Awareness or skin itching in a person with immobility syndrome; check for signs of pain in patients unable to communicate	ESS*, Norton Scale*, Braden Scale*	Geriatrician and specialized nurse, dermatologist, wound manager. *Exton Smith Scale. Many of the pressure ulcer scales can be used for prevention purposes
Mental			
Cognition	Clinics, Question on subjective memory impairment; 3-item immediate and delayed recall	International Diagnostic Criteria, SPMSQ*, Clock-drawing test*, MMSE*, MoCA*, CAM*, 4AT*	Geriatrician with neurologist and psychiatrist if needed; ergotherapy and logopedy if needed; *Short Portable Mental Status Questionnaire, Mini-Mental State Examination, Montreal Cognitive Assessment, Confusion Assessment Method, Assessment Test for Delirium and Cognitive Impairment
Mood	Do you often feel sad or depressed? GDS*	MADRS* CDSS*	Geriatrician with neurologist and psychiatrist if needed; *Geriatric Depression Scale; * Montgomery and Asberg Depression Scale; * Cornell Scale of Depression in Dementia
Spirituality			Geriatrician upon severity of condition with spiritual counselor if needed
Behavior	Do you often feel agitated?	NPI*	Geriatrician and specialized nurse; *Neuropsychiatric Inventory; NPI is used in dementia.
Functional			
Basic and instrumental activities	Do you have difficulties with bathing, dressing, getting to the toilet, transferring, continence, feeding?	ADL*, IADL*, Barthel scale*, Hand grip test*	Geriatrician and specialized nurse with physical therapist; social worker, logopedician/dentist nutritionist/ urologist/gastroenterologist/ nephrologist if needed; *Activities of Daily Living, Instrumental Activities of Daily Living

(continued)

Table 26.1 (continued)

Dimension (in bold the 4 CGA domains)	Screening Example	Example of Assessment if screening positive	Geriatric team expertise and comment
Balance and Gait, Sarcopenia, Frailty	Do you often feel dizzy? Have you fallen to the ground in the past year? Nutritional screenings Frailty screenings	TUG* and Tinetti* tests, Five times sit to stand test, lying to standing orthostatic test, nutritional assessments, frailty assessments	Geriatrician with physical therapist; neurologist, cardiologist, pharmacist, podiatrist, orthopedic if needed; *Timed Up-and-go Test
Socioenvironmental			
Social status	Who do you leave with?	Extended social assessment for healthcare and social support	Geriatrician with social worker and case manager
Financial status	Are you financially independent?		Social worker and case manager
Architectural barriers	Do you live in an apartment, in a house, which floor, with elevator?		Social worker
Care preferences			
Advanced care planning	Have you planned your care preferences?		Geriatrician with team and caregivers: goals of care, shared decision-making

*Tests in alphabetical order and respective references:

- 4AT. 4AT: rapid assessment for delirium; 2011. www.the 4at.com/.
- ADL. Katz S, Ford AB, Moskowitz RW, Jackson BA, Jaffe MW. Studies of illness in the aged. The index of ADL: a standardized measure of biological and psychological function. JAMA. 1963;185:914–9.
- Barthel Index. Mahoney FI, Barthel DW. Functional evaluation: the Barthel Index. Md State Med J. 1965;14:61–5.
- Braden Scale. Braden scale for preventing pressure sore risk. Prevention Plus. 2001. http://www.bradenscale.com/bradenscale.htm.
- CAM. Inouye, S., van Dyck, C., Alessi, C., Balkin, S., Siegal, A. & Horwitz, R. Clarifying confusion: the confusion assessment method. Ann Intern Med. 1990; 113(12): 941–948.
- CIRS. Conwell Y, Forbes NT, Cox C, Caine ED. Validation of a measure of physical illness burden at autopsy: the Cumulative Illness Rating Scale. J Am Geriatr Soc. 1993;41:38–41.
- Daniels Test. Daniels SK, McAdam CP, Brailey K, Foundas AI. Clinical assessment of swallowing and prediction of dysphagia severity. Am J Speech Lang Pathol. 1997;(6):17–24.
- ESS. Bliss MR, McLaren R, Exton-Smith AN. Mattresses for preventing pressure sores in geriatric patients. Mon Bull Minist Health Public Health Lab Serv. 1966.
- GDS. Yesavage JA, Brink TL, Rose TL, Lum O, Huang V, Adey MB, Leirer VO. Development and validation of a geriatric depression screening scale: a preliminary report. J Psychiatr Res. 1983;17:37–49.

Table 26.1 (continued)

- HHIE. Ventry IM, Weinstein BE. The hearing handicap inventory for the older persons: a new tool. Ear Hear. 1982;3(3):128–34.
- IADL. Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. Gerontologist. 1969;9:179–86.
- Jaeger's chart. Schrift-Scalen. In: Jaeger V, editor. Wien; I874. Fünfte Auflage.
- MMSE. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state". A practical method for grading the cognitive state of patients for the clinician. J Psychiatr Res. 1975;12(3):189–98.
- MNA. Vellas B. The Mini Nutritional Assessment (MNA) and its use in grading the nutritional state of older persons patients. Nutrition. 1999;15:116–22.
- MoCA. Nasreddine ZS, Phillips NA, Bédirian V, Charbonneau S, Whitehead V, Collin I, Cummings JL, Chertkow H. *The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment.* J Am Geriatr Soc. 2005;53(4):695–699.
- Norton scale. Norton D. Geriatric nursing problems. Int Nurs Rev. 1962;9:39–41.
- NPI. Cummings JL, Mega M, Gray K, Rosenberg-Thompson S, Carusi DA, Gornbein J. The neuropsychiatric inventory: comprehensive assessment of psychopathology in dementia. Neurology. 1994;44(12):2308–14.
- Snellen chart. H. Snellen, Probebuchstaben zur Bestimmung der Sehschärfe, Utrecht; 1862.
- Wisper Test. Swan IR, Browning GG. The whispered voice as a screening test for hearing impairment. J R Coll Gen Pract. 1985;35(273):197.

BMI = body mass index, CAM = confusion assessment method, CDSS = Calgary depression scale for schizophrenia, CIRS = Cumulative Illness Rating Scale, DRGs = diagnosis related groups, DXA = Dual-energy X-ray absorptiometry, EC = European community, EU = European union, GDS = Geriatric Depression Screening Scale, GPs = general pactitioner, MMSE1 = mini mental status examination, PDF = portable document format, QUADAS = quality assessment of diagnostic accuracy studies, RCTs = randomised controlled trails, TUG = Timed Up & Go, TV = television

26.3 CGA in Different Settings and Clinical Conditions

There is strong evidence for the efficacy of the performance of a CGA in specific settings—hospital, long-term care, and the community—as well as in specific clinical conditions—fractures, preparation to operative procedures, and cancer. Large meta-analyses showed the beneficial effects of CGA use also in the hospital:

- Reduction of mortality of up to 39%
- 25% increase in being discharged at home
- 12% reduction in hospital readmission and
- 41% increased chance of cognitive improvement

Units for Geriatric Evaluation and Management as well as for Acute Care for Elders as separate wards in the hospital showed consistent benefit on functional improvement of older patients after hospitalization. The effect of inpatient geriatric consultation services did not show similar beneficial results and recommendation for its implementation was not encouraged (Stuck et al. 1993). A recent meta-analysis of 22 randomized controlled trials (RCTs) on over 10,300 inpatients confirms that patients receiving CGA also in a post-hospital discharge program (started usually 2 days prior to discharge) are more likely to be alive and in their own homes at the end of a predetermined follow-up (Ellis et al. 2011).

As far as specific clinical conditions of older patients are concerned, CGA programs and geriatric comanagement have been proven beneficial in terms of

reduction in hospitalization rates, long-term mortality, postoperative complications, chemotherapy intolerance, cognitive impairment, and falls among older patients with fractures (Prestmo et al. 2015), those undergoing surgery (Partridge et al. 2014) and suffering from cancer (Caillet et al. 2014; Kalsi et al. 2015).

In conclusion, due to the rapid increase in the number of old-old and especially oldest-old persons in the frame of the third phase of the epidemiologic transition, the geriatric discipline and its main instrument, the CGA, have expeditiously emerged and expanded during the 20th century. As the projections for the future foresee many more millions of older adults than the already impressive ones, the focus of health professionals, healthcare providers, and policy makers is switching from disease-related outcomes to patient-centered outcomes such as healthy life expectancy, quality of life, and well-being during aging (Rubenstein 2015). Older persons are most frequently affected by multimorbidity and disability as well as by geriatric syndromes; the reasons of hospital admission in advanced age are often largely independent from main organ diagnosis and strictly related to functional impairment and increased risk for adverse outcomes. The multidimensional evaluation of the older person and the CGA in its structured form have proven effective since the beginning of the last century in improving diagnosis, ameliorating cognition, reducing rehospitalization rates, as well as favoring discharge at home, among others. Although more studies are needed, the adequate implementation of CGA programs in the hospital, long-term care, and in the community is mandatory to contain the personal suffering and huge socioeconomic burden associated with disability and geriatric syndromes.

26.4 CGA-Based Prognosis Evaluation for Clinical Decision-Making and Identification of Priorities

In spite of the urgent envisioned need for health expectancy-oriented multidisciplinary actions and patient-centered care, the single-mechanism, single-disease, single-therapy life expectancy approach is still imposingly under the spotlight for clinicians and researchers. In the diseases of advanced age, a drastic paradigm shift is needed towards personalized interdisciplinary and intersectorial multimorbidity medicine taking into account complexity, prognosis, and multifactoriality as protagonist of the scene. The EU calls for action in the fields of multimorbidity and patient-centered medicine have increased enormously the public awareness for the societal burden of disadvantageous patient trajectories in advanced age. Thus, ongoing programs address the effects of prognosis calculation on clinical decision-making in European older hospitalized citizens with chronic conditions.

26.5 The Multidimensional Prognostic Index

The Multidimensional Prognostic Index (MPI) is a tool that predicts survival and other negative health outcomes (hospitalization, institutionalization, length of hospital stay), based on a standard CGA, that considers information on eight domains, i.e.,

basal and instrumental activities of daily living, cognitive, nutritional, and mobility functions, multimorbidity, polypharmacy, and cohabitation status (Pilotto et al. 2008). Up to date, MPI has been validated and successfully applied in older patients hospitalized for acute diseases (i.e., gastrointestinal bleeding, heart failure, pneumonia, transient ischemic attack) or re-acutization of chronic disorders (i.e., chronic kidney disease, liver cirrhosis, dementia, cancer). Modified versions of MPI have been validated (Pilotto et al. 2013) and successfully applied in large populations of community-dwelling "frail" older subjects who underwent a CGA to be admitted to nursing homes or homecare services and affected by dementia, diabetes mellitus, atrial fibrillation, and coronary heart disease (CAD). Moreover CGA-based MPI have been validated and successfully applied in healthy older persons at population-based level in different countries from Europe, Australia, and far-East (Korea) also demonstrating excellent results in terms of accuracy, calibration, and feasibility.

Systematic reviews recently report that the MPI demonstrated the highest validity, reliability, and feasibility (i.e., a score 14—maximum value—on the Quality Assessment of Diagnostic Accuracy Studies (QUADAS) system), compared to other tools used to identify frail older patients (Warnier et al. 2016) and that MPI was one of the three CGA-based prognostic tools that are validated both in clinical practice and in research to measure frailty (Dent et al. 2016).

Very recently the MPI_AGE project (www.mpiage.eu), a multicenter project including over 20 partners from 7 different EC countries, United States and Australia, was co-funded by the European Union through the Health 2007–2013 Programme with the main objective to improve cost-effectiveness of interventions in multimorbid frail older persons by using MPI (Pilotto et al. 2015a). The main project results demonstrated that: (1) there is a clear and significant association between MPI score and survival time and risk of hospitalization in a population-based cohort with a very long-term follow-up up to 12 years (Angleman et al. 2015); (2) multidimensional indicators are not frequently recorded in general practitioners database across Europe; however, the accuracy of a MPI model incorporating age, sex, functional and cognitive functions result very effective in predicting 1-month and 1-year mortality among community-dwelling older people (Sultana et al. 2016; (3) MPI at hospital admission is an accurate predictor of in-hospital mortality, length of stay (LOS), and long-term mortality (Volpato et al. 2015). Moreover, during hospitalization MPI score changes in most of the patients and thus MPI may be useful to objectively monitoring the clinical evolution of acutely ill older patients admitted to the hospital (Volpato et al. 2016). An important aim of the project was to evaluate whether drug treatments in which the evidences are still lacking and the risk-benefit ratios are still under debate in older subjects, i.e., antidementia drugs, statins, and anticoagulants, were differently effective across strata of mortality risk assessed by the MPI. A series of studies carried out in subjects with dementia, diabetes mellitus, coronary artery disease, and atrial fibrillation (MPI_Age Investigators, Pilotto et al. 2015b, Pilotto et al. 2016a and 2016b) confirm that MPI may be useful in clinical decision-making and give the opportunity to the clinicians to identify the most effective interventions of older subjects according to their individual life expectancy profile.

26.5.1 Practical Notes

The MPI includes 63 items distributed in eight domains of CGA as follows:

1. Activities of Daily Living (ADL): 6 items
2. Instrumental Activities of Daily Living (IADL): 8 items
3. Short Portable Mental Status Questionnaire (SPMSQ): 10 items
4. Mini Nutritional Assessment (MNA): 18 items
5. Exton-Smith Scale (ESS): 5 items
6. Cumulative Index Rating Scale-Comorbidity Index (CIRS-CI): 14 items
7. Number of drugs used: 1 item
8. Cohabitation status: 1 item

To obtain the final index of a given individual, a software calculates a MPI score, which ranges from 0 to 1. This calculation can be easily performed by a program that can be downloaded at no cost (http://www.mpiage.eu/home/about-mpi) or using an IOS free app (iMPI).

Usually, results are ranked in three levels:

- 0 to 0.33—low mortality risk, MPI 1
- 0.34 to 0.66—moderate mortality risk, MPI 2
- 0.67 to 1—high mortality risk, MPI 3

A modified version of the MPI has been developed and validated for community-dwelling older adults (Pilotto et al. 2013). This index can be calculated with the use of a free program (http://www.mpiage.eu/home/about-mpi-svama), and also ranges from 0 to 1. However, cutoff points used to rank MPI-SVAMA are different and time dependent.

For short-term mortality (1 month):

- 0 to 0.41—low mortality risk, MPI 1
- 0.42 to 0.53—moderate mortality risk, MPI 2
- 0.54 to 1—high mortality risk, MPI 3

For long-term mortality (1 year):

- 0 to 0.33—low mortality risk, MPI 1
- 0.34 to 0.47—moderate mortality risk, MPI 2
- 0.48 to 1—high mortality risk, MPI 3

It is available, also, as an app for iPhone and iPad (download for free from App Store, iMPI). Both applications have the ability to generate a file PDF with the evaluation executed.

References

Angleman SB, Santoni G, Pilotto A, et al. Multidimensional prognostic index in association with future mortality and number of hospital days in a population-based sample of older adults: results of the EU funded MPI_AGE project. PLoS One. 2015;10:e0133789.

Caillet P, Laurent M, Bastuji-Garin S, et al. Optimal management of elderly cancer patients: usefulness of the comprehensive geriatric assessment. Clin Interv Aging. 2014;9:1645–60.

Carpenter CR, Shelton E, Fowler S, et al. Risk factors and screening instruments to predict adverse outcomes for undifferentiated older emergency department patients: a systematic review and meta-analysis. Acad Emerg Med. 2015;22:1–21.

Dent E, Kowal P, Hoogendijk EO. Frailty measurement in research and clinical practice: a review. Eur J Intern Med. 2016;31:3–10.

Ellis G, Whitehead MA, Robinson D, et al. Comprehensive geriatric assessment for older adults admitted to hospital: meta-analysis of randomised controlled trials. BMJ. 2011;343:1034–54. https://doi.org/10.1136/bmj.d6553.

Gladman JRF, Conroy SP, Ranhoff AH, Gordon AL. New horizons in the implementation and research of comprehensive geriatric assessment: knowing, doing and the "know-do" gap. Age Ageing. 2016;45:194–200.

Kalsi T, Babic-Illman G, Ross PJ, et al. The impact of comprehensive geriatric assessment interventions on tolerance to chemotherapy in older people. Br J Cancer. 2015;28:1435–44.

Lachs MS, Feinstein AR, Cooney LM Jr, et al. A simple procedure for general screening for functional disability in elderly patients. Ann Intern Med. 1990;112:699–706.

McCusker J, Bellavance F, Cardin S, et al. Detection of older people at increased risk of adverse health outcomes after an emergency visit: the ISAR screening tool. J Am Geriatr Soc. 1999;47:1229–37.

Partridge JS, Harari D, Martin FC, Dhesi JK. The impact of pre-operative comprehensive geriatric assessment on postoperative outcomes in older patients undergoing scheduled surgery: a systematic review. Anaesthesia. 2014;69(Suppl 1):8–16.

Pilotto A, Ferrucci L, Franceschi M, et al. Development and validation of a multidimensional prognostic index for one-year mortality from comprehensive geriatric assessment in hospitalized older patients. Rejuvenation Res. 2008;11:151–61.

Pilotto A, Gallina P, Fontana A, et al. Development and validation of a multidimensional prognostic index for mortality based on a standardized multidimensional assessment schedule (MPI-SVaMA) in community-dwelling older subjects. J Am Med Dir Assoc. 2013;14:287–92.

Pilotto A, Sancarlo D, Polidori MC, et al. The MPI_AGE European Project: using multidimensional prognostic indices (MPI) to improve cost-effectiveness of interventions in multimorbid frail older persons. Background, aim and design. Eur Geriatr Med. 2015a;6:184–8.

Pilotto A, Panza F, Copetti M, et al. Statin treatment and mortality in community-dwelling frail older patients with diabetes mellitus: a retrospective observational study. PLoS One. 2015b;10:e0130946.

Pilotto A, Gallina P, Panza F, et al. Relation of statin use and mortality in community-dwelling frail older patients with coronary artery disease. Am J Cardiol. 2016a;118:1624–30.

Pilotto A, Gallina P, Copetti M, et al. Warfarin treatment and all-cause mortality in community-dwelling older adults with atrial fibrillation: a retrospective observational study. J Am Geriatr Soc. 2016b;64:1416–24.

Pilotto A, Cella A, Pilotto A, et al. Three decades of comprehensive geriatric assessment: evidence coming from different healthcare settings and specific clinical conditions. J Am Med Dir Assoc. 2017;18:192.e1–192.e11.

Prestmo A, Hagen G, Sletvold O, et al. Comprehensive geriatric care for patients with hip fractures: a prospective, randomised, controlled trial. Lancet. 2015;385:1623–33.

Rubenstein LZ. Evolving models of comprehensive geriatric assessment. J Am Med Dir Assoc. 2015;16:446–7.

Rubenstein LZ, Josephson KR, Wieland GD, et al. Effectiveness of a geriatric evaluation unit. A randomized clinical trial. N Engl J Med. 1984;311:1664–70.

Stuck AE, Siu AL, Wieland GD, et al. Comprehensive geriatric assessment: a meta-analysis of controlled trials. Lancet. 1993;342:1032–6.

Stuck AE, Egger M, Hammer A, et al. Home visits to prevent nursing home admission and functional decline in elderly people: systematic review and meta-regression analysis. JAMA. 2002;287:1022–8.

Sultana J, Basile G, Trifirò G. Measuring frailty in population-based healthcare databases: multi-dimensional prognostic indices for the improvement of geriatric care. Geriatr Care. 2016;2:5596.

Volpato S, Bazzano S, Fontana A, et al. Multidimensional prognostic index predicts mortality and length of stay during hospitalization in the older patients: a multicenter prospective study. J Gerontol A Biol Sci Med Sci. 2015;70:323–9.

Volpato S, Daragjati J, Simonato M, et al. Change in the multidimensional prognostic index score during hospitalization in older patients. Rejuvenation Res. 2016;19:244–51.

Warnier RMJ, Van Rossum E, Van Velthuijsen E, et al. Validity, reliability and feasibility of tools to identify frail older patients in inpatient hospital care: a systematic review. J Nutr Health Aging. 2016;20:218–23.

The Geriatric Team

27

Sofia Duque

Abstract

Comprehensive and multidimensional assessment and intervention performed by an interdisciplinary geriatric team is the most efficient and effective method to deliver care to frail older people with complex medical conditions and care requirements that cannot be addressed by a single health professional.

Geriatric teams are established in different clinical settings such as acute geriatric units, outpatient geriatric clinic, in-hospital mobile teams, primary care facilities, rehabilitation facilities, nursing homes and others.

Geriatric teams are cost-effective, improving diagnostic precision, functionality and patient and caregiver satisfaction, and reducing mortality, hospitalization and institutionalization. Geriatric interdisciplinary care must be the standard of care for frail older people, but also non-frail older people may benefit. Geriatric teams may smooth fragmentation of care and transitions of care, improving quality of care.

Outstanding benefits of geriatric teams should support their dissemination across different settings of care attending older people.

S. Duque
Orthogeriatric Unit, Department of Internal Medicine, São Francisco Xavier Hospital, Occidental Lisbon Hospital Centre, Lisbon, Portugal

University Geriatric Unit, Faculty of Medicine, University of Lisbon, Lisbon, Portugal
e-mail: sofia.b.duque@gmail.com

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_27

Learning Objectives

By the end of the chapter, the reader will be able to

- Understand which patients are in need for comprehensive and multidimensional assessment and intervention by an interdisciplinary team
- Identify the geriatric team members and specific skills
- Identify the values and principles of the geriatric team to effectively deliver an interdisciplinary care plan
- Recognize that geriatric teams are cost-effective, improve several health and hospital outcomes and reduce fragmentation of care

27.1 What Is the Reason Behind Working in and with a Geriatric Team?

Previous chapters have mentioned that the older patient may present at the same time several risk factors, multimorbidity and geriatric syndromes. Also, diseases tend to have an atypical presentation. In the traditional medical approach the focus is disease centred; consequently, the diagnosis of geriatric syndromes and the assessment of function, quality of life, social, psychological, spiritual, financial, environmental and ethical are underestimated in routine care (Caplan et al. 2004). As the impact of a holistic and comprehensive management of older patients has been proven for evidence on morbidity, mortality and function, tailored assessment and interventions are required to improve quality of care (Caplan et al. 2004; Van Craen et al. 2010; de Jaime et al. 2013).

The purpose of the geriatric team is to gather all the skills of several healthcare professionals and to promote interdisciplinarity so that comprehensive care can be delivered to older patients in a linked fashion (Saltvedt et al. 2002). Multidisciplinarity is not sufficient to get the best standard of care due to the linkage and interaction between the conditions amongst older patients. For example: geriatricians and physiotherapists may provide a complete and individualized rehabilitation programme for a stroke patient, but if the patient has no social and economic resources to attend the rehabilitation centre, the rehabilitation plan won't succeed; in this case interdisciplinarity is needed and the social worker must be engaged. Interdisciplinarity is regarded as a core feature of the geriatric team and all the members of the geriatric team should maintain high-quality communication in assessment and decision-making processes, sharing the same goals and values for the patient.

27.2 How Does the Geriatric Team Work?

The geriatric team must include several healthcare professionals from different fields. The composition of the geriatric team is flexible according to the setting of care, the human and financial resources available and local specificities, including

physicians (geriatricians, physical medicine and rehabilitation physicians, old age psychiatrists, surgeons, oncologists), nurses, physiotherapists, occupational therapists, social workers, dieticians/nutritionists, clinical pharmacists, psychologists, speech and language therapists, spiritual support workers and social care workers (Caplan et al. 2004; Van Craen et al. 2010; de Jaime et al. 2013; Saltvedt et al. 2002; Ekdahl et al. 2015; Deschodt et al. 2013; Harari et al. 2007). A core team may be considered, usually including the physician, the nurse, the social worker and the clinical pharmacist, although it depends on the clinical setting (Caplan et al. 2004, de Jaime et al. 2013; Arbaje et al. 2010). The patient, the family and caregivers be also considered players of the team, and their preferences and goals must be respected (Ekdahl et al. 2015). The geriatric team professionals work and collaborate together to deliver patient-centred care (Van Craen et al. 2010; Saltvedt et al. 2002; Deschodt et al. 2013; Arbaje et al. 2010). Tailored care plan must result from a shared decision-making process (see also Chapter 5) by all professionals, driven by shared goals for a specific patient. Therefore, the responsibility for decisions and outcomes are also shared by the team, including the patient and the family. The outcomes do not only depend on individual competencies of team members but also on their competence as a group working collectively and in tight connection.

The Comprehensive Geriatric Assessment (CGA) is the standard method to evaluate patients (Deschodt et al. 2013; Hickman et al. 2015), to identify their problems and needs and to build an individualized plan of care (Van Craen et al. 2010, Ekdahl et al. 2015, Fulmer et al. 2005) (see also Chapter 26). While structuring the plan of care priorities frequently need to be identified and addressed primarily (for example: problems addressed at the first time should be those with greater impact on quality of life). The plan of care joins together the different perspectives of the team members and can include diagnostic procedures, medical referral to other health professionals, drug prescription, drug withdrawal, healthy lifestyle counselling (for example: nutrition and exercise recommendations, cognitive stimulation tasks), rehabilitation exercises, home environment adjustments, caregiver counselling (for example: advice how to manage behavioural and psychological symptoms of dementia), education and training to caregivers in providing care and support to the patient, counselling about social resources, services and policies, monitoring strategies, follow-up schedules, and several other interventions (Caplan et al. 2004; de Jaime et al. 2013; Ekdahl et al. 2015; Arbaje et al. 2010).

To effectively structure an integrated plan of care that results from a shared decision process and common goals, several skills and values must be developed amongst all the members of the team such as effective communication, respect and trust and team spirit (Arbaje et al. 2010).

Each member of the team has specific tasks and skills (Table 27.1), but all of them should understand that specific skills are mutually reinforcing and complementary (Hickman et al. 2015; Fulmer et al. 2005). However, strict restrictions should not be imposed, otherwise the continuity of care might be disrupted (for example: the nurse may activate social resources if the social worker is not able to do it in time). Nevertheless, it is crucial that the role and responsibility of each member are well defined (Hickman et al. 2015; Fulmer et al. 2005), avoiding

Table 27.1 Skills and tasks of core members of the geriatric team

	Skills and tasks
Geriatrician	Contributes to comprehensive geriatric assessment (greater focus in diagnosis of acute and chronic diseases and geriatric syndromes). Orders diagnostic tests. Prescribes pharmacological and non-pharmacological interventions. Provide counselling to patients and caregivers about disease prevention and monitoring and management of physical or mentally disabled patients. Referral to other healthcare professionals. Periodic reassessment and monitoring.
Nurse	Contributes to comprehensive geriatric assessment (greater focus in functional status and well-being, identification of needs and problems in care delivery). Assessment of adherence to pharmacological and non-pharmacological prescriptions. Counselling to patients and caregivers about healthy lifestyle, disease monitoring and practical implementation of the care plan. Provides education and training about how to assist the patient with activities of daily living and how to manage behavioural and psychological symptoms of dementia.
Social worker	Contributes to comprehensive geriatric assessment (greater focus in social, environmental, psychological, cultural and spiritual dimensions). Identifies community resources available and help patients and families / caregivers obtaining those services. Coordinates utilization of services and resources (transports, schedules, payment, administrative issues, etc.). Provides counselling about social policies and advocates for the patients and families to get benefits and services. Coordinate transitions of care. Identify and appropriately refers (suspected) cases of abuse and/or negligence. Provides support to caregivers.
Pharmacist	Optimizes drug prescription (dosage, formulation, schedule, withdrawal or replacement of drugs to reduce drug interactions and side effects). Alert about prescription of potentially inappropriate medications. Assessment of adherence to drug therapy. Counselling and education of patients and caregivers about the drug regimen. Monitoring of side effects. Delivery of drugs.
Physical therapist	Contributes to comprehensive geriatric assessment (greater focus on mobility and functionality). Deliver exercises to maintain, improve or restore mobility and function and to relieve pain. Counselling about safe physical activity to maintain health, fitness and quality of life. Delivery of programmes for falls prevention and cardiac and pulmonary rehabilitation.
Nutritionist	Contributes to comprehensive geriatric assessment (greater focus in nutritional status and diet habits). Assessment of nutritional status. Counselling about recommended dietary needs and strategies to improve intake. Prescribes medical nutrition therapy. Monitoring of nutritional status and adherence to healthy diet and nutrition therapy.
Psychologist	Assessment of cognitive, emotional and affective status and behaviour. Delivers psychotherapy and cognitive stimulation therapy. Counselling about informal cognitive training and how to manage behavioural and psychological symptoms of dementia.

overlap of tasks and unnecessary waste of time and resources, because the success of interventions results from appropriate integration of tasks.

To achieve this, each member of the team should deeply understand his task, but should also recognize when other skills are needed and which professionals must be called into action (Hickman et al. 2015; Fulmer et al. 2005); in addition, each

professional must anticipate potential interaction between interventions and provide the other team members the information needed to develop complementary tasks (Arbaje et al. 2010) (for example: if the physician is prescribing an expensive drug, the social worker must be informed about the possible need for reimbursement; if the physiotherapist identifies orthostatic hypotension during training, the physician must be informed in order to review drug treatment). Team building is important to develop the team spirit and training together might be useful to develop this value.

Team meeting is the most common technique used to develop teamwork (Caplan et al. 2004, de Jaime et al. 2013, Saltvedt et al. 2002, Ekdahl et al. 2015, Fulmer et al. 2005), but alternative processes may be used, provided that high-quality information is warranted and goals of intervention are clearly understood by all team members. In daily clinical practice, shorter meetings may be more effective and efficient to set individualized intervention plans; in such short meetings, some team members might not be present, although they can be called into action if the patient requires their specific skills (for example: the psychologist may only intervene when a neuropsychological condition is suspected). Administrative meetings with all the team members are also important to analyse outcomes and to reset goals and procedures.

High-quality communication is essential to teamwork succeed (Fulmer et al. 2005). To improve communication between team members they should use the same language, concepts and terminology. Information about the patients must be shared and clinical annotations, reports and registries must be clear (Arbaje et al. 2010). The responsibility of each task should be recorded. The record system documents and other tools used in patient assessment must be standardized. Information technology can be applied to get more user-friendly tools. Informal communication between team members can also be used to build a coherent care plan and promote continuity of care, but results of interventions or decisions must be recorded so that all the team is aware of that (Arbaje et al. 2010).

Effective communication (Hickman et al. 2015, Fulmer et al. 2005) is also important between the healthcare professionals and the patient, the family and caregivers (Arbaje et al. 2010). The geriatric team must be highly committed to motivate, educate and train the patient, the family and caregivers as they are key elements for the success of the intervention. Recommendations should be very clear and the team should be available to clarify doubts, to offer counselling and to reassure them whenever needed. Self-management is usually highly encouraged by geriatric teams whenever possible.

Leadership is an important skill to build an effective and efficient team. Different healthcare professionals can take the lead and rotate between them, to share responsibility and workload and to avoid conflicts. Leadership should not be confused with hierarchy; hierarchical structure does not facilitate teamwork. In clinical practice a case manager may be identified (usually the nurse or the geriatrician).

Like the composition of the geriatric team, also the structure and processes of the geriatric team are not rigid and depend on several aspects, such as: setting of care and type of patient, availability of healthcare professionals, goals of intervention, financial resources and local geography.

Geriatric teams may exist in different clinical settings inside and outside the hospital, varying according to the country. In the hospital, geriatric teams are established in acute geriatric units, orthogeriatric units, rehabilitation units, outpatient geriatric clinic, emergency departments, and as mobile teams delivering geriatric assessment to patients admitted to non-geriatric units but requiring geriatrics expertise (Caplan et al. 2004; Van Craen et al. 2010; de Jaime et al. 2013; Saltvedt et al. 2002; Ekdahl et al. 2015; Deschodt et al. 2013; Arbaje et al. 2010). Outside the hospital, geriatric teams can exist in primary care facilities, rehabilitation facilities, nursing homes/long-term care facilities, palliative care units, day care centres, assisted living facilities and others. Geriatric teams can also provide home visits to environmental assessment and intervention (Saltvedt et al. 2002; Ekdahl et al. 2015).

27.3 The Role of Geriatric Teams in Integrated Healthcare

Geriatric interdisciplinary care must be the standard of care for **frail older people** (Van Craen et al. 2010, Saltvedt et al. 2002, Deschodt et al. 2013). Evidence shows that geriatric teams can improve effectiveness of healthcare processes and outcomes.

Geriatric team care models showed

- To be cost-effective (Ekdahl et al. 2015; Harari et al. 2007)
- To improve diagnostic precision (de Jaime et al. 2013, Saltvedt et al. 2002, Harari et al. 2007), functionality (Caplan et al. 2004; Van Craen et al. 2010; de Jaime et al. 2013; Hickman et al. 2015), well-being (de Jaime et al. 2013) and patient and caregivers satisfaction (Van Craen et al. 2010; Arbaje et al. 2010)
- To optimize drug prescription (Saltvedt et al. 2002)
- To reduce depression (de Jaime et al. 2013), mortality rates (Saltvedt et al. 2002; Ekdahl et al. 2015; Deschodt et al. 2013; Hickman et al. 2015), hospital readmissions (Caplan et al. 2004; Hickman et al. 2015), outpatient consultations (de Jaime et al. 2013) and institutionalization (Van Craen et al. 2010; Ekdahl et al. 2015)

Overall interdisciplinary models can reduce medical errors and increase the patient safety (Arbaje et al. 2010). Comparing to traditional medical care, geriatric teams are very focused on patients and caregiver concerns and priorities, home environment safety and community resources utilization, aspects that may improve functionality and quality of life of patients and caregivers. Geriatric teams can therefore benefit patients and caregivers and the sustainability of healthcare system.

Fragmentation of care frequently occurs during delivery of geriatric care, namely when care is delivered by several providers (for example: hospital outpatient clinic, community health centre and home care services) (also see Part VII). This harmful

fragmentation of care can be smoothed by geriatric teams. Indeed, geriatric teams may be considered major players in integrated care systems, which recently have been advocated to best replace the standard models of healthcare. Geriatric teams have wide experience in coordination of services and appropriate management of limited resources.

Non-frail older people may also benefit from a comprehensive preventive programme to promote an active and healthy ageing delivered by a geriatric team.

Geriatric teams must be disseminated across different settings of care, tailored to the specific needs of the patients they are attending.

References

Arbaje AI, Maron DD, Yu QL, Wendel VI, Tanner E, Boult C, et al. The geriatric floating interdisciplinary transition team. J Am Geriatr Soc. 2010;58(2):364–70.

Caplan GA, Williams AJ, Daly B, Abraham K. A randomized, controlled trial of comprehensive geriatric assessment and multidisciplinary intervention after discharge of elderly from the emergency department--the DEED II study. J Am Geriatr Soc. 2004;52(9):1417–23.

Deschodt M, Flamaing J, Haentjens P, Boonen S, Milisen K. Impact of geriatric consultation teams on clinical outcome in acute hospitals: a systematic review and meta-analysis. BMC Med. 2013;11:48.

Ekdahl AW, Wirehn AB, Alwin J, Jaarsma T, Unosson M, Husberg M, et al. Costs and effects of an ambulatory geriatric unit (the AGe-FIT Study): a randomized controlled trial. J Am Med Dir Assoc. 2015;16(6):497–503.

Fulmer T, Hyer K, Flaherty E, Mezey M, Whitelaw N, Jacobs MO, et al. Geriatric interdisciplinary team training program. Journal of aging and health. 2005;17(4):443–70.

Harari D, Martin FC, Buttery A, O'Neill S, Hopper A. The older persons assessment and liaison team OPAL: evaluation of comprehensive geriatric assessment in acute medical inpatients. Age Ageing. 2007;36(6):670–5.

Hickman LD, Phillips JL, Newton PJ, Halcomb EJ, Al Abed N, Davidson PM. Multidisciplinary team interventions to optimise health outcomes for older people in acute care settings: A systematic review. Archives of gerontology and geriatrics. 2015;61(3):322–9.

de Jaime E, Vazquez O, Rodriguez ML, Sevilla E, Burcet S, Huarte-Mendicoa A, et al. Geriatric day hospital improves quality of life: a before and after study. Eur Geriatr Med. 2013;4(5):304–9.

Saltvedt I, Mo ESO, Fayers P, Kaasa S, Sletvold O. Reduced mortality in treating acutely sick, frail older patients in a geriatric evaluation and management unit. A prospective randomized trial. J Am Geriatr Soc. 2002;50(5):792–8.

Van Craen K, Braes T, Wellens N, Denhaerynck K, Flamaing J, Moons P, et al. The effectiveness of inpatient geriatric evaluation and management units: a systematic review and meta-analysis. J Am Geriatr Soc. 2010;58(1):83–92.

Part VII

Healthcare Settings for Older Persons

Types of Care in Geriatric Patients

28

Thomas Münzer

Abstract

Geriatric patients are a vulnerable population which presents with multiple medical and psychosocial problems. Thus, medical care should closely follow their functional and social pathway, include assessments that should be adapted to the underlying care timeline, and respect relevant social aspects. Although most of the older patients will be managed by primary care and family physicians, the slow transition from functional independence to increased care demands geriatric expertise. Care for geriatric patients in all settings should be respectful and tailored to the patient's needs.

Learning Objectives

By the end of the chapter, the reader will be able to

- Know about different types of care for geriatric patients
- Describe a classical in-hospital care pathway for geriatric patients
- Recommend specialty clinics based on a patient history
- Adapt care for geriatric patients according to their functional status

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_28) contains supplementary material, which is available to authorized users.

T. Münzer
Geriatrische Klinik St. Gallen and University of Zürich, Switzerland
e-mail: thomas.muenzer@geriatrie-sg.ch

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_28

28.1 Outpatient Medical Care for Older Adults

Outpatient medical care for older adults in Europe is often provided through primary care physicians and to a lesser extent directly by geriatricians who are predominantly hospital based. In general, old patients who need geriatric care are dependent on specialist referral that can sometimes lead to significant delay. Nevertheless several geriatric ambulatory care models exist. They all share some common features such as interdisciplinary and interprofessional team approach to the patients and continuation of care from ambulatory to hospital and within dedicated centers. For example, the US program for all-inclusive care for the elderly (PACE) has been demonstrated to improve quality of patient and to be cost effective (Segelman et al. 2014; Ekdahl et al. 2015). PACE provides a full range of healthcare for older adults including:

- Dentistry
- Emergency services
- Home care
- Hospital care
- Laboratory/X-ray services
- Meals
- Medical specialty services
- Nursing home care
- Nutritional counseling
- Occupational therapy
- Physical therapy
- Prescription drugs

In Europe, on a much smaller scale, only few such programs exist and they are not as well recognized as the PACE. In addition, insurance coverage of these programs varies between countries. One common European model is day care clinics which allow geriatric patients to participate in an interprofessional ambulatory day care program several times per week. Such programs mostly cover physical, occupational and speech therapy, in rare cases psychologists offer psychotherapy. In day care programs, the medical care of the patient remains in the responsibility of their primary care physicians. Other models of ambulatory care include outpatient clinics that concentrate on several functional aspects of geriatric medical care that offer organ or problem-specific diagnostics and give treatment recommendations to the referring physician (see Table 28.1).

Table 28.1 Established ambulatory specialist services for geriatric patients

Type of ambulatory service	Indication
Gait and falls clinic	Recurrent falls, fractures, gait, and mobility problems
Memory clinic	Cognitive decline, unstable driving
Nutrition counseling	Malnutrition, enteral tube feeding, sarcopenia
Preoperative assessment	Scheduled major surgery
Incontinence clinic	Recurrent urinary tract infections, continence problems
Geriatric psychiatry consultation	Anxiety, fear of falling, depression, medication, or drug addiction
Polypharmacy clinic	Medication associated adverse events, falls, cognitive problems

28.2 Inpatient Medical Care for Older Adults

An ideal process of in-hospital care each geriatric patient is depicted in Fig. 28.1. This process can be described as a care cycle starting in the prehospital period. Patient relevant information provided by general practitioners (GP) and family are key elements of this period and should delivered to the hospital. During the hospital period, every patient should receive a comprehensive geriatric assessment that triggers individualized goals and then interventions set by an interprofessional team. The patient's progress should be monitored weekly by interprofessional conferences (ITC) and reassessments. One key element of geriatric in-hospital care is the early discharge planning, starting immediately after admission and leading into a longer discharge period that prepares and bundles all relevant information for the GP and the family prior to the discharge of the patient.

Important characteristics of this circle of care are that:

- Each posthospital period can be viewed as a prehospital period.
- Discharge planning starts immediately after admission.

In contrast to geriatric medicine most medical specialties have different opinions and knowledge in how to communicate with or how to manage old persons. This can lead to misapprehension of patient's needs.

28.3 Social Care

Social support varies widely between European Countries as does the number of social counselors with gerontological training or geriatric knowledge. One of the problems with such services is that they deliver excellent consultation quality to the individual however the services are often not organized in a network and focus on one single topic (e.g., financial counseling, housing). The following topics are usually important for older people living at home:

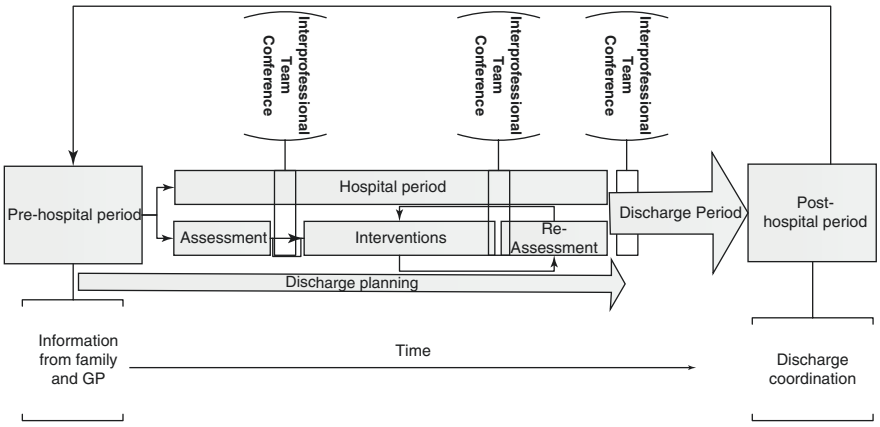


Fig. 28.1 Ideal inpatient geriatric care process

- Organization and financing of ambulatory home nursing care
- Financial counseling (e.g., filling out tax files, insurance company problems)
- Financing of long-term care facilities
- Support with legal aspects such as living wills
- Help with transportation in the case of mobility disability
- Measures to reduce caregiver burden

28.4 Integrated Care

One of the most important tasks for a geriatrician is to oversee and manage the multiple forms of professional systems providing care for the patient. As illustrated in Fig. 28.2, the role of a geriatrician in most cases is cross-professionally. During the time period of functional transition and or disease progress up to multiple players take care of patient's needs and interests. Integrating information and translating it with respect to the patient's functional capacity and desire is highly relevant in order to prevent over- and undertreatment. In such sense, geriatricians function as the patient's advocate and need a sound knowledge about the national and regional systems. They need to talk to primary care physicians, know which care the community nurses provide, and should exchange information also with family members. They are active in institutional care (acute and long term) and have to argue with insurance companies. Finally geriatricians need to have a sound knowledge of the national and regional social care systems in order to help to organize the ideal social solution for their patients (Di Pollina 2017).

28.5 Caregiver Burden

Given that many spouses and children of older persons take care of their relatives caregiver burden impacts tremendously on the carers (Adelman et al. 2014). Caregivers are often women with a lower level of education who live in the same household. They normally spend many hours with the care recipient, a situation that

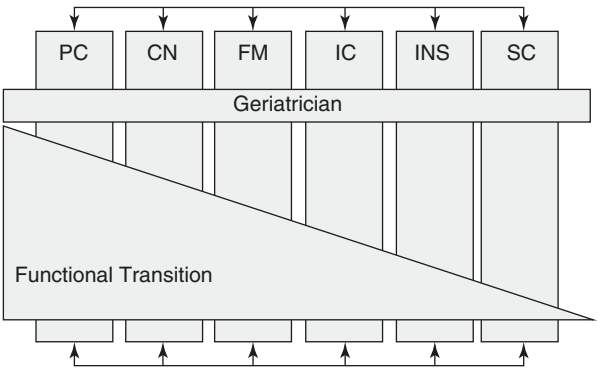


Fig. 28.2 The integrative role of geriatricians within a certain healthcare system. Abbreviations: *PC*, primary care; *CN*, community nursing; *FM*, family members; *IC*, institutional care; *INS*, insurance companies; *SC*, social care

can induce depression, social isolation, and potentially financial consequences. This induces feelings of guilt in both patients and caregivers. Patients do not want to become dependent and feel guilty whereas caregivers do not want to insist on the fact that they want to live their own lives. In addition, many traditional rules increase the caregiver load in family members who originate from different cultures and now live abroad as a second generation. The assessment of caregiver stress should be part of every geriatric history since it sets the basis for appropriate counseling (e.g., professional home nursing care) and for the development of coping strategies. A simple test is provided in the pocket card (Graessel et al. 2014). Since caregiver stress can also lead to aggression against the care recipient, it is important to examine patients for signs of older persons abuse such as:

- Bruises at the upper arms and or difficult to reach areas
- Unexplainable burns
- Genital bruises

28.6 Transition and Continuity of Care

With advanced aging the net sum of organ deterioration may lead to organ failure. Concomitantly fully functional persons undergo a slow transition towards reversible functional decline and finally dependence. Thus, medical care at each state should be based on the functional status of an older person and adapted accordingly. Initially a lot of medical care can be provided ambulatory. As soon as functional deficits appear care models shift towards institutions (hospital, rehabilitation unit) and finally into long-term care or hospice care (Fig. 28.3). For each transition phase care models have to be tailored to the person. Ideally each individual receives a care plan that includes biological, social, medical, and functional aspects as well as the individual wishes of the person. Geriatric medicine undergoes a continuous shift from cure to care as do persons who first are patients in a hospital and then residents in a nursing home. Thus, assessment, diagnostics, and treatment have to be carefully adapted to this transition. Finally in each phase a well-written living will or advanced care plan will help to guide medical diagnostics and or therapy. To date, medical care in many long-term care institutions is provided by the primary care physician who has taken care of the patient before admission. From a geriatric point of view this model is not ideal for several reasons. First, different physicians may also significantly differ in terms of medical diagnostics and treatment which bears the risk for unnecessary referral to an acute care hospital. Second, nursing staff may have difficulties reaching the responsible physician who is absorbed in his busy practice. In the last years several long-term care institutions have started to hire geriatricians as full time staff members who provide medical care to a defined number of residents and who are available for the development and implementation of quality care standards (Buurman et al. 2016; Nyweide and Bynum 2016).

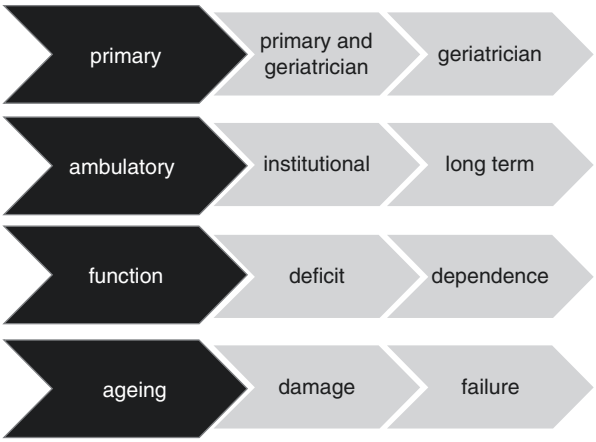


Fig. 28.3 Model of biological, functional, and care transitions over time

28.7 Social and Environmental Factors in the Care of Older Persons

Old patients often suffer from social isolation and poor financial status. Such conditions impact upon housing, nutrition, and mobility. All these problems are well-known risk factors for depression and self-neglect (Hand et al. 2014). Thus, good social care can only be delivered based on a specific socioeconomic history. Factors contributing to an old person's socioeconomic status are:

- Family, companion status, or marital status
- Financial situation
- Education history and work experience
- Personal psychosocial trauma (negative life events), coping strategies
- Patient and external resources

Other important factors associated with good quality of care are a positive attitude towards old persons and giving them the feeling that their problems are taken serious. From an environmental point of view older persons often suffer from mobility problems that limit the accessibility to care. Public transportation in metropolitan as well as rural areas is a key element to providing high-quality health services, and living in an age friendly neighborhood significantly increases life satisfaction and mental health.

References

Adelman RD, Tmanova LL, Delgado D, Dion S, Lachs MS. Caregiver burden: a clinical review. JAMA. 2014;311(10):1052–60.

Buurman BM, Parlevliet JL, Allore HG, Blok W, van Deelen BA, Moll van Charante EP, de Haan RJ, de Rooij SE. Comprehensive geriatric assessment and transitional care in acutely hospitalized patients: the transitional care bridge randomized clinical trial. JAMA Intern Med. 2016;176(3):302–9.

Di Pollina L, Guessous I, Petoud V, Combescure C, Buchs B, Schaller P, Kossovsky M, Gaspoz JM (2017) Integrated care at home reduces unnecessary hospitalizations of community-dwelling frail older adults: a prospective controlled trial. BMC geriatrics 17 (1):53.

Ekdahl AW, Wirehn AB, Alwin J, Jaarsma T, Unosson M, Husberg M, Eckerblad J, Milberg A, Krevers B, Carlsson P. Costs and effects of an ambulatory geriatric unit (THE AGe-FIT Study): a randomized controlled trial. J Am Med Dir Assoc. 2015;16(6):497–503.

Graessel E, Berth H, Lichte T, Grau H. Subjective caregiver burden: validity of the 10-item short version of the Burden Scale for Family Caregivers BSFC-s. BMC Geriatr. 2014;14:23.

Hand C, McColl MA, Birtwhistle R, Kotecha JA, Batchelor D, Barber KH. Social isolation in older adults who are frequent users of primary care services. Can Fam Physician. 2014;60(6):e322–e324-329.

Nyweide DJ, Bynum JP. Relationship between continuity of ambulatory care and risk of emergency department episodes among older adults. Ann Emerg Med. 2016.

Segelman M, Szydlowski J, Kinosian B, McNabney M, Raziano DB, Eng C, van Reenen C, Temkin-Greener H. Hospitalizations in the program of all-inclusive care for the elderly. J Am Geriatr Soc. 2014;62(2):320–4.

Primary and Community Care

29

Anne Wissendorff Ekdahl

Abstract

Care of older persons in community and primary care differs substantially between European countries, but most countries pursue the concept of "ageing in place", meaning that most older people do not live in institutions. More and more older people are living alone. Relatives still play an important role in the care of older people, but it differs substantially within Europe, and will probably remain the case even in the future. Care of older people with complex needs requires corresponding complex teams to be able to provide adequate and good quality of care, which means that there must be geriatric skills to diagnose, treat, and comprehensively follow up people with common geriatric diseases, including dementia, within primary and community care.

Specially designed structures within primary and community care should work proactively to take care of older people as many do not and cannot seek care appropriately. One of the reasons for this is cognitive decline.

A.W. Ekdahl
Division of Clinical geriatrics, Department of Neurobiology, Care Sciences and Society (NVS), Karolinska Institutet (KI), Solna, Sweden

Department of Clinical Sciences Helsingborg, Lund University, Lund, Sweden
e-mail: anne.ekdahl@gmail.com

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_29

Learning Objectives

By the end of the chapter, the reader will be able to

- Obtain an overview of the organisation of primary and community care in Europe
- Describe the geriatric patient in primary and community care
- Know about the inter-professional team taking care of frail older people and the way of working
- Be aware of the need of diagnosing dementia and proactive care for some older people
- Be aware of how to initiate Advanced Care Planning

29.1 Primary and Community Care of Older Adults in Europe

The population of Europe is ageing, as in rest of the world, and there has been a transition from an agrarian society living in big families to urban societies, where many are living alone. The most common household type in the European union (EU)-28 in 2015 was the single person living alone (33.4%) (Eurostat 2016a).

In recent decades, institutional living for older people has been gradually replaced by support in-home (home-help services) as many governments pursue the concept of "ageing in place" (Lundsgaard 2005). This shift from institutional living to living at home, even for the most ill, has been driven by the will of the populations and politicians, but also the high costs of as institutional living (Eenoo et al. 2016; Genet et al. 2012). As an example, in Sweden, it is almost impossible to move to an institutional living facility if you do not have a diagnosis of dementia and thereby the inability to call for help. Thus, conditions such as loneliness, old age (>90 years), the need for help in personal activities of daily living (ADL), or feeling insecure do not easily lead to moving into an institution as the number of beds in nursing homes has been steadily declining in recent years despite the higher number of older people (Eurostat 2016b).

In the majority of EU countries, informal caregivers provide a great deal of the care needed, estimated at 60% of the total, on average (Genet et al. 2012). But there are big differences between countries. In some, especially the Nordic countries, this part of informal caregiving is much less than 60%, as in these countries the family has no legal responsibilities; this lies with local authorities. On the other hand, in Bulgaria and Romania, all responsibilities lie with the family, but in most European countries the situation is a combination. In several countries, collective agreements provide the opportunity to take leave on grounds of adult care (Francesca and Prechal 1998).

Primary care providers offer the first point of contact for patients in most countries and are responsible for guiding the patient in their health care journey (Kringos et al. 2013). In many countries, primary care has the role of gatekeepers,

which means that all care passes through primary care, if acute hospital care is not needed. Referral systems are a requirement for coordination. In about half of the European countries such a system is obligatory for visiting all, or most, medical specialists. Whether primary care has the role of gatekeeping or not has an impact on the possibility to keep all forms of care together, providing a holistic view (see also Chapter 7). Also, the patient's opportunities for "shopping around" in a strong gatekeeping system have an impact on physicians' ability to deny prescriptions for antibiotics or hypnotics if not medically indicated.

The quality of care in primary care in Europe is safeguarded by minimum standards in most countries, including professional education, clinical guidelines, and patient rights (Kringos et al. 2013) (see also Chapter 18).

When the primary care system is built on "care on demand" there is a risk that younger and more demanding patients will usurp the care of the eldest and chronically ill.

29.2 Who Is the Geriatric Patient in Primary and Community Care?

What are the symptoms, diagnoses, and conditions of a geriatric patient living at home or in an institution? The most common diagnoses are heart failure and other diagnoses related to the cardiovascular system. Patients often suffer from symptoms such as fatigue, pain, breathlessness and dry mouth (Eckerblad et al. 2015; Gurner 2012). The polypharmacy is a special problem to address, and the time required to get a clear picture of the patient's actual medication list cannot be underestimated.

Common hearing and vision problems together with cognitive decline make communication time-consuming and difficult. Continuity of the primary and community caregiver supports good communication and is therefore very important. Unfortunately, cognitive decline is often overlooked and not diagnosed (Ekdahl et al. 2015; Lang et al. 2017), which makes appropriate care planning and follow-up difficult. In the future, the primary care physician must make the diagnosis of dementia more often than they do today, especially if older patients seek care with diffuse symptoms several times, where no plausible explanation can be found. But loneliness, depression, and anxiety are also common conditions and often co-exist with cognitive decline. There is therefore a need for proactive care when these conditions are suspected, and to organise primary and community care so that contacts among different caregiver organisations flow easily.

In caring for a patient with such complex conditions in primary and community care, there is an undisputable need for inter-professional teams including social care. All members of the team should be working towards the same goal, including the patient and their relatives as important participants in setting these goals. As cognitive decline is often present—not only because of dementia—the team, besides having skills in common geriatric physical illnesses, must have the ability to perform suitable investigations when a diagnosis of dementia is suspected. Also, pharmaceutical skills that address polypharmacy are very much needed. (For a suggestion of common members of the geriatric team, please see Table 29.1.)

When a frail older person comes to the attention of primary/and or community care, a Comprehensive Geriatric Assessment (CGA), described elsewhere in the book, should be performed (see also Chapter 26). The exact content and resources will differ in different contexts, but it is essential to cover medical, functional, psychological, and social needs if possible, and to use a standardised checklist containing validated instruments adapted and accepted by the members of the team in which they are to be used.

Working with geriatric patients requires time-consuming team work. It is therefore essential to allow enough time for team meetings. Not only team meetings, but also time for "softer things" such as education, comfort, and adaptation to a new life situation for the older patients and their relatives. This is in addition to the "regular" care such as physical examinations, laboratory and other investigations, treatments, and pharmaceutical prescriptions.

Table 29.1 Suggestion for the role and main tasks of team members in primary and community care of older people

Profession	Main tasks
Physician (geriatrician)[a]	Overview of all illnesses and their prognosis. Responsible for referrals to other specialist care and to team members not presently involved in the patient's care
Nurse	Main person responsible for the care process and a "hub" for all professionals in the team. Should carry out home visits
Physiotherapist	Aside from treating specific conditions, the physiotherapist has a very important role in preventing falls and giving advice in training
Occupational therapist	Assesses of functional status including for people with cognitive decline. Assistance with different helping aids
Clinical pharmacist	Works directly with physicians, other health professionals, and patients to ensure that the medications prescribed contribute to the best possible health outcomes
Dietician	Identifies nutrition problems and assesses the nutritional status of patients. Develops diet plans and counsels patients on special diet modifications/ nutritional supplies
Social worker	Promotes social change such as home-help services or moving to an institution. Problem solving in human relationships to enhance well-being
Psychologist	Assesses cognitive and behavioural functions in older people
Speech and language therapist	Promotes the diagnosis and treatment of communication, eating, and swallowing problems
Spiritual support worker	Focuses on meaning of life, hope and purpose, relationships
Assistant nurses/home help services	Assists in ADL and instrumental activities of daily living (iADL) functions

[a]The role of the geriatrician in out-patient care seems to be increasing in Europe [9], but for the purpose of this chapter the physician is mainly thought of as a primary care physician

29.3 Funding of Primary and Community Care

Most countries in Europe have well-developed primary and community care that covers almost all citizens. There is, though, a large variation in how funding, organisation, and delivery of community-based care are organised (Genet et al. 2012). There are different ways to distribute responsibility for home care: In some countries, health and social care are integrated, as in Portugal and Ireland, but most often they are not, which hinders communication. Also, in some countries policymaking is national, while in others it is more local, leading to inequity within a country (Finland, The Netherlands, Sweden) (Genet et al. 2012).

Between 50 and 75% of all formal long-term care is provided in the community (Organization WH 2008), but there are wide variations between countries. Usually a mix of funding mechanisms is in place (i.e. tax-based or insurance-based; national or regional) (Genet et al. 2012). A north-south or north-east gradient seems to exist, the north having more comprehensive publicly funded home-care systems than the southeast (Genet et al. 2012).

29.4 Implications for Organisation of Primary and Community Care for Older Adults

For the care of our older citizens, cooperation and communication between hospital and primary and community care is vital. As these organisations in most countries are reimbursed from different sources, this is a significant challenge (Kringos et al. 2013).

Primary care should be easily accessible for older people with cognitive decline and physical restrictions. Push-button telephones with multiple choices should be avoided as they cause anxiety and avoidance for this category of patients (Nygård et al. 2012). It should be easy to receive home visits, which is not the case in most of Europe—and above all the care should be comprehensive and personalised (Kringos et al. 2013).

To be able to provide this kind of care, it is suggested that part of the organisation within the primary care should focus on frail older people. This part of the primary care organisation should cooperate with out- and inpatient geriatric care for patients in need of intensive and sometimes in-hospital care. The aim must be to keep older people out of the hospital if hospital care is not strictly needed, because of the risk of falls, medication errors, or confusion, which often affect this patient group when hospitalised. (For a suggestion of a model, please see Table 29.1.)

29.5 Advanced Care Planning

It is important, based on best practice and known evidence not to expose frail older people to unnecessary life-sustaining actions in their extreme form such as thoracic compressions in an osteoporotic body, which would only lead to a painful and

prolonged death. This also applies to artificial nutrition and tube-feeding in people with severe dementia, which has not shown that it leads to a prolonged meaningful life (Brody et al. 2011). At the same time, it is important to acknowledge that boundaries and possibilities for treatment are shifting—so what seems to be appropriate today might be inadequate tomorrow.

As for the question of cardiopulmonary resuscitation, it is of value to discuss this with the patient before a critical event. Physicians are often uncertain about their patient's values and preferences, and relatives may feel stressed, uncertain, and reluctant to relinquish treatment aimed at sustaining life, even if cure is no longer possible. To ameliorate Advanced Care Planning (ACP) in older adults in primary and community care, it can be very useful to pose questions such as:

What do you understand about your illness or what's happening to you?

This can be a good question to open up discussions of ACP. One could also pose the more direct question:

Do you have an advanced care plan? Do you know what I mean by this?

If the answer is yes discuss the details—but a no would naturally lead to the question:

If we need to make decisions about your care and you are unable to speak for yourself, whom would you want me to speak to about your care?

This leads to natural exploration of the role of a Substitute Decision Maker (SDM) (You et al. 2014).

It is the physicians' delicate role to guide the patient to make decisions in his or her own best interest, since an impaired mental capacity to make decisions is not unusual when dealing with geriatric patients in primary and community care. There is a fine balance between guiding and overruling, and it is essential to keep the focus on dignified care and whenever possible in accordance with the older person's preferences.

The bylaws for withdrawal or withholding of medical treatment, euthanasia, and assisted dying are different in different European countries. It is of utmost importance to understand that euthanasia is not a replacement for good palliative care.

References

Brody H, Hermer LD, Scott LD, Grumbles LL, Kutac JE, McCammon SD. Artificial nutrition and hydration: the evolution of ethics, evidence, and policy. J Gen Intern Med. 2011;26(9):1053–8.

Eckerblad J, Theander K, Ekdahl AW, Unosson M, Wirehn A, Milberg A, et al. Symptom burden in community-dwelling older people with multimorbidity: a cross-sectional study. BMC Geriatr. 2015;15(1):1.

Eenoo LV, Declercq A, Onder G, Finne-Soveri H, Garms-Homolová V, Jónsson PV, et al. Substantial between-country differences in organising community care for older people in Europe—a review. Eur J Pub Health. 2016;26(2):213–9.

Ekdahl AW, Odzakovic E, Hellström I. Living unnoticed: cognitive impairment in older people with multimorbidity. J Nutr Health Aging. 2015:1–5.

Eurostat. Household composition statistics. 2016a. http://ec.europa.eu/eurostat/statistics-explained/index.php/Household_composition_statistics.

Eurostat. Long-term care beds in nursing and residential care facilities, 2008 and 2014 (per 100 000 inhabitants).png". 2016b. http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Long-term_care_beds_in_nursing_and_residential_care_facilities,_2008_and_2014_(per_100_000_inhabitants).png. Assessed 16 Feb 2017.

Francesca B, Prechal S. Care in Europe Joint report of the 'Gender and Employment' and the 'Gender and Law' Groups of Experts. Equal opportunities for women and men and matters regarding families and children. Brussels: European Commission; 1998.

Genet N, Boerma W, Kroneman M, Hutchinson A, Saltman RB. Home care across Europe- current structure and future challenges. WHO European Observatory on Health Systems and Policies; 2012.

Gurner U. Kvalitativ uppföljning av multisjuka äldre i ordninärt boende. Sveriges Kommuner och Landsting. Rapport. 2012. http://webbutik.skl.se/sv/artiklar/battre-liv-for-sjuka-aldre-en-kvalitativ-uppfoljning.html

Kringos D, Boerma W, Bourgueil Y, Cartier T, Dedeu T, Hasvold T, et al. The strength of primary care in Europe: an international comparative study. Br J Gen Pract. 2013;63(616):e742–e50.

Lang L, Clifford A, Wei L, Zhang D, Leung D, Augustine G, et al. Prevalence and determinants of undetected dementia in the community: a systematic literature review and a meta-analysis. BMJ Open. 2017;7(2):e011146.

Lundsgaard J. Consumer direction and choice in long-term care for older persons, including payments for informal care: how can it help improve care outcomes, employment and fiscal sustainability? OECD health working papers, No 20. Paris: OECD Publishing; 2005.

Nygård L, Pantzar M, Uppgard B, Kottorp A. Detection of activity limitations in older adults with MCI or Alzheimer's disease through evaluation of perceived difficulty in use of everyday technology: a replication study. Aging Ment Health. 2012;16(3):361–71.

Organization WH. The solid facts: home care in Europe. Milan: Università Commerciale Luigi Bocconi; 2008. ISBN:978-92-890-4281-9

You JJ, Dodek P, Lamontagne F, Downar J, Sinuff T, Jiang X, et al. What really matters in end-of-life discussions? Perspectives of patients in hospital with serious illness and their families. Can Med Assoc J. 2014;186(18):E679–87.

Urgent Care

30

Simon Conroy, Christian Nickel, and Simon P. Mooijaart

Abstract

Older people are increasingly becoming the major users of urgent care; this is a global issue. Older people are heterogeneous and there is not a simple algorithm that can describe the response to their urgent care needs. However, risk stratification, for example, using frailty in addition to conventional risk stratification tools such as triage or vital signs, can help segment the population into groups in whom some overarching principles can guide clinical care. Comprehensive Geriatric Assessment (CGA) is a useful evidence-based, overarching framework to guide assessment and management of older people with frailty presenting with crises. All clinicians throughout the health and social care system need to be able to apply the principles of CGA, adapted to the context. The initial assessment and attention to the urgent and important issues (e.g. delirium) can be adapted to the urgent care context. Rapid CGA in urgent care settings, supported by robust early supported discharge services, can improve outcomes for patients and for services. The clinical response needs to be supported by a systems-based approach that integrates governance, information and risk sharing, underpinned by stable leadership and a shared common vision.

S. Conroy (✉)
Department of Health Sciences, College of Medicine, Biological Sciences and Psychology, University of Leicester, Centre for Medicine, University Road, Leicester, UK
e-mail: spc3@leicester.ac.uk

C. Nickel
Emergency Department, University of Basel Hospital, Basel, Switzerland
e-mail: Christian.Nickel@usb.ch

S.P. Mooijaart
Internist-geriatrician, Department of Gerontology and Geriatrics, Leiden University Medical Centre, Leiden, The Netherlands

Institute for Evidence-based medicine in Old Age, Leiden, The Netherlands
e-mail: s.p.mooijaart@lumc.nl

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*, Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_30

Learning Objectives

By the end of the chapter, the reader will be able to

- Appreciate the importance of risk stratifying older people with urgent care needs
- Adapt the framework of Comprehensive Geriatric Assessment to urgent care settings
- Appreciate that different healthcare systems throughout Europe may require different organisation of the care for older patients

30.1 Introduction: Urgent Care for Older People

Urgent care is increasingly synonymous with older peoples' care in Organisation for Economic Co-operation and Development (OECD) countries, especially in Europe which has 23 of 25 of the world's 'oldest' countries. However, care models vary throughout Europe and differ, for instance, with respect to the presence and use of General Practitioners, the proportion of older patients living in nursing homes or sheltered home and the availability of home support for care and meals. All these factors necessitate a different organisational structure around the acutely ill older patient and may affect the characteristics of older patients who present to the Emergency Department (ED) or to the hospital. Across healthcare systems, there are also commonalities. Older patients presenting to the ED differ from younger patients. They are more acutely ill than younger patients, are more likely to have a longer stay in the ED, and are more likely to be hospitalised (Biber et al. 2013). Mortality after 90 days is reported to be around 10%, and functional decline up to 20% (Provencher et al. 2015).

30.2 Older People and Emergency Care: Presentation

Unlike patients with single presenting problems, older people will usually present with a range of issues, not just medical, that require addressing in order to achieve an effective management plan. It is not possible to describe every possible scenario; rather we offer a framework describing overarching principles that can be useful when assessing older people. There are four key points to consider:

- Non-specific presentations
- Multiple comorbidities
- Functional decline and altered homeostasis
- Differential challenge

Older people with frailty will usually present non-specifically. This means that the textbook clues for diagnosis may not be present (see also Chapter 5). For instance, an 85-year-old man with a fever and a systolic blood pressure of 110 mmHg might be hypotensive. If this is not appreciated correctly, sepsis may be missed. Do not interpret a lack of specificity as a lack of seriousness or urgency. Recognise the non-specific presentations (off legs, falls, immobility, delirium, etc.), and use them as a prompt to switch on your diagnostic antennae to focus upon objective pointers towards a diagnosis.

Risk stratification tools such as frailty scores can be useful to segment older people into different groups in whom different forms of interventions can be applied (see also Chapter 4). These interventions can be distinguished in two levels: first, in very vulnerable older patients the focus of care may shift from treating diseases and long-term outcomes to more palliative care focussing on improving and keeping quality of life. Second, in other patients, prevention measures may help to reduce the risk of adverse outcome such as functional or cognitive decline or mortality. CGA can inform the approach to systematically assess the individual patient situation and tailored prevention.

Although there is no perfect screening tool for use in urgent care settings, the Clinical Frailty Scale (CFS) has reasonable predictive proprieties, but more importantly is quick (<1 min) and simple to use. The grading of frailty status in the two weeks prior to attending urgent care—either by the individual or by their key informant—adds important information about prognosis and likely service outcomes (adapted from Wallis et al. 2015) (see also Chapter 4):

CFS grade	Length of Stay	Readmission rate	In-patient mortality	Care intentions	Service referrals	Post-discharge support
1	4	4%	2%	Reversible conditions	General internal medicine	Self-care
2	5	7%	2%			
3	7	11%	2%			Prevention (e.g. falls, memory clinic)
4	8	13%	3%			
5	10	15%	4%			
6	12	15%	6%			
7	13	14%	11%	Palliative > curative	Think about referral to geriatric medicine	Transitional care
8	12	10%	24%			
9	10	13%	31%			

Recently, it was shown in a retrospective study on patients aged 75 and older that frailty as measured by the CFS was independently associated with inpatient mortality (Romero-Ortuno et al. 2016). These data suggest that frailty helps in the prediction of inpatient mortality in patients aged 75 and older, independently of potential confounders. If these promising results are reproduced in other settings, the combination of vital sign abnormalities and frailty might be helpful in targeting early patient-centred interventions. However, assessing frailty is complex and there is a lack of consensus as to its definition. Furthermore, none of these frailty assessments are sufficiently precise to direct clinical care. In addition, frailty classifications can differ substantially depending on which frailty assessment tool is used.

30.3 Interventions

There is a strong evidence base indicating that older people with urgent care needs will benefit from a holistic approach to their care, as opposed to pathways or protocols tailored to specific presenting conditions. This holistic approach is often described as CGA (see also Chapter 26). The aim is to provide specialist care to those most in need but this is rarely possible for all patients, and in some health services specialist old age services do not exist. There is need therefore to upskill general acute care services that operate throughout the 24-hour cycle. CGA offers a useful structure to ensure that the assessment is holistic, and therefore more likely to result in a management plan that will be successful; CGA encompasses five domains. *Medical*: Have you got a working primary diagnosis, as well as a list of comorbidities that are active or important that also require attention? *Psychological*: Have you assessed for the presence of delirium, dementia or depression/anxiety? These will have a substantial impact upon ongoing management. *Functional ability*: You may have made a diagnosis, but how will you get the patient 'clinically stable for transfer'. Being 'medically fit' is meaningless if the person cannot mobilise to the toilet and back. *Social circumstances*: What support exists? What more is needed to enable a return home? Do you know how to access resources that can help? *Environment*: Is the home setting conducive to ongoing care needs, or are adaptation required? Do you know how to organise a home hazards review for people who have fallen?

A typical frailty (CGA) service will consist of a physician with expertise in the care of frail older people—usually, but not exclusively, a geriatrician; physiotherapists and/or occupational therapists; and nurse specialists that can offer a case management function. However, not in all healthcare settings, such expertise is available 24-7 and, especially in smaller hospitals, not cost-effective to organise. More important than the specific roles is the ability of the team, whichever their specialty, to deliver a proportionate, competent assessment and ongoing management. As a frailty service matures, role boundaries will blur, for example, with emergency physicians proving the diagnostic element in the emergency department, or single speciality therapists taking responsibility for physical and environmental assessments, as opposed to dual (duplicate) assessments.

30.4 Priorities in the Clinical Management of Older People with Frailty

General medical care principles apply as much to older people with frailty as anyone else—exclusion of life-threating situations such as airway compromise, evaluation of patient stability, e.g. with Early Warning Scores, timely diagnostics and so on. Typically, non-specific presentations with geriatric syndromes such as falls or delirium may cause diagnostic uncertainty (Nemec et al. 2010). Communication barriers necessitate involvement of carers and families. Coexisting problems

including multimorbidity make assessment and management complex. Problem lists are helpful, and in addition to traditional diagnoses also should include the range of relevant issues identified by CGA. This is achieved most efficiently by coordinated teamwork supported by structured but rapid communication, such as frequent brief discussion around marker boards highlighting actions and progress. It can be challenging to carry out a CGA in urgent care settings because of constraints of time and place or because of the priority of urgent medical treatment (e.g. for septic shock) or resuscitation. But even then, elements of CGA are needed as factors such as mobility, cognition, and patient's wishes at the end of life have important impact on clinical management (see also Chapter 26). Balanced decision-making should be governed by *values* more than *standards* (e.g. standard 'troponin pathways' to rule out cardiac disease). Increasingly, values are being conceptualised in terms of person and family-centred care, defined as 'healthcare that establishes a partnership among practitioners, patients, and their families (when appropriate) to ensure that decisions respect patient's wants, needs and preferences and that patients have the education and support they need to make decisions and participate in their own care'.

Do not content yourself with a single system diagnosis; there will usually be multiple active issues, which often interact and compete for prioritisation. List the active diagnoses and stratify them in order of urgency, as this will help you prioritise those that need addressing now, and those that can wait a few hours, but should not be forgotten. Multiple comorbidities often bring polypharmacy; use the urgent care episode to discern if there are active adverse drug events, or opportunities for deprescribing.

Older people with frailty will often have pre-existing functional impairment added to which, they will often delay presentation with acute illness, either through inherent reticence or reduced access to support or even neglect by carers. This means that the impact of an acute event will already have started to manifest in terms of functional ability, which could be exacerbated by enforced bed rest. A period of rehabilitation will often be needed—increasingly this should be done at home rather than in an institutional setting. Older people with frailty will have altered homeostatic mechanisms, which means that their reserve is impaired, making them more vulnerable to apparently minor insults, but also altering their responses, for example, altered drug handling. Remember 'start low, go slow' when introducing new drug treatments.

Those most in need are least able to access the services they require—this can be due to intrinsic factors, such as cognitive or sensory impairment, or extrinsic factors, such as the lack of age-attuned services or broader socio-economic factors.

Acute illness in the older patients represents a very vulnerable time in the life of a patient that requires specific care while in the hospital. It is important to realise, however, that for the best results, continuity of care is extremely important. The patient may already have been frail prior to hospital presentation, so gathering information about the current care plan will provide valuable information to direct care in the emergency setting. Likewise, once a patient has stabilised and can be

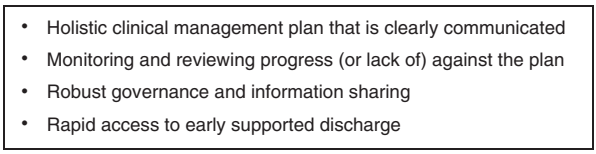


Fig. 30.1 Discharge planning at a glance

discharged from the hospital, either home or to an institution, discharge management is very important to ensure effective continuation of the initiated care plan. Key components of an effective early supported discharge service are shown in Fig. 30.1.

References

Biber R, Bail HJ, Sieber C, Weis P, Christ M, Singler K. Correlation between age, emergency department length of stay and hospital admission rate in emergency department patients aged >/=70 years. Gerontology. 2013;59(1):17–22.

Nemec M, Koller M, Nickel C. Patients presenting to the emergency department with non-specific complaints: the Basel non-specific complaints (BANC) study. Acad Emerg Med. 2010;17(3):284–92.

Provencher V, Sirois M-J, Ouellet M-C, Camden S, Neveu X, Allain-Boulé N, et al. Decline in activities of daily living after a visit to a Canadian emergency department for minor injuries in independent older adults: are frail older adults with cognitive impairment at greater risk? J Am Geriatr Soc. 2015;63(5):860–8.

Romero-Ortuno R, Wallis S, Biram R, Keevil V. Clinical frailty adds to acute illness severity in predicting mortality in hospitalized older adults: an observational study. Eur J Intern Med. 2016;35:24–34.

Wallis SJ, Wall J, Biram RW, Romero-Ortuno R. Association of the clinical frailty scale with hospital outcomes. QJM. 2015;108(12):943–9.

Inpatient and Outpatient Rehabilitation Care

31

Finbarr C. Martin

Abstract

Rehabilitation is about preventing, preserving and recovering the losses of functional ability that are so important for well-being. Functional ability is central to healthy ageing. Age-related changes are inevitable though highly variable between individuals. Additional disorders, including acute and long-term conditions and injuries are common. Together these factors determine the intrinsic capacity of the individual. How this impacts functional ability depends on the environmental challenges and enablers and the individuals' interactions with them. The term "disability" covers the range of changes in capacity and abilities. As its population ages, older people account for an increasing proportion of disability in Europe.

Rehabilitation is part of the clinical care of most older patients. The goals and techniques differ in different settings but the principles remain the same. A multidimensional assessment, usually by a multidisciplinary team, leads to individualised goal setting and treatment plans. Exercise and other forms of training are common features of the interventions. Evidence is growing fast about how best to organise and provide rehabilitation. It is important for geriatricians, but also for primary care and other specialists to understand the place of rehabilitation in the care of the older patient.

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_31) contains supplementary material, which is available to authorized users.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_31.

F.C. Martin
Division of Health and Social Cate Research, King's College London, London, UK
e-mail: finbarr.martin@kcl.ac.uk

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_31

Learning Objectives

By the end of the chapter, the reader will be able to

- Understand the model of functioning, disability and health applied to older people
- Appreciate the combined lifecourse impact of ageing, acute and long-term conditions
- Know what is meant by a multidimensional, multidisciplinary approach
- Be aware of the growing evidence for clinical effectiveness of rehabilitation in a number of community and hospital clinical settings

31.1 What Is Rehabilitation?

The World Health Organization (WHO) estimated that over a billion people, about 15% of the world's population, had some form of disability. Rates of disability are increasing due to population ageing and increases in chronic health conditions. When WHO launched the "*WHO global disability action plan 2014-2021*, the *World report on disability",* it did so as a human rights issue as well as a public health issue because disability is associated with socio-economic disadvantage and poorer health.

A quarter of the European Union adult population (aged 16+) reported some or severe long-standing limitation in usual activities for 6 months or longer due to health problems in 2015 (http://ec.europa.eu/eurostat). These activities include working, housekeeping or participating in leisure activities. Prevalence of disability is higher in:

- Women than men
- Older than younger people
- About twice as high in poorer individuals and communities

Disability is best understood with the WHO's "International Classification of Functioning, Disability and Health (ICF) framework" (http://www.who.int/classifications/icf/en). This can help create a shared understanding and language across disciplines, better clarify the focus of interventions and the need for divisions of labour and therefore help collaborative multidisciplinary practice. The model promotes a holistic approach because it provides an understanding of the interplay between individual characteristics and the physical and social environment in which people live (see also Chapter 3).

In this model, the body (including organs) structure and function are impacted by ageing and disease which both contribute to the intrinsic capacities of the individual, across domains such as strength and mobility, vitality, cognition, mood, nutritional status, vision and hearing. Functional ability is a product of intrinsic capacity,

environment and the interactions between them, i.e. what an individual does and how. Intrinsic capacity generally declines from midlife onwards but peak capacity and its rate of decline are both highly variable between individuals. Some loss of capacity has little or no effect but when reserve is lost, either acutely or gradually, then functional ability is impacted. How this then affects an individual's everyday life depends on how their environment helps or hinders them.

31.1.1 Rehabilitation for Older People

There are several situations where rehabilitation has an important role:

- Identifying losses of capacity or functioning before a crisis occurs in order to enhance both by community-based clinical and social interventions.
- Prevention or minimising loss of function during the acute phase of illness or injury and assisting recovery of function afterwards.
- Supporting the individual with reduced capacity and function to slow further deterioration, and to enhance autonomy and participation in life thorough practical assistance, assistive devices and enabling environments.

The role of primary care, medical specialists, community services and hospitals in these activities differs across Europe:

- Only in countries with well-developed primary care is it possible to have proactive identification of individuals with early declines in function which can prompt more detailed evaluation leading to restorative treatments
- Some countries have few geriatricians, or the geriatricians have limited roles
- Responsibility for stroke care varies between geriatricians, internists and neurologists, although geriatricians have been the main leaders in effective stroke rehabilitation
- Rehabilitation from trauma may be led by medical rehabilitation specialists, geriatricians or orthopaedic services.
- The numbers of hospital beds vary enormously: for example, Germany has over twice the number relative to its population compared to UK. This means that recovery/rehabilitation is more likely to be provided in hospitals in some countries but in community settings in others.
- Community-based services may be in care homes, but in some countries, it is increasingly being offered in patient's homes.

31.2 Who Needs Rehabilitation?

Rehabilitation is part of the clinical care of most older patients. It is rare that nothing useful can be done to enhance even very limited function or autonomy, even near the end of life. It can be a valid component of palliative care. Thus a broad conception of rehabilitation is necessary: it is not only about restoration to full capacity!

31.2.1 Community Dwelling People

Many older people accommodate to a decline of intrinsic capacity by changing their activities or how they do them. This can be helpful, but may also mask potentially remediable change. Ageist presumptions may result in older people themselves, and/or their families, reducing expectations. Therefore detecting decline before it becomes disabling is important. This can be achieved by (i) case finding, i.e. seeking opportunities for treatments to stop/slow/reverse loss of reserve capacities when patients attend for other reasons or are seeking practical help; (ii) screening within higher risk populations based on age.

Either way, simple assessments or questions followed by structured comprehensive geriatric assessment can identify losses of capacity, the explanation for them, and the potential and desire for treatment. Some examples are:

- Low strength or slow walking speed relative to age defined ranges, both being predictive of subsequent loss of functional abilities.
- Vision impairment, leading to increased risk of falls or reduced physical activity.
- Cognitive decline, leading to poor diet, social isolation or depression.

31.2.2 Hospital Inpatients

For older people with an acute illness or injury, a rapid reduction of functional ability is common, whether the person is admitted to hospital or treated with a "hospital at home" approach. For older patients, hospital admission itself is almost always associated with a decline in function, regardless of the cause of admission, due to reduced physical activity and nutrition, and loss of autonomy (Covinsky et al. 2011). The acute event itself may also lead to an acute decline of intrinsic capacity (strength, cognition, etc.), but this may be superimposed on gradual declines associated with long-term conditions. Frailer individuals are particularly liable to have steep declines in function when ill.

Patients suffering a stroke or fragility fracture merit a special mention as they are both frequent and potentially very disabling events.

31.3 How to Organise and Provide Rehabilitation

31.3.1 General Principles

The content of any rehabilitation programme will be designed to address the particular impairments and functional difficulties identified on a multidimensional assessment. For older patients in the community or as inpatients, regardless of the new condition, a comprehensive geriatric assessment is needed, and there is usually a need for interventions across a range of domains.

Training is usually part of any rehabilitation plan. This means the repetitive performance of a well-defined task which may not have any immediate functional component. Examples include:

- Progressively increasing resistance exercise in order to improve muscular strength and power
- Increasing walking distances repeated several times a day to increase endurance
- Standing on one/both feet, and with/without eyes open to improve balance
- Cognitive exercises to improve alertness and sustained attention

Detail of the specific techniques used by the variety of therapists involved is beyond the scope of this chapter. Training will be accompanied by functional activities. Evidence suggests that the benefits are complementary.

31.3.2 Goal Setting

Goal setting is central to a patient-centred approach to successful rehabilitation. Agreeing goals with patients is only meaningful if it is based on honest communication of the potential benefits, risks and burdens of the treatments on offer. These will change over time. For example, after an acute illness, the goals evolve as the patient recovers (or does not recover) functional abilities. Relevant considerations when considering the timing and options of rehabilitation include:

- What are the patient's fears, expectations, beliefs and priorities, short and long term?
- What is the patient's current emotional and cognitive state and is this likely to change?
- Has the patient achieved physiological stability?
- What is the limit of the patient's current ability to participate in active exercise?
- Might the patient participate more or recover quicker at home? This will be influenced by their attitudes as well as the social support available to them.

31.3.3 The Multidisciplinary Team

If you refer back to the WHO ICF model to understand disability, it is clear that rehabilitation may be aimed at ameliorating the effects of disease, rebuilding intrinsic physical or mental capacity, learning to overcome limitations by doing things differently, altering the environment, or providing human, mechanical or even computer-based assistance. Thus, a team with many different skills is needed. Multidisciplinary team working is a cornerstone of rehabilitation. In geriatric medicine services, this typically consists of doctors, nurses, physical therapists and occupational therapists as core members plus other disciplines as

needed, including speech and language therapy, clinical psychology, social work, dietetics, pharmacy, podiatry and orthotics (see also Chapter 27). The patient and very often their family are also team members, but their roles and responsibilities need sensitive discussion. In some countries, physicians prescribe most elements of the rehabilitation care, but in others, physical and other therapists are more autonomous.

The balance of inputs will differ between patients and for the same patient over time. A holistic appreciation of patient's needs means that none of these have primacy. On the other hand, teams need coordination and this is often done by an experienced doctor, a nurse with case management skills or the therapist most intensively involved with the rehabilitation programme. Effective communication within the team is a critical success factor. Crucially, team members must have the same understanding of the overall goals of their joint efforts, whilst each member is also likely to have specific objectives to work on that contribute to achieving the goals. Team meetings are usually needed, augmented by shared clinical records, which is easier to achieve if based on web-based or other electronic sharing systems. Frequency of meeting depends on the context, perhaps daily on acute wards, or weekly in community rehabilitation settings where the patient's condition changes slower (see also Chapter 27).

31.4 Rehabilitation in Specific Settings

31.4.1 Community Settings

Community programmes are usually short term, prompted as explained above by screening or case finding, but may also be provided after a hospital inpatient spell. For many patients, the interventions are generic, such as strength and balance training to postpone mobility disability. But exercise programmes vary according to the objective, from cardiorespiratory fitness (endurance), strength and power to enhance activities of daily living (ADL), strength and balance to prevent falls. Fear of falling can be reduced and other confidence issues addressed with a supervised gradual approach.

Some people will need a rehabilitation component built into a longer term tailored approach specific to their condition. An example is Parkinson's disease. In addition to optimal drug therapies, rehabilitation interventions need to be tailored as the individual's needs and priorities change. Goals include falls and injury prevention, avoiding protein-energy malnutrition with supplements, preventing aspiration pneumonia by therapy advice and altering food and drink choices, maintaining spoken communication with speech or assistive devices for dysarthrophonia, mitigating the risk of depression with social stimulus and various measures to enhance sleep. Addressing these in primary or community health settings will usually require expert input from relevant therapists, and becomes increasingly important as the disease progresses.

31.4.2 Rehabilitation After Acute Illness

Rehabilitation interventions for hospital in patients can be directed at different targets:

- Minimise the duration and extent of the loss of intrinsic capacity by diagnosis and rapid treatment of acute illness.
- Maximise functional ability despite reduced intrinsic capacity by reducing unnecessary barriers in the clinical environment (e.g. hospital ward design and routines).
- Prevent or minimise losses of lean body mass, particularly muscle, by optimal nutrition, and early exercise training.
- Promote independent activity when capable, balanced by supportive care when necessary.
- Rebuild intrinsic capacity in the post-acute phase, usually by some sort of training exercise.
- Maximise functional recovery by reducing environmental and domestic barriers such as steep steps and/or providing assistive devices.

The details of these interventions and the balance between them will vary considerably between individuals with different problems, and for any one individual during their journey of recovery. This is the clinical science of geriatric rehabilitation. Table 31.1 shows how this applies to the conditions most often involving significant rehabilitation. This demonstrates whilst certain conditions may present specific challenges, there are strong similarities in the needs of patients despite them having different medical conditions. This illustrates the general principle in Geriatric Medicine: a focus on function and syndromes, rather than diseases. The hallmark of geriatric rehabilitation is that it is based on a comprehensive assessment of all domains rather than disease-based protocols. Table 31.2 shows some differences in rehabilitation between younger and older people.

Ward-based rehabilitation of older patients recovering from acute illness usually combines specific training with functional activities such as walking to a toilet. These are more meaningful to the patient and therefore encourage participation but also effective as they tap into previously learned coordinated cognitive and neuromuscular patterns. To do so, it is usual to repeat the tasks each time in the same manner. Certain rehabilitation programmes are less likely to benefit patients with depression, extreme frailty or dementia and these factors must be realistically considered.

Patients differ in their ability to participate in rehabilitation interventions. This can limit the benefits and can also increase the burden experienced by patients. The doctor has responsibility to identify and overcome the medical obstacles to patient's participation, which include unresolved delirium, depression, pain, anaemia, dehydration and physiological instability: it may be necessary to modify or to postpone interventions.

Table 31.1 General approach to rehabilitation with some examples of the interventions needed for common acute problems of older people

Intervention to maximise recovery		Condition			
		Acute medical illness, e.g. sepsis	Exacerbation of COPD	Hip fracture	Stroke
Acute	Generic	Prevent falls and deconditioning		Prevent complications of immobility	
		Prevent dehydration, delirium, correct vitamin/mineral deficiencies			
	Specific	Rapid diagnosis and treatment	Optimise oxygenation, airways and treat infection	Rapid surgery to reduce pain and immobility. Orthogeriatric inpatient care	Depends on neurological deficit: stretch, positioning, manage dysphagia, communication
Post-acute into recovery phase	Enhancing intrinsic capacity	Strength, balance and endurance exercise to reverse deconditioning Optimise protein/calorie intake.		Address falls risk, sarcopenia and bone health with medications and strength and balance exercise	Structured specialist stroke rehabilitation to promote neurological recovery
	maximising function	Enhance environmental and social enablers, reduce barriers, promote self-efficacy, assistive devices, support for carers			

Table 31.2 Differences in rehabilitation involving older and younger patients

	Younger patient	Older patient
Timeline of functional change	single event, sudden	often a gradual loss, with ups and downs
Cause of reduced function	accident or uncommon illness	often multiple factors, with final decompensation
Range of impairments	usually similar between patients with same condition	more variable reflecting a range of frailty and multimorbidity
Expectations	shock: then an intention to return to “normal”	doubt about future prospects, sometimes acceptance
Mental/physical resources	Often good	Often frail, +/− cognitive impairment
Staff attitudes and priorities	usually similar to the patient;	patient’s individual variation is greater plus generational differences

Anxiety, fear of injury and patient’s concerns about their prospects for recovery will also impede progress. At this stage the patient’s priorities may not be the same as the healthcare professionals or indeed of the patient’s family. In this context, it is important to balance care and support with active rehabilitation. This balance is challenging, particularly for nurses. For example, physical recovery may be helped by encouraging patients to wash themselves at the sink rather than being passively washed in bed by a nurse, or assisting the patients to get dressed instead of dressing them. But this can expose the patient to repeated failure which reduces self-esteem and can be counterproductive, as well as unkind. Thus it is important to agree achievable short-term objectives with the patient.

31.4.3 Fragility Fractures

Hip fracture is the commonest orthopaedic trauma in most countries and is set to increase several fold globally in coming decades. Mortality is up to 10% in the first month and only a third or less of patients regain their pre-fracture mobility. Early surgery and post-operative mobilisation improve functional recovery, but high rates of frailty and dementia in this group are limiting factors, and the search is still on to establish the optimum rehabilitation approach. Collaborative clinical teams including geriatricians working together from the time of hospital admission improve some outcomes (Prestmo et al. 2015). Certainly resistance strength along with balance training reduces later functional decline.

Proximal humerus fractures are disabling with very few patients regaining full range of functional movement. Surgery produces better outcomes but is rarely offered to older patients. This may change! Other common fractures are vertebral and pelvis: both are painful and can have enduring negative impact on quality of life. The rehabilitation approach for these patients, once pain is controlled (see also Chapter 21), is similar to patients with deconditioning after acute illness.

31.5 Why—What Is the Evidence of the Effectiveness for Rehabilitation?

Clinicians, and to some extent patients and their families, are becoming more optimistic about the potential for improved functional ability that can be achieved, even in advanced old age, and there is growing evidence to support this. For stable but poorly functioning community dwelling older people, the Cochrane Review in 2009 included 121 trials and 6700 participants undergoing progressive resistance exercise (high intensity, 2–3/week). The analyses showed a small but significant improvement in speed of getting up from a chair, and of walking, and improvements in daily activity such as bathing or preparing meals. Pain was reduced in people with osteoarthritis. Subsequent studies of interventions emphasising aerobic, resistance and flexibility training activities showed improvements in self-reported well-being and reduced the risk of incident disability (Pahor et al. 2014).

Exercise programmes have also been shown to enhance cognitive function in healthy older people. A systematic review of 22 trials showed cognitive benefits (executive function, attention and delayed recall) in people with mild cognitive impairment but effects on people with established dementia were not conclusive. However, an intensive 1 year exercise programme improved physical function of people with Alzheimer's disease without any significant adverse effects. Psychosocial group rehabilitation with emphasis on improved peer support and social integration improves not only psychosocial function and quality of life, but also survival (Pitkala et al. 2009).

A key study of frail care home residents demonstrated that combined high intensity, progressive resistance exercises and a nutritional supplement improved muscle strength, gait velocity, and stair climbing.

Even in short inpatient spells with acute illness, there is evidence that comprehensive geriatric assessment including tailored interventions produces better functional outcomes (and reduced mortality) than standard disease orientated medical care (Baztan et al. 2009; Ellis et al. 2011). This approach will include some rehabilitation but there is also evidence specifically for benefit, albeit moderate, for short-term exercise programmes in such patients (Bachmann et al. 2010). Inpatient orthogeriatric care includes a focus on early rehabilitation and this approach has shown moderate benefit over traditional orthopaedic ward care, although the benefits for the most frail may be less.

There is substantial evidence for the benefits of specialist stroke unit care on mortality, and functional recovery. Although interpretation is subject to the inherent difficulty of unpicking the individual component of a complex intervention, an important aspect is early and multidisciplinary rehabilitation.

Post-acute community-based rehabilitation has shown short-term functional benefits and reduced rates of care homes admission. Studies of rehabilitation programmes showing functional benefits for people recovering from exacerbations of heart failure and chronic obstructive pulmonary disease (COPD) have included predominantly older people.

Overall, the evidence of benefit is growing for the multifaceted multidisciplinary approach to the care of both stable poorly functioning individuals and for older people experiencing acute illness or injury. This approach incorporates rehabilitative principles, augmented by specific exercise and other interventions.

References

Bachmann S, Finger C, Huss A, Egger M, Stuck AE, Clough-Gorr AM. Inpatient rehabilitation specifically designed for geriatric patients: systematic review and meta-analysis of randomised controlled trials. BMJ. 2010;340:c1718.

Baztán JJ, Suárez-García FM, López-Arrieta J, Rodriguez-Manas L, Rodriguez-Artalejo F. Effectiveness of acute geriatric units on functional decline, living at home, and case fatality among older patients admitted to hospital for acute medical disorders: meta-analysis. BMJ. 2009;338:b50.

Covinsky KE, Pierluissi E, Johnston CB. Hospitalization-associated disability. JAMA. 2011;306:1782–93.

Ellis G, Whitehead MA, O'Neill D, Langhorne P, Robinson D. Comprehensive geriatric assessment for older adults admitted to hospital. Cochrane Database Syst Rev. 2011;(7). Art. No.: CD006211.

Pahor M, Guralnik JM, Ambrosius WT, Blair S, Bonds DE, Church TS, LIFE study investigators, et al. Effect of structured physical activity on prevention of major mobility disability in older adults: the LIFE study randomized clinical trial. JAMA. 2014;311(23):2387–96.

Pitkala KH, Routasalo P, Kautiainen H, Tilvis RS. Effects of psychosocial group rehabilitation on health, use of health care services, and mortality of older persons suffering from loneliness: a randomized, controlled trial. J Gerontol A Biol Sci Med Sci. 2009;64(7):792–800.

Prestmo A, Hagen G, Sletvold O, Helbostad JL, Thingstad P, Taraldsen K, et al. Comprehensive geriatric care for patients with hip fractures: a prospective, randomised, controlled trial. Lancet. 2015;385(9978):1623–33.

Further reading can be accessed online at https://doi.org/10.1007/978-3-319-61997-2_31.

Institutional and Non-institutional Long-Term Care

32

Adam Gordon

Abstract

Good long-term care is shaped by good management of long-term conditions, effective implementation of comprehensive geriatric assessment, person- and relationship-centred care and holistic models of health and well-being. Person-centred care is defined as giving patients voice, choice and control over management decisions. This is more difficult in more dependent patients. Long-term care is different in different countries because of social and policy-based considerations that will change over time. Regardless of international differences, the need for long-term care is shaped by similar care requirements between countries. Common nursing home-defining diagnoses are stroke and dementia and common syndromes are faecal incontinence and nocturnal agitation.

Learning Objectives

By the end of the chapter, the reader will be able to

- Outline how management of long-term conditions, implementation of comprehensive geriatric assessment and principles of person- and relationship-centred care shape good care in long-term care settings
- Define person-centred care in the context of long-term care in terms of giving patients voice, choice and control over management decisions
- Describe the considerations, related to health and social care policy that shape long-term care in their own and other countries
- Describe the commonalities in the long-term care recipients between countries in terms of long-term care defining diagnoses and common syndromes affecting those receiving long-term care

A. Gordon
Division of Medical Sciences and Graduate Entry Medicine,
University of Nottingham, Nottingham, UK
e-mail: adam.gordon@nottingham.ac.uk

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_32

A consequence of increasing prevalence of frailty and dependency associated with demographic ageing is the need for an increasing number of older adults to receive long-term care outside of the acute hospital setting. The number of older people requiring long-term care and the settings within which it is delivered vary between countries but, increasingly, the number of older patients with dependency and multimorbidity receiving care outside of acute hospital settings is substantially greater than the number cared for within the acute hospital sector at any one time.

32.1 Overarching Principles of Long-Term Care

Patients cared for outside of the acute hospital have different care requirements from those in the acute setting. Much of this is defined by the principles shaping effective management of long-term conditions. At a clinical level, this usually comprises effective case management, with appropriately skilled professionals regularly reviewing clinical progress against stated treatment goals, but a number of organisational and structural factors also determine effective care in this context. These have been summarised in the "House of Care" Model (see Fig. 32.1). A key concept shaping the clinical care, service design, education provision and resource planning for management of long-term conditions is that it must be anticipatory and proactive—if teams wait for patients to come to them, or for problems to arise, patients will inevitably be acutely unwell by the time of presentation.

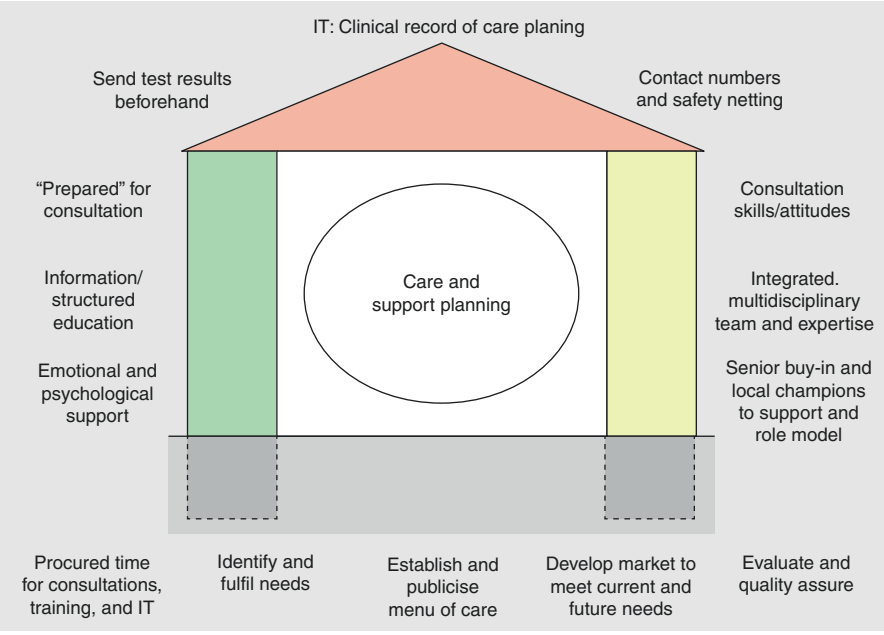


Fig. 32.1 The National Health Service House of Care Model, reproduced from Eaton et al. (2015)

These principles work well in all long-term conditions but are complicated, somewhat, in patients with complexity and multimorbidity. Here good care is shaped by the concepts of Comprehensive Geriatric Assessment (CGA) (Welsh et al. 2013). This involves:

- Initial comprehensive assessment covering medical, psychological, functional, social and environmental domains.
- Input from a multidisciplinary team (MDT) with sufficient expertise to populate the above assessment—this will usually comprise at least a doctor, nurse, physiotherapist and occupational therapist (+/− a social worker depending on the setting) with access to a broader array of specialists (psychiatrist, orthotist, speech and language therapist, dietician, dentist, podiatrist, audiologist, optometrist) on an as-required basis.
- Establishment of a problem list which includes all of the above domains, with establishment of treatment goals which should be SMART (**S**pecific, **M**easurable, **A**chievable, **R**ealistic, **T**ime-delimited).
- Regular iterative review by the MDT, with consideration of treatment goals.

Because long-term care is less shaped by response to acute crises and deteriorations and more by supporting health and well-being, it is important that a holistic approach to health is taken. An important conceptual framework in this setting is the World Health Organization International Classification of Functioning, Disability and Health (ICF for short) (World Health Organization 2001). This is complementary to the International Classification of Diseases (ICD-10) but, instead of using diagnoses as its primary focus, it considers instead how patients interact with their surroundings in order to live the fullest possible life (Fig. 32.2).

The ICF encourages MDTs to consider patients in terms of:

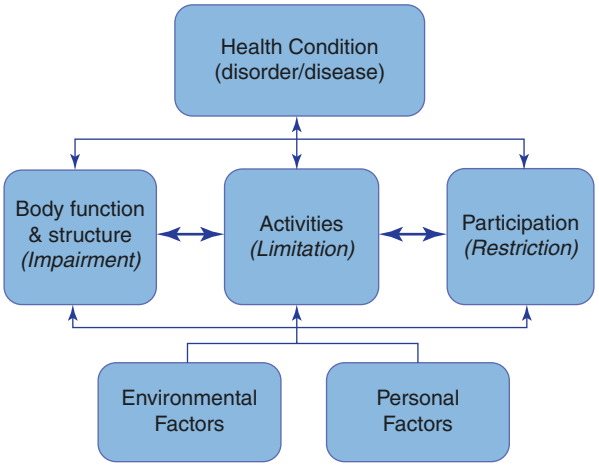


Fig. 32.2 Schematic of the ICF

- Body structure and function—how anatomy and physiology are affected by health conditions.
- Activity—the extent to which patients are able to conduct their activities of daily living.
- Participation—the extent to which patients are able to engage with wider society.
- Environment—the world with which patients must engage in order to participate in life, including social support mechanisms such as family.
- Personal factors—issues such as personality or belief systems that impact an individual's participation needs and how they engage with their environment.

Approaching patients with this broad perspective encourages MDTs to develop broad and inclusive management plans that promote well-being. Traditionally, healthcare professionals have tended to focus on deficits—what patients are unable to do or achieve. There is, however, increasing evidence that such a focus lowers the expectations of healthcare professionals and patients. There is, for example, a recognition that, in some cultures, the term "frail" has such negative connotations that patients are deterred from consulting services labelled as frailty-specific. An asset-based approach to health—focussing on what can be achieved, rather than what cannot—is increasingly encouraged. Thus a frailty service in the long-term care setting might be badged as "building resilience" or "maintaining function".

Important in all of these models is the recognition that care should be "person-centred" (The Health Foundation 2014). There is a large literature on what represents truly person-centred care but it can be summarised as ensuring that patients have "voice, choice and control" over their care. This becomes more challenging as patients become more frail and, particularly, when they become cognitively impaired. The temptation to resort to traditional paternalistic models of medical consultation becomes greater when patients are less able to communicate their needs and when shared-decision-making becomes more complicated as a consequence. The skills and resources required to give a 25-year-old type-1 diabetic a say in their healthcare decisions are quite different from those required to support an 88-year-old dysphasic patient with hemiplegia and an emergent vascular dementia. A complicating feature is that older patients are frequently dependent on social networks—whether informal and unpaid, or formal and paid—for their care. Decisions about a patient's well-being cannot be undertaken without consideration of how this impacts upon the networks they depend upon for care. This has led to the idea of "relationship-centred care"—an enhanced model of person-centred care which considers and consults the social network around a patient as decisions are made (Nolan et al. 2006). Different legislations have differing legal and ethical frameworks to safeguard the rights of individuals and guide healthcare professionals through such complicated decisions. Practitioners in care of older people must become *au fait* with these for the country where they work.

32.2 Settings for Long-Term Care

Care for older people is delivered across a continuum—ranging from care in the patient's own home, through to 24-hour specialised nursing care in an institutional setting. Exact terminologies differ between countries—there are, for example, eight different terminologies describing settings which match the international definition of a nursing home (Sanford et al. 2015).

In addition, the determination and ability of different health services to care for patients in each setting is influenced by a number of considerations which are often not directly health related. There is evidence from cross-national studies that the ready availability and close proximity of extended family networks is an important determinant of a patient's ability to receive care in their own home, whilst ready availability of state- or insurance-funded long-term care increases the likelihood of early institutionalisation.

Broad categories of care are:

- Care at home—This includes support with activities of daily living and is often provided by staff without specific healthcare qualifications. In some countries an arbitrary distinction is made between "social care" (that which does not require input from traditional healthcare disciplines such as nursing, physiotherapy and medicine) and "healthcare". It is not clear whether such distinctions are helpful and they are more frequently driven by how care is financed—and care workforces organised—than any particular consideration of patient needs.
- Intermediate care—This is an inclusive terminology which has been used to encompass care which is based outside the acute hospital, is time-limited and focussed upon specific care requirements. It encompasses short bursts of more intensive support in the patient's own home and also in non-acute institutional settings. It usually involves traditional healthcare professions alongside care assistants. It includes:
  - "Step-up" intermediate care: Short-term rehabilitation, reablement or healthcare intervention as a step-up from the patient's usual long-term care requirements, either by an MDT seeing the patient at home or in a long-term care facility such as a nursing home. This is often characterised as a way of avoiding an admission to an acute hospital setting by providing more intensive care closer to home.
  - "Step-down" intermediate care: Short-term rehabilitation, reablement or convalescence care as a step-down from acute hospital following admission and treatment. This can be for a broad range of indications ranging from specific rehabilitation goals, for example, following a hip fracture, to more generic convalescence whilst a patient with advanced frailty recovers from an episode of deterioration associated with an acute medical diagnosis.
- Hospital at home—This is a particular form of intermediate care which enables high level medical and nursing input to be given at home for short periods. It is, again, frequently characterised as avoiding hospital admissions. Hospital at

home regimens have included, but not been limited to, intravenous therapies, enteral and parenteral nutrition and complex wound care including vacuum therapy in the patient's own home.

- "Extra-care"—This describes a long-term care setting, where residents are given additional support by resident care teams whilst also maintaining a degree of independent living—retirement farms and villages, warden-aided and "sheltered" accommodation all follow this broad template, albeit with quite different underpinning philosophies of care. The care teams, although based within the extra-care facility, are often not available 24 h a day or, if they are available, it is at a staffing ratio where residents would not expect to be routinely supervised, particularly at night.
- Institutional care—Increasingly "nursing home" is used as the all-embracing term to cover these settings. The international definition of nursing home includes, however, organisations ranging from care homes and residential homes through to community hospitals. The unifying feature that shapes all of these institutions is that care staff are available to supervise residents 24 h a day. At the more intensive end of the spectrum, there will be fully trained nurses on site 24 h a day. Although the type and number of residents living in long-term institutional care differs between countries, common themes shape the need for such high-intensity care. Increased functional dependency due to stroke and the need for increased supervision in more advanced dementia are important "nursing home-defining diagnoses". Double or faecal incontinence and nocturnal agitation and wandering are particular syndromes that frequently trigger referral to such settings.

There is evidence from most countries that, over time, better availability of care in patient's homes, short-burst intensive intermediate care services and the increasing availability of computer-based telemonitoring and telehealth interventions have led to ever-more dependent patients living at home. This has led to increasing levels of dependency within the long-term care sector, placing increased demands upon staff—both in terms of workload and competency requirements—in those settings. Recruiting and training staff in sufficient numbers and sufficiently skilled to work in long-term care is a challenge in most healthcare economies. The shape of long-term care is likely to continue to change over time in response to changes in social structures and economic challenges in different health and social care economies. Because of this, it is likely that international differences in how such care is organised will be a persistent feature.

References

Eaton S, Roberts S, Turner B. Delivering person centred care in long term conditions. BMJ. 2015;350:h181.

Nolan M, Davies S, Brown J. Transitions in care homes: towards relationship-centred care using the 'Senses Framework'. Qual Ageing Older Adults. 2006;7:5–14.

Sanford AM, Orrell M, Tolson D, et al. An international definition for 'nursing home'. JAMDA. 2015;16(3):181–4.

The Health Foundation. Person-centred care made simple. 2014. http://www.health.org.uk/sites/health/files/PersonCentredCareMadeSimple.pdf. Accessed 3 Mar 2017.

Welsh TJ, Gordon AL, Gladman JR. Comprehensive geriatric assessment - a guide for the non-specialist. Int J Clin Pract. 2013;68(3):290–3.

World Health Organization. International classification of functioning, disability and health. Geneva: WHO; 2001.

Palliative and End-of-Life Care

33

Annette Hylen Ranhoff

Abstract

The principal goal of palliative care is to alleviate suffering in patients with serious non-curable disorders and help their relatives during the last days of life.

Palliative care is a team approach, and comprehensive geriatric assessment (CGA) is the best basis to decide if the old and multimorbid patient meets the indications for palliative care, to find treatment targets and to meet his/her and their relatives' needs.

Common symptoms like pain, nausea, dyspnoea, delirium and restlessness should be systematically assessed and monitored. Close communication with patients and relatives and advance care planning improve quality of care.

Good nursing care is a cornerstone of palliative care and should be practised in close collaboration with the physician.

In end-of-life care, nutrition, i.v. fluids and drugs not effective in symptom control should be discontinued. Four drugs that can be given subcutaneously can reduce most symptoms in end-of-life care.

A.H. Ranhoff
Department of Clinical Science, University of Bergen, Bergen and Diakonhjemmet Hospital, Oslo, Norway
e-mail: Anette.Ranhoff@uib.no

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_33

Learning Objectives

By the end of the chapter, the reader will be able to

- Know the general principles of palliative care and end-of-life care, and what it can offer to older adults with serious and complex diseases
- Know that palliative care can be applied in combination with more curative-intended treatment, or as the only focus
- Know simple and effective treatments of symptoms such as pain, nausea, anxiety and delirium in older adults
- Understand the importance of close communication with patients and relatives in the different phases of palliative care

33.1 Palliative and End-of-Life Care of Older Adults

Palliative care is an interdisciplinary treatment focused on the relief of suffering and achieving the best possible quality of life for patients and their caregivers. It differs for geriatric patients from what is usually appropriate in younger patients because of the nature and duration of chronic illness during old age (Goldstein and Morrison 2005). Most people die in advanced age and usually not from cancer, but from a combination of chronic age-related diseases and acute events. Heart failure, dementia, chronic lower respiratory disease and pneumonia are shown to be the major causes of death in old age (Tinetti et al. 2012). Falls, oedema and delirium are more common symptoms in older people than in younger during the last days of life. The pathophysiology of the symptoms can be difficult to explain, due to complex health status and multiple diseases and impairments. Polypharmacy due to multimorbidity and cognitive impairment are complicating factors. Close communication with patient and the relative is a prerequisite for good palliative care.

In end-of-life care, palliation to relieve symptoms and contribute to a dignified death is the main focus. The treatment may be directed to the disease (i.e. heart failure treatment or tumour-targeted treatment) or be intended to have a general effect, but most often a combination of these (Fig. 33.1).

33.2 The Definition of Palliative Care—From WHO

Palliative care is an approach that improves the quality of life of patients and their families who are facing problems associated with life-threatening illnesses. It prevents and relieves suffering through early identification, correct assessment and treatment of pain and other problems, whether physical, psychosocial or spiritual.

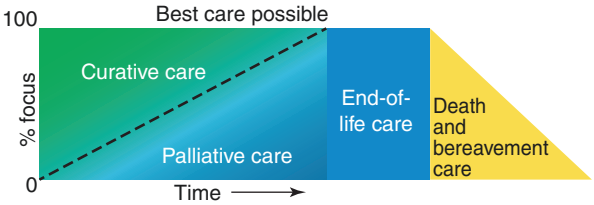


Fig. 33.1 Focus for the best possible care for older people with terminal disease shifts with time

Addressing suffering involves taking care of issues beyond physical symptoms. Palliative care uses a team approach to support patients and their caregivers. This includes addressing practical needs and providing bereavement counselling. It offers a support system to help patients live as actively as possible until death.

33.3 Settings for Palliative Care

Where older people spend their last phase of life and where they die differs throughout Europe. The most common places to stay during the last days of life are hospitals and nursing homes (NH), but some also die in their own homes. Although there are special clinics and care homes for palliative care, such as hospice, few older people die in such settings. Many NH residents do not receive optimal palliative and end-of-life care, and in hospitals curative intentions dominate palliative measures. Ideally, palliative care should be offered independently of where the older patient is. However, transfer to a hospital or a NH can be appropriate to improve the quality of care.

Reasons for transfer to hospital:

- Pain or other discomfort cannot be relieved in the NH or at home.
- Diagnostic workup to target treatment of symptoms.
- Treatment that will improve comfort for the patient is only available in hospital, such as invasive procedures or repair of a hip fracture.

Reasons for transfer to NH or care home:

- Need for 24 h nursing care that cannot be provided at home.

33.4 Indications for Palliative Care and End-of-Life Care

Assessment of life expectancy and when death is near in older and multimorbid persons is not easy, and is based on clinical judgement more than objective criteria. To observe and treat unpleasant symptoms is obvious, but when to switch to palliative care is a decision that usually should be taken by a team and with close

communication with the patient and his/her relatives. The indications for palliative care are (WHO):

- Non-curable progressing disease, such as advance-stage dementia
- Impaired function, dependency, that is progressing and unbearable
- Patient preferences

33.5 Comprehensive Geriatric Assessment

In complex older patients with multimorbidity, frailty and functional impairment, CGA is the best basis to decide if the patient meets the indications for palliative care, find treatment targets and meet his/her and their relatives' needs. This is a multidisciplinary approach and collaboration between nurses, physicians and relevant others (social workers, physiotherapists, occupational therapists, nutritionists and pharmacists). A priest or vicar can be involved for communication about existential matters if preferred by the patient (see also Chapter 25).

33.6 Assessment and Monitoring of Symptoms

Symptoms should be systematically assessed and monitored, preferably with a validated instrument like the Edmonton Symptom Assessment System (ESAS) (Bruera et al. 1991). Pain and other symptoms in patients with dementia can be difficult to assess; observational pain scores like Pain Assessment in Advanced Dementia (PAINAD), Pain Assessment Checklist for Seniors with Limited Ability to Communicate (PACSLAC), Non-Communicative Patient's Pain Assessment Instrument (NOPAIN), Abbey and DOLOPLUS2 can be helpful.

The Main Elements of Communication with Patient and Relatives
(Morrison et al. 2004)

- Establishing goals of medical care
  - Based on CGA and patient preferences
- Communicating bad news
  - Establish what the patient and relatives know.
  - Give realistic information.
- Withdrawing treatment
  - Discuss treatment in relation to goals for medical care and switch to palliative care.
- Advance Care Planning (Houben et al. 2014)
  - Enables individuals to make plans about their future healthcare and provide direction to healthcare professionals when they are no longer capable to either make and/or communicate their own healthcare choices.
  - The main components of advance care planning include the nomination of a substitute decision-maker, who is usually a close relative, and the completion of an advance care directive.

  - Participation in advance care planning can reduce stress and anxiety for patients and their families, and lead to improvements in end-of-life care.
- Spiritual care
  - Spirituality can be a key factor in how the patient copes with illness and achieves a sense of coherence and peace.
  - Spirituality is a fundamental element of human experience, the individual's search for meaning and purpose in life and in connection to others.
  - Severe chronic and life-threatening illness can lead to spiritual struggles for patients.
  - Spiritual needs should be addressed through communication with the patient and met if possible. The most important domains of needs are need for religion, companionship, to be involved and in control, to finish business, to experience nature, and the need for a positive outlook.

33.7 Structured Treatment Algorithms

Structured treatment algorithms, such as the Liverpool Care Pathway (LCP) (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/212450/Liverpool_Care_Path), can be useful in palliative care for older adults, and also to improve palliative care at the organisation level (in a healthcare service). When implemented with adequate staff training and support, the Liverpool Care Pathway for the Dying Patient may be a useful tool for providing end-of-life care of older persons at the end of life in non-cancer settings. Also, the Resident Assessment Instrument for Palliative Care (RAI-Palliative Care, www.interrai.org/palliative-care.html) provides a structural assessment tool with triggers for interventions.

33.8 Nursing Care

Good nursing care is a cornerstone of palliative care that should be integrated with medical care:

- Good communication with the older patient and relatives, with the physician and the other members of the interdisciplinary team
- Assessment and monitoring of symptoms
- Good hygiene

- Oral care: cleaning and hydration of oral mucosa and lips
- Comfortable placement of the patient for rest and relief of pain
- Systematic prevention of pressure ulcers
- Nutrition and hydration when adequate
- Elimination: prevention and treatment of constipation and urinary retention

33.9 Pharmacological Treatment

- Many drugs, such as cholesterol-lowering agents, antihypertensives, dementia drugs, osteoporosis drugs and drugs used for endocrine disorders (i.e. thyroxine and diabetes drugs) can be discontinued because they don't reduce suffering.
- Antibacterial drugs can in some situations relieve symptoms (i.e. painful skin infections) and prolong life (pneumonia) if expedient. In an end-of-life situation with excessive secretion from the lower respiratory system, glycopyrrolate and morphine can reduce symptoms.
- Analgesics and other drugs used for symptom relief should usually be continued, but often in another form of administration, i.e. patch or subcutaneous injections, in end-of-life care.

33.10 Oxygen Treatment

Oxygen treatment by mask or nose catheter can sometimes reduce delirium symptoms due to hypoxia and the feeling of suffocation, but often gives more discomfort than benefits (dry airways, ulcers and noise). Discontinuation of oxygen treatment can cause breathlessness that can be helped by morphine.

33.11 Nutrition and Hydration

- To stop eating and drinking is part of the natural death process.
- Nutrition supplements, tube feeding, parenteral nutrition and i.v. fluids should be discontinued when prolonging of life is no longer a goal.
- A patient that is able to drink or eat a little should be offered what he/she wants.
- Oral care is important to prevent discomfort.
- Terminal patients usually don't feel thirst.
- I.v. fluid treatment can prolong the death process and increase excessive secretion and the risk of pulmonary oedema.

33.12 End-of-Life Drug Treatment

Adapted with permission from Kjell Kruger; Handbook in Nursing home medicine (Norw.)

Indication	Drug	Dose	Maximum dose/24 h
Pain, dyspnoea	Morphine (opioid)	2.5–5–10 mg or 1/6 of daily dose. oral:sc = 3:1. At demand, until every 60 min.	Dependent on effect, rarely more than 400 mg
Anxiety, restlessness, convulsions	Midazolam (benzodiazepine)	1–2.5 mg Repeat if necessary, up to every 30 min. (titration to effect)	Dependent on effect, rarely more than 20 mg
Nausea, agitation, hyperactive delirium	Haloperidol (antipsychotic)	0.5–2 mg × 2 (nausea) 0.5–2 mg × 2–4 (agitation, hyperactive delirium)	10 mg
Excessive airway secretion, abdominal colic	Glycopyrrolate (anticholinergic)	Start 0.4 mg. If effect, after 2 h 0.2 mg × 4	1.8 mg (rarely necessary)

All drugs can be given subcutaneously

33.13 Palliative Care for Patients with Advanced Dementia

Dementia is a life-limiting condition with prolonged and progressive disability. Patients experience not only loss of cognition, but also loss of basic bodily functions, particularly the ability to swallow correctly and fight infections. These complications are the most common causes of death in advanced dementia. The general principles of palliative care should be applied, but palliative care needs of patients with dementia are often poorly addressed:

- Symptoms such as pain are undertreated.
- They often have unrecognised delirium superimposed on dementia.
- Their preferences can be difficult to clarify due to cognitive impairment and communication difficulties.

Most dementia patients are old with comorbidities and complex and challenging problems as the disease progresses: aggressive behaviour, restlessness, incontinence, delusions and hallucinations, reduced mobility and feeding problems.

Since the disease progresses gradually, it can be difficult to know when the patient enters the terminal phase and the timing of when to give palliative care or end-of-life care.

Principles to meet palliative care needs for patients with dementia (van der Steen et al. 2014):

- General principles of palliative care should be applied; systematic monitoring of symptoms by using observational tools.
- Person-centred care, communication and shared decision-making (patient and family).
- Setting care goals and advance care planning; preferably before the patient becomes highly disabled, but continuously with close communication with the relatives and carers.

References

Bruera E, Kuehn N, Miller MJ, Selmser P, Macmillan K. The Edmonton Symptom Assessment System (ESAS): a simple method for the assessment of palliative care patients. J Palliat Care. 1991;7:6–9.

Goldstein NE, Morrison RS. The intersection between geriatrics and palliative care: a call for a new research agenda. J Am Geriatr Soc. 2005;53:1593–8.

Houben CH, Spruit MA, Groenen MT, Wouters EF, Janssen DJ. Efficacy of advance care planning: a systematic review and meta-analysis. J Am Med Dir Assoc. 2014;15:477–89.

Lindqvist O, Lundquist G, Dickman A, Bükki J, Lunder U, Hagelin CL, Rasmussen BH, Sauter S, Tishelman C, Fürst CJ, OPCARE9. Four essential drugs needed for quality care of the dying: a Delphi-study based international expert consensus opinion. J Palliat Med. 2013;16:38–43.

Morrison RS, Meier DE. Clinical practice. Palliative care. N Engl J Med. 2004;350:2582–90.

Tinetti ME, McAvay GJ, Murphy TE, Gross CP, Lin H, Allore HG. Contribution of individual diseases to death in older adults with multiple diseases. J Am Geriatr Soc. 2012;60:1448–56.

van der Steen JT, Radbruch L, Hertogh CM, de Boer ME, Hughes JC, Larkin P, Francke AL, Jünger S, Gove D, Firth P, Koopmans RT, Volicer L, European Association for Palliative Care (EAPC). White paper defining optimal palliative care in older people with dementia: a Delphi study and recommendations from the European Association for Palliative Care. Palliat Med. 2014;28:197–209.

Part VIII

Considering the Vulnerability of the Older Person in the Society

Ethics and Legal Issues in the Care of Older Persons

34

Thomas Frühwald

Abstract

Ethics is a fundamental part of geriatric medicine. Ethical questions are important in all fields of medicine, but in geriatric medicine they are of particular importance. Geriatric medicine is concerned with the care of health problems of mostly very old people close to the end of their life. Frequently they are frail—individuals with a high risk for progressive deficits in physical and cognitive functions, thus progressively dependent on help and care.

Decisions about medical interventions are easier when the patients concerned have an intact decisional capacity. This situation becomes more complex and difficult when dealing with multimorbid, frequently cognitively impaired very old individuals.

Ethics is about systematically asking the right question. This process should be logically structured and questions may remain unanswered. It is about questioning prejudices and modes of action, it means explaining terminology, requesting the best facts possible, formulating definitions, and helping to reflect a problem. Good ethics begins with good facts, with good evidence—not with groundless assumptions.

Learning Objectives

By the end of the chapter, the reader will be able to

- Know the basic principles of present day bioethics
- Reflect about ethical issues in caring for vulnerable geriatric patients
- Deal easier and better with ethical problems in clinical practice

T. Frühwald
Austrian Association of Geriatrics and Gerontology, Wien, Austria
e-mail: fruehwald@netway.at

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_34

34.1 Ethics: Attempts of a Definition

Ethics is a discipline of philosophy. Generally speaking, it deals with questions concerning the good and the attitude that should determine human action. Ethics is about questions arising from the interaction between individuals of a society. Using philosophical methods ethics attempts to demonstrate the fundamental principles for a just and meaningful action in living together with others. Ethics always comes into effect when it is about acting with or deciding for other individuals. Ethical principles and justifications should not rely on external authority or convention, they should be applicable universally with reason and sense, and they should take a higher-ranking position than morals. Ethics is not about the exchange of unfounded arguments, it is concerned with general rules and guidelines as well as with problems in individual cases. Ethics calls for tolerance of other opinions in a human framework (Loewy 1996).

Ethics is not an individual's personal morality. One's own conception of morality can be derived from religion, culture, tradition, personal experience, and conscience but it will not be the same for a person of another tradition, with different experiences. Ethics attempts to find a common denominator for different world-views, religions, and cultures and whenever possible to propose a framework in which different individual moral conceptions can be expressed. Ethics should question prejudices and established procedures, demand exact definitions, it should help to logically reflect problems, to pose questions in a systematic, structured way. In a secular and pluralistic society ethics should be kept free of all religious and ideological premises (Pauer-Studer 2003).

Good ethics needs some prerequisites: first of all it needs a good knowledge basis and good facts. In medicine this means that physicians who are not competent enough in their domain, who do not continuously keep themselves informed, and who are not up-to-date with the latest developments in their specialty cannot act also ethically correctly. Good ethics begins with good facts, not with groundless assumptions (Loewy 2007).

Another aspect to keep in mind is the fact that professionally and ethically good medical actions do not happen "in a vacuum." The framework in which the physician has to act is determined by the institution (the hospital, the healthcare system), and thus by the society. It is more difficult to act in an ethical way in an institution that is not based on ethical principles. It is also difficult to build a just, ethical healthcare system in an unjust society (Loewy and Loewy 2004).

34.2 The Importance of Ethical Considerations in Geriatric Medicine

Why should ethical considerations have such a high level of significance particularly in geriatrics? Especially when ethics is about the search for basic principles for just, meaningful, judicious, reasonable—in one word, good—action. There are a few explanations:

- Geriatric Medicine deals with old, very old, patients who frequently are in need of help and care because of their higher risk for losses of physical, cognitive, emotional, and social function. The situation of these vulnerable, frail patients often is not adequately being taken care of by our social and healthcare system.
- Geriatric Medicine can also be characterized by the fact that it deals with people at the end of their lives. Death is not the absolute adversary in this field of medicine, not necessarily a symbol of failure. In many respects there is concordance between Palliative Care and Geriatric Medicine.
- In Geriatric Medicine patients are being taken care of not only for a more or less limited period of time, but also for the whole of the final period of their lives, often in an environment not of their primary choice, like, for example, in a nursing home.

Therefore, ethics is a fundamental part of geriatric action. This is particularly true when considering frailty and the risk of losing one's autonomy and becoming dependent on help and care by others.

The discussion of ethical problems in geriatrics circles around two poles: one is autonomy, the right of a person to determine his or her own fate, to exert his or her own will—even though taking into account certain limits set by society. With geriatric patients frequently the question arises whether he or she possesses the competence to comprehend and to judge the situation and if he or she has sufficient independent decisional capacity. The other pole is beneficence, the obligation to do well to others, to help minimize suffering. This may border on paternalism—one acts and decides in conflict with the principle of autonomy.

The infantilization of the older person is wrong and unethical, even in the presence of cognitive impairment (dementia) that may lead to a gradual loss of cognitive capacities (see also Chapters. 3 and 7). But there are variably long individual progressions of cognitive functional deficits between early and advanced stages of dementia. The presence of this diagnosis does not automatically imply an incapacity to comprehend and to choose and decide independently.

34.3 Principles of Biomedical Ethics

Present day biomedical ethics is guided by four key considerations proposed by Beauchamp and Childress to help focus everyday decisions in medical practice. They are the basis of an ethical system termed "principlism" that guides medical decision-making in our pluralistic society, they provide a basic analytical framework for reflecting on moral issues within biomedicine (Beauchamp and Childress 2012).

These four guiding principles are:

1. *Beneficence*: this principle implies the general human obligation to do good, to act to the benefit of others, for the physician it means the duty to act in the best interest of the individual patient. It demands to weigh the expected benefit of

medical interventions against their potential harm—this judgment always has to be done in the decision-making process.
2. *Non-maleficence*: requires to avoid harm and suffering to other individuals. It means the obligation to respect the individual patient's right to his or her spiritual and physical integrity.
3. *Autonomy*: requires the respect of the individual's right for self-determination as far as his or her personal existential perspectives and concepts go. This is implicit in the rule of informed consent in decision-making by which the patient should be provided with clear information about the expected benefits and risks of the procedure. This principle also implies the physician's duty to help the patient maintain control over his or her medical treatment.
4. *Justice*: this principle obliges to avoid discrimination by irrelevant criteria, to guarantee fairness of access to resources. It means also that patient selection criteria should be as objective as possible, transparent and reproducible. This principle is the core argument against the use of any age-weighting approach that gives less value to benefits for the older than for younger persons. This would constitute an unfair discrimination, ageism. Allocation of resources based only on the criterion of age is unethical. Withholding treatment from a person just because he/she is old is both unethical and illegal (Doyal and Wilsher 1994).

Tensions and conflicts between these four principles may arise, frequently they cannot be eliminated, and one has to be able to tolerate them in a constructive way (Borasio 2006).

Weighing expected benefits and potential harms of a medical intervention for the individual patient, thus following the principles of beneficence and non-maleficence, is crucial. When considering an intervention, the fundamental question is the extent to which the patient's quality of life will be improved. This key question must be considered and discussed with each individual—thus honoring his or her autonomy.

In this respect "what can be done" and "what should be done" are not equivalent questions. A patient's right to die with dignity must also be respected. The principle of autonomy makes informed consent in decision-making obligatory. The patient should be provided with clear, comprehensible information about the expected benefits and risks of a planned procedure. The principle of justice implies that patient selection criteria are as objective and transparent as possible and that access to medical services is fair and just. Respecting the principle of justice also requires the consideration of how decisions regarding one patient may also affect other patients and providers (Levine et al. 2011).

The principle of justice calls for an unbiased, equal allocation of resources that are not unlimited. Medical interventions should be planned and care provided with the sole intention of improving the individual patient's quality of life and/or decreasing his or her risk of mortality "independent of reimbursement considerations and without inappropriate bias or influence from industry, administrators, referring physicians, and other sources" (Cameron et al. 2004).

34.4 About Ethical Problems and Issues in the Care of Geriatric Patients

An ethical problem is present when in a situation requiring a decision or an action uncertainty or disagreement arises in judging the decision or action according to the categories good and bad or right and wrong. With the aim of productively transforming this uncertainty or disagreement into a realistic course of action, a process should start in which moral judgments become clear and can be expressed (Steinkamp and Gordinj 2010).

The response to an ethical question—the solution of an ethical problem—is not only a certain action, but in addition also its explanation and justification based on specific knowledge and facts. Thus the question by which to start an ethical case discussion should first of all aim at the course of action in the particular situation.

An ethical problem should elicit the question of what should be done, not what can be done.

Deciding about medical diagnostic and therapeutic interventions for and with geriatric patients may present some particular ethical challenges.

These are some examples of more or less general question with ethical implications arising in everyday medical, nursing, and rehabilitative care of geriatric patients. A practical suggestion how to approach them in a structured, systematic way will follow:

- What are our therapeutic, rehabilitative, nursing care efforts good for? How do they make sense?
- Who is being taken care of in reality? Is it always the patient? Could it in some cases not be the patient but rather the relatives, the institution, or the society?
- The patient's will is sometimes the opposite of the benefit intended for him—how to deal with this situation?
- How does one determine the will of a patient who is not (any longer) able to communicate, like in advanced dementia, in coma?
- What is the physician's obligation to perform a therapeutic intervention? What not? How to go about limiting or discontinuing active treatment?
- In medical interventions it is often easier to do everything that can be done, it is more difficult to justify not doing everything that is possible, how to go about this?
- Is curative therapy justifiable even in the end-of-life situation? How invasive may it be?
- Is the patient capable of understanding the situation, the clinical dilemma? Can he/she make a competent choice between the possible options?

These are concrete situations a physician can be confronted with almost daily and in which a decision has to be made. This can become particularly difficult if the patient concerned is old, frail, and cognitively impaired.

Other examples of concrete clinical topics of ethical decision-making:

- Intensification, or de-escalation of invasive therapy
- Transition from curative to palliative care—when is the right moment?
- Treatment of infection or other intercurrent conditions in terminally ill patients, for example, in advanced stages of dementia
- Cardiopulmonary resuscitation—in which patients not to start? How to terminate it?
- Artificial nutrition—is it to be considered as any therapy that should be terminated when it doesn't have an indication any more, when it doesn't make sense any longer? Is there a place for percutaneous endoscopic gastrostomy (PEG) tubes?
- Patient abuse—particularly abuse of the older person, frail, functionally impaired, dependent, vulnerable patient. How to recognize the various forms abuse can take? How to intervene?

34.5 Decision-Making in Geriatric Medicine

In decision-making situations as they occur frequently in everyday geriatric clinical experience it may be of help to refer to the abovementioned ethical principles. Marckmann and in der Schmitten derive from them three legitimizing preconditions for deciding about initiating a therapeutic intervention (Marckmann and in der Schmitten 2010)

1. The patient should have more benefit than harm from the intervention
2. The patient must give informed consent
3. The intervention must comply with state-of-the-art medical standards

A therapeutic intervention should be abstained from if only one of these three conditions is not met. Such a renouncement of therapy based on individual ethics arguments requires a reliable judgment of the uselessness—futility—of a medical intervention and of the patient possibly lacking capability for consent.

It can be of help to distinguish between the individual benefit and general efficacy: an intervention can be theoretically efficacious but of no usefulness or benefit for the individual patient. But it is only this individual aspect that is relevant and essential in the decision for or against a particular medical intervention.

The evaluation of the efficacy of an intervention relies on evidence from clinical trials and on clinical guidelines and/or on expert consensus recommendations based on those. Finally, the individual physician's professional expertise is also of relevance.

The presence or absence of a medical indication is the key precondition for initiating or foregoing a therapeutic intervention. In the absence of efficacy, indication is not present—this is particularly the case in patients in the terminal stages of their lives (Austrian Bioethics Commission 2011).

Medical futility implies that it is appropriate to withhold a therapeutic procedure from patients who are at high risk of not benefiting from it or when the expected

outcome would not improve the patient's quality of life. Recognizing such situations is challenging (Hawkins et al. 2014).

Defining medical futility is controversial though: Schneiderman proposed that physicians "should regard a treatment as futile if empirical data show that the treatment has less than a 1 in 100 chance of benefiting the patient in a qualitatively meaningful and reliable manner" (Schneiderman et al. 1990). But he also admits that it is very difficult to precisely estimate expected benefit—a consensus about what constitutes the threshold of a worthwhile outcome is lacking (Schneiderman et al. 1996).

34.6 Independence and/or Autonomy of the Geriatric Patient

The mere prolongation of life is not a criterion in evaluating the positive effect of a medical intervention. "Active life expectancy" meaning life in functional health is a term that informs about a different dimension of health and morbidity, about another perspective than death alone. The end of active life expectancy is not death but the loss of functional independence and autonomy. They become an important factor of the subjective and objective appreciation of quality if life. But what about autonomy at the end of life of frail, multimorbid, perhaps cognitively impaired older persons—geriatric patients? Increasingly, autonomy is not regarded as the sole determining factor in decision-making in geriatric medicine, often times it is a rather unrealistic myth (Rehbock 2002).

Particularly toward the end of life geriatric patients may experience a double erosion of autonomy: on the one hand through cognitive impairment (dementia), on the other through loss of functional independence with consecutive institutionalization, for example, in a nursing home with its rules and regulations restricting privacy, limiting the older person's will by paternalistic rules and regulations. The principle of the individual's autonomy is undermined by the institution's principle of beneficence. Atul Gawande in his reflections on aging, frailty, and the last years of life notes: "…our elderly are left with a controlled and supervised institutional existence, a medically designed answer to unfixable problems, a life designed to be safe but empty of anything they care about…" (Gawande 2014).

The reality of everyday geriatric medicine proves that without optimal care in the form of adequate counseling, empathy, personal attendance, and assistance there would be the danger of gradually slipping into a certain "autonomism," relying on autonomous decisions of people who are no more capable of them and thus risk mainly disadvantages. A further danger would be the development of an indifferent attitude that sees only the autonomous client and disregards the consequences. According to Theda Rehbock, to accept the limitation of autonomy in advanced age with its immanent progressive need for help, support and care is a precondition for successful aging and contradicting the basic principle of geriatric care to do the maximum possible to preserve or to regain an optimum of independence (Rehbock 2002).

34.7 The Patient's Will

Of course, in most situations in geriatric medicine, including the presence of cognitive impairment, decision-making is dominated and determined by the patient's will. But one has to bear in mind that first there has to be a valid indication for a medical intervention in question. According to Gian Domenico Borasio, the issue of the indication for a medical procedure has to be clarified before asking about what the patient wants. This can be done by two questions:

1. Is there a reasonable treatment goal?
2. Is this goal realistically attainable?

Only if both questions are answered affirmatively can the physician proceed to an individual appraisal of the indication and estimate whether the treatment goal is in accordance with the patient's declared or presumed preferences. Asking for the patient's presumed will is of no relevance if the therapeutic intervention in question is not indicated, if there is no reasonable therapeutic goal. It is not so much about the specific intervention potentially performed than about the question whether it has a meaningful, attainable goal and whether its benefit outweighs the potential risks (Borasio 2006).

But even before that it is about the patient's capacity of consenting to it or not—after having been duly informed by the physician. Such situations are clear and without ambiguity if the patient has decisional capacity, if he or she is cognitively competent. It is more difficult with a patient who is multimorbid, frail, perhaps cognitively impaired, of advanced age and approaching the end of his or her life.

34.8 A Practical Approach to Ethical Decision-Making in Individual Situations

According to Erich Loewy, it is all about posing the right questions, not about expecting and following fixed instruction manuals for the particular situation that poses an ethical problem. The questions can be formulated in a structured, systematic way—this would make it easier to find an appropriate individual answer. Two questions should be clarified first:

1. Who is entitled to make a decision?
2. Who is it all about (who is being treated, who wants the treatment)?

To illustrate the ethical decision-making process, Erich Loewy utilizes the metaphor of planning a voyage: in it the ethicist has the role of a travel agent who places three questions in a logical fixed order: (Loewy 1996)

1. The first question "Where does the voyage start from?" explores the present situation. This "status quo" question is primarily a medical one: physicians, nurses,

and therapists have to inform about the diagnosis, the prognosis, and about problems still to be clarified. The ethics consultation has to make certain that experts have been involved and that the patients and his or her relatives have been adequately informed. If there is disagreement in the team on clinical issues, not even the best ethicist can be of help.

2. The second question "Where does one want to go?" is the "quo vadis" question. The one that asks about the desired goal, the destination. It is not a purely medical one. The physician provides the prognosis, says what is the best, what the most probable scenario is. Other than that this question has mostly a biographical character: the patient's values, personal history, ambitions, goals, wishes determine the answer.
3. The third question "How do we arrive at the desired destination?" is about the means to attain the goal. It is a technical question like "Should we place a PEG (percutaneous endoscopic gastrostomy) tube?" which frequently is the wrong first question before one even knows where the voyage should go.

To connect these three points—facts, goal, means to arrive at it—should now be easier.

In Geriatric Medicine one frequently has to deal with patients whose decisional capacity can be questioned because of cognitive impairment. The capacity for informed consent frequently is just a gradual one and it may be sufficient for the problem at issue. From an ethical point of view it should be possible to obtain informed consent after providing adequate information adapted to the situation, to the issue to be decided about and to the cognitive capacity of the patient. Preconditions for accepting a decision—even when decisional capacity is in doubt because of cognitive impairment—are:

- Sufficient knowledge
- Sufficient time for reflection
- Authenticity
- Absence of external pressure or coercion—for example, social pressure

There are criteria for acceptability of a decision:

- The patient has to know the facts.
- He or she has to be aware of alternative options for the therapeutic interventions.
- He or she has to be capable of clearly communicating his or her preferred option.
- He or she is aware of the consequences of his/her decision.
- He or she has to be capable of explaining it and of declaring that it is in accordance with his or her values—regardless if the physician shares them or not.

In the absence of decisional capacity, for example, in more advanced cognitive impairment, it may be of help to consider the presumable will of the patient which

can be elucidated in communicating with the relatives of the patient or proxies previously designed by the patient.

This is also the function of the written patient advance directives. In the rare cases where such indications cannot be obtained, it may help to reflect about what the patient certainly would not want to experience: pain, hunger and thirst, coldness, isolation… (Loewy 1996).

34.9 End-of-Life Issues

The proximity of death can be seen as a characteristic of geriatric patients. Death is a clearly defined irrevocable state, whereas the phase preceding it, the end-of-life phase is a process ending in death, a biologically and chronologically extendible phase of life becoming even more fuzzy by applying medical interventions (Austrian Bioethics Commission 2011). The lack of a clear definition and a diagnosis for this state means that there is no exact basis for medical interventions in the end of life—they become a tightrope walk between prolonging life or prolonging dying, often resulting in a conflict between the medically doable and the individual benefit for the patient. In this situation classical medical patterns of decision-making based on evidence-based medical facts frequently cannot be applied because such empirical facts are not available. Decision-making often is dominated by fears of failure or of legal consequences. Dying appears to be less a natural event than a medically determined and shaped process. Collision scenarios between moral conceptions of the patients and the physicians, economic constraints, medical promises and patient's expectations become imaginable (Austrian Bioethics Commission 2011).

At the end of life, perhaps during the dying process, the physician may become confronted by the demand of the patient, or relatives to actively assist him or her in dying. In such a case one has to consider that behind this demand there is the wish not to have to continue living in the present condition. Palliative care can—to a large extent—ameliorate the condition perceived as unbearable by the patient. To actively assist during the dying process is a key task of palliative care. In most European countries physicians' obligations reach their ethical and legal limits when the demand is for active euthanasia (SAMW (Schweizerische Akademie der Medizinischen Wissenschaften) 2012).

In voluntary euthanasia the dying process is actively induced by a physician administering a lethal dose of medication upon the formal request of a patient with a terminal condition and with full decisional capacity. It may be practiced legally in the Netherlands, Belgium, and Luxembourg. Physician Assisted Suicide (PAS) or "physician aid-in-dying" is distinct from euthanasia: physicians can provide patients with the medications that will end their lives, assuming they meet certain strict criteria, but physicians cannot administer the medication, a patient still has to be able to take it on his or her own, it is not illegal in Belgium, Finland, Germany, Luxembourg, the Netherlands, and Switzerland (Emanuel et al. 2016).

Primarily, euthanasia and PAS involve patients with cancer, but there is an ongoing discussion of accepting these acts as being legal in situations of "unbearable

suffering" due to conditions not immediately terminal like depression or Alzheimer's disease.

There are typical areas of tension in which geriatric medicine has to decide and to act: for example, the one between the proximity of death and the obligation to secure optimal quality of life not regarding the length of the life still remaining. Another such area of conflict is the one between promoting the individual autonomy and independence on one side and securing the protection, help and care through benevolent, caring paternalism when the older persons are not capable of it by themselves on the other (Morrison and Meier 2003).

An advance directive, also known as living will, personal directive, advance healthcare directive, medical directive, or advance decision, is a legal document in which a person specifies what actions should be taken for their health if they are no longer able to make decisions for themselves because of illness or incapacity to decide. It specifies future situations in which certain medical interventions, even if life prolonging should be abstained from. It offers the possibility to maintain one's autonomy and self-determination. In most European countries it has legal status, in some it is "legally persuasive" without being a binding legal document.

Another possibility of advance directive giving instructions for treatment is the formal designation by the patients of a healthcare proxy, a person with power of attorney to make decisions on their behalf when they become unable to do so themselves. People are often encouraged to complete both documents to provide comprehensive guidance regarding their care.

Advance directives and the designation of a healthcare proxy are cornerstones of Advance Care Planning, a process that enables individuals to make plans about their future healthcare. Participation in advance care planning has been shown to reduce stress and anxiety for patients and their families, and lead to improvements in end-of-life care (Gillick 2004; Coors et al. 2015).

References

Austrian Bioethics Commission. Recommendations for the terminology of medical decisions in end-of-life Situations. 2011. http://archiv.bundeskanzleramt.at/DocView.axd?CobId=46713. Accessed 28 Feb 2017.

Beauchamp TL, Childress JF. Principles of biomedical ethics. 7th ed. New York: Oxford University Press; 2012.

Borasio GD. Lecture at the 66th Annual German Jurist's Conference, Sep 20th, 2006, Stuttgart.

Cameron AA, et al. Ethical issues for invasive cardiologists: society for cardiovascular angiography and interventions. Catheter Cardiovasc Interv. 2004;61:157–62.

Coors M, Jox RJ, in der Schmitten J. Advance care planning. Kohlhammer; 2015.

Doyal L, Wilsher D. Withholding and withdrawing life sustaining treatment from elderly people: towards formal guidelines. BMJ. 1994;308:1689–92.

Emanuel EJ, et al. Attitudes and practices of euthanasia and physician-assisted suicide in the United States, Canada, and Europe. JAMA. 2016;3016(1):79–90.

Gawande A. Being mortal – illness, medicine and what matters in the end. New York: Metropolitan Books, Henry Holt & Co; 2014.

Gillick M. Advance care planning. NEJM. 2004;350(1):7–8.

Hawkins BM, et al. High-risk percutaneous coronary intervention in the era of public reporting – clinical and ethical considerations in the care of the elderly patient with critical left main disease and shock. Circulation. 2014;129:258–65.
Levine GN et al.. ACCF/AHA/SCAI guideline for percutaneous coronary intervention. Catheter Cardiovasc Interv. 2011.
Loewy EH. Textbook of health care ethics. New York: Plenum Press; 1996.
Loewy EH. Ethics and evidence-based medicine: is there a conflict?. Med Int Med. 2007. http://www.medscape.com/viewarticle/559977_2. Accessed 7 Jan 2015).
Loewy EH, Loewy-Springer R. Textbook of healthcare ethics. 2nd ed. Dordrecht: Kluwer Academic Publishers; 2004.
Marckmann G, in der Schmitten J. Begrenzung lebenserhaltender Maßnahmen – eine Handreichung für die Praxis auf der Grundlage der aktuellen Gesetzgebung. Dtsch Med Wochenschr. 2010;145:570–4.
Morrison RS, Meier DE. Geriatric palliative care. Oxford: Oxford University Press; 2003.
Pauer-Studer H. Einführung in die Ethik. Wien: Facultas; 2003.
Rehbock T. Autonomie, Fürsorge, Paternalismus – zur Kritik medizin-ethischer Grundbegriffe. Z. Ethik Med. 2002;3:131–50.
SAMW (Schweizerische Akademie der Medizinischen Wissenschaften). Medizin-ethische Richtlinien Betreuung von Patientinnen und Patienten am Lebensende. (2004, update 2012). http://www.samw.ch/de/Ethik/Richtlinien/Aktuell-gueltige-Richtlinien.html. Accessed 15 Jan 2015).
Schneiderman LJ, et al. Medical futility: its meaning and ethical implications. Ann Intern Med. 1990;112:949–54.
Schneiderman LJ, et al. Medical futility: response to critiques. Ann Intern Med. 1996;125:669–74.
Steinkamp N, Gordinj B. Ethik in Klinik – Ein Arbeitsbuch. Munich: Luchterhand; 2010.

Abuse of Older Persons

35

Gianfranco Salvioli and Chiara Mussi

Abstract

Abuse of older persons (physical, sexual, financial, or psychological), neglect, and self-neglect are major public health problems, sometimes underdiagnosed and overlooked because of a poor clinician education regarding this "geriatric giant." The recognition of mistreatment or suspected abuse in older persons needs the careful evaluation of relationships with caregivers to identify both risk factors and warning signs. About 95% of older people live with their spouses, children, siblings, or other relatives or paid caregivers; these are usually the potential abusers. Although some cases of abuse of older persons (AOP) have criminal aspects, often the abuse is subtle, and the distinction between normal interpersonal stress and abuse is not easy to discern. Appropriate preventive interventions aim to protect the most vulnerable older persons at risk.

Learning Objectives

By the end of the chapter, the reader will be able to

- Keep in mind the problem of abuse in the older population
- Define the different types of abuse
- Detect patient's signs of abuse and identify the possible perpetrator
- Develop possible preventive strategies

Electronic supplementary material The online version of this chapter (https://doi.org/10.1007/978-3-319-61997-2_35) contains supplementary material, which is available to authorized users.

G. Salvioli (✉) • C. Mussi
Modena and Reggio Emilia, Modena, Italy
e-mail: gianfranco.salvioli@unimore.it; chiara.mussi@unimore.it

R. Roller-Wirnsberger et al. (eds.), *Learning Geriatric Medicine*,
Practical Issues in Geriatrics, https://doi.org/10.1007/978-3-319-61997-2_35

35.1 Description and Types of Abuse of Older Persons

AOP is defined as "a single, or repeated act, or lack of appropriate action, occurring within any relationship where there is an expectation of trust which causes harm or distress to an older person." The types of AOP are: physical, psychological/emotional, sexual, and financial; it can also be the result of intentional or unintentional neglect; even self-neglect occurs frequently. In many parts of the world AOP occurs with little recognition or response event. AOP is a "geriatric giants," as falls and frailty, and it represents an important public health and societal problem; it can lead to premature death or make existing health problems worse. AOP is a multifactorial problem that may affect older persons from different backgrounds and involve a wide variety of potential perpetrators, including caregiver, adult children, and partners.

The factors contributing to misdiagnosis and underreporting include denial by both the victim and the perpetrator, clinicians' reluctance to report victims, disbelief by medical providers, and clinicians' lack of awareness of warning signs (Lachs and Pillemer 2015).

AOP types are:

- *Physical abuse*: most recognizable (yet neglect is most common); it is a non-accidental use of force (hitting, kicking, pushing, slapping, burning) against an older person resulting in pain, injury, or impairment. Possible indicators are multiple bruising, fractures, burns.
- *Psychological or emotional abuse*: more easily missed: people speak to or treat older persons in ways that cause emotional pain or distress (intimidation through yelling or threats, humiliation and ridicule, habitual blaming or scapegoating, ignoring the older person, isolating the person from friends or activities, terrorizing or menacing the older person).
- *Sexual abuse*: any unwanted sexual conduct against an older person; it may cause harm by tricking, manipulating, or coercing the elder person into undesired sexual contact; sometimes victims are unable to communicate consent or disapproval.
- *Financial exploitation*: very common, it depends on the unauthorized use of an older person's funds or properties by caregiver or a relative (e.g., cashing the elder's pension without permission, sudden changes in the older person financial condition, addition of names to the senior's signature card).
- *Elder neglect*: the failure to fulfill a caretaking obligation; it consists in repeated deprivation of assistance needed for activities of daily living (ADL) and help with medication; half of all reported cases of AOP are abandonment; it can be intentional or unintentional, based on factors such as ignorance or denial that an older person charge needs as much care as he or she does. Unusual weight loss, malnutrition, dehydration, untreated physical problems (e.g., bed sores), unsanitary living conditions: dirt, bugs, soiled bedding and clothes, being left dirty or unbathed, unsuitable clothing or covering for the weather, unsafe living conditions (no heat or running water; faulty electrical wiring, other fire hazards), desertion of the elder at a public place.

- *Self-neglect*: probably the most common of non-financial kind of abuse, a growing problem that commonly goes unreported. It is associated with impairment in activities of daily living (ADLs) and instrumental activities of daily living (IADLs). Residents of long-term care facilities who have disabilities in self-care (e.g., eating, toileting, transfers, and mobility) are at increased risk for morbidity and mortality from neglect.

35.1.1 Setting and Risk Factors

AOP is to some degree dependent upon environmental factors: financial and psychological abuses are associated with domiciliary setting whereas physical abuse and neglect with institutional settings. The highest rates of AOP are in women and in persons 80 years of age and older. The abuser is a family member (usually a spouse or adult child) in approximately 90 percent of cases. Risk factors of AOP can be categorized by victim or perpetrator; dependency, on the part of the victim or perpetrator, and caregiver stress are frequent common denominators in abusive situations. Many elders are either cognitively impaired and don't recognize or remember the offenses, or are reluctant to report abuse or neglect for fear of being removed from their own homes or implicating family members. Several risk factors (Table 35.1.) and warning signs have been identified that help to suspect AOP; however, having these risk factors does not always mean violence will occur.

Coping challenges of caregiver play an important role in the AOP when the relationship is more emotional than rationale: the Caregiver Burden Inventory http://www.aafp.org/afp/2000/1215/p2613.html helps to identify a stressed caregiver; the personality of caregiver may increase the likelihood for AOP and neglect above all if adequate social support is lacking.

35.2 Prevalence and Recognition

Data exist only in selected developed countries; the prevalence ranges from 5 to 10% of older population, with an incidence of 4% every year. In ABUEL Study (ABUse and health among ELderly in Europe), the prevalence was of 19.4% for mental abuse, 2.7% for physical abuse, 0.7% for sexual abuse, 3.8% for financial

Table 35.1. Risk factors for AOP (Wang et al. 2015)

Relating to:
1 *The older person*: age >80 years, cognitive impairment, behavioral problems, psychiatric illness or psychological problems, functional dependence (requiring assistance with activities of daily living), poor physical health or frailty (history of stroke or hip fracture), inappropriate or excessive medication, substance abuse, low income or wealth, trauma or past abuse, ethnicity (increased risk among nonwhites for overall abuse), social isolation, poor relationships with caregivers or relatives
2 *The perpetrator*: caregiver burden or stress, psychiatric illness or psychological problems
3 *The relationship*: family disharmony with poor or conflictual relationships
4 *The environment*: low social support, living with others (except in financial abuse)

abuse, and 0.7% for injury (https://social.un.org/ageing-working-group/documents/ElderAbuseNGOEWG2012.pdf).

To Assess AOP, General Questions to Screen for the Various Types Are Useful; For Example

1. Has anyone at home ever hurt you?
2. Has anyone ever touched you without your consent?
3. Has anyone ever made you do things you didn't want to do?
4. Has anyone taken anything that was yours without asking?
5. Has anyone ever scolded or threatened you?
6. Have you ever signed any document that you didn't understand?
7. Are you afraid of anyone at home?
8. Are you alone a lot?
9. Has anyone ever failed to help you take care of yourself when you needed help?

Any question answered affirmatively must be followed by details in order to indicate when the mistreatment occurs, who perpetrates it, and how the patient feels about it and copes with it.

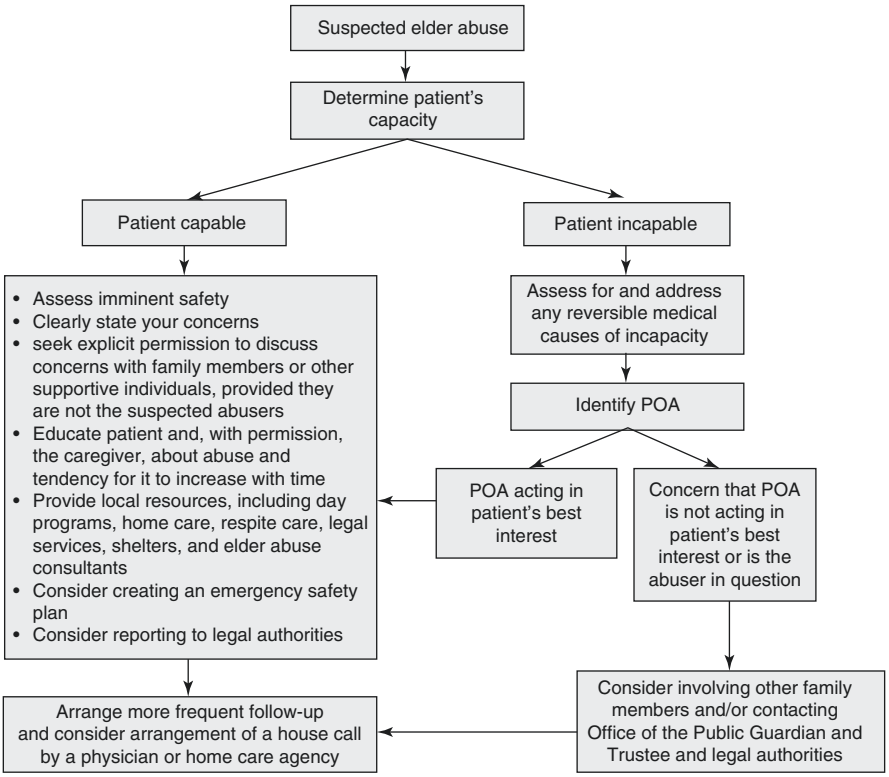
The EASI (Elder Abuse Suspicion Index) is a 6-questions questionnaire to raise the suspicion of abuse; a "yes" response to any of these questions should concern about abuse and lead to a follow-up (see Pocket form for details) (https://www.mcgill.ca/familymed/research-grad/research/projects/elder).

The Comprehensive Geriatric Assessment (CGA), a multidisciplinary multidimensional diagnostic process, can help to identify AOP and to prevent it (see also Chapter 26); CGA provides useful insight for physical and psychological signs of abuse (http://www.cgakit.com/elder-abuse). Unfortunately, this correct approach to geriatric medicine is not used in clinical practice, above all in primary care; ageism, a stereotyping and disseminating against individuals or groups on the basis of their age, is prevailing and prelude to AOP. For the health operators an important application for smartphone is available: http://www.centeronelderabuse.org/368elderabuseca.asp.

35.3 How to Prevent Abuse of Older Persons?

The most important challenge is the prevention of AOP occurrence; it requests a global multifaced involvement with the target of protecting the rights and dignity of older person. To prevent AOP, older people should be informed about the possible abuse events, above all if they are disabled or with cognitive impairment; the nurses should report suspected case of abuse, neglect and exploitation monitoring the quality of relationships between older person and caregiver (Dong 2015).

Services for older people can help to prevent abuse and neglect; but there is inadequate trustworthy evidence to assess the effects of AOP interventions on occurrence or recurrence of abuse; combined measure of anxiety and depression of caregivers can positively influence the trend of abusive events. Educational interventions are able to improve knowledge and attitude of caregivers, but it is uncertain whether such programs reduce the occurrence of abuse (Baker et al. 2016). Insufficient evidence exists to recommend screening all older people for abuse (Wang et al. 2015). Following an assessment of capacity, physicians should educate the patient about abuse problems; the activation of local protection services (legal or police services) is requested. In presence of suspected elder abuse the possible interventions are listed below (Wang et al. 2015).



POA is the power of attorney; in the case of an incapable older person somebody who has power of attorney must be identified. The true problem seems the improvement of family caregivers' awareness, efficacy, and empowerment for a better self-recognition of their own needs and improved effort for developing and accessing coping resources: the implementation of the InformCare Web platform in European countries is recommended (Barbabella et al. 2016).

Hidden cameras or recording equipment can be used in certain circumstances if families are concerned about poor care or abuse of people under care above all in

nursing home; new guidance from England's Care Quality Commission and a law in some regions of Italy allow this help to improve safety of older patients even if it may intrude on other people's privacy, including other people who use the service, staff, families, and visiting professionals.

References

Baker PRA, Francis DP, Hairi NN, Othman S, Choo W. Interventions for preventing abuse in the elderly. Cochrane Database Syst Rev. 2016; Issue 8.

Barbabella F, Poli A, Andréasson F, Salzmann B, Papa R, Hanson E, et al. A web-based psychosocial intervention for family caregivers of older people: results from a mixed-methods study in three European countries. JMIR Res Protoc. 2016;5:e196.

Dong XQ. Elder abuse: systematic review and implications for practice. J Am Geriatr Soc. 2015;63:1214–38.

Lachs MS, Pillemer KA. Elder abuse. N Engl J Med. 2015;373:1947–56.

Wang XM, Brisbin S, Loo T, Straus S. Elder abuse: an approach to identification, assessment and intervention. CMAJ. 2015;187:575–81.