

Original Article

Effect of reconditioning exercises program on hospital-acquired deconditioning in elderly hospitalized patients

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ABSTRACT

Objectives: The objectives of the study were as follows: 1. To determine the effect of reconditioning exercise program on hospital-acquired deconditioning in elderly hospitalized patients. 2. To compare the conventional therapy and reconditioning exercise program training on the hospital-acquired deconditioning in elderly hospitalized patients.

Materials and Methods: Thirty-two elderly hospitalized patients from the inpatient hospital setup were randomly allocated into two groups. Group A received conventional therapy and Group B received reconditioning exercise program. Outcome assessment was done using the visual analog scale, manual muscle testing, spirometry, and range of motion. Later, both the protocols were implemented 5 times a week for a total period of 4 weeks, that is, a total of 20 sessions.

Results: Statistically significance was found to be present in Group B in terms of pain ($P < 0.0001$), respiratory capacities ($P = 0.033$), muscle strength ($P = 0.025$), and joint range of motion ($P = 0.027$).

Conclusion: Reconditioning program shows significant improvement and is also beneficial in the reduction of pain, improving muscle strength and range of motion, and also in increasing lung capacities in hospital-acquired deconditioning in hospitalized elderly patients.

Keywords: Aging, Body composition, Manual muscle testing, Nutritional status

INTRODUCTION

Deconditioning was defined by Hanson *et al.* as “a complex process of physiological change that can affect many body systems and often results in functional deterioration.” In a clinical aspect, deconditioning, which is also called hospital-acquired functional deterioration, is much more than muscle tone and fitness.^[1] As our understanding of human physiology in times of imposed bed rest has developed, it highlights that this is more a syndrome rather than a condition and a different definition can, therefore, be considered. Having said that it can affect people of any age, the effect on the older population can be more rapid, severe, and can often be irreversible.^[2] Prevalence in older hospitalized patients is estimated to be up to 95% of their time in bed or chair, during their hospitalization.^[3]

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Deconditioning can often start within the 1st day of hospitalization and possibly while patients are still on a trolley in the emergency department and interventions such as intravenous infusion, catheterization, nasogastric tube, bed rails, nasogastric tube, and gravitational edema causing peripheral neuropathy^[2] may precipitate deconditioning even sooner. Deconditioning syndrome, an effect of lack of mobility, is, therefore, a complex physiological process that results in a multisystem decline in function. This concept can result in a significant decline in bone mass, muscle mass, and durability as well as demotivation, difficulty in swallowing, confusion, and increased dependence on others.^[3]

Physiological effects of bed rest are, within 24 h, there is a reduced muscle power by 2–5% and also reduced circulatory volume by up to 5%. During the first 7 days, there is reduction in 25% of circulatory volume, 8–15% of VO₂ max, 5–10% of muscle strength, and 15–30% of functional residual capacity and also the skin integrity, dignity, self-confidence, independence, choice, and quality are majorly affected.

Deconditioning can have a dramatic impact on the hospitalized frail older population. The combination of an acute surgical or medical condition with prior poor functional reserves can result in prolonged immobility. The addition of sleep disturbance, nutritional deficiencies, and relative inactivity will intensify the detrimental effects of deconditioning.^[4,5] There is evidence that regular activity and exercise help in a speedy recovery and, therefore, can contribute to reduced duration of stay in hospitals and improve fitness potentially impacting on self-care, independence, and care needs.^[6]

A simple and safe interventional exercise program will be applied on these elderly patients to activate the reconditioning process. However, early application of these exercises will help in improving the patient's present health status and further prolonged bed hospitalization complications associated with it.

MATERIAL AND METHODS

This was a comparative study of pre- and post-test study design. Thirty-two hospitalized patients were considered in this study. They were selected and randomly allocated into two groups. The study was conducted from February 2021 to April 2021. Group A was considered as a conventional group who were given regular hospital-acquired treatment while Group B was considered as an experimental group. Written consent was taken and the procedure of the study was explained to each group, respectively. A pre-test outcome assessment was done. An exercise program was implemented and a later outcome assessment was done to record the post-test values.

Inclusion and exclusion criteria

Inclusion criteria

Patients of both the genders, with their age above 65 years, who were mainly hospitalized for elective orthopedic surgeries of the spine, hip, and knee and those mostly bed bound over a period of 10 days^[7] were included in the study.

Exclusion criteria

Patient's with a history of cancer, recent abdominal surgery, severe morbidity (uncontrolled diabetes mellitus, and hypertension), neurological impairments (unconscious, lack of orientation, and inattentive), and severe orthopedic complications (osteoporosis, osteosarcoma, and bony deformities) were excluded from this study.

Outcome measures

Visual analogue scale (VAS)

The simplest visual analog scale is a straight horizontal line with a fixed length, usually 100 mm. At the finish, it is defined as the extreme limit of the criterion that measures pain, which is orientated from the left (worst) to the right (best). In a few studies, horizontal scales are orientated from the right to left, and many investigators use vertical VAS.^[8]

Manual muscle testing (MMT)

MMT is the most routinely used method for documenting impairments in muscle strength. The examiner during the application of MMT applies a force to the subject's resistance evaluates the muscle groups being studied as subjectively "weak" or "strong" on a 5-point scale.^[9] MMT for the major group of muscles, that is, muscles of the neck, back, upper limbs, and lower limbs, was assessed.

Spirometry

Incentive spirometry is a method conducted using devices that provide visual cues to the patients that the planned flow or volume has been accomplished. The basis of incentive Spirometry includes having the patient take a steady, maximal inspiration. It is a slow and profound inspiration from the functional residual capacity up to the total lung capacity followed by ≥ 5 s breath-hold.^[10]

Range of motion (ROM)

ROM is measured by goniometry which is a reliable and valid way, and is a convenient, approachable outcome measure for clinical trials and physiotherapy practice. We suggest that combining patient-reported outcome measures

with goniometry may provide a more comprehensive view of the person's welfare, function, and involvement.^[11] ROM for the cervical and lumbar spine, and also both the shoulders, elbows, hips, and knees were recorded.

Exercise protocol

Group A was considered for the conventional protocol. As per the hospital management, they were given positioning every day, brace for the management of their injury, elevation, and stockings if any swelling was present on the distal part of the limbs. No other exercise program was implemented as this was considered as a controlled group.

The reconditioning protocol was given to Group B, 5 times a week for 4 weeks, that is, a total of 20 sessions were given to each patient as per their requirements.^[12]

- 1) Cardiopulmonary reconditioning program:
 - Modified bed aerobics
 - Segmental chest expansion exercises
 - Breathing control training
 - Pacing
- 2) Musculoskeletal reconditioning program:
 - Isometric training progression to free exercises
 - Resistance exercise progression to endurance training.
- 3) Postural training

Follow-up was done later, post 2 weeks after the implementation of both the protocols, none of the patients presented with any negative consequences or any other complications.

RESULTS

Pain intensity significantly decreased in both groups post-treatment ($P < 0.05$). The mean decrease in VAS scores was significantly higher in Group B than in Group A (4.01 ± 1.54 vs. 6.21 ± 1.46). Moreover, there was a significant difference between both groups regarding pain scores post-treatment, being significantly lower in Group A [Table 1].

MMT scores showed a significant increase in Group B post-treatment ($P = 0.25$) indicating a slight increase in muscle strength. The mean increase in MMT scores is seen in Group B than Group A (4.14 ± 1.76 vs. 3.84 ± 2.14). However, a significant difference was noted between both groups regarding MMT scores post-treatment [Table 2].

The ROM significantly increased in Group B post-treatment ($P < 0.05$). The mean of change in ROM was significantly higher in Group B than in Group A (131.34 ± 4.59 vs. 125.44 ± 4.35). However, there was a significant difference between both groups regarding the ROM post-treatment [Table 3].

The spirometry significantly increased in Group B post-treatment ($P < 0.05$). The mean of change in ROM was significantly higher in Group B than in Group A (16.27 ± 4.5 vs. 12.72 ± 3.4). However, there was a significant difference between both groups regarding the ROM post-treatment [Table 4].

DISCUSSION

Deconditioning can have a dramatic influence on the in-hospital older population, especially those with frailty. The combination of acute health or surgical condition with prior poor functional reserves can result in prolonged immobility. The combination of lack of sleep, nutritional deficiencies, and relative inactivity will intensify the severity of deconditioning.^[4,5]

In this study, 32 hospitalized patients were considered. Sixteen individuals were present in each group, respectively. Group A (controlled group) received regular hospital-acquired care whereas Group B (experimental group)

Table 1: Comparison of the mean scores of VAS within and between both the groups.

VAS	Pre	Post	P-value	Inference
Group A	7.44±1.446	6.21±1.46	0.321	Not significant
Group B	7.13±1.795	4.01±1.54	<0.0001	Extremely significant

Table 2: Comparison of the mean scores of MMT within and between both the groups.

MMT	Pre	Post	P-value	Inference
Group A	3.81±1.73	3.84±2.14	0.348	Not significant
Group B	3.70±2.51	4.14±1.76	0.025	Significant

MMT: Manual muscle testing

Table 3: Comparison of the mean of ROM within and between both the groups.

ROM	Pre	Post	P-value	Inference
Group A	124.95±4.33	125.44±4.35	0.582	Not significant
Group B	125.32±4.26	131.34±4.59	0.027	Significant

Table 4: Comparison of the mean of spirometry within and between both the groups.

Spirometry	Pre	Post	P-value	Inference
Group A	12.56±2.23	12.72±3.4	0.624	Not significant
Group B	13.25±3.1	16.27±4.5	0.033	Significant

received the reconditioning program. Among the 16 individuals in Group B, nine were male and seven were female. Statistically, significance was found to be present in terms of pain, respiratory capacities, muscle strength, and joint range of motion.

We had considered assessing the patients on the 10th day of admission with reference to a review given by Kortebein *et al.*, they concluded their study that 10 days of bed rest can lead to substantial loss in the lower extremity strength, reduction in physical activity, and aerobic capacity.^[7] McComb *et al.*^[13] did a study to develop a reconditioning program for elderly patients. A total of 66 patients participated in the substudy. The reconditioning program was shown to be safe and feasible within the hospital setting for elderly emergency abdominal surgery patients. More rigorous assessment is needed to confirm this effectiveness and to better assess patient adherence to self-directed exercise. There is evidence that regular activity and regular exercise help in a speedy recovery and, therefore, can contribute to reduced length of stay in hospitals and improve fitness potentially impacting self-care, independence, and care needs.^[6] However, in the short term, after suggesting rest as a medical therapy, he noticed that prolonged inactivity led to a significant decline in both strength and exercise performance.^[12]

The strong association between stress and deterioration can increase the risk of negative outcomes such as dependence or mortality,^[14-16] and this particularly affects the oldest patients.^[17] This decline in capacities may continue months after discharge,^[17,18] even more than 1 year following hospital admission,^[19] and without appropriate intervention, hospital-associated deconditioning has the potential to chronically precipitate poor outcomes.^[20,21]

Arora *et al.*^[22] have mentioned in their review that, with a rapidly shifting population, deconditioning syndrome must be addressed more robustly across the board. Deconditioning has significant implications related to the quality of life, dignity, and mortality but also in the number of occupied hospital beds and in reducing health care-associated unintended harms.^[3] All members of the staff including receptionists, therapists, porters, health-care assistants, nurses, doctors, and others have an important role in patient care and therefore in preventing deconditioning. The present challenge is in the implementation and creation of new and also effective strategies to prevent deconditioning in hospitals and care homes. Older people deserve no less.

The American Physical Therapy Association, as part of the American Board of Internal Medicine Foundation's Choosing Wisely campaign, as educated consumers to question the application of under-dosed strength training programs for older adults – these programs are defined as including resistance exercise prescriptions that do not match intensity, duration, and frequency of training to functional goals.^[23]

Limitations to this study were the duration allotted for the study and the availability of the study population in accordance to the geographical area. We would suggest the future researchers to take a bigger area or larger population for further research.

CONCLUSION

In this study, based on statistical analysis, presentation, and interpretations, it was concluded that reconditioning program shows a significant improvement and is also beneficial in the reduction of pain, improving muscle strength and range of motion, and also in increasing lung capacities in hospital-acquired deconditioning in hospitalized elderly patients.

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Ethical clearance

Taken from the Institutional Ethics Committee of KIMSUDU, Karad.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

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Conflicts of interest

There are no conflicts of interest.

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