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The Influence of Early Physical Therapy on Hospital Length of Stay

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Physical Therapy

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Title: The Influence of Early Physical Therapy on Hospital Length of Stay

Brief Introduction: I want to know what the research says about hospital length of stay for patients in the intensive care unit (ICU) who receive early mobilization vs. usual care. Many of the patients I am currently treating in the ICU are on mechanical vents and heavily sedated. There was recent discussion between the medical and rehabilitation teams regarding the appropriateness and possible benefits of early physical therapy for patients in the ICU. Both sides agreed that early mobilization provided numerous benefits to the patient.

Clinical Scenario: The patient who led me to pursue this question is a 25 y/o female with a diagnosis of acute renal failure and sepsis secondary to multiple drug overdoses. Problems identified include immobility and weakness.

My Clinical Question: Does early physical therapy for patients in the ICU decrease their hospital length of stay?

Clinical PICO:

Population: Patients between the ages of 18 – 100 years old admitted to the ICU
Intervention: Early physical therapy
Comparison: Usual care
Outcome: Hospital length of stay

Overall Clinical Bottom Line: Based on the outcomes from Schweickert *et al.* and Needham *et al.*, whether or not early physical therapy decreases hospital length of stay remains undetermined. Schweickert *et al.* (PEDro score 7/10 with 104 subjects) determined that early physical and occupational therapy during interruptions in sedation did not decrease hospital length of stay compared to a control group. The most significant threat to this study's internal validity was not having information concerning how sick the patients were. If one group had patients

with overall more favorable prognoses, the results could have been influenced. In contrast, Needham *et al.* (PEDro score 3/10 with 576 subjects) determined that early physical and occupational therapy during interruptions in sedation as part of a quality improvement project significantly decreased hospital length of stay by 3.1 days compared to a control group. However, this study has poor internal validity (PEDro score 3/10); the most significant threat concerns how much early physical and occupational therapy (the independent variable of interest) truly affected hospital length of stay. Given that early rehabilitation (physical and occupational therapy) was only one part of a larger quality improvement project, it is impossible to determine the effect of early physical and occupational therapy alone. Based on the results of these two studies, I am unable to answer my clinical question. More literature needs to be evaluated to determine whether or not early physical therapy decreases hospital length of stay. Early physical therapy vs. physical therapy when patients are no longer sedated should be the only variable manipulated, so study results can be attributed to this one intervention. Also, more patient information should be obtained regarding diagnosis/prognosis to provide a more accurate comparison between groups at baseline.

Search Terms: Early mobilization, ICU, physical therapy, length of stay

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Rationale for my chosen articles

My search process began with a multidisciplinary "journal club" meeting at Rogue Valley Medical Center that focused on the results of an article concerning early mobilization for patients in the ICU. I decided to look into the topic more and found two additional articles that fit the criteria I was looking for. I ranked the three

articles using the Physiotherapy Evidence Database scale (PEDro scale) to help me decide which two articles to critique.

(1) Schweickert W.D., Pohlman M.C., Pohlman A.S., Nigos C., Pawlik A.J., Esbrook C.I., Spears L., Miller M., Franczyk M., Deprizio D., Schmidt G.A., Bowman A., Barr R., McCallister K.E., Hall J.B., Kress J.P. Early Physical and Occupational therapy in Mechanically Ventilated, Critically Ill Patients: A Randomised Controlled Trial. *The Lancet* 2009; 1874 – 1882.

PEDro Score 6/10

Population: Included patients who were similar to my patient based on inclusionary criteria

Intervention: Early exercise and mobilization (physical and occupational therapy)

Comparison: Therapy as ordered by the primary care team

Outcome measures: The number of patients able to return to independent functional status at hospital discharge, number of days with delirium, number of days breathing without assistance during the first 28 days, length of stay in the ICU and length of stay in the hospital

(2) Needham D.M., Korupolu R., Zanni J.M., Pradhan P., Colantuoni E., Palmer J.B., Brower R.G., Fan E. Early Physical Medicine and Rehabilitation for Patients With Acute Respiratory Failure: A Quality Improvement Project. *Arch Phys Med Rehail* 2010; 536 – 542.

PEDro Score 4/10

Population: Included patients who were similar to my patient based on inclusionary criteria

Intervention: A quality improvement project consisting of a multidisciplinary team that increased staffing, reduced sedation, and altered physical and occupational therapy consultation guidelines

Comparison: Typical treatment prior to the quality improvement project

Outcome measures: Status of sedation, delirium, and medications, number of rehabilitation treatments and interventions provided, hospital length of stay and in-

hospital mortality

(3) Morris P.E., Goad A., Thompson C., Taylor K., Harry B., Passmore L., Ross A., Anderson L., Baker S., Sanchez M., Penley L., Howard A., Dixon L., Leach S., Small R., Hite R.D., Haponik E. Early Intensive Care Unit Mobility Therapy in the Treatment of Acute Respiratory Failure. *Crit Care Med* 2008; 2238 – 2243.

PEDro Score 3/10

Population: Included patients who were similar to my patient based on inclusionary criteria

Intervention: Early mobilization (physical and occupational therapy) during interruptions in sedation

Comparison: Therapy as ordered by the primary care team

Outcome measures: Number of patients reaching independent functional status at discharge, duration of delirium, number of ventilator-free days, hospital and ICU length of stay, hospital mortality, hand-grip strength, greatest walking distance, discharge location

Table 1 shows the breakdown of each article on the PEDro scale and the corresponding PEDro score. I personally ranked each article using PEDro criteria.

Table 1. Comparison of PEDro Scores

	Schweickert *et al.*	Needham *et al.*	Morris *et al.*
Random	Yes	No	No
Concealed allocation	No	No	No
Baseline comparability	Yes	Yes	Yes
Blind subjects	No	No	No
Blind therapists	No	No	No
Blind assessors	Yes	No	No
Adequate follow-up	Yes	Yes	No
Intention-to-treat	Yes	No	No
Between group	Yes	Yes	Yes
Point estimates & variability	Yes	No	Yes
Total score	7/10	3/10	3/10

Based on the above comparisons, I have chosen to write this critically appraised paper on the two articles by Schweickert *et al*. and Needham *et al*. The Schweickert article scored the highest on the PEDro scale, and a higher PEDro score indicates higher validity of the study. The reason I did not choose the article by Morris *et al.* was because this study lacked adequate follow-up as compared with the article by Needham *et al*.

Article: Schweickert *et al*., 2009.

Clinical Bottom Line: Based on this study with 104 adults who were sedated and mechanically ventilated in the ICU, early physical and occupational therapy did not decrease hospital length of stay compared to a control group. The control group received physical and occupational therapy as ordered by the primary care team while the intervention group received early physical and occupational therapy during interruptions in sedation. The median hospital length of stay for the intervention group was 13.5 days with an interquartile ratio (IQR) of 8.0 – 23.1, whereas the control group had a median hospital length of stay of 12.9 days with an IQR of 8.9 – 19.8. The most significant threat to this study's internal validity was not having information concerning how sick the patients were. If one group had patients with overall more favorable prognoses, the results could have been influenced. Because there was no decrease in hospital length of stay between groups, the costs of additional therapy services would not be beneficial in this regard. However, given the decreases in days with delirium and days on mechanical ventilation, early rehabilitation may be cost efficient given the decrease in overall hospital cost. The results of this study can be applied to a small portion of patients in the ICU.

Article PICO:

Population – Adults in the ICU who were sedated and had been mechanically ventilated for less than 72 hours and expected to continue mechanical ventilation for a minimum of 24 hours

Intervention – Physical and occupational therapy during daily sedation interruption beginning immediately after admission

Comparison – Physical and occupational therapy as ordered by the primary care team

Outcomes – Hospital length of stay

Blinding: The subjects were not blinded. However, subjects and their families were asked not to discuss previous treatment sessions with the therapists conducting assessments. The treating therapists were not blinded and provided interventions in the mornings. The assessing therapists were blinded and assessed the patients in the afternoons. Given the nature of this study, I do not see any threats to validity based on blinding.

Controls: The control group received standard care, which consisted of physical and occupational therapy as ordered by the primary care team. The intervention group received physical and occupational therapy during interruptions in sedation while the control group did not. Since the therapies during sedation interruption were the only difference between groups, the control group was an appropriate comparison group.

Randomization: Patients were randomly assigned to the intervention or control group by a person with no further involvement in the study. Randomization was concealed and successful. The authors did not clearly state whether the baseline characteristics of the two groups were statistically similar, however there did not appear to be large differences (based on the table provided by the authors).

Study: This study was a randomized controlled trial. There were 49 participants in the intervention group and 55 participants in the control group. Inclusionary criteria consisted of patients in the ICU over the age of 18 who had been on mechanical ventilation for less than 72 hours and were expected to continue for another 24 hours. Patients also had to meet baseline functional independence criteria, defined as a Barthel Index score of greater than 70 as related to patient function two weeks prior to admission. Exclusionary criteria consisted of rapidly developing neuromuscular disease, cardiopulmonary arrest, disorders with a six-month mortality estimated at more than 50% that were irreversible, high intracranial pressure, amputated limbs, and enrollment in other trials. Patients in the intervention group received physical and occupational therapy beginning on the day of enrollment, while patients in the control group received standard care

physical and occupational therapy as ordered by the primary care team. Patients in the intervention group received therapy in the mornings during sedation interruption. Unresponsive patients received passive range of motion in all cardinal planes for 10 repetitions each on all limbs. When patients were no longer sedated and able to interact, therapy began with active assisted, active, or manually resisted range of motion exercises in supine. If tolerable, treatment progressed to bed mobility activities, including sitting at the edge of the bed. This was followed by participation in activities of daily living and exercises to assist with functional tasks. These interventions were followed by transfer training, pre-gait exercises, and ambulation. Patients were advanced on an individual basis given tolerance and ability. Therapy sessions continued until the patient was discharged or reached his/her prior level of function. The following situations prevented initiation or continuation of therapy: mean arterial blood pressure less than 65 mm Hg or greater than 110 mm Hg, systolic blood pressure greater than 200 mm Hg, low heart rate (less tan 40 beats per minute), high heart rate (greater than 130 beats per minute), low respiratory rate (fewer than 5 breaths per minute), high respiratory rate (greater than 40 breaths per minute), or oxygen saturation less than 88%. Other reasons patients missed therapy sessions included typical contraindications to physical and occupational therapy.

Outcome measures: Hospital length of stay is the outcome measure relevant to my clinical question. The authors did not discuss a threshold for minimally clinically important difference (MCID) for this outcome measure and there was no MCID found in the literature. However, it makes sense that the MCID may be the lowest length of stay without an increase in adverse effects. Given the nature of this outcome measure, reliability was not addressed.

Study losses: Of the 49 patients in the intervention group, 9 (18%) died prior to hospital discharge. Of the 55 patients in the control group, 14 (25%) died before discharge. An intention-to-treat analysis was performed to account for these study losses. All subjects were analyzed in the groups to which they were assigned. It does

not appear that the study losses were related to the interventions. Visual inspection of the data does not reveal any missing or questionable data.

Summary of internal validity: Overall, the internal validity of this study is good (PEDro score 6/10). Patients were randomized, assessors were blinded, an intention-to-treat analysis was performed, and the outcome measure that I am interested in (hospital length of stay) was valid. The baseline characteristics appeared similar between groups. The most significant threat to internal validity is the lack of information concerning how sick the subjects were. If one group had subjects with more favorable prognoses, the results of the study could have been influenced.

Evidence: I want to know if hospital length of stay differed between the intervention and control groups. Table 2 shows the median hospital length of stay for subjects in the intervention and control groups and the corresponding p value.

Table 2. Hospital length of stay (days)

	Intervention (n = 49)	Control (n = 55)	p value
Median hospital length of stay and IQR	13.5 (8.0 – 23.1)	12.9 (8.9 – 19.8)	0.93

The above data are from the authors' data analyses. The data indicate the difference between the two groups' median hospital stays was 0.6 days. However, this difference was not statistically significant.

Applicability of study results:

Benefits vs. Costs: Patients in the intervention group did not have a decreased hospital length of stay compared to patients in the control group. Based on the results of this study, the costs of implementing early mobilization for ICU patients is not worthwhile if only considering this one outcome measure. Early physical and

occupational therapy result in more rehabilitation costs because more therapy is being provided. However, the authors reported that subjects in the intervention group had statistically significant fewer days with delirium and spent fewer days on mechanical ventilation. Based on these additional outcomes, early physical and occupational therapy would cost less than treating prolonged delirium and providing mechanical ventilation, and may increase the patient's quality of life.

Feasibility of treatment: Providing early mobilization is feasible but would require planning and communication between nursing staff, doctors, and rehabilitation therapists to coordinate therapy with breaks from sedation. Study procedures were explained well enough that they could be reproduced. It would be difficult for therapists to see other patients in the hospital twice a day if patients in the ICU had to be seen at specific times in the morning during breaks from sedation. Early mobilization is feasible and beneficial for patients in the ICU, specifically because it may reduce duration of delirium and days spent on mechanical ventilation. Based on this study, a decreased hospital length of stay is not one of the benefits.

Summary of external validity: The internal validity of this study slightly compromises the ability to apply these results to a larger population. First, many patients were excluded from the study based on specific medical complications. Second, how ill the patient is will affect his/her outcome. The subjects in this study represent only a small portion of the patients treated in ICUs.

Article: Needham *et al*., 2010.

Clinical Bottom Line: Based on this study of 576 patients admitted to the medical intensive care unit (MICU), early physical and occupational therapy as part of a quality improvement project significantly decreased hospital length of stay compared to a control group. The control group (314 subjects) received standard care on year prior to the quality improvement project while the intervention group (262 subjects) received early physical medicine and rehabilitation. The mean difference between groups was a hospital length of stay of 3.1 days (total length of stay 14.1 days and 17.2 days for the intervention group and control group, respectively.) Given these outcomes, the costs of additional therapy services would be beneficial. This study has poor internal validity (PEDro score 3/10); the most significant threat concerns how much early physical and occupational therapy (the independent variable of interest) truly affected hospital length of stay. Given that early rehabilitation was only one part of a larger quality improvement project – which included changes in sedation practice, physiatry consultations for subjects receiving rehabilitation, and increased neurology consultations, it is impossible to determine the effect of early physical and occupational therapy alone. Future studies should focus on one variable to allow better interpretation of results.

Article PICO:

Population – Patients admitted to the MICU at a single academic teaching hospital

Intervention – Early physical medicine and rehabilitation during interruptions in sedation as part of a quality improvement project

Comparison – Physical medicine and rehabilitation prior to the quality improvement project during the same months the previous year

Outcomes – Hospital length of stay

Blinding: The subjects and the members of the health care team were not blinded. Patient length of stay is an outcome determined by how quickly the patient improves and would not have been influenced by lack of blinding.

Controls: The control group received standard care, which consisted of physical medicine and rehabilitation prior to the quality improvement project. The intervention group received early physical medicine and rehabilitation that was coordinated with interruptions in sedation. It is appropriate to compare these two groups because subjects in the intervention group received more physical and/or occupational therapy than patients in the control group. The implementation of the quality improvement project included: Changing the MICU admission orders default activity level from "bed rest" to "as tolerated", sedation practices were changed from continuous to as needed, physical and occupational therapy consultation guidelines were established, safety guidelines were implemented, rehabilitation staffing in the MICU was changed to include both a full-time physical and occupational therapist as well as a part-time rehabilitation aide, increased physiatry consultations, and increased neurological consultations. These were the only differences between the intervention and control groups. It is important to note that these groups were only used for determining differences in hospital length of stay and number of physical/occupational therapy visits. The authors looked at additional outcomes and used different intervention and control groups for those comparisons.

Randomization: Subjects were not randomized into groups. Rather, subjects in the intervention group (in the MICU from May – August) were compared to subjects in a control group (in the MICU from May - August of the previous year). Unfortunately, the authors did not provide baseline data for the intervention and control groups used to evaluate hospital length of stay. Therefore, similarity between groups at baseline is unknown.

Study: This was a prospective before and after quality improvement study. There were 314 participants in the intervention group and 262 participants in the control group. Inclusionary criteria consisted of patients admitted to the MICU. There were

no exclusionary criteria pertinent to my outcome of interest (hospital length of stay). Patients in the intervention group received early physical medicine and rehabilitation, while patients in the control group received standard care prior to the quality improvement project. The relevant changes made in the intervention (compared with the control group) were: Activity level was changed from "bed rest" to "as tolerated", sedation was given on an as needed basis rather than continuously, guidelines for physical and occupational therapy were established, safety guidelines were developed, and staffing was modified to include full-time physical and occupational therapists.

Outcome measures: Hospital length of stay is the outcome measure relevant to my clinical question. The authors did not discuss a threshold for minimally clinically important difference (MCID) for this outcome measure and there was no MCID found in the literature. However, it makes sense that the MCID may be the lowest length of stay without an increase in adverse effects. Given the nature of this outcome measure, reliability was not addressed.

Study losses: The authors did not report any study losses. All subjects were analyzed in their respective groups. Visual inspection of the data does not reveal any missing or questionable data.

Summary of internal validity: Overall, the internal validity of this study is poor (PEDro score 3/10). The outcome measure that I am interested in (hospital length of stay) was valid. The most significant threat to internal validity is the fact that early physical medicine and rehabilitation encompasses more than just physical and occupational therapy. The true effect of early rehabilitation on hospital length of stay is unknown because this intervention was not isolated. In addition to early physical and occupation therapy, sedation practices varied, specialized consultations increased, and safety guidelines to determine when patients were ready for physical medicine and rehabilitation were implemented.

Evidence: I want to know if hospital length of stay differed between the intervention and control groups. Table 3 shows the mean hospital length of stay for subjects in the intervention and control groups and the corresponding p value.

Table 3. Hospital length of stay (days)

	Intervention (n = 314)	Control (n = 262)	p value
Mean hospital length of stay	14.1	17.2	0.03

The above data are from the authors' data analyses. The mean data difference of 3.1 days between the two groups mean hospital stay was statistically significant. A 3.1 day reduction in hospital length of stay may also have clinical significance due to decreased overall cost and increased patient function.

Applicability of study results:

Benefits vs. Costs: Patients in the intervention group had a statistically significant decreased hospital length of stay compared to patients in the control group. Based on the results of this study, it is difficult to determine how worthwhile the costs of implementing early mobilization for MICU patients would be because the physical and occupational therapy were not isolated. By combining so many different changes in the quality improvement project in addition to early physical and occupational therapy during breaks in sedation, it is difficult to say which variable(s) were responsible for a decreased hospital length of stay for patients in the MICU. It is difficult to discern if these improvements were truly based solely on early rehabilitation, or if they were due to changes in sedation practice. Early physical and occupational therapy result in more rehabilitation costs because more therapy is being provided. However, according to data from the 2002 Michigan state inpatient database, the mean cost of staying in an intensive care unit was $2,401 per day, while the mean cost of a regular hospital stay was $1,122 per day. These data indicate that a reduced ICU and/or hospital length of stay would be cost effective.

Feasibility of treatment: Providing early mobilization is feasible but would require planning and communication between nursing staff, doctors, and rehabilitation therapists to coordinate therapy with breaks from sedation. Quality improvement procedures were mostly administrative in nature and were explained adequately enough for reproduction. Early mobilization is feasible and beneficial for patients in the ICU as part of a quality improvement project, specifically because it may decrease hospital length of stay, reduce duration of delirium, and increase functional mobility.

Summary of external validity: The internal validity of this study (PEDro score 3/10) compromises the ability to apply these results to a larger population. There were no exclusionary criteria for my outcome of interest, making these results applicable other patients in intensive care units. However, how effective early physical and occupational therapy really is remains to be determined because those interventions were only part of a larger quality improvement project.

Synthesis: It is difficult to determine the answer to my clinical question based on the two articles by Schweickert *et al.* and Needham *et al.* The study by Schweickert *et al.* (PEDro score 7/10 with 104 subjects) included adults in the ICU who were sedated and had been mechanically ventilated for less than 72 hours and expected to continue mechanical ventilation for a minimum of 24 hours. Subjects in the intervention group received early physical and occupational therapy during breaks from sedation while subjects in the control group received standard care as ordered by the primary care team. There was not a statistically significant difference between the groups for my outcome of interest (hospital length of stay). The study by Needham *et al.* (PEDro score 3/10 with 576 subjects) included patients admitted to the MICU at a single academic teaching hospital. Subjects in the intervention group received physical and occupational therapy during breaks in sedation as part of a quality improvement project. Subjects in the control group received physical and occupational therapy prior to the quality improvement project during the same months the previous year. There was a statistically significant decrease in hospital length of stay by 3.1 days for subjects in the intervention group.

The different results these studies obtained could be attributed to threats to internal validity. Schweickert *et al.* only had 104 subjects and used hospital length of stay as a secondary outcome measure. The parameters for "standard" physical therapy as ordered by the primary care team were not well described. Needham *et al.* had 576 subjects and a better study design; however, their results cannot be attributed solely to early physical therapy as this was not the only variable manipulated. In particular, the intervention group had varied sedation practices and increased number of specialized consultations that could have contributed to the decreased length of stay in this group. It seems reasonable that these two studies obtained different results because the variables that were manipulated were not the same. Schweickert *et al.* focused on physical and occupational therapy, while Needham *et al.* manipulated several other variables in addition to physical and occupational therapy. If the guidelines for providing early physical and occupational therapy vs. "standard" therapy had been more clear, the results from Schweickert *et*

al. would have been more applicable to my patient. Also, if physical and occupational therapy were the only variables manipulated, the results from Needham *et al.* would be more applicable to my patient. Additional literature needs to be evaluated in order to determine if early rehabilitation affects hospital length of stay.

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