Chapter 16
Cognitive Rehabilitation and Recovery After Stroke

Audrey Bowen and Emma Patchick

Introduction

As the previous chapters have described in detail, many of those fortunate to survive their stroke do so with detrimental alterations to their cognitive and psychological well-being. These impairments impact the affected individual's ability to participate in, and benefit from, multidisciplinary stroke rehabilitation, to safely and independently carry out activities of everyday living, and to resume pre-morbid personal, social, and vocational roles [1–4]. Previously automatic and effortless tasks require exhausting levels of concentration and, despite the efforts invested, often end in perplexing and de-motivating failure. Uncertainty in one's own abilities and reliance on others makes people with cognitive problems vulnerable to frustration, humiliation, worry, and feelings of hopelessness. These topics are covered elsewhere in this book. The current chapter focuses on cognitive rehabilitation by exploring the evidence base from the perspective of informing clinical service improvements and strives to root cognitive recovery firmly within a broader psychological context.

> I couldn't understand why things were so much harder…I couldn't follow things. I worked before my stroke and was…am…an intelligent man, but didn't feel that way anymore. The tests were interesting for me…some bits were so easy, other bits just made me unravel… things I knew I should be able to do. It really helped me and my wife that the girls explained why this was happening…that it was the stroke, not me. I guess I felt it gave me some control to understand it…. Quote from person with stroke. Reprinted with permission from NHS Improvement -Stroke [31].

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T.A. Schweizer and R.L. Macdonald (eds.), *The Behavioral Consequences of Stroke*,
DOI 10.1007/978-1-4614-7672-6_16,

Consensus on Prioritizing Psychological Problems

Stroke survivors often seek to express that they feel like a different person, their essence has changed, and their self-identity as well as esteem has been threatened, not necessarily by their hemiplegia or their hemianopia but by changes to the cognitive functions underlying their capacity for language, attention, spatial awareness, memory, and so on [5]. Families notice a difference too, although as they anecdotally report, it is the dysexecutive impairments altering social behavior that cause the greatest concern about having "lost" the person they knew. It is therefore not surprising that there is a consensus amongst people with stroke, their health service providers, and stroke rehabilitation researchers regarding the importance of the behavioral consequences of stroke.

Research into psychological problems was raised as a priority area by the National Stroke Strategy for England [6] despite, or perhaps because of, uncertainties regarding the most effective rehabilitation interventions. When stroke survivors were recently asked about their unmet needs following stroke, almost half of the 799 respondents reported problems with their mood and cognition [7]. Of those, a high proportion felt that issues such as memory and concentration had not been addressed appropriately, especially when compared with other issues such as mobility and pain. Similarly, the James Lind Alliance took a comprehensive and rigorous approach to identifying research priorities relating to life after stroke by consulting with stroke survivors, caregivers, and health professionals as well as searching relevant literature. They concluded that the number one research priority was investigating the best ways to improve cognition after stroke [8].

Quality of the Evidence Base for Cognitive Rehabilitation

One conclusion that might be drawn from the above is that there is very little existing research in cognitive rehabilitation. However, there is in fact an abundance of literature on the topic, and cognitive rehabilitation research is now well established with contributions from several fields including neuropsychology, cognitive psychology, clinical psychology, neurorehabilitation, occupational and speech and language therapy, and acquired brain injury. The full gamut of research designs are employed from qualitative methods exploring survivors' perspectives and priorities through the whole range of quantitative methodologies. The latter consist of single case designs and case series, cohort and case–control observational studies, experimental group designs (within and between subject controls) up to and including randomized controlled trials, and the recent emergence of health economic evaluations. Readers interested in the topic of research design for the evaluation of complex interventions such as cognitive rehabilitation are referred to the framework proposed by the Medical Research Council [9, 10].

Perhaps this abundance of evidence is the problem. How do those charged with improving national and local clinical services extract the most relevant and reliable

research, especially where it appears contradictory? The two most internationally accepted methods of evidence synthesis for clinical service development are the Cochrane Collaboration's established systematic review and meta-analysis, disseminated widely throughout the world via the web-based Cochrane Library [11]; and the national clinical guidelines/recommendations for stroke now produced and regularly updated by a growing number of countries, e.g., Australia [12], Canada [13], the UK (except Scotland) [14], and a separate guideline for Scotland [15]. Cochrane reviews employ a tried and tested formula for systematic searching to extract and include published and unpublished data that meet agreed quality standards, thereby reducing the risk of bias. This usually restricts the review to evidence collected from well-conducted randomized controlled trials.

From Cochrane Reviews to National Clinical Stroke Guidelines

Cochrane reviews of cognitive rehabilitation that focus on dysfunctions such as neglect, apraxia, memory, perception, and attention problems exist, and others—such as those concerned with executive dysfunction—are close to publication. The Cooksey review of UK healthcare research highlighted two problematic "gaps" that hold back clinical service development in healthcare generally [16]. One of the gaps is relevant to cognitive rehabilitation and is specifically concerned with how we transfer research evidence into clinical knowledge or clinical practice.

Assumptions that data/evidence and knowledge are one and the same are naïve, as is the expectation that clinicians can and will automatically implement published evidence and evidence syntheses into practice. National clinical guidelines seek to address this gap [12–15]. They perform the essential translator role, producing recommendations for implementation into clinical practice based on high quality searching, evidence appraisal, and consensus level agreement. Where evidence is missing, recommendations are formulated around expert opinion and good practice points. Often they also complete the loop by conducting national audits of adherence to the recommendations [17, 18]. This can help by highlighting areas of practice in need of greatest improvement such as the area of psychological needs, including cognitive rehabilitation, in England [7]. The Canadian guideline (i.e., their Stroke Strategy: Best Practice Recommendations) explicitly includes helpful links to "Implementation Resources and Knowledge Transfer Tools" for each topic within stroke care [13, 19].

Aims of This Chapter

There are now several excellent textbooks [20, 21], journal review papers [22, 23], and Cochrane reviews on post-stroke cognitive rehabilitation that can be referred to for detailed descriptions of both the interventions and the studies that evaluate their

efficacy [24–30]. The current chapter describes and compares the recommendations for cognitive rehabilitation currently advocated in various National guideline, which themselves are heavily influenced by the Cochrane reviews and randomized controlled trials. We review each cognitive area and conclude with what has been termed "comprehensive holistic neuropsychological rehabilitation." The evidence base for this borrows heavily from the traumatic brain injury literature but suggests a pragmatic way forward for stroke rehabilitation services. The final issues considered will be service organization and the workforce needed to deliver effective cognitive rehabilitation, with reference to the recent National Health Service (NHS) Improvement Program's useful stepped care model of improving stroke services for people with cognitive and mood problems in England [31].

Cognitive Rehabilitation: Screening and Assessment

The most striking common feature of the clinical guidelines is their emphasis on screening and assessment to elicit underlying cognitive impairments and determine the likely functional and personal impact for each individual with stroke. In some guidelines a larger proportion of the recommendations focus on assessment compared to restorative or compensatory interventions (e.g., Scottish). Providing explanations to demystify patients and caregivers is often a core recommendation and the rationale for this is illustrated in the previous quote from a person with stroke [31]. The following definition of cognitive rehabilitation from the Scottish guideline places this message up front. It also highlights the current paucity of evidence for the benefits of assessment [15]. Although the Scottish guideline writers raise a valid methodological concern with the one existing study, the practical and cost implications of using qualified psychologists rather than assistants would need careful consideration.

> Cognitive rehabilitation concerns efforts to help patients understand their impairment and to restore function or to compensate for lost function (e.g., by teaching strategies) in order to assist adaptation and facilitate independence….When cognitive problems are suspected and relatives report personality change, the patient can be referred to a clinical psychologist to provide assessment and where appropriate, psychological intervention which may include career education and support. One [randomized controlled trial] found a trend only toward reduced [caregiver] strain when this service was provided. Assistant psychologists, not fully trained clinical psychologists, were used in this study. Reprinted with permission from Scottish Intercollegiate Guidelines Network [15]

Key recommendations on the topic of screening and assessment have been extracted and presented in Table 16.1. These include the reminder that assessment should determine a person's cognitive strengths and not just their impairments. The stroke team needs to be informed regarding the person's learning potential and how best to maximize that, not just for the rehabilitation of their cognitive difficulties, but as an "integral part of the [multidisciplinary] rehabilitation plan" [15]. Other recommendations common amongst guidelines concern balancing the utility of

Table 16.1 Recommendations from National Clinical Guidelines: screening and assessment for cognitive problems (selected extracts)

Australia	a) All patients should be screened for cognitive and perceptual deficits using validated and reliable screening tools. b) Patients identified during screening as having cognitive deficits should be referred for comprehensive clinical neuropsychological investigations.
UK[a]	A. Interventions or patient management should be organised so that people with cognitive difficulties can participate in the treatments and regularly reviewed and evaluated. B. Every patient seen after a stroke should be considered to have at least some cognitive losses in the early phase. Routine screening should be undertaken to identify the patient's broad level of functioning, using simple standardised measures (e.g. Montreal Cognitive Assessment MOCA). C. Any patient not progressing as expected in rehabilitation should have a more detailed cognitive assessment to determine whether cognitive losses are causing specific problems or hindering progress. D. Care should be taken when assessing patients who have a communication impairment. The advice from a speech and language therapist should be sought where there is any uncertainty about these individuals… E. The patient's cognitive status should be taken into account by all members of the multidisciplinary team when planning and delivering treatment. F. Planning for discharge from hospital should include an assessment of any safety risks from persisting cognitive impairments. G. People returning to cognitively demanding activities (e.g. some work, driving) should have their cognition assessed formally beforehand.
Scotland	A full understanding of the patient's cognitive strengths and weaknesses should be an integral part of the rehabilitation plan. *Screening* Short, standardised cognitive screening measures can be used by a health professional with knowledge and experience of the presentations of cognitive functioning and factors influencing it. They can be used as a broad screen to reduce the possibility that problems will be missed and as a measure of progress. It is important for staff to understand that these screening measures will miss some of the cognitive problems which can be most important for rehabilitation and eventual functioning. These are varied but can include such issues as poor awareness of deficits or their implications, slowing of information processing, and the ability to cope with distraction. Care needs to be taken in selecting measures for use with people who have communication difficulties and, ideally, the selection should be made in collaboration with a speech and language therapist. *Assessment* Screening measures do not provide information about the depth and nature of the patient's problems or strengths and therefore do not constitute an assessment sufficient for rehabilitation planning or for establishing suitability for a particular work role (e.g. operating machinery). Administering and interpreting full assessment results requires specialist training and should be carried out in the context of clinical interviews with access to background information. Stroke patients should have a full assessment of their cognitive strengths and weaknesses when undergoing rehabilitation or when returning to cognitively demanding activities such as driving or work. Cognitive assessment may be carried out by occupational therapists with expertise in neurological care, although some patients with more complex needs will require access to specialist neuropsychological expertise.

(continued)

Table 16.1 (continued)

Canada	1. All high-risk patients should be screened for cognitive impairment using a validated screening tool. 2. Screening to investigate a person's cognitive status should address arousal, alertness, attention, orientation, memory, language, agnosia, visuospatial/perceptual function, praxis and executive functions such as insight, judgment, social cognition, problem solving, abstract reasoning, initiation, planning and organization. 3. The Montreal Cognitive Assessment is considered more sensitive to cognitive impairment than the Mini Mental Status Exam in patients with vascular cognitive impairment. Its use is recommended when vascular cognitive impairment is suspected. Additional validation is needed for the Montreal Cognitive Assessment as well as other potential screening instruments such as the 5-min protocol from the Vascular Cognitive Impairment Harmonization recommendations. 4. Post-stroke patients should also be screened for depression, since depression has been found to contribute to cognitive impairment in stroke patients. A validated screening tool for depression should be used. 5. Post-stroke patients who have cognitive impairment detected on a screening test should receive additional cognitive and/or neuropsychologic assessments as appropriate to further guide management.

[a]Covers all of the UK except Scotland, which has a separate guideline

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- Intercollegiate Stroke Working Party. National clinical guideline for stroke, 4th edition. London: Royal College of Physicians, 2012 [14]
- Scottish Intercollegiate Guidelines Network (SIGN). Management of patients with stroke: Rehabilitation, prevention and management of complications and discharge planning. A national clinical guideline. Edinburgh: SIGN, 2010 [15]
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brief screening tools against consideration of their limitations, when to refer for more detailed assessment and by whom. Examples of useful tools are given in some guidelines. The Canadian and the recent update of the UK (except Scotland) guidelines suggest the Montreal Cognitive Assessment as a simple, standardized screening tool. The latter suggests more detailed assessments within later sections covering specific cognitive impairments (Table 16.1).

Timing and Workforce Mobilization: Cognitive Screening and Assessment

Workforce competencies for cognitive screening and assessment require careful planning as does the timing of these activities, which should influence clinical decision-making and outcomes for people with stroke, without using valuable

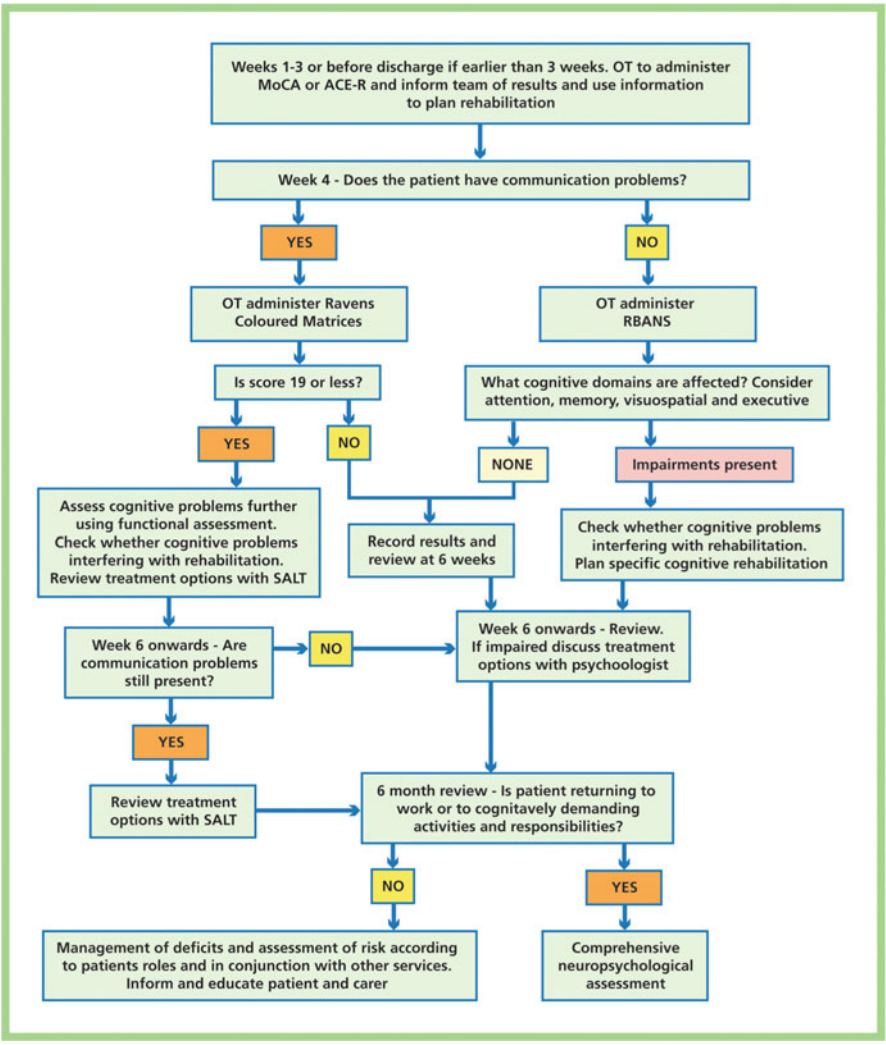

Fig. 16.1 Pathway for assessing cognitive problems. Reprinted with permission from Gillham S, Clark L. Psychological care after stroke—improving stroke services for people with cognitive and mood disorders. NHS Improvement—Stroke, 2011. http://www.improvement.nhs.uk/stroke/Psychologicalcareafterstroke/tabid/177/Default.aspx

resources to simply confirm the obvious (i.e., most acute stroke patients will have some cognitive impairment). Investigations should provide more information than a simple "cognitive impairment absent/present" tick box. Guidelines emphasize the roles of occupational therapists and psychologists. A recent document from the NHS Improvement Stroke program for England [31] suggests a pathway for assessing cognitive problems by way of the first step towards cognitive rehabilitation (Fig. 16.1). As shown, key time points in the UK model are: pre-transfer of care

from hospital to community at 6 weeks and 6 months. The latter review is recommended for identifying long-term problems persisting beyond the period when much spontaneous recovery has occurred. For some people with stroke, this can also be a significant time during which they appreciate the extent of their residual cognitive difficulties and the need to adjust and accept compensatory rehabilitation strategies and aids. Canada recommends the following more frequent cognitive screening/assessment regime (and extends this to those who have had a transient ischemic attack) "at various transition points throughout the continuum of stroke care [13]":

1. During presentation to emergency when cognitive, perceptual, or functional concerns are noted.
2. Upon admission to acute care, particularly if any evidence of delirium is noted.
3. Upon discharge home from acute care or during early rehabilitation if transferred to inpatient rehabilitation setting.
4. Periodically during inpatient rehabilitation stage according to client progress and to assist with discharge planning.
5. Periodically following discharge to the community by the most appropriate community healthcare provider according to client's needs, progress, and current goals.

Beyond Assessment: General Cognitive Rehabilitation

The National guideline differ slightly in how they treat the management of cognitive problems after assessment. Rather than covering general cognitive rehabilitation most (e.g., Australia, Scotland, and UK except Scotland) go straight to domain-specific advice (e.g., interventions for memory and neglect). These often include recommendations of assessment tools specific to that impairment but the point here is that they also cover restorative and compensatory techniques. The Canadian guideline includes recommendations for the rehabilitation of cognitive problems as a single collective (see Table 16.2). This includes the broadest range of interventions including psychopharmacology (not reprinted here, see full report [13]) since this guideline covers "vascular cognitive impairment and dementia."

Domain-Specific Recommendations

The Australian, Scottish, and UK (except Scotland) guidelines take the approach of dividing cognition into specific impairments. Recommendations for attention, memory, neglect, and aphasia are covered by all. Apraxia and executive functions are included in the UK (except Scotland) and Australian guidelines. Agnosia is specifically covered by the Australian guideline whilst the most recent guideline (UK with the exception of Scotland) makes recommendations more broadly on perception. Space does not permit detailed coverage of all eight domains. The approach taken

Table 16.2 Canadian recommendations: interventions for general cognitive problems (extracts)

Patients who demonstrate cognitive impairments in the screening process should be referred to a healthcare professional with specific expertise in this area for additional cognitive, perceptual and/or functional assessments. • Additional assessments should be undertaken to determine the severity of impairment and impact of deficits on function and safety in activities of daily living and instrumental activities of daily living, and to implement appropriate remedial, compensatory and/or adaptive intervention strategies. • A team approach is recommended, and healthcare professionals may include an occupational therapist, neuropsychologist, psychiatrist, neurologist, geriatrician, speech–language pathologist or social worker.
An individualized, patient-centered approach should be considered to facilitate resumption of desired activities such as return to work, leisure, driving, volunteer participation, financial management, home management and other instrumental activities of daily living.
Intervention strategies including rehabilitation should be tailored according to the cognitive impairments and functional limitations as well as remaining cognitive abilities, as identified through in-depth assessment and developed in relation to patients' and caregivers' needs and goals.
Strategy training provides individuals who have limitations in activities of daily living with compensatory strategies to promote independence and should be offered to patients with cognitive challenges. The evidence for the effectiveness of specific interventions for cognitive impairment in stroke is limited and requires more research. • Attention training may have a positive effect on specific, targeted outcomes and should be implemented with appropriate patients.
Compensatory strategies can be used to improve memory outcomes.

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has been to extract the relevant information into tables to enable comparisons between guidelines. The reader is referred to the original documents for specifics on the studies on which these recommendations were made.

Although this modularized approach to cognitive rehabilitation is an oversimplification intended to aid clarity, it is also a true reflection of the design of the majority of the rehabilitation studies, which focus on a single impairment (e.g., neglect). In clinical practice, rehabilitation acknowledges that each cognitive domain, such as perception, attention, and memory, cannot be considered in isolation, as most everyday activities draw on a range and interaction of cognitive abilities.

Attention/Concentration

Each of the four guidelines mentions the pivotal role played by attention and the impact of attentional impairments. The ability to select and concentrate on relevant information or events is fundamental to everyday life. When this ability is impaired,

other cognitive skills will be affected. Attention can therefore be considered a "mediator" or starting point for many aspects of cognition. Attentional deficits have an acute negative impact on functional ability [32–34].

Trials of rehabilitation of attention involve a number of different approaches. Computerized rehabilitation has been used; this allows repetition of tasks that draw on attention [35–37]. Approaches also focus on practice and development of specific strategies for time pressure management (TPM) [38, 39]. TPM is an intervention directly aimed at behavioral and cognitive change in treatment situations that are designed to mirror real-life situations. The goal is to develop alternative cognitive strategies to compensate for mental slowness. Attention process training (APT) has also been used [40, 41]. APT is "a theoretically based, hierarchical, multilevel treatment, including sustained, selective, alternating, and divided attention" [40].

A Cochrane systematic review of attention [24] concluded that there was no evidence to refute or support the use of specific rehabilitation techniques for attentional impairments that improve functional independence after stroke. An update to this review is in progress. The latest update to Cicerone's review of cognitive rehabilitation for attention impairments [23] made practice standard recommendations for interventions for traumatic brain injury but this may well be applicable to stroke. The UK (except Scotland) guidelines, the most recently updated of all the guidelines, make recommendations based mainly on consensus opinion and a recent underpowered randomized controlled trial [39] of TPM (see Table 16.3). Although inconclusive, the latter trial suggests that TPM shows promise with younger, more physically independent stroke survivors and that it is feasible to train staff to deliver TPM in hospital or community stroke services.

Overall, there is a lack of high quality trials to inform selection of specific interventions and much of the evidence is at consensus level. Adequately powered randomized controlled trials of TPM and other interventions (e.g., APT) would greatly improve the evidence base for these commonly disabling impairments (Table 16.3).

Memory

Memory impairments (see Chap. 8) are related to a general reduction in functional ability for everyday tasks, even after factors such as age and stroke severity are taken into consideration [42]. Memory impairments also are upsetting for family members who cope with the consequences of forgetfulness; caregiver well-being correlates negatively with a patient's memory problems [43]. The following simple three-step model has been advocated as useful for explaining and offering interventions to rehabilitate the effects of memory impairments:

1. Encoding—organizing and processing information for later recall. Encoding may happen consciously or unconsciously.
2. Consolidation—the process by which a piece of information becomes stored in memory in a more permanent way.
3. Retrieval and recognition—recalling previously encoded and consolidated information in a meaningful way [44].

Table 16.3 Recommendations from National Clinical Guidelines: Attention (extracts)

Australia	Cognitive rehabilitation can be used in stroke survivors with attention and concentration deficits
Canada	The evidence for the effectiveness of specific interventions for cognitive impairment in stroke is limited and requires more research • Attention training may have a positive effect on specific, targeted outcomes and should be implemented with appropriate patients
Scotland	There is not yet sufficient evidence to support or refute the benefits of cognitive rehabilitation for patients with problems of attention
UK[a]	A. Any person after stroke who appears easily distracted or unable to concentrate should have their attentional abilities (e.g. focused, sustained and divided) formally assessed B. Any person with impaired attention should have cognitive demands reduced through: – having shorter treatment sessions – taking planned rests – reducing background distractions – avoiding work when tired. C. Any person with impaired attention should: – be offered an attentional intervention (e.g. Time Pressure Management, Attention Process Training, environmental manipulation), ideally in the context of a clinical trial – receive repeated practice of activities they are learning.

[a]Covers all of the UK except Scotland, which has a separate guideline

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As suggested in Table 16.4, there are two main methods used in memory rehabilitation: (1) approaches to help encode, store, and retrieve new information (e.g., deep [semantic] encoding of material); and (2) teaching compensatory techniques to reduce disabilities (e.g., diaries, electronic organizers, and audio alarms). The Cochrane review for memory impairments post-stroke [26] concluded that there was "no evidence to support or refute the effectiveness of memory rehabilitation on functional outcomes, and objective, subjective, and observer-rated memory measures." The more recent guidelines' conclusions regarding the effectiveness of memory rehabilitation note there are serious limitations in the evidence base. The Australian and UK (except Scotland) recommendations are the most detailed and are very similar. There is widespread agreement between Cochrane reviewers and guideline writers that research is needed to establish both the clinical effectiveness

Table 16.4 Recommendations from National Clinical Guidelines: Memory (extracts)

Scotland	There is not yet sufficient evidence to support or refute the benefits of cognitive rehabilitation for patients with problems of attention or memory.
Canada	The evidence for the effectiveness of specific interventions for cognitive impairment in stroke is limited and requires more research. • compensatory strategies can be used to improve memory outcomes
Australia	Any patient found to have memory impairment causing difficulties in rehabilitation or adaptive functioning should: • be referred for a more comprehensive assessment of their memory abilities • have their nursing and therapy sessions tailored to use techniques which capitalise on preserved memory abilities • be assessed to see if compensatory techniques to reduce their disabilities, such as notebooks, diaries, audiotapes, electronic organisers and audio alarms, are useful • be taught approaches aimed at directly improving their memory • have therapy delivered in an environment as like the patient's usual environment as possible to encourage generalisation.
UK[a]	A. Patients who complain of memory impairment and those clinically considered to have difficulty in learning and remembering should have their memory assessed using a standardised measure such as the Rivermead Behavioural Memory Test (RBMT). B. Any patient found to have memory impairment causing difficulties in rehabilitation or undertaking activities should: • be assessed medically to check that there is not another treatable cause or contributing factor (e.g. hypothyroidism) • have their profile of impaired and preserved memory abilities determined (as well as the impact of any other cognitive deficits on memory performance for example, attentional impairment) • have nursing and therapy sessions altered to capitalise on preserved abilities • be taught approaches that help them to encode, store and retrieve new information for example, spaced retrieval (increasing time intervals between review of information) or deep encoding of material (emphasizing semantic features) • be taught compensatory techniques to reduce their prospective memory problems, such as using notebooks, diaries, electronic organisers, pager systems and audio alarms • have therapy delivered in an environment that is as similar to the usual environment for that patient as possible.

[a]Covers all of the UK except Scotland, which has a separate guideline

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(particularly at an activity rather than impairment level of outcome measurement) and the patient acceptability of different memory rehabilitation approaches, recruiting larger, more representative, groups of stroke patients (Table 16.4).

Neglect

Unilateral spatial neglect was originally classified as a perceptual impairment, before being widely accepted as an attentional disorder. It tends to stand alone these days perhaps because neglect is the most frequently researched topic within cognitive rehabilitation for stroke. The disabling effects of neglect have been well documented [45] (see Chap. 4). Although severe neglect is rather easily recognized, diagnosing milder neglect can be less obvious and only become apparent when observing higher-level activities such as driving, preparing a meal, and interacting in real-world social situations [46]. These difficulties obviously impact patient function and safety on transfer of care from hospital to community.

There is a relative wealth of research evidence in this field. Twelve randomized controlled trials were included in the Cochrane review of the cognitive rehabilitation of neglect [25]. A recent update of this review (in press) has included a further 11 trials [47–57]. Providing visual scanning training remains a popular intervention in neglect trials, as is the use of prisms. The latter is sometimes prescribed as an aid to be routinely worn on glasses but recent pilot trials have succeeded in determining the feasibility (but not yet the effectiveness) of prism adaptation training, a short therapist-led intervention using prisms during a specific computerized training activity [54].

The original review [25] concluded that cognitive rehabilitation can improve performance on impairment level tests but there is insufficient evidence to support or refute its effectiveness at reducing disability, one of the main aims of rehabilitation. This gap in the evidence base is due to limitations in the quality of the research studies, especially around the reduction of bias and the choice of appropriate outcome measures. The updated review will provide a systematic determination of whether the evidence base has been strengthened recently but for now the National guideline recommendations remain mostly at the consensus level and stress the need to invite people with neglect to participate in clinical trials (Table 16.5).

Aphasia

Aphasia (see Chap. 6) rehabilitation is a topic that has generated considerable research interest for decades and yet controversies regarding the quality of the evidence base remain. Clinical uncertainty persists around the most clinically and cost-effective method of supporting people with aphasia. Several major trials [55–58] and an update to the existing Cochrane review [28] that are likely to impact on National guideline were recently published. The new trials primarily concern impairment-focused intervention delivered at varying rates of intensity in the acute phase of the stroke pathway. Overall, the recent evidence does not support this

Table 16.5 Recommendations from National Clinical Guidelines: Neglect (extracts)

Canada	No specific recommendation beyond assessment
Scotland	Patients with visuospatial neglect should be assessed and taught compensatory strategies.
Australia	a) Any patient with suspected or actual neglect or impairment of spatial awareness should have a full assessment using validated assessment tools. b) Patients with unilateral neglect can be trialled with one or more of the following interventions: • simple cues to draw attention to the affected side • visual scanning training in addition to sensory stimulation • prism adaptation • eye patching • mental imagery training or structured feedback.
UK[a]	A. Any patient with a stroke affecting the right cerebral hemisphere should be considered at risk of reduced awareness on the left side and should be tested formally if this is suspected clinically. B. Due to the fluctuating presentation of neglect a standardised test battery such as the Behavioural Inattention Test should be used in preference to a single subtest, and the effect on functional tasks such as dressing and mobility should be determined. C. Any patient shown to have impaired attention to one side should be: – given a clear explanation of the impairment – taught compensatory strategies to help reduce impact on functional activities such as reading – given cues to draw attention to the affected side during therapy and nursing procedures – monitored to ensure that they do not eat too little through missing food on one side of the plate – offered interventions aimed at reducing the functional impact of the neglect (eg visual scanning training, limb activation, sensory stimulation, eye patching, prism wearing, prism adaptation training), ideally within the context of a clinical trial.

[a]Covers all of the UK except Scotland, which has a separate guideline

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approach at this time point. A qualitative study of patients' perspectives, nested within our own trial, suggested service reorganization to provide a more psychosocial approach to early aphasia rehabilitation, perhaps shifting the cognitive neuropsychological model approach to later [59–63]. In addition to rehabilitation directed

at the language impairment, emerging evidence supports the effectiveness of structured behavioral interventions in reducing low mood in people with aphasia [64] right across the pathway.

This flurry of recent research interest in aphasia is welcome news for people with aphasia and their caregivers but makes it difficult to compare the latest recommendations from guidelines as several have yet to be updated (see Table 16.6). Interested readers are referred directly to the studies referenced previously and to the recent Cochrane review and UK (except Scotland) guideline. There remains a striking need for research into interventions for people with chronic aphasia and to supporting caregivers and other communication partners.

Table 16.6 Recommendations from National Clinical Guidelines: Aphasia (extracts)

UK[a]	A. All patients with communication problems following stroke should have an initial assessment by a speech and language therapist to diagnose the communication problem and to explain the nature and implications to the patient, family and multidisciplinary team. Routine reassessment of the impairment or diagnosis in the early stages of stroke (immediate and up to four months) should not be performed unless there is a specific purpose eg to assess mental capacity. B. In the early stages of stroke (immediate and up to four months) patients identified as having aphasia as the cause of the impairment should be given the opportunity to practise their language and communication skills as tolerated by the patient. C. Beyond the early stages of stroke (immediate and up to four months), patients with communications problems caused by aphasia should be reassessed to determine if they are more suitable for more intensive treatment with the aim of developing greater participation in social activities. This may include a range of approaches such as using an assistant or volunteer, family member or communication partner guided by the speech and language therapist, computer-based practice programmes and other functional methods. D. Patients with impaired communication should be considered for assistive technology and communication aids by an appropriately trained clinician. E. Patients with aphasia whose first language is not English should be offered assessment and communication practice in their preferred language. F. Education and training of health/social care staff, carers and relatives regarding the stroke patient's communication impairments should be provided by a speech and language therapist. Any education and training should enable communication partners to use appropriate communication strategies to optimise patient engagement and choice, and the delivery of other rehabilitation programmes. G. Any person with stroke at home who has continuing communication difficulty due to aphasia and whose social interactions are limited by it should be provided with information about any local or national groups for people with long-term aphasia, and referred to the group as appropriate.
Canada	Patients with aphasia should be taught supportive conversation techniques. Access to training for care providers in programs that facilitate communication with stroke survivors with aphasia.
Scotland	Aphasic stroke patients should be referred for speech and language therapy. Where the patient is sufficiently well and motivated, a minimum of two hours per week should be provided. Where appropriate, treatments for aphasia may require a minimum period of six months to be fully effective. Referral to the volunteer stroke service …. should be considered as an adjunct.

(continued)

Table 16.6 (continued)

Australia	a) All patients should be screened for communication deficits using a screening tool that is valid and reliable. b) Those patients with suspected communication difficulties should receive formal, comprehensive assessment by a specialist clinician. c) Where a patient is found to have aphasia, the clinician should: • document the provisional diagnosis • explain and discuss the nature of the impairment with the patient, family/carers and treating team, and discuss and teach strategies or techniques which may enhance communication • in collaboration with the patient and family/carer, identify goals for therapy and develop and initiate a tailored intervention plan. The goals and plans should be reassessed at appropriate intervals over time. d) All written information on health, aphasia, social and community supports (such as that available from the Australian Aphasia Association or local agencies) should be available in an aphasia-friendly format. e) Alternative means of communication (such as gesture, drawing, writing, use of augmentative and alternative communication devices) should be used as appropriate. f) Interventions should be individually tailored but can include: • treatment of aspects of language (including phonological and semantic deficits, sentence level processing, reading and writing) following models derived from cognitive neuropsychology • constraint-induced language therapy • the use of gesture • supported conversation techniques • delivery of therapy programs via computer. g) The routine use of piracetam is NOT recommended. h) Group therapy and conversation groups can be used for people with aphasia and should be available in the longer term for those with chronic and persisting aphasia. i) People with chronic and persisting aphasia should have their mood monitored. j) Environmental barriers facing people with aphasia should be addressed through training communication partners, raising awareness of and educating about aphasia in order to reduce negative attitudes, and promoting access and inclusion by providing aphasia-friendly formats or other environmental adaptations. People with aphasia from culturally and linguistically diverse backgrounds may need special attention, for example, from trained healthcare interpreters. k) The impact of aphasia on functional activities, participation and quality of life, including the impact upon relationships, vocation and leisure, should be assessed and addressed as appropriate from early post-onset and over time for those chronically affected.

[a]Covers all of the UK except Scotland, which has a separate guideline

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- National Stroke Foundation. Clinical Guidelines for Stroke Management; 2010. Melbourne, Australia [12]
- Intercollegiate Stroke Working Party. National clinical guideline for stroke, 4th edition. London: Royal College of Physicians, 2012 [14]
- Scottish Intercollegiate Guidelines Network (SIGN). Management of patients with stroke: Rehabilitation, prevention and management of complications and discharge planning. A national clinical guideline. Edinburgh: SIGN, 2010 [15]
- Lindsay MP, Gubitz G, Bayley M, Hill MD, Davies-Schinkel C, Singh S, and Phillips S. Canadian Best Practice Recommendations for Stroke Care (Update 2010). Prepared by the Canadian Stroke Strategy Best Practices and Standards Writing Group, on behalf of the Canadian Stroke Strategy (a joint initiative of the Canadian Stroke Network and the Heart and Stroke Foundation of Canada). 2010; Ottawa, Ontario, Canada: Canadian Stroke Network [13]

Other Cognitive Domains: Apraxia, Perception, Agnosia, and Executive Functions

As mentioned previously, not all the guidelines address each of these topics so, where available, they are simply listed in a single table (see Table 16.7). Cochrane reviews exist for apraxia [27] and perception [29] and one on executive function has been submitted for publication [30]. The apraxia review is now out of date but relevant rehabilitation trials published since that review are included in the recent UK (except Scotland) guideline (see the guideline's evidence tables). Generally these topics lack a clear evidence base (in the case of apraxia of speech [65] there are no trials at all) and implications for future research are discussed in the reviews. The Australian guideline selects the management of agnosia as a research priority, although they are alone in this (Table 16.7).

Table 16.7 Recommendations from National Clinical Guidelines: other cognitive domains

Apraxia: Australia	a) People with suspected difficulties executing tasks but who have adequate limb movement should be screened for apraxia and, if indicated, complete a comprehensive assessment. b) For people with confirmed apraxia, tailored interventions (e.g. strategy training) can be used to improve ADL.
Apraxia: UK[a]	A. Any person who has difficulties in executing tasks despite apparently adequate limb movement should be assessed formally for the presence of apraxia. B. Any person found to have apraxia should: – have their profile of impaired and preserved action abilities determined using a standardised approach (e.g. Test of Upper Limb Apraxia TULIA) – have the impairment and the impact on function explained to them, their family, and their treating team. – be given therapies and/or taught compensatory strategies specific to the deficits identified ideally in the context of a trial
Executive functions: Australia	a) Patients considered to have problems associated with executive functioning deficits should be formally assessed using reliable and valid tools that include measures of behavioural symptoms. b) External cues, such as a pager, can be used to initiate everyday activities in stroke survivors with impaired executive functioning. c) In stroke survivors with impaired executive functioning, the way in which information is provided should be considered.
Executive functions: UK[a]	A. Any person who appears to have adequate skills to perform complex activities but who fails to organise the tasks needed should be formally assessed for the dysexecutive syndrome, for example using the Behavioural Assessment of the Dysexecutive Syndrome (BADS). B. Any person with an executive disorder and activity limitation should be taught compensatory techniques. This may include internal strategies (eg self-awareness and goal setting) and/or external strategies (eg use of electronic organizers or pagers, or use of written checklists) ideally in the context of a clinical trial. C. When a patient's activities are affected by an executive disorder, the nature and effects of the impairment and ways of supporting and helping the patient should be discussed with others involved (eg family and staff).

(continued)

Table 16.7 (continued)

Agnosia: Australia	The presence of agnosia should be assessed by appropriately trained personnel and communicated to the stroke team.
Perception: UK[a]	A. Any person who appears to have perceptual difficulties should have a formal perceptual assessment (eg using the Visual Object and Space Perception battery (VOSP)) B. Any person found to have agnosia should: – have the impairment explained to them, their carers and their treating team – be offered a perceptual intervention, ideally within the context of a clinical trial

[a]Covers all of the UK except Scotland, which has a separate guideline
Selected extracts reprinted with permission from:

- National Stroke Foundation. Clinical Guidelines for Stroke Management; 2010. Melbourne, Australia [12]
- Intercollegiate Stroke Working Party. National clinical guideline for stroke, 4th edition. London: Royal College of Physicians, 2012 [14]
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- Lindsay MP, Gubitz G, Bayley M, Hill MD, Davies-Schinkel C, Singh S, and Phillips S. Canadian Best Practice Recommendations for Stroke Care (Update 2010). Prepared by the Canadian Stroke Strategy Best Practices and Standards Writing Group, on behalf of the Canadian Stroke Strategy (a joint initiative of the Canadian Stroke Network and the Heart and Stroke Foundation of Canada). 2010; Ottawa, Ontario, Canada: Canadian Stroke Network [13]

Models of Comprehensive Neuropsychological Rehabilitation

It is clinically intuitive that for maximum efficacy a program of cognitive rehabilitation must be delivered as part of a comprehensive neuropsychological approach and within a clear pathway specifying different levels of involvement by differently skilled professionals. Comprehensive programs are sometimes referred to, especially within the US traumatic brain injury rehabilitation literature, as "holistic" [22] although in Europe the term holistic usually relates to alternative medicine.

The inclusion of recommendations on a comprehensive neuropsychological approach is very new in national stroke guidelines, appearing for the first time in 2012 [14]. It is based on a biopsychosocial model of illness for the organization and delivery of psychological care after stroke. As stated in the preamble to the forthcoming UK (except Scotland) guideline:

> The comprehensive model was developed because domain-specific cognitive rehabilitation interventions (e.g. memory rehabilitation) tend not to address the complexity of life after stroke. The same limitation applies to interventions that focus on a specific mood disorder and this may lead to ineffective treatment (e.g., cognitive problems misdiagnosed as depression).

> Comprehensive-holistic rehabilitation programmes integrate evaluations of cognition, behaviour and mood to formulate the individual's difficulties. They then assist in the development of alternative or compensatory expectations and behaviours, leading towards independent self-management. They acknowledge that people with stroke may have limited awareness of their impairments or their impact (anosognosia), and that many therapies require motivation for engagement. [14]

The evidence base for comprehensive rehabilitation is mostly at the level of case series or cohort studies and largely focused on rehabilitation after acquired brain injury. There have also been two randomized controlled trials, the findings from which support the integration of cognitive, interpersonal, and functional skills [66, 67]. However, there is no unequivocal evidence that benefits are long-lasting (i.e., beyond the end of the treatment), which is a key requirement of an effective rehabilitation program. Interested readers are referred to two recent reviews of this topic [22, 23]. The UK (except Scotland) guideline is therefore largely at the level of consensus and based on extrapolation from promising research with younger, traumatically brain injured samples. The main recommendation concerns how multidisciplinary team (MDT) services are delivered, by whom and when, advocating a dynamic, rather than linear, stepped care approach, whereby patients move up and down the following steps of the model as required:

- *Step 1* comprises the routine assessments conducted within the MDT of all admitted patients, and the more detailed assessment of patients exhibiting symptoms of psychological disorder at any time after stroke.
- *Step 2* comprises the management of mild or moderate problems by MDT members who have been appropriately trained and where possible working under specialist supervision.
- *Step 3* comprises the management of more severe or persistent disorder, usually by a specialist.

The model in Fig. 16.2 illustrates the approach recommended by the NHS Stroke Improvement Program for England [31] and was developed from the stepped care model for adults with depression described by the National Institute for Health and Clinical Excellence (NICE) [68]. The latter defines stepped care as providing "a framework in which to organize the provision of services supporting patients, [caregivers] and healthcare professionals in identifying and accessing the most effective interventions." The NHS Improvement publication includes more details on operationalizing the stepped care model for people with stroke, including cognitive problems [31]. One of the core aspects of the model concerns skill mix and the employment of trained non-psychologists at certain steps of the model. This is a specific issue in the UK where difficulty accessing clinical psychologists has been a common and persisting finding from national audits [17, 69].

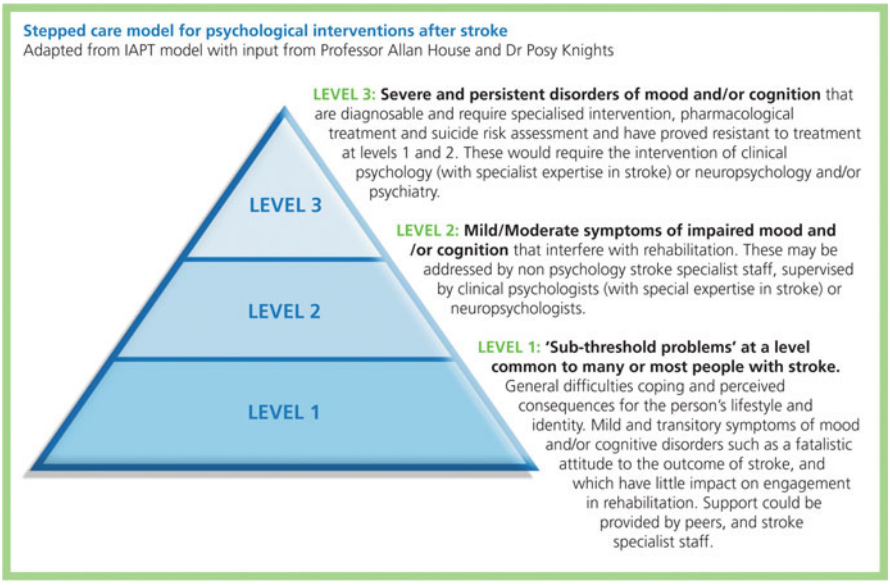

Fig. 16.2 Stepped care model for psychological interventions after stroke. Reprinted with permission from Gillham S, Clark L. Psychological care after stroke—improving stroke services for people with cognitive and mood disorders. NHS Improvement—Stroke, 2011. http://www.improvement.nhs.uk/stroke/Psychologicalcareafterstroke/tabid/177/Default.aspx

Summary

There is much to celebrate in the achievements of those working to develop an evidence-based approach for the rehabilitation of people with cognitive problems after stroke. Certain cognitive domains (e.g., neglect and aphasia) have attracted considerable research interest resulting in a range of interventions, many trials, and other levels of evidence. These feed into Cochrane systematic reviews and inform national clinical guidelines. These are exciting times with great potential for significant service improvement through emerging evidence for comprehensive neuropsychological rehabilitation approaches. In addition, practical recommendations for service delivery and organization are beginning to appear such as through recent modifications to the English stepped care model of psychological services.

On the other hand, even within heavily researched topics such as aphasia and neglect, there is still considerable uncertainty about which interventions to use, for which subgroup, when in the stroke pathway, and at what intensity. These are important questions. Furthermore, it is not clear why some topics (e.g., apraxia and memory) are, relatively speaking, under-researched and it certainly does not appear to be linked to either low prevalence or minimal impact on activity or social role

Implications for Research

Future studies should:

1. Provide a sufficiently detailed theoretical rationale for, and description of, the interventions including type and amount to allow implementation into clinical practice and research replication.
2. Provide a standard care control group, carefully documenting the content and amount of standard care, which can be highly variable.
3. Include detailed diagnostic information on individuals' perceptual problems given the heterogeneity in perceptual problems in terms of type, severity, and likely impact on everyday function.
4. Ensure low risk of study bias through rigorous methodological development and reporting, e.g., ensure allocation concealment, attempt to blind outcome assessors and report the success or failure, report all loss to follow-up, report results from all outcome measures, and control for other possible sources of bias.
5. Be of sufficient size to have adequate statistical power to answer clinically important questions about long-term functional outcomes.
6. Specify a primary endpoint and include analysis of other key outcomes such as adverse events, psychosocial benefits, and other outcomes deemed important by service users.
7. Adopt an intention-to-treat approach to measurement of outcomes in all individuals as well as to analysis of measured outcomes by treatment group.
8. Include a health economic assessment.

participation. Nor is it certain that simply producing "more of the same" research is the most productive way forward. As suggested in several of the Cochrane reviews of cognitive rehabilitation (see following for a recent example from the perception review [29]), future research could greatly improve clinical care through certain methodological and reporting changes:

Several countries now produce and audit against national clinical guidelines. In terms of cognitive rehabilitation there is reasonable consistency between the nations. Sometimes their differences are simply due to their publication date, with less evidence available to the older guidelines. The Scottish, Canadian, and Australian publications were in 2010, whereas the UK (excluding Scotland) guideline from the Royal College of Physicians London was updated for publication in 2012. Other differences result from the choice of either a wide or more focused breadth of topics and of course judgments about the standards set for accepting a piece of evidence, the criteria for which are described within each guideline.

Finally, the oft-repeated conclusion when examining the evidence is that we need more evidence! However there is also a need—and indeed it is already being

met—for a paradigm shift in how we think about rehabilitation for people with cognitive problems. We need to reach a balance between domain-specific research (essential for helping us understand specific impairments and mechanisms for recovery) and research into broad-based comprehensive approaches (that treat the person's cognitive deficits within the broader perspective of impact on everyday life and well-being). We must also engage in implementation research, so that the emerging evidence is translated into clinical practice.

Acknowledgements We are grateful to the authors of the national clinical guidelines (Australia, Canada, Scotland, RCP London) and the NHS Improvement—Stroke program for England and to Wiley for allowing us to reprint sections of their work. Our ideas are the result of collaborative working with the RCP London's Intercollegiate Stroke Working Party, and especially the members of the cognitive psychology subgroup: Janet Cockburn, David Gillespie, Andrew Bateman, and Peter Knapp whose input we wish to acknowledge.

Potential Conflict of Interest: Audrey Bowen is a member of the RCP London Intercollegiate Working Party for Stroke that produces the National Clinical Guideline referred to as UK (except Scotland), and author of some of the studies referred to in this chapter.

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