ORIGINAL RESEARCH

# Effect of Graded Early Mobilization on Psychomotor Status and Length of Intensive Care Unit Stay in Mechanically Ventilated Patients

Bijoy Das[1], Sanchita Saha[2], Feroz Kabir[3], Sazzad Hossain[4]


## Abstract

**Introduction:** The main purpose of this study was to evaluate the effectiveness of graded early mobilization on psychomotor status and duration of ICU stay of patients with mechanical ventilation.

**Method:**

**Design:** Quasi-experimental study.

**Setting:** BRB Hospitals Limited, Dhaka, Bangladesh. A reputed 500-beddedgeneral hospital with 30 ICU beds.

**Participants:** A total of 30 patients were selected as participants in the study from the hospital. 15 patients were included in the ICU treatment group and the remaining 15 were in the intervention group using the purposive sampling method.

**Scales used:** Functional independence measure (FIM) scale and 7 point generalized anxiety depression (GAD-7) scale.

**Intervention:** Graded early mobilization was provided as an intervention to all participants of the intervention group by a professionally qualified ICU physiotherapist for 10 sessions. Most of the patients received multiple sessions of intervention within a day.

**Results:** In the control group mean FIM score was 17.40 (SD±4.88), and in the intervention group mean score was 65.70 (SD±12.18). The mean difference was statistically significant in the '*t*' test (*p*-value > 0.001). In the control group, the mean GAD-7 score was 19.50 (SD±2.71), and in the intervention group the mean GAD-7 score was 7.5 (SD±2.59). The mean difference was statistically significant in the '*t*' test. (*p*-value > 0.001). The mean length of ICU stay in the control group was 5.60 (SD±1.07) and in the intervention group it was 3.10 (SD±0.56). The mean difference was statistically significant in the '*t*' test (*p*-value > 0.001).

**Conclusion:** This research showed that graded early mobilization was highly effective to improve the motor and psychological status of mechanically ventilated patients and reduce their length of ICU stay.


**Keywords:** Functional status, Graded early mobilization, Intensive care unit, Mechanical ventilation, Psychological status, Physiotherapy.

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## Background

Mechanical ventilation (MV) is a life-support therapy that improves anoxia, carbon dioxide retention, and acid-base equilibrium. Due to the focus on stabilization of life-threatening pathophysiologic changes, little attention has been paid to neuromuscular and long-term cognitive function in such critically ill patients.[9]

In most of the intensive care units (ICUs), bed rest is considered as the routine standard of care which leads to immobility, deconditioning, and weakness. Critically ill patients in the ICU commonly receive less than 60% of their nutritional intake during their ICU stay leading to further malnutrition. The presence of muscle weakness is associated with the duration of mechanical ventilation and length of ICU stay. Muscle strength decreases to 20% within one week of immobilization with an additional decrease of 20% in each subsequent week.[11]

## Materials and Methods

### Design

Considering the availability of participants in the ICU that met the selection criteria and given time frame by the research Ethics committee for data collection quasi-experimental design was selected as the research design.

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**Source of support:** Nil

**Conflict of interest:** None

### Setting

BRB Hospitals Limited, Dhaka, Bangladesh. A reputed 500-bedded general hospital with 30 ICU beds.

## Participants

A total of 50 patients were selected as participants in the study from the hospital. Twenty-five patients were included in the ICU treatment group and the remaining 25 were in the intervention group using the purposive sampling method.

## Intervention

Graded early mobilization was provided as an intervention to all participants of the intervention group by a professionally qualified ICU physiotherapist.

## Process of Application of Intervention

Graded early mobilization was provided as an intervention to all participants of the intervention group by a professionally qualified ICU physiotherapist for 10 sessions to each participant. Most of the patients received multiple sessions (2–3 sessions) of intervention within a day.

Another senior physiotherapist was assigned as a data collector for both control and intervention groups to reduce bias and ensure the blindness of the experiment. Written consent was obtained from legal guardians ofall patients initially when patients were in ICU. But patient concerns were also addressed and they were explained all the areas of the study when they were capable to talk.

## Scales Used

Functional independence measure (FIM) scale and7 point generalized anxiety depression (GAD-7) scale.

## Interventions

### *Graded Early Mobilization Protocol*

According to this protocol, graded early mobility can be defined as beginning the mobility program when the patient is minimally able to participate in the therapy, has stable hemodynamic status, and is receiving acceptable levels of oxygen. The criteria for mobilization were heart rate less than 110/min at rest, mean arterial blood pressure between 60 and 110 mmHg, the fraction of inspired oxygen less than 0.6, and oxygen saturation on activity greater than 88%. The vitals of the patient were to be assessed before, during, and after any mobility intervention.

The protocol was modified due to practical concerns and was divided into four phases.

### *Phase 1*

This included patients who were critically ill with multiple medical problems, had limited activity tolerance and were unable to walk. The goal of phase 1 was to make the patient sit at the edge of the bed unsupported or with minimal assistance and initiate standing with manual assistance and walker support. General criteria for progressing to the next phase were that the patient followed commands, had stable hemodynamic and acceptable oxygenation, and was able to stand with a walker.

### *Phase 2*

This phase included patients in the acute/sub-acute phase with multiple medical problems, in a stable condition, and able to participate better in the activities. The goal of phase 2 was to initiate re-education of gait with the walker. General criteria for progressing to the next phase involved the patient following commands, having stable hemodynamic and acceptable oxygen, being capable of transfer to the chair with the assistance of a walker, and walker re-education.

### *Phase 3*

This phase included patients in the acute/sub-acute phase with multiple medical problems or resolving medical problems and able to participate actively in the therapy. The goal of phase 3 was to initiate independent transfer training with a walker and provide progressive walking re-education. General criteria for progressing to the next phase included the patient following commands, being hemodynamically stable, with acceptable oxygen levels, and with improved tolerance to a progressive walking program.

### *Phase 4*

Patients in the sub-acute phase, who had been weaned from mechanical ventilation, were able to participate actively. The goal of phase 4 was to promote progressive transfers and walking independence. Assessment of physical therapy was carried out, the phase of the program in which the patient should be included was determined, and the mobility plan of care was established.[13]

## Data Collection Methods

A total of 30 patients were selected as participants in the study from BRB Hospitals Ltd., Dhaka. Fifteen patients were included in the ICU treatment group and another 15 were in the intervention group. Graded early mobilization was provided as an intervention to all participants of the intervention group by a professionally qualified physiotherapist for 5 sessions to each participant. Another senior physiotherapist was assigned the role of a data collector for both control and intervention groups to reduce bias and ensure the blind nature of the study.

## Data Processing and Analysis

All interviewed questionnaires were checked for their completeness, accuracy, and consistency to exclude missing or inconsistent data. The data was processed and analyzed using an SPSS 16.0 version software program. Data were cleaned and edited by running frequency and cross-tabulation. Data processing was done by coding, recoding, sorting, categorizing, computing, etc. The tools needed for the study were consent paper, questionnaire, paper, pen, file, calculator, computer, and printer.

# Results

In the control group mean FIM score was 17.40 (SD ±4.881) and in the intervention group mean score was 65.70 (SD±12.184). The mean difference was statistically significant in the '*t*' test. (*p*-value > 0.001). In the control group, the mean GAD-7 score was 19.50 (SD±2.717), and in the intervention group the mean GAD-7 score was 7.5 (SD±2.593). The mean difference was statistically significant in the '*t*' test (*p*-value > 0.001) (Table 1).

100% of participants of the control group were out of bed first at the date of discharge from ICU. But it was possible for a maximum (90%) of participants of the intervention group to get out of bed on the second (2nd) day within ICU.

Only 10% of participants were out of bed on the third day. The mean length of ICU stay in the control group was 5.60 (SD±1.07497) and in the intervention group it was 3.10 (SD±0.56765).

The mean difference was statistically significant in the '*t*' test. (*p*-value > 0.001).In the Chi-square result, it was found there is a significant relationship between participant's 1st day out of bed and FIM improvement and GAD-7 improvement (*p*-value > 0.001) (Tables 2 and 3).

**Table 1:** Different variables in two groups

| *Variables* | *Control group* | *Intervention group* |
|---|---|---|
| FIM score | Mean score: 17.40<br>SD: ±4.881<br>Variance: 23.822 | Mean score: 65.70<br>SD: ±12.184<br>Variance: 148.456 |
| GAD-7 score | Mean score: 19.50<br>SD: ±2.171<br>Variance: 4.711 | Mean score: 5.50<br>SD: ±2.593<br>Variance: 6.722 |
| Day 1stout of bed | Mean: 5.60<br>SD: ±1.075<br>Variance: 1.156 | Mean: 2.10<br>SD: ±0.316<br>Variance: 0.1 |
| Length of ICU stay | Mean: 5.60<br>SD: ±1.075<br>Variance: 1.156 | Mean: 3.10<br>SD: ±0.568<br>Variance: 0.322 |

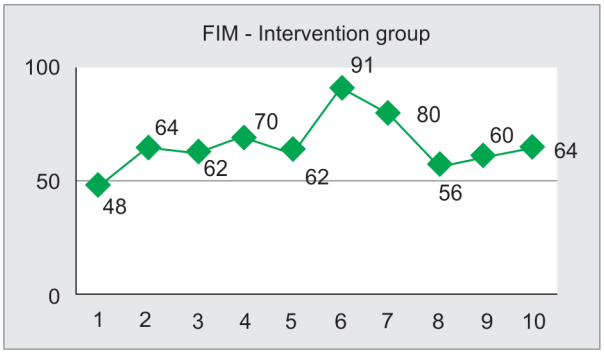


**Fig. 1:**

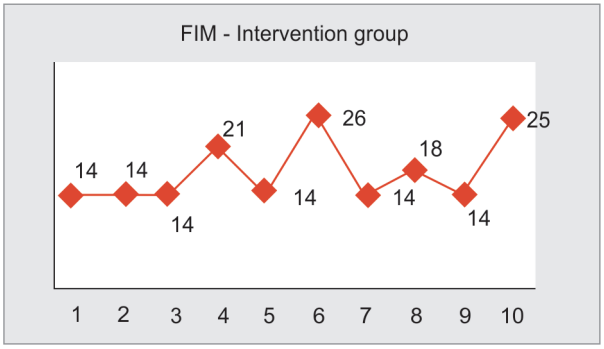


**Fig. 2:**

**Table 2:** The 't' test findings for FIM change

| | *Control group* | *Intervention group* |
|---|---|---|
| Data | 14, 14, 15, 21, 14, 26, 14, 18, 14, 25 | 60, 56, 80, 91, 62, 70, 62, 64, 48, 64 |
| Mean | 17.40 | 65.70 |
| SD | 4.81318 | 12.18423 |
| (df) | 18 | |
| Numbers | 10 | 10 |
| '*t*' | 11.635 | |
| '*p*' value | Less than 0.001 | |

**Table 3:** The '*t*' test findings for GAD-7score change

| | *Control group* | *Intervention group* |
|---|---|---|
| Data | 19, 21, 20, 18, 19, 14, 21, 21, 21, 20 | 6, 7, 3, 3, 4, 3, 4, 7, 11, 7 |
| Mean | 19.50 | 5.50 |
| (SD) | 2.17051 | 2.59272 |
| df | 13 | |
| Numbers | 10 | 10 |
| '*t*' | 13 | |
| '*p*' value | Less than 0.001 | |

According to the findings of Chi-square, the "*p*" value was less than 0.001. So, participants who got out of bed early from the intervention group got better improvement. So, there is a significant relationship between participant's 1st day out of bed and FIM improvement and GAD-7 improvement.

## Discussion

The main objective of this study was to explore the effectiveness of graded early mobilization on psychomotor status and duration of ICU stay of the patients who were mechanically ventilated in the ICU of a hospital setting.

In this study, we have found that graded early mobilization significantly improved patient functional independence. Almost every patient in the control group scored very low in the FIM assessment (mean: 17.40). On the other hand, as all the participants of the intervention group wear treated in ICU with graded mobilization and most of them were brought out of bed on the 2nd day within ICU, they became functionally very active within ICU stay. During discharge from ICU, their FIM assessment score was very high (mean: 65.70) compared to the control group and the change was statistically significant.

In the current study, we observed some psychological issues of participants during ICU stay. In the control group, 80% of participants were reported with severe anxiety level in GAD-7 assessment, only 20% were in the moderate anxiety level and no one reported normal during ICU stay (GAD-7 mean: 19.50).

But in the intervention group, the scenario was different. All the participants received graded mobilization in the ICU setting. The professional physiotherapist did plenty of verbal interaction with each participant which may have played a vital role in their psychological status as well. The result showed that only 40% of participants responded to mild anxiety and 10% of participants responded to moderate anxiety in GAD-7 assessment. But 50% of participants responded with an anxiety-free score in GAD-7 assessment. (mean GAD-7: 5.50). In comparison to the control group, the change was statistically significant (*p*-value was less than 0.001).

In this study, findings were in some features similar and some area better. It was found from the statistical analysis from functional improvement measure (FIM) of patients that at 18df the value of '*t*' at 5% level of significance was 11.635 as found on reference to '*t*' table (appendix). Thus, the probability of occurrence (*p*) of the value obtained (11.635) by chance is much less than 0.001, the critical or 5% level of significance. '*p*' comes to <0.001 on referring to the '*t*' table. It can occur less than 01 times in 1000 which occurs very rarely by chance. So it showed that graded early mobilization is significantly more effective rather than Only ICU Treatment for

functional improvement and independence of patients. So this study confirms the hypothesis and rejects the null hypothesis.

For reduction of ICU-acquired anxiety, at 13df the value of '*t*' at 5% level of significance was 13 as found in reference to the '*t*' table (appendix). Thus, the probability of occurrence (*p*) of the value obtained (13) by chance is much less than 0.001, the critical or 5% level of significance. '*p*' comes to <0.001 on referring to the '*t*' table. It can occur less than 01 times 1000 which means very rarely by chance. So it showed that graded early mobilization is significantly more effective rather than only ICU Treatment for the reduction of ICU acquired anxiety. So this experiment establishes the hypothesis and rejects the null hypothesis.

In respect of ICU stay, at 18df the value of '*t*' at 5% level of significance is 6.50 as found in reference to the '*t*' table (appendix). Thus, the probability of occurrence (*p*) of the value obtained (6.50) by chance is much less than 0.001, the critical or 5% level of significance. '*p*' comes to <0.001 on referring to the '*t*' table. It can occur less than 01 times in 1000 which occurs very rarely by chance. This finding showed that graded early mobilization is significantly more effective rather than Only ICU Treatment for the reduction of length of ICU stay. So this experiment confirmed the hypothesis and rejected the null hypothesis.

In this study, the Chi-square test was calculated to determine any significant relationship between the outcome frequencies and variables in one or more categories. There was no significant relationship between gender and FIM improvement and GAD-7 improvements ($p = 0.245$). So, there is some relationship showed that of Graduation and higher education holder participants are better to get improvement but the change was not statistically significant ($p = 0.077$). But, there was a strong relationship between the participant's 1st day out of bed and improvement. According to the findings of the Chi-square, the *p*-value was less than 0.001. So, participants from the intervention group who could not get out of bed early improved better. So, there is a significant relationship between participant's 1st day out of bed and FIM improvement and GAD-7 improvement.

## Limitation and Recommendation

Patients in ICU may not be similarly critical and their medical conditions also may not be of a similar level. So, there is a possibility to enroll medically less ill patients in the intervention group and more ill patients in the control group which may affect the findings of this study.

The results of this study have pursued the effects of graded early mobilization for 10 session's intervention effects whereas its long-term effects are unknown so a follow-up research study of these interventions would be more valid.

The study was conducted in one general hospital only. Further research can be recommended with multiple hospitals ICU to get varieties of patients where the chance of comparison study is also feasible.

## Conclusion

This study has proven that graded early mobilization is statistically highly significant to gain functional improvement of a patient within ICU stay and reduces the length of ICU stay. Not only functional improvement, but GAD-7 assessment findings were also significantly better during discharge from ICU. So participants of the intervention group got better psychological status and less anxiety level compared with the control group. It was a study with a very small group of respondents with only 05 sessions of intervention. So, it is strongly recommended to conduct a follow-up study to see the long-term effectiveness.

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