Postoperative Rehabilitation of the Elderly

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With our aging population, improvement of surgical techniques and perioperative care, more elderly patients are undergoing and surviving aggressive surgeries that were not performed even 10 years ago. Because of an increased prevalence of pre-existing medical conditions among the elderly group, they are more at risk for complications following surgery, either elective or an emergency basis. Those complications often lead to longer hospital stays, longer ICU stays, and extended usage of the ventilators with increased mortality [1, 2].

Physicians have recognized the benefits of early ambulation, and that unnecessary bed rest and immobility lead to physiologic changes in individuals who are sick, aged, or disabled and are particularly susceptible to the adverse effects of immobilization. Immobility reduces the functional reserve of the musculoskeletal system and functional capacity of the cardiovascular system, resulting in weakness. Early rehabilitation intervention may prevent deconditioning thus maximize function and improve the quality of life in older adults; the main goal is to help achieve independence. Early mobilization of these elderly patients includes positioning, dangling of their legs static and dynamic standing balance exercises, transfer training, ambulation on postoperative day one [1, 3, 4].

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The new enhanced rehabilitation strategies improve the functional outcome in the elderly patients following abdominal surgery, especially those done on an emergency basis without optimal pre-habilitation.

The scope of this chapter is to review some physiologic changes in the elderly that one must consider in any rehabilitation strategy for this group of patients. We will also cover all rehabilitation interventions in the Intensive Care Unit (ICU), in the acute or subacute rehabilitation services, and as outpatient following their discharges.

32.1 Definition of Terms

Rehabilitation is defined as the development of a person to the fullest potential, consistent with his or her impairment, and environmental limitations.

Impairment disability and handicap definitions, according to the World Health Organization, are provided in Table 32.1 [1].

There are differences in health risk factors, life expectancy, and patient goals among the different elderly subgroups (65–75 years of age) who may still be working, (categorized as old) persons over the age of 85 years (oldest-old), and those over the age of 90 years (nonagrian).

32.2 Physiology of Normal Aging

32.2.1 Musculoskeletal System

Normal aging influences the skeletal muscle in both structure and function: muscle mass decreases, strength diminishes, the rate of concentration slows, and the resistance to fatigue is reduced [5].

Muscle endurance relative to maximum strength does not appear to diminish with age. The loss of muscle mass has been related to a reduction in the total number of muscle fibers or a reduction of the size of type fibers [6].

The decline of muscle strength may be due to the reduction in the number of functioning motor units and change in the pattern of activity, leading to disuse of certain muscles. This may be reversible if older adults are physically active. Stiffness is usually present due to changes in the connective tissue of tendons, ligaments, joint capsules, and muscles. The bone mass is affected by bodyweight loading and

Table 32.1 Definitions according to the World Health Organization

Term	Definition
Impairment	Any loss or abnormality of function
Disability	Any restriction resulting from an impairment the ability to perform an activity, which is considered normal for a person
Handicap	Any disadvantage resulting from impairment or disability that limits or prevents the fulfillment of a role that is normal for an individual

the tensile forces that the muscles exert on the skeletal structure. Insufficient load-bearing activity will result in bone demineralization [7].

Changes in the endocrine system also lead to bone loss, which is more significant in women after menopause. Increased or excess osteoclast activity which occurs during aging activity, possibly due to the results of vitamin D deficiencies leading to an imbalance in the bone remodeling and ultimate weakening of the Cortical and trabecular bone. Risk factors for osteopenia and osteoporosis include increasing age, smoking, family history, and glucocorticoid therapy. Bone mineral density measurements with dual-energy x-ray absorptiometry (DEXA) scans are used to diagnose and track osteopenia and osteoporosis.

The high prevalence of osteoporosis and degenerative joint disease (osteoarthritis) in the elderly raises the question concerning normal physiological changes versus pathology. Degenerative joint changes in weight-bearing joints are essentially a universal occurrence in both sexes by the age of 60. These changes include biochemical alteration of cartilage with decreased ability to bear weight without fissuring, focal fibrillation, and ulceration of cartilage leading eventually to exposure of subchondral bone. This is not simply an issue of wear and tear, but an end-stage phenotype of an abnormal balance of the breakdown repair of analogous to the failure in other organs. Fortunately, significant symptoms and disability occur only in a fraction of those with radiographically identifiable degenerative changes. There is a poor correlation between radiographic findings and clinical picture.

32.2.2 Cardiovascular System

Several changes have been documented in the aging cardiovascular system. Particularly of major importance regarding activity tolerance are a decrease in maximal oxygen consumption (V02max) which decreases 5–15% per decade after the age of 25 years old and a decrease in the maximal heart rate by approximately 6–10 beats per minute per decade. This results in reduced capacity for work [8].

Aging is also associated with progressive gradual increase in both Systolic and Diastolic blood pressure, apparently owning more to loss of arterial elasticity than neurogenic factors (e.g., increase in circulating norepinephrine). This leads to a decrease in arterial compliance, left ventricular hypertrophy with impaired filling. There is also a decrease in beta-adrenergic receptors stimulation response, decreased sinoatrial node automaticity, and decreased number of myocytes [9].

Another important age-related physiological change with significant clinical applications is the decreased baroreceptor sensitivity. This results in a diminished reflex tachycardia upon rising from a recumbent position and accounts in part along with blunted plasma renin activity and reduced angiotensin II and vasopressin levels, for the increased incidence of symptomatic orthostatic hypotension in the elderly.

Orthostatic hypotension, also common after prolonged bed rest is in part due to intravascular volume depletion, compounded by an increase in venous pooling from the lower extremities. Immobilization is a risk thrombotic complication from stasis due to reduced muscle pumping of blood from the lower extremities and increased blood viscosity.

32.2.3 Neurological System

Numerous changes have been noted in relation to the functioning of the neurological system with aging. The three most important areas of dysfunction accompanying normal aging include loss of short-term memory, loss of speed of motor activities (with slowing in the rate of essential information processing), and impairment in stature, properception, and gait. There are altered neurofunctional and structural organization in the aging brain. Functional neuroimaging studies have shown a shift in brain activity from the posterior to the anterior regions with aging, as well as a decrease in cortical thickness, which is more pronounced in the frontal lobe followed by the parietal, occipital, and temporal lobes.

Widespread changes in the white and gray matter areas of the brain have been reported with aging [9]. There are decreased brain volume, frontal gray matter lost, and decreased cerebral blood flow. With aging, there is a decline in episodic memory. By contrast, procedural and semantic memory is stable and may even improve. The fluid intelligence decreases with age.

Rates of cognitive decline vary between individuals and may affect the ability to live independently. The vision declines with age as a result of changes in all the tissues of the eye. Age-related hearing loss is a common condition in the elderly adults [10]. In the peripheral nervous system, a decline in nerve conduction velocities have been well documented. The elderly in general demonstrates a progressive decline in coordination and balance. Perhaps related in part to impaired proprioception [11]. Progressive loss of nigrostriatal neurons with advancing age may also contribute to these changes. The basal ganglia play a major role in control of movement and regulation of muscle tone. This explains the fixed posture, muscle rigidity, akinesia, tremors, weak voice, and shuffling gait which is occasionally seen in older individuals [12].

32.2.4 Pulmonary System

With aging, an enlargement of the distal airspaces due to loss of supporting tissue can be found, a condition for which the terms “senile lung” or “senile emphysema” have been proposed [13]. This results in impaired pulmonary gas exchange and ventilation/perfusion (V/Q) mismatch. In addition, there is a loss of elastic recoil and lung stiffening resulting in increased lung compliance and decreased thoracic wall mobility in the elderly. Respiratory muscle strength also decreases. These changes lead to increased residual volume and functional residual capacity. Compensation during exertion can occur even in healthy older adults to a limited extent [14]. Further morphological changes with aging are progressive calcifications of the airways and the rib cage. Like other muscles, there is a loss of diaphragmatic muscle mass [13].

32.2.5 Gastrointestinal System

The primary changes in the aging intestine involve decreased motility and a relatively hypotonic colon, leading to longer stool transit time, greater stool dehydration, and commonly constipation [15].

Esophageal motility is also often decreased with aging, with a decreased peristaltic response, increased non-peristaltic response, or decreased relaxation of the lower esophageal sphincter.

Gastric compliance decreases with aging causing early satiety and prolonged postprandial satiety. There is also a hypochlorhydria and subsequent impaired absorption of vitamin B12, calcium, iron, zinc, and folic acid.

Hypochlorhydria can also lead to bacterial overgrowth in the small intestine. Several age-related changes in the gastrointestinal tract potentially can alter drug absorption. There is a less effective surface area available for absorption, decreased motility, and reduced splanchnic blood flow [16].

32.3 ICU-Acquired Weakness

ICU admission following major surgery is considered a standard of care in many healthcare systems [17]. The goal of intensive care is to decrease short-term mortality. Furthermore, advances in technology and medical knowledge have led to an improvement in survival rates following critical illness. Nonetheless, there are important complications of care in the intensive care unit (ICU) consisting of infections including ventilator-associated pneumonia, catheter-associated bloodstream infections, and urinary tract infections; venous thromboembolism, delirium, myopathies, and neuropathies related to critical illness and stress ulcers. Furthermore, ICU-acquired weakness is common following prolonged immobilization, high doses of corticosteroid, and or neuromuscular blockers which are frequently used in the ICU plan of care [18, 19]. The etiology of ICU-acquired weakness is multifactorial [20, 21], with critical illness polyneuropathy and or myopathy known to be a well-known cause [22, 23].

Bed rest is commonly prescribed in the ICU setting. Lack of physical activity and prolonged bed rest have significant physiologic effects on musculoskeletal system. Healthy muscle is maintained through a balance of protein breakdown and synthesis. In contrast, muscle wasting occurs when the breakdown is increased relative to synthesis. With bed rest evidently, muscles are not being used and thereby atrophy occurs. Muscle responds quickly to use and disuse by altering diameter length types of contractile fibers and vascular supply [24]. Atrophy begins within 72 h of immobility and even healthy well-nourished individuals show loss in muscle mass and strength within 10 days of bed rest [25, 26]. With the reduction in muscle mass, up to 40% of muscle strength can be lost with the first week of immobilization [27]. There is a 1.3–3% daily loss of muscle strength during immobility [27]. The resultant deconditioning caused by bed rest can be independent of the primary disease and physically debilitating.

The muscle atrophy found with aging and disuse has been studied and found to be very similar suggesting that similar processes are occurring [28]. Elderly patients with muscle mass reduce from aging are particularly vulnerable to muscle dysfunction from disuse [24]. Furthermore, immobilization can result in joint contractures and peripheral nerve injury.

Anti-gravity muscles such as leg extensors and trunk musculature are preferentially affected by the loss of mechanical loading compared to hand and upper limb musculature [27, 29]. Furthermore, in chronic ventilated patients proximal muscles are more affected than distal muscles and larger muscle groups were more severely affected than smaller muscle groups [30].

The skeletal system also reacts quickly to bed rest and mechanical loading [27]. There is greater bony resorption than formation resulting in reduction in bone integrity and demineralization [29] which primarily affects trabecular bone [27]. Consequently, patients on bed rest are at an increased risk of fractures. As opposed to muscular changes the skeletal system responds more slowly. In his study, Le Blanc reported just after 1 week of immobility there was a 1% reduction in bone density within the vertebral column [31].

The respiratory system is also negatively affected by immobility with the risk of developing atelectasis and increased likelihood of developing respiratory complications such as pneumonia [32]. Reduced respiratory muscle strength is a common feature in patients with prolonged mechanical ventilation. Lung-derived inflammatory mediators, e.g., tumor necrosis factor is associated with muscle wasting in chronic lung disease [33].

Bed rest also leads to cardiac deconditioning. There is a reduction in stroke volume by 30% within the first month of bed rest. On the other hand, heart rate is increased and orthostasis can develop within 72 h of immobility [34]. To a large extent, these changes are secondary to a decrease in blood volume [35].

Moreover, even though it is more important to improve outcomes in critically ill patients, one should also consider the economic burden of the cost of ICU patients who are critically ill with respiratory failure and thereby require mechanical ventilation [36]. In the North American region ICU, approximately 40% of the patients are on mechanical ventilation [37]. Overall critical care costs account for approximately 1% of the US Gross Nation Product or 90 billion dollars [38].

32.4 Early Mobilization

Early mobilization of ICU patients may directly modify the negative effects of bed rest. Early ambulation of hospitalized patients was first introduced late during World War II in order to hasten the recovery of soldiers in order to return to the battlefield

[39]. Implementing aspects of physical medicine and rehabilitation within days of ICU admission is an ICU care strategy to improve patient recovery and minimize potential complications. The aims of mobilization include [40]:

1. Improving respiratory function by optimizing ventilation/perfusion matching increasing lung volumes and improving airway clearance
2. Reducing the adverse effects of immobility
3. Increasing levels of consciousness
4. Increasing functional independence
5. Improving cardiovascular fitness
6. Increasing psychological well-being

Additionally, mobilization may decrease the risk of pulmonary complications speed recovery decrease the duration of mechanical ventilation and decrease the length of ICU or hospital stay [40]. In Morris et al. prospective cohort study, although not statistically significant ($P = 0.262$) the total direct inpatient costs for protocol group inclusive of mobility team salaries were less than the usual care group. This was believed to be secondary to the length of stay related cost reduction [41].

Yet early mobilization is not practiced on a widespread basis in the ICUs. Needham et al. reported that only 27% of ICU patients had received physical therapy and exposure to physical therapy had occurred on only 6% of all ICU days [42]. Safety concerns were a major barrier to the implementation of early mobilization in the ICU. There may be a fear of endotracheal tube or drain dislodgment or need for sedation [43]. Clinicians are also concerned for significant changes in hemodynamic parameters such as increases in heart rate and blood pressure and decrease in oxygen saturation, especially with the more demanding activities. Moreover, pain and or anxiety associated with mobilization may also increase hemodynamic parameters. Furthermore, there is a time constraint for nurses and physicians [43] and increase in staff members' workloads. Other barriers brought down include lack of knowledge and training [44].

Stiller provides ICU practitioners a comprehensive guideline to be used to assess the safety of mobilizing critically ill patients. He states that the main safety factors to be addressed include the intrinsic factors which are the patient's medical background and cardiovascular and respiratory reserve vs the extrinsic factors such as patient attachments environment and staffing. Prior to mobilization, the patient's medical background should be reviewed including past medical history. As with all physiatrist evaluation, one should also consider the patients' premorbid functional status and thereby ascertain if his or her current condition is preexisting, caused by the current problem or a combination. The history of present illness and current symptoms will help the ICU practitioner gain an indication of what systems are likely to limit mobilization. This also includes a patient's current medications such as sedating agents [40].

Other intrinsic factors listed include the patient's cardiovascular reserve more specifically the heart rate and blood pressure. As with heart rate, there are no published clinical data concerning safe levels of resting blood pressure when deciding whether to mobilize critically ill patients. Stiller and Phillips considered an acute increase or decrease in blood pressure of 20% or more represented hemodynamic instability and would delay mobilization. Furthermore, they state in many instances where inotropes are required to maintain blood pressure, mobilization should be deferred. We can apply the American College of Sports Science and Medicine list of cardiac conditions that preclude performance of exercise test to early mobilization [40]:

Recent significant change in the resting ECG, suggesting significant ischemia recent myocardial infarction (within 2 days) or other acute cardiac events

Unstable angina

Uncontrolled cardiac arrhythmia causing symptoms or hemodynamic compromise

Severe symptomatic aortic stenosis

Uncontrolled symptomatic heart failure

Acute pulmonary embolus or pulmonary infarction

Acute myocarditis or pericarditis

Dissecting aneurysm

Acute infections

Additional intrinsic factor includes the respiratory reserve. Stiller and Phillip recommend calculating the patient's partial pressure of oxygen in the arterial blood/inspired fraction of oxygen. As a second choice, the patient's SpO_2 can be used as an indicator of oxygenation. A SpO_2 of 90% or more accompanied by a recent fluctuation of less than 4% is suggestive of adequate respiratory reserve for mobilization. Hypercapnia may be indicative of respiratory failure which should caution for mobilization. Respiratory pattern should also be observed including respiratory rate, chest wall and abdomen pattern, usage of accessory respiratory muscles, and presence of wheezing. Clearly, mechanical ventilation is not a reason to prevent or even modify mobilization. Stiller also recommends that patients should remain on the most supportive level of ventilation during mobilization to maximize their respiratory reserve. Moreover, in cases with limited respiratory reserve it is preferred to increase the level of ventilatory support during mobilization to increase mobilization tolerance [40].

Another intrinsic factor includes hematological and metabolic factors. For example, hemoglobin, platelet counts, white cell count, body temperature, and blood glucose level. Instead of relying on the absolute low level for hemoglobin of 7, the clinician should be aware of an acute drop in hemoglobin as an indication of active or recent bleeding. Even though there are no absolute clinical guidelines regarding the minimum for platelet count, 20,000 may be considered a safe lower limit. An abnormally high or low white cell count is a possible marker for infection. Acute infection by itself does not disallow mobilization. However, infection can increase the need for the patient's oxygen use which may be further increased during mobilization [40].

Other intrinsic factors to consider are the patient's appearance, neurological status, orthopedic condition, and nutritional status. Factors to pay attention in the patient's appearance include facial expressions, conscious state, emotional status, level of pain and anxiety, presence of central or peripheral cyanosis, pallor, flush, sweatiness or clamminess, over or underweight, and muscle bulk. Both a decreased and increased level of consciousness (such as agitation, restlessness, or confusion may affect the patient's participation with therapeutic exercise. Inclusive in the neurological status is the assessment of patient's muscle strength. Inclusive in the early mobilization approach is the minimization of heavy sedation. The presence of high intracranial pressure or low cerebral perfusion may preclude mobilization. Weight-bearing status and orthopedic precautions should be investigated prior to mobilization therapy. Furthermore, as per the hospital protocol, extra caution should be considered with surgical conditions such as split skin grafts or myocutaneous flaps [40].

Comparatively, there are also numerous extrinsic factors to be aware of. Except for the need to ensure that attachments should not be dislodged, ECG lead, arterial lines, venous lines, central venous catheters, pulmonary artery catheters, urinary catheters, pulse oximetry, and drains should not prevent mobilization. Tracheostomy may ease mobilization of mechanically ventilated patient as compared to endotracheal tubes. Clinicians should consider that longer length of tubing increases the risk of dislodgement and/or movement which may cause vocal cords trauma. Likewise, similar care should be applied to patients under noninvasive ventilation. Epidural line does not preclude mobilization either. Granted that dialysis tubing does not preclude mobilization clinical practice is that mobilization is deferred during dialysis. An intra-aortic balloon pump used in patients with critically low cardiac output and blood pressure is indicative of hemodynamic instability and thereby may contraindicate mobilization. On the other hand, secondary, the risk of dislodging pacing wires, a temporary pacemaker also precludes mobilization. Mobilization with Sengstaken-Blakemore/Minnesota tubes used for managing bleeding esophageal varices is also contraindicated secondary to the risk of dislodgement of esophageal and or gastric balloons and could result in rupture of the esophagus or stomach. Intracranial pressure monitor is commonly used in the setting of major brain injury and thereby the underlying neurological condition may preclude mobilization [40].

There has been ongoing research on early mobilization therapy in intubated patients proving it to be feasible and safe. Retrospective cohort analysis found that increased physiotherapy intervention in patients with sepsis resulted in less ICU mortality [45].

Peter Nydahl et al. in a systematic review and meta-analysis demonstrated that early mobilization and rehabilitation in ICU is safe. The sturdy safety profile of mobilization of critically ill patients may have several potential reasons including simultaneous effort and attention of multiple clinicians during a session along with continuous cardiorespiratory monitoring and specialized equipment to support mobility [46].

Mobilization therapy may involve activities such as sitting on the edge of the bed or in a chair and ambulating which have proven to prevent or minimize the weakness and reduce the duration of mechanical ventilation and ICU/hospital length of stay [30, 41, 47–50]. Studies have shown that oxygenation improved significantly with mobilization therapy thereby atelectasis also improved. During mobilization, oxygenation was expected to improve because of anticipated beneficial effects of sitting in an upright position on lung volumes and ventilation perfusion distribution [51, 52]. The most important factor in uneven ventilation and blood flow distribution in the healthy lung is gravity [43]. In the erect seated position, the base to apex ratios for ventilation and perfusion distribution is increased as compared to supine position. Body positioning and mobilization optimize airway secretion clearance and oxygenation by improving ventilation alveolar recruitment and ventilation/perfusion matching [53]. In one study following several weeks of the whole body and respiratory rehabilitation, patients had a significant increase in whole-body and respiratory muscle strength and were weaned off the ventilator and functionally improved. Upper extremity strength significantly correlated with weaning time [30]. Upper extremity strengthening exercises facilitate the respiratory actions of the pectoralis muscle and other accessory respiratory muscles.

Whole-body rehabilitation conducted by a multidisciplinary team appears to improve both motor strength and functional variables and should therefore be considered an important part in the care of chronically ventilated patients. With the current research studies, we see how important it is to change the traditional ICU culture in which ICU patients are not encouraged to move until they have recovered from severe illness.

32.4.1 Acute Rehabilitation Phase

A team approach to the rehabilitation of the elderly patient is essential following emergency surgery. Regular physical exercises in older adults can improve strength, endurance, balance, coordination, and range of motion [54]. This can also reduce the risk of hypertension, cardiovascular disease, diabetes, and stroke. The physical therapy program must be tailored to the patient diagnosis, nature of surgery, and restrictions. This will be followed by a home exercise program as outpatient.

Resistance training can lead to improved muscle strength, power, and endurance. There is also increased muscle cross-sectional area, muscle volume, decreased body fat, and improvement of body composition. Resistance exercises can be performed with or without equipment. Some well-known resistance exercises include push-ups, sit-ups, squats, and pull-ups. Isometric exercises can strengthen muscle without joint motion which may be useful in patients with arthritis. Weight training machines with equipment may increase the risk of injuries and require good balance and coordination.

Aerobic exercises can lower the resting heart rate and the blood pressure. They also improve the muscle oxygen uptake, increase the VO_2 max, and cardioprotective effects in older patients after 3–4 months of regular exercise. Those exercises also improve glycemic control, postprandial lipid clearance, and slows the age-related decline in bone mass density.

Exercises such as yoga and tai chi are very important to improve balance in the elderly, both standing static balance and dynamic balance. Falls in the elderly remain a big epidemiologic concern since an elderly patient dies every 20 min in the United States as a consequence of a fall. These exercises improve also the flexibility and the strength. Even elderly patients without medical issues should follow a regular exercise program to decrease the incidence of eventual falls. Weight-bearing exercises are recommended for a patient with osteoporosis. All exercise programs should have beneficial effects on lower extremity function (balance, walking speed, ability to rise from a chair) which are factors associated with possible future disabilities [55].

For training effect, the best exercise is the task itself. Ambulation training with or without the appropriate walking aid will also improve strength and endurance. Those gait aid may include cane, quad cane, hemi walker, walker, rollator, platform walker, etc. Stair training should also be an integral part of the rehabilitation strategy for those elderly patients before going home.

Muscle endurance can be defined as the ability to produce work overtime or the ability to persist or maintain an effort. Endurance can be measured in several ways depending on the particular kind of activity studied. Anaerobic endurance is measured under stimulated anaerobic conditions, with the high intensity or isometric activity decreasing the oxygen availability. Aerobic endurance must be measured under conditions that use an aerobic metabolism, such as low-intensity dynamic exercise. Isotonic endurance is measured by the number of repetitions with given weight. Isokinetic endurance is the number of repetitions at certain angular velocity before a specified decrease in torque develops. Isometric endurance is the time that a certain weight could be maintained in a static position or a certain force exerted against a strain gauge. To compare endurance between individuals, it is most appropriate to use a percentage of individuals' maximum force capability for testing rather than a fixed load, because of the relationship between strength and absolute endurance which is hyperbolic. This hyperbolic relationship may be related to the relative contributions from aerobic and anaerobic metabolism.

Before prescribing an exercise program, several factors should be considered.

32.4.2 Type of Exercise

If an exercise is done passively, it implies that all the effort must come from the therapist and none from the patient. Usually, this is done to maintain the range of motion as the patient may be unable to provide the necessary effort. Exercises can also be done actively or with some assistance.

Exercises can be also done by engaging in functional activities such as mobility training, activity of daily living, stairs training, and leisure activities. All involved strength, endurance, control, balance, and range of motion.

Activity recommendations in older adults with no limitation
• Moderate intensity aerobic activity enough to result in a noticeable increase in heart rate and breathing for at least 30 min 5 days a week
• Resistance training (calisthenics, weight training) at least 1 set 10–15 repetitions of an exercise that trains the major muscle group on 2 or 3 nonconsecutive days each week
• Flexibility at least 10 min of stretching major muscle and tendon groups at least 2 days each week: 10–30 s of static stretches and 3–4 repetitions for each stretch. Ideally performed every day that aerobic and resistance training is performed
• Balance exercise 3 times a week (ideal type, frequency and duration has not been defined).
Adapted from American College of Sports Medicine and the American Heart Association 39: 1435–1445, 2007

Assessment of the patient performance of the activities of daily living by the occupational therapist is critical. Appropriate therapy program will be instituted and all needed adaptive equipment will be provided. Those adaptive equipments enable the patients to perform a functional task, help make those tasks easier, or may prevent complications. They may include a tub bench, a reacher, a raised toilet seat, grab bars, etc. Wheelchair allows for long-distance mobility in the community if not use within the home.

Extensive preparation for discharge must be performed. This requires planning and forethought by the physiatrist, therapist, social worker, and case manager. Additionally, the patient or caregivers may need to alter their homes to create optimal conditions for receiving a patient with a liability that was not present prior to hospitalization. Modifying the environment can have a positive impact on health, injury prevention, and quality of life. Design of larger spaces within the home for better accessibility while a rolling walker is used can have a beneficial impact on comfort and safety. Adequate lighting, decreased bed height, and removal of area rugs can contribute to reduce the incidence of falls.

The patient should leave the acute rehabilitation service with all the pertinent information regarding their hospitalization, pathological condition, and surgical intervention. For more complex patients as in patients with colostomy, complex wounds, they should have the support of a team that visits the home and manages some of these aspects (complex wounds, drains, bladder catheterization, VAC dressing, etc.)

This information is necessary for a health professional who provides continuity of care to integrate it into their assessment and management of those diseases' circumstances.

Finally, the outpatient follow-up should not be neglected. Outpatient physical and occupational therapy may be needed for the patient to reach full functional potential. Reobservation of patients until treatment consolidation is essential.

32.5 Conclusion

Urgent Surgical treatment of the elderly patients is associated with higher morbidity and mortality rates than those of younger patients and there is room for improvement. A multimodality rehabilitation program, particularly if started early, as early as the intensive care unit is a good working model for achieving this improvement.

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