ABSTRACT

Increased life expectancy have an effect on the rising percentage of elderly population in Indonesia and health problem associated with the elderly, particularly immobilization. Immobilization may cause various complications, especially when it has been overlooked without any appropriate and proper medical care in keeping with the procedures. High incidence of immobilization in elderly and the life-threatening complication call for an agreement on management of immobilization and its complication.

Management of immobilization needs interdisciplinary team-work cooperation, the patients and their family. The management may be commenced through a complete geriatric review, formulating functional goals and constructing therapeutic plan. Various medical conditions and external factors that may act as risk factors of immobilization as well as drugs intake that may exaggerate the immobilization should be evaluated and optimally managed. Any complication due to immobilization and other concomitant disease/condition should be recognized and managed comprehensively in order to reduce morbidity and mortality. Management of immobilization and its complications include pharmacological and non-pharmacological treatment, i.e. various mobility exercises, utilization of ambulatory device and supporting appliance for assisting patients in stand-up position, as well as the management of urinary voiding and defecation.

Key words: elderly, immobilization, complication, pharmacological and non-pharmacological treatment.

INTRODUCTION

Life expectancy has been increased from time to time, which indicates that there has also been an increase percentage of elderly inhabitant. In 2000, the life expectancy of Indonesian women reached 70 years, and in male 65 years.\(^1\) It is assumed that the percentage of Indonesian people aged 60 years or over in 2020 will increase to 11.4% or 25.5 million elderly people compared to the percentage of elderly population in 2000, i.e. 7.4%.\(^2\)

Increased life expectancy have an effect on the rising percentage of elderly population in Indonesia and health problem associated with the elderly. Aging process resulting in reduced function of various organs in the body. An acute condition of a disease, such as infection, will drain the remaining physiological supply of various organs in the body, which has been degenerated; therefore, it will reduce the functional status (independence) of an elderly.\(^3\) At severe condition, they have to lay down on bed for more than 3 days or sitting down on a wheel chair, unable to move or to have any activity unless assisted. Immobilization may cause various systemic complications which will lead the elderly into a terminal state and death, particularly if that condition has been ignored without any appropriate and proper medical care in keeping with the procedures.\(^4,5\)

Death that frequently occurs in elderly with immobilization is usually caused by pulmonary embolism. In USA, 1 of 200 hospitalized elderly patients (0.5%) has experienced pulmonary embolism. The prevalence of chronic medical condition in elderly population is quite high, i.e. 88% people aged over 65 years has at least one chronic medical condition. Such comorbidity is correlated to the high incidence of disability and predisposed factors of an increased risk of reduced functional status.\(^4\) In Indonesia, the Division of Geriatri, Department of Internal Medicine at Faculty of Medicine, University of Indonesia Cipto Mangunkusumo Hospital found that 5.7% hospitalized elderly patients at the acute geriatric ward had immobilization in 2007.\(^6\)
The high incidence of immobilization in elderly and its life-threatening complication call for an agreement on management of immobilization and its complication.

**IMMOBILIZATION: DEFINITION, RISK FACTORS AND ITS COMPLICATIONS**

**Definition and Concept**

Immobilization is defined as loss of anatomical movement due to alteration of physiological function, which in daily practice it may commonly known as more than three-day-bed rest or inability to perform mobile activity on bed, transfer or ambulation.\(^4,7\)

In medical practice and medical rehabilitation, the term of immobilization is applied to describe a physiological degeneration syndrome resulting from reduced activity and “deconditioning”.\(^4\)

**Risk Factors of Immobilization**

Various factors including physical, psychological and environment may cause immobilization in elderly (Table 1).\(^5\)

**Immobilization may directly cause venous congestion, which will inhibit the clearance and dilution of activated coagulation factor, that easily induce embolism. Venous thromboembolism, particularly pulmonary embolism, may be fatal if there is no prevention and optimal management carried out. Venous thromboembolism (VTE) may manifest as deep vein thrombosis (DVT) or pulmonary embolism (PE).\(^8-14\)**

The classic clinical signs and symptoms of DVT include swelling, pain, change of skin color on the affected extremity. On physical examination, we may find the thrombotic venous by palpation, unilateral edema, warm surface, Homans sign (pain during passive plantarflexion of foot), and superficial venous dilatation, which may also occur in other conditions such as musculoskeletal injury, cellulitis and venous insufficiency.\(^8-14\)

Clinical prediction rule from Wells et al (Table 3) together with other tests such as D-dimer test and ultrasonography (doppler) may confirm or exclude the diagnosis of DVT; while to confirm the diagnosis of PE, the Wells clinical prediction rule can be used together with other tests such as pulmonary angiography CT, ventilation-perfusion scanning, angiography, D-dimer test and serial ultrasonography.\(^14\)
Decubitus ulcers or pressure ulcers are frequently occur in immobilized elderly patients due to prolonged compression on bony prominence in a quite long-term care period.5,15-17

Every patient with immobilization should be assessed to identify the risk of pressure ulcer by using the Norton scale (Table 4).15,18 A score <14 indicates a high risk of pressure ulcers development. A score <12 associated with increased risk of 50 times greater for pressure ulcers, score 12-13 indicates moderate risk; while score ≥14 indicates a very low risk.18

Based on the Shea modified classification which has been applied in clinical guidelines by The Agency for Health Care Policy and Research (AHCPR), pressure ulcers is classified into 4 stages (Table 5).15-17

The most serious complication of pressure ulcers is sepsis; while other complications include local infection, cellulitis, osteomyelitis, pain and death. Pressure ulcers also correlates to long hospitalization days and high cost.15

Four factors that may affect the pathogenesis of pressure ulcers are compression, shearing forces, friction, and moisture.5,15 In addition to immobilization and limited activity, the other risk factors that also affect the development of pressure ulcers are dry skin, increased body temperature, low blood pressure, elderly age, incontinence, malnutrition, diabetes mellitus, vascular insufficiency, obesity, hypoalbuminemia, severe dementia state and altered consciousness level.4,15

One of complications of immobilization on cardiovascular system is orthostatic hypotension, such diagnosis can be made when there is a decrease of systolic blood pressure of ≥20 mmHg or diastolic blood pressure ≥10 mmHg from lying down to standing up position, which may be accompanied by several symptoms such as dizziness, black out, or palpitation.4,19 Moreover, immobilization in a non-functional position, such as prolonged bedridden with extremities in flexion position may cause shortening of muscle fibers leading to contracture or musculoskeletal deformity such as drop foot (the ankle in plantarflexion position).4

**TREATMENT FOR IMMOBILIZATION**

A complete geriatric review is necessary in evaluating elderly patients with immobilization, including history taking, physical examination, evaluation of
functional status, mental condition, cognitive condition, and mobility as well as the supporting laboratory test in accordance with the indications (Table 6).4,5

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</table>

**MANAGEMENT**

Managing interdisciplinary medical team work together with the patient’s participation and their family including the caregiver services from the elderly care center.4

Providing education and information to the patients and their family about the danger of prolonged bed rest, the importance of progressive exercise and early ambulation, as well as preventing patient reliance by promoting self-activation of daily living, in accordance to the patient’s best ability.4

Performing a complete geriatric review, formulating functional goals and arranging therapeutic plan including the time plan that necessary to achieve the therapeutic goals.5

Evaluating all of drug intake; reduce the dose of drugs that may cause weakness or fatigue or if it is possible, stop it.5

Giving adequate nutrition with consideration to fluid and fiber intake, and supplementation of vitamin and mineral for patients with hypokinesia problem.4

Performing immediate and progressive re-mobilization in hospitalized patients or patients at the elderly care center to prevent further immobilization. The training program and remobilization should be commenced during a stable medical condition, including bedside mobility training, exercise on joint range of motion (passive, active, active with help), exercise for muscle strength (isotonic, isometric, isokinetic), exercise for coordination/balance (such as walking along a straight line), transfer with help and limited ambulant.4,7

Managing the risk factors of immobilization (Table 1) and complication due to immobilization (Table 2). Recognizing and managing infection, malnutrition, anemia, fluid and electrolyte imbalance that probably occur in immobilization cases as well as other concomitant diseases/comorbidity. For special cases, consult the medical condition to a competent specialist.4,5

In general, prevention of venous thromboembolism may be performed through 2 methods, i.e. mechanical and pharmacological method; while to achieve the therapeutical goals, we can use several kinds of anticoagulants.8-14,20-37

- Mechanical methods to prevent venous thromboembolism including: graduated compression stocking (GCS) by using elastic stocking, which is girded on extremities with gradual tightness from the tightest to less tight area, from distal to proximal; intermittent pneumatic compression (IPC); and venous foot pump (VFP)
- Other available methods: exercising the extremities and joint movement, either active or passive, as tolerated by the patient; foot elevation placed at a 15-20° with knee in slight flexion position; sliding down the bed or flat bed; avoid sitting on the chair during early post-operative period; apply the anti-phlebitis elastic stocking for patients with varices or history of phlebitis; post-operative regular exercise, i.e. walking in a short time period.
- As prophylaxis treatment of DVT and PE, low-dose unfractionated heparin (UFH) is immediately administered (5000 unit) subcutaneous every 8 or 12 hours, until the patient is able to be mobilized adequately; while for DVT treatment, loading dose UFH is administered by bolus of 80 unit/kgBW and maintained further with 18 unit/kgBW per hour through continuous drip. We should also monitor the activated partial tromboplastin time (APTT), with expected APTT 1.5 to 2.0 times the control.
As prophylaxis treatment, various Low-molecular-weight heparin (LMWH) can be administered, such as: enoxaparin (40 mg subcutaneous, once daily), dalteparin (5000 units subcutaneous, once daily), nadroparin (2850 units subcutaneous, once daily), and tinzaparin (3500-45000 units, once daily) for 10 days or until adequate ambulation. While for therapeutic treatment, the dose of enoxaparin is 1 mg/kgBW twice daily or 1.5 mg/kgBW once daily, subcutaneous; tinzaparin is administered at dose of 175 anti-Xa/kgBW per day. In a clinical trial of DVT treatment, dalteparin was administered at dose 200 IU/kgBW per day (as a single dose or twice daily). While for PE treatment, only enoxaparin and tinzaparin have showed effective evidence and approved by the FDA.

Fondaparinux, an antithrombin that directly inhibits factor Xa, may also be administered at dose 2.5 mg once daily subcutaneous for prophylaxis treatment. As therapeutic treatment, either for PE or DVT, subcutaneous fondaparinux may be given once daily at dose 5 mg (for patients with body weight <50 kg), 7.5 mg (for BW 50-100 kg), or 10 mg (for BW >100 kg).

For secondary prevention, oral anticoagulants such as warfarin or other type of coumarin may be used with a goal of international normalized ratio (INR) between 2 and 3. As the effect of antithrombotic by warfarin will be obvious only after 72-96 hours; therefore, warfarin is usually given for 3-4 days prior to diminution of heparin or other antithrombotic treatment.

In venous thromboembolism, the anticoagulant treatment is administered after 48 hours, and physiotherapy may also be applied including exercise of joint range of movement, either passive or active with help as well as using the elastic stocking.

Preventing contracture/deformity due to shortening of muscle fibers resulting from immobilization in non-functional position, such as prolonged bedridden with extremities in flexed position or drop foot (the ankle in plantarflexion position). The prevention methods include: 4,7,38

- Immediate progressive mobilization and proper positioning, by positioning the patients in such a way so that they can lay down on the supporting joints of the body similar to their standing up position, i.e. head, back and extremities in a straight position; while the ankle also in the position similar to the standing up position, i.e. the extremities and foot form a 90 degree angle. Static splinting (foot board, ankle foot orthosis) may also be applied in order to maintain the ankle at the functional position.
- When the contracture has occurred or if there is any limitation of joint movement, exercise on active and passive joint movement is recommended as well as slow stretching minimal once to twice daily in order to maintain complete range of joint movement. Diathermy ultrasound on muscles may be applied to facilitate stretching.

Preventing pressure ulcer by frequent repositioning as many as possible: 4,15-17,39,40

- Repositioning the patient’s back position, i.e. turning the position at the angle of 30° to the mattress, alternately to the left or right side, and supine position in every 2-3 hours for high-risked patients and 2-4 times daily for patients with lower risk.
- Using protective padding include pillows placed between extremities, lower back and arm-supporting pad to maintain the optimal position, preventing contact within bony prominence, extremities or with the mattress; elevating the heels of the mattress and supporting the patient on lateral side position at 30° angle.

For patients who must have their head at straight position (sitting position) on their bed or for patients who are wheel chair-bound, periodic repositioning for every 1 hour should be performed or ask the patients to reposition himself altering his weight point for every 15 minutes; however, avoid the doughnut supporting device for chair and wheel-chair and do not positioning the patient on sitting position at 30° angle.
To prevent skin maceration, keep the skin dry (using high absorbance mattress for incontinent patient) but yet lubricated by applying lubricant on it, such as emolient, the cooking oil, or cream. Apply the lubricants sparingly after bath or voiding. Protective covering, female napkins or overlay on the prominent bone (such as water-gloves on the maleolus) may also be helpful.

To prevent any friction, use the ankle and heel protective pad and the patients should be elevated, do not move the patients by rubbing or pulling movement off the mattress. Use the low-pressure, low-friction, or low-stretching mattress (such as air-fluidized or high-air-loss/anti-decubitus mattresses) for patients when the repositioning technique is not adequate enough or not possible to perform.

When the pressure ulcer has occurred, according to the AHCPR guidelines, the treatment should include systemic approach, using specialized mattress, appropriate ulcer care, surgery and experimental treatment.\(^{15-17,40,41}\)

- Pay attention to the patient’s hydration status and manage it appropriately if there is any disorder. Provide adequate nutrition intake by considering the required mineral and vitamin. In malnourished patient with pressure ulcers, at least 30-35 calori/kgBW/day of nutrition should be provided, in addition to protein intake of 1.25-1.5 g/kgBW/day to achieve the positive nitrogen balance.

- Systemic antibiotics are indicated in patients with sepsis, cellulitis, and osteomyelitis or as prophylaxis method to prevent bacterial endocarditis in patients with heart-valve disease who need any wound debridement. Wide-spectrum antibiotics should be given as initial therapy awaiting for the culture result, including antibiotics for positive- and negative-gram, as well as the anaerobic microorganism. Ampicillin-sulbactam, imipenem, meropenem, ticarcillin clavulanate acid, piperacillin tazobactam, and combination of clindamycin and ciprofloxacin or with aminoglikoside are appropriate for initial therapy.

- Use specialized mattress: air-fluidized bed, low-air-loss bed, or specialized mattress that can automatically change the patient positioning.

- In general, stage I and stage II pressure ulcer does not need any topical treatment, just maintain appropriate cleaning and moisture of the ulcers and the ulcers are expected to have self-healing process.

- Clean ulcers which do not heal or keep excreting exudates after 2-4 week optimal care may be treated with topical antibiotics such as silver sulfadiazine for 2 weeks, but avoid to use the following agents, i.e. povidone-iodine, iodophore, sodium hypochlorite hydrogen peroxide, and acetic acid.

- Perform adequate wound debridement if there is any necrotic tissue. There are several methods including debridement by using scalpels or scissors, mechanical debridement with wound dressing, hydrotherapy, irrigation, dextranomers, enzymatic or autolytic therapy. Pain management should be considered, particularly when performing wound debridement.

- After the ulcers are clean and granulation tissue or epithelization has developed, maintain the moisture around the ulcer area without inhibiting the tissue healing by using some dressing such as transparent film, hydrocolloid dressing, or simply clean it with normal saline.

- Perform manual circular massage on the edge of decubitus wound, phonophoresis with transducer ultrasound and ZnO\(_2\) as well as low-frequency transcutaneus electric nerve stimulation (TENS) on the edge of wound to improve wound vascularization, development of granulation tissue and epithelization.

- If necessary, surgical procedure may be commenced including wound closure, skin graft, and myocutaneous flap as well as discarding the prominent bone which causing ulcer. Radical treatment such as amputation is occasionally necessary in ulcer with complicated or spreading infection.

- As adjunctive treatment, hyperbaric oxygen therapy and several kinds of topical treatment and growth factor are being developed as a method to enhance the wound healing; however, no data has been demonstrated to support their application.

- Preventing orthostatic hypotension by immediate progressive mobilization, mainly performed so that the patient can sit on the bed with the leg being dangled, and evaluating the consumed medicine as well as the hydration status of the patient because orthostatic hypotension may result from consumption of anti-hypertensive drugs, diuretics and body fluid depletion. When the orthostatic hypotension has occurred, reconditioning exercise should be recommended by using a tilt table or by raising the headboard of the bed gradually.\(^{7,19,38}\)

- Attempting environmental support and available device for supporting adequate mobility in patients with permanent disability. If necessary, provide and give instruction about how to use the standing-supporting device, ambulation as well as the management of
micturition and defecation, including using comod or toilet to facilitate straightening of body posture.4

CONCLUSION

Immobilization is one of common health problem in elderly population and it may cause various life-threatening complications.

In brief, the treatment of immobilization requires interdisciplinary team work together with the patient participation and their family. The treatment starts from commencing a complete geriatric review, formulating functional goals, and constructing therapeutic plan. Various conditions that probably act as the risk factors for immobilization and complications resulting from immobilization as well as other concomitant disease/comorbidity should be recognized and managed comprehensively including the non-pharmacological and pharmaceutical treatment in order to reduce morbidity and mortality rate.

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