Published in final edited form as:

Crit Care Med. 2009 February ; 37(2): 561–568. doi:10.1097/CCM.0b013e3181957449.

Physical Therapy Utilization in Intensive Care Units: Results from a National Survey

Katherine E. Hodgin, Amy Nordon-Craft, Kim K. McFann, Meredith L. Mealer, and Marc Moss

Division of Pulmonary Sciences and Critical Care Medicine, Physical Therapy Program, and Department of Preventive Medicine and Biometrics, University of Colorado Denver and Health Sciences Center, Denver, CO

Abstract

Objective—Patients who survive admission to the intensive care unit (ICU) commonly complain of fatigue, weakness, and poor functional status. This study sought to determine the utilization of inpatient physical therapy for patients recovering from critical illness.

Design—Surveys were mailed to 984 physical therapists from across the United States. Each survey included questions concerning staffing and availability of physical therapists for ICU patients, and the utilization of physical therapy (PT) for six patient scenarios requiring ICU admission and mechanical ventilation.

Main Results—Overall 482 physical therapists completed their survey. The majority of hospitals (89%) at which the physical therapists were employed require a physician consultation to initiate PT for ICU patients. Established hospital criteria for the initiation of PT in the ICU were present at only 10% of the hospitals. Community hospitals were more likely to routinely provide PT on weekends compared to academic hospitals ($p=0.03$). The likelihood of routine PT involvement varied significantly with the clinical scenario (highest 87% status post cerebrovascular accident, lowest 64% chronic obstructive pulmonary disease, $p<0.001$). The most common types of PT that would be performed on these critically ill patients were functional mobility retraining and therapeutic exercise. The type of PT identified by the physical therapists as having the most positive impact also significantly varied according to the clinical scenario ($p<0.001$).

Conclusions—PT is commonly administered to ICU patients during the recovery from critical illness in the United States. However the frequency and type of PT significantly varies based on the type of hospital and the clinical scenario.

Keywords

Intensive care units; Physical Therapy; Critical Care; Rehabilitation

Introduction

Critically ill patients, especially those that require mechanical ventilation, commonly develop acute neuromuscular weakness resulting in increased rates of intensive care unit (ICU) readmission, an increased risk of institutionalization, decreased long term physical functioning, and an overall decreased health-related quality of life (1–3). Immobility, the

Please address correspondence to: Marc Moss, M.D., Division of Pulmonary Sciences and Critical Care Medicine, 4200 East 9th Ave, C272, Room 5525, Denver, CO 80262-8634, Phone: 303-315-1365, Fax: 303-315-1356, marc.moss@uchsc.edu.

The authors have no financial relationship to disclose relative to this work.

systemic inflammatory response that accompanies critical illness, poor nutritional status, and exposure to pharmacologic agents such as neuromuscular blocking agents and corticosteroids all contribute to the development of this potentially debilitating neuromuscular weakness (4).

While in the ICU, patients are often initially prescribed bed rest. However, inactivity and immobility by themselves have significant and deleterious physiologic effects, including atelectasis, pressure ulcers, and an increased susceptibility to aspiration and pneumonia (5;6). With a daily loss of 1.3% to 3% of muscle strength from immobility, a 10% reduction in postural muscle strength can occur after only one week of complete bed rest in healthy volunteers (7). The effect of immobility is even more profound in the elderly and in patients with chronic illnesses, including congestive heart failure and chronic obstructive pulmonary disease (8–10). In addition to the deleterious effects of immobility, ICU patients are at increased risk for the development of acquired neuromuscular disorders. Multiple studies have reported the development of critical illness polyneuropathy or critical illness myopathy in over 50% of patients who required mechanical ventilation for more than 7 days (11–14). The development of neuromuscular weakness in patients recovering from critical illness has dramatic effects on their physical functioning and health related quality of life after ICU discharge. The greatest impairments are especially related to daily physical functioning including an inability to lift and carry groceries, climb stairs, bend, kneel, or walk moderate distances (15).

Physical therapy is one potential intervention that has been studied in patients recovering from critical illness (16). Bailey and colleagues determined that PT can be safely performed on patients with acute respiratory failure who required mechanical ventilation for greater than 4 days (17). A small cohort study from Taiwan also demonstrated modest improvements in the Barthel Index of Activities of Daily Living scores (BI) after a six week physical training program (18). Another randomized control Italian study of 24 chronically ventilated chronic obstructive pulmonary disease (COPD) patients suggested that the addition of electrical stimulation to active limb mobilization in these patients decreased the number of days needed to transfer from bed to chair (19). However, activities such as ambulation, positioning, and passive range of motion exercises are reported to be among the most commonly missed inpatient nursing interventions (20;21). Based on this relatively small body of literature, a European Respiratory Society and European Society of Intensive Care Medicine Task Force concluded that there was only level C (uncontrolled or nonrandomized trials) evidence regarding effectiveness of acute physical therapy for critically ill adults (22).

How physical therapy is actually utilized for patients recovering from critical illness has not been widely studied. Surveys of physiotherapists in European and Australian ICUs reported that their primary responsibility was to perform respiratory forms of therapy including airway suctioning, postural drainage, and weaning from mechanical ventilation (23;24). There are presently no studies that examine the utilization of PT for patients recovering from critical illness in the United States. Therefore we conducted a national survey of physical therapists to elucidate current physical therapy practices for patients recovering from critical illness including hospital staffing patterns, the likelihood that ICU patients would receive PT, and to identify the most common types of PT that are performed.

Materials and Methods

Initially we organized several conferences with physical therapists and critical care physicians from our institution to identify common ICU diagnoses that may receive an inpatient physical therapy consultation. Based upon their opinions and our clinical

experience, we constructed six different ICU patient scenarios where physical therapy may become involved in patient care. In order to isolate the effect of the primary diagnosis on the utilization of physical therapy, we standardized all of the other components of each patient scenario. For example, the patient was intubated and remained on mechanical ventilation for two weeks in each of the six scenarios. Except for the cerebrovascular accident (CVA) scenario and the cervical (C6) fracture scenario, all of the patients were described as being alert, able to follow commands and diffusely weak throughout (3+ to 4 out of 5 muscle strength). The age and gender of the patient were deliberately not included in any of the six case scenarios in order to remove these factors from consideration. The survey was then distributed to several critical care physicians and physical therapists to assess for clarity, completeness, and realism of the scenarios. Minor modifications in the protocols were made based on their suggestions.

The first survey was mailed to the 984 members of the acute care section of the American Physical Therapy Association, a national association representing 71,000 members across the United States. The American Physical Therapy Association is the principal membership organization representing and promoting the profession of physical therapy (PT). The survey included a cover letter stating that the purpose of the study was to identify the present use of PT for patients recovering from critical illness in the United States. Non-respondents to the initial mailing were not sent a reminder postcard or a second mailing of the survey. The survey was completed anonymously. None of the respondents were compensated for their involvement and all responses were voluntary. This study was approved by the University of Colorado Institutional Review Board.

The survey required about 15 minutes to complete and included questions regarding general information about the demographics of the primary hospital of employment and issues regarding PT staffing. The survey also consisted of questions concerning a series of six scenarios of mechanically ventilated patients commonly encountered in the ICU (Appendix 1). The physical therapists were questioned regarding the likelihood that physical therapy would be consulted and the number of days per week that PT would be administered for each scenario. The likelihood that PT would be involved was considered to be “frequent” if the estimated percentage of involvement was greater than 75%. Using a 1 to 7 scale (where 1 was “very unlikely” and 7 was “very likely”), the physical therapists were asked to determine the likelihood that six different types of PT would be performed for each of the six patient scenarios including: chest physiotherapy, passive range of motion exercises, positioning to prevent contractures and wounds, therapeutic exercise (as defined by either aerobic or resistive movement initiated by the patient with the assistance of the physical therapist), functional mobility retraining (as defined by bed mobility, balance training, transfer training, and ambulation exercises), and functional electrical stimulation. The final question for each of the six patient scenarios determined which single type of physical therapy was felt to be the most efficacious for that patient scenario.

Statistical Analysis

Descriptive statistics were reported as Mean $\pm$ SD or percent (95% CI). Cronbach’s alpha was calculated to determine the reliability of the entire survey and each sub-scale. In order to demonstrate construct validity, exploratory factor analysis (EFA) was performed using Principal Component Analysis. Principal component analysis (PCA) involves a mathematical procedure that transforms a number of correlated variables into a smaller number of uncorrelated latent variables called principal components. In this case, the principal components represent the underlying or latent constructs contained in the survey. Scree plots (plots of the eigenvalues) and Wrigley’s Criterion (unique loadings ≥ 3.0) were used to evaluate the number of components to be retained. Chi Square test of independence

was used to test categorical variables. Mixed model repeated measures analysis was used to determine the difference in likelihood scores among 6 different forms of PT as measured by a Likert scale ranging from 1–7, where 1 was “very unlikely” and 7 was “very likely”. The Tukey-Kramer p-value adjustment was used to adjust for the number of pair-wise comparison. Ordinal logistic regression was used to determine the odds of using physical therapy, the odds of working with a patient > 3–5 days per/week, and the odds of using each form of therapy by patient scenario. Reliability and PCA analysis were performed in SPSS 16.0 while all other analyses were performed using SAS 9.1.

Results

Demographics

Between March and May 2007, a total of 490 physical therapists representing hospitals from 49 of the 50 states responded to the survey (overall response rate of 50%). A total of eight of the respondents returned but did not complete the survey as they no longer worked in a critical care setting. Therefore the responses from 482 physical therapists were included in the final analysis. A total of 33% of the respondents worked in a university or university-affiliated hospital with the remaining 67% working in community hospitals. The hospitals were of varying sizes: 34% of the hospitals were <250 beds, 29% were 250–400 beds and 37% were >400 beds. Nearly one half of these hospitals (49%) had more than 24 ICU beds.

Internal consistency was high on the entire survey and for each of the subscales with values ranging from 0.755 to 0.974 (Table 1). A plot of the Eigenvalues (scree plot) suggested the existence of 10 unique components. These 10 components explained 68.5% of the variance and supported the presence of 10 independent scales. The majority of items loaded on one and only one component with loadings ≥ 3.0 , thus, Wrigley's Criterion also supported the existence of 10 components. Strong loadings on each of the components confirmed the construct validity of the 10 subscales as named in Table 1.

The majority of hospitals (89%) where these physical therapists were employed required a physician consultation to initiate PT for their ICU patients. Established hospital criteria for the initiation of PT in the ICU were present at only 10% of the hospitals. Physical therapists automatically evaluated all ICU patients at only 1% of the hospitals. Those hospitals with established criteria did not differ from the hospitals that required a physician consultation to initiate PT when analyzed in relationship to hospital affiliation, hospital size, ICU size, number of full-time physical therapists, number of ICU physical therapists, or the number of nights that physical therapy was available at those institutions. Only 58% of the university or university-affiliated hospitals had routine weekend physical therapist coverage in comparison to 68% of the community hospitals ($p = 0.03$). A very small percentage of the hospitals provided physical therapist coverage at night (1% of the university or university-affiliated hospitals and 3% of the community hospitals, $p = 0.28$).

Physical therapy involvement

Physical therapy was likely to be routinely provided in all six of the patient scenarios (Table 2). However, physical therapy was statistically more likely to be routinely provided to the two neurological and the trauma patient scenarios than for the three medical patients {CVA: OR = 3.7 (2.693–5.106), $p < 0.0001$, C6 fracture: OR = 3.274 (2.381–4.502), $p < 0.0001$, motor vehicle accident (MVA): OR = 2.32 (1.736–3.101), $p < 0.0001$, COPD: 1.268 (0.973–1.651), $p = 0.0784$, and myocardial infarction (MI): OR=1.091 (0.840–1.416), $p = 0.5150$ } when analyzed with the pneumonia scenario as the reference. In addition, ordinal logistic regression demonstrated that the two neurological cases {CVA: OR= 1.684 (1.295–2.188), $p < 0.0001$ and C6 fracture: OR = 1.761 (1.349–2.299), $p < 0.0001$ }, and trauma patient (OR

= 1.478 (1.136–1.924), $p = 0.0037$), were more likely to receive therapy greater than 3–5 days per/week in comparison to the three medical patients. The effects of the patient scenario on the frequency of therapy remained in a multivariate logistic model adjusting for the type of hospital (university or university-affiliated versus community). However, the odds of receiving physical therapy for greater than 3–5 days was lower in university hospitals (OR=0.258 (0.196–0.339), $p < 0.0001$) and university-affiliated hospitals (OR=0.312 (0.253–0.384), $p < 0.0001$) when compared to community hospitals.

Type of physical therapy performed

Therapeutic exercises and functional mobility retraining were the most common types of PT provided to ICU patients (see Table 3). Positioning and passive range of motion exercises were occasionally administered to the six clinical scenarios by physical therapists especially for the two neurological patient scenarios. Mixed model repeated measures analysis demonstrated that the likelihood scores were significantly lower for chest physiotherapy ($p < 0.0001$) and functional electrical stimulation ($p < 0.0001$) than all other forms of physical therapy for all of the six scenarios. The scores for positioning, therapeutic exercise and passive range of motion exercises tended to be similar for the C6 fracture scenario and the most likely to be used in this case (Table 3). The score for functional mobility retraining was lower than for positioning ($p < 0.0001$) or passive range of motion exercises ($p = 0.0195$) given the C6 fracture scenario. Mixed model repeated measures analysis demonstrated that the likelihood scores were significantly lower for chest physiotherapy ($p < 0.0001$) and functional electrical stimulation ($p < 0.0001$) than all other forms of physical therapy while the scores for functional mobility retraining and therapeutic exercise tended to be similar for the COPD and MI scenarios (Table 3). All other pair-wise comparisons were significant at $p < 0.0001$ for those two cases. For the trauma, pneumonia and stroke scenarios, scores were highest for functional mobility retraining and therapeutic exercise ($p < 0.0001$), but functional mobility retraining and therapeutic exercise were not different from each other when compared. Scores were highest for functional mobility retraining, positioning, and therapeutic exercise in reference to these three scenarios (Table 3).

Using the pneumonia scenario as the control, ordinal logistic regression by type of physical therapy was performed in order to further explore the effect of patient scenario on the likelihood of performing each type of physical therapy. Passive range of motion was more likely to be performed for the scenario of stroke, C-6 fracture and trauma; positioning was more likely to be used for the scenario of stroke or C-6 fracture; while functional mobility training was unlikely to be used for a C6 fracture; and functional electrical stimulation was more likely to be used in the scenario of stroke, C6 fracture, and COPD (Table 4).

Functional mobility retraining was the most common answer to the question “which single type of physical therapy was felt to be the most efficacious for that patient scenario”, and therapeutic exercises the second most common answer for all six of the scenarios (Table 5). However there were significant differences in the distribution of these responses based on the specific patient scenario ($p < 0.001$). The most uncertainty concerning the type of PT that would have the most positive impact was in response to the patient with the C6 fracture and quadriplegia. When we compared the responses for only the three medical scenarios, there were significant differences in the opinions of the physical therapists between functional mobility retraining and therapeutic exercises ($p = 0.02$, Table 5).

Discussion

In this national survey, we identified several important trends concerning the utilization of physical therapy for critically ill patients. In the United States, PT was commonly administered to ICU patients during their recovery from critical illness. In most hospitals,

the primary physician was required to initiate the PT consultation, and less than 10% of hospitals have established criteria for the institution of PT for ICU patients. The likelihood that a patient received PT and the frequency that PT was delivered varied significantly with the type of hospital and the specific clinical scenario. The most common forms of PT that would be performed by physical therapists were functional mobility retraining and therapeutic exercises. However the type of PT most likely to be delivered differed significantly depending on the patient scenario. As opposed to European and Australian physiotherapists, physical therapists in the United States were unlikely to provide chest physiotherapy to critically ill patients (23;24). In addition, there was significant variability among the physical therapists as to the type of PT that would have the most positive impact for the clinical scenarios.

Therapeutic exercises and functional mobility retraining are two forms of physical therapy with different therapeutic goals. The aim of therapeutic exercise is to restore strength, flexibility, and endurance (28). In therapeutic exercise sessions, the patient may undergo exercises aimed at passively and actively training both the lower and upper extremities, such as lifting light weights or pushing against a resistance. The goal of functional mobility retraining is to regain balance, coordination, and the ability to walk independently (29). Any patient able to walk can start directly with progressive walking retraining, aided by a rolling walker and/or by the therapist. When a patient cannot be weaned from the ventilator, a portable ventilator can be provided to aid with the patient's work of breathing during exercise. Based upon the responses to our national survey, both therapeutic exercise and functional mobility retraining are commonly used in PT sessions for ICU patients recovering from critical illness. However, determining the proper balance between therapeutic exercises and functional mobility retraining during PT sessions for patients recovering from critical illness will require future investigations.

There are several potential detractors to our study. The response rate to the survey was 50%. The physical therapists that responded to the survey could have provided a skewed view of the actual practice across the country. In addition, our survey only collected the opinion of the physical therapists concerning common but hypothetical patient scenarios, rather than collecting data about true involvement based upon visual confirmation of such practices. Such a study would be interesting and would require either prospective or retrospective medical record audits which represent an avenue for further investigation. We also did not include the opinions of other health care professionals, such as respiratory therapy, nursing, critical care physicians, or occupational therapy in this survey to determine their activities with ICU patients. It is possible that these health care professionals actually provide certain forms of physical therapy to these patients, such as positioning, passive range of motion exercises and chest physiotherapy, that may not be performed by physical therapists. Therefore the results of our study should not be interpreted that these patients do not routinely receive positioning, passive range of motion exercises and chest physiotherapy; simply that physical therapists do not routinely perform these types of PT to patients recovering from critical illness. Future surveys regarding the role of other health care professionals will need to be performed to further elucidate the utilization of these interventions in the critically ill population.

All of our patient scenarios involved patients who had been mechanically ventilated for two weeks. Therefore, the involvement of physical therapists very earlier in the ICU course of critically ill patients was not addressed by this study. One randomized clinical trial of PT in mechanically intubated patients that started therapy on average of 1.4 days after intubation demonstrated a reduction in duration of mechanical ventilation and greater functional independence with early PT (25). Similarly our survey did not examine the utilization of PT after hospital discharge. Two studies have examined the efficacy of physical therapy

interventions for ICU survivors. One study was a retrospective analysis of patients admitted to a chronic ventilatory hospital (26). Of note, none of these patients had received PT during their ICU stay. With physical therapy sessions conducted five days per week, each session being 30–60 minutes in duration, there were significant improvements in both upper and lower limb motor strength as well as functional independence scores. Jones and colleagues performed a randomized clinical trial of PT education for 126 ICU patients who had required mechanical ventilation (27). At hospital discharge, these patients were randomized to receive either a six week rehabilitation package consisting of 93 pages of text with illustrations or no educational materials at all. Compared to controls, the intervention group had significant improvement in the Short Form Health Survey (SF-36) physical function scores at both 8 weeks and 6 months. Based on the results of these studies, a European Respiratory Society and European Society of Intensive Care Medicine Task Force concluded that there was only level D (expert opinion) evidence regarding effectiveness of long term or chronic physical therapy for critically ill adults (24).

In summary, in the United States, physical therapy is commonly administered to patients recovering from critical illness. Given the debilitating aspect of immobility and neuromuscular weakness that develops in association with critical illness, future research should be performed to help determine the efficacy of PT interventions for patients who survive critical illness, with an added emphasis on the determination of the specific types of PT which will be most efficacious. The overall goal of future research in this field will be to identify effective therapies that improve the long-term physical function and health related quality of life for survivors of critical illness.

Acknowledgments

Supported by grants K24-HL-089223 (MM) from the National Institutes of Health

Reference List

1. Ceriana P, Delmastro M, Rampulla C, Nava S. Demographics and clinical outcomes of patients admitted to a respiratory intensive care unit located in a rehabilitation center. *Respir Care* 2003;48(7):670–676. [PubMed: 12841857]
2. Combes A, Costa MA, Trouillet JL, et al. Morbidity, mortality, and quality-of-life outcomes of patients requiring ≥ 14 days of mechanical ventilation. *Crit Care Med* 2003;31(5):1373–1381. [PubMed: 12771605]
3. Stiller K. Physiotherapy in intensive care: towards an evidence-based practice. *Chest* 2000;118(6):1801–1813. [PubMed: 11115476]
4. Convertino VA, Bloomfield SA, Greenleaf JE. An overview of the issues: physiological effects of bed rest and restricted physical activity. *Med Sci Sports Exerc* 1997;29(2):187–190. [PubMed: 9044221]
5. Allen C, Glasziou P, Del MC. Bed rest: a potentially harmful treatment needing more careful evaluation. *Lancet* 1999;354(9186):1229–1233. [PubMed: 10520630]
6. Harper CM, Lyles YM. Physiology and complications of bed rest. *J Am Geriatr Soc* 1988;36(11):1047–1054. [PubMed: 3049751]
7. Topp R, Ditmyer M, King K, Doherty K, Hornyak J III. The effect of bed rest and potential of prehabilitation on patients in the intensive care unit. *AACN Clin Issues* 2002;13(2):263–276. [PubMed: 12011598]
8. Duscha BD, Annex BH, Green HJ, Pippen AM, Kraus WE. Deconditioning fails to explain peripheral skeletal muscle alterations in men with chronic heart failure. *J Am Coll Cardiol* 2002;39(7):1170–1174. [PubMed: 11923042]
9. Mador MJ, Bozkanat E. Skeletal muscle dysfunction in chronic obstructive pulmonary disease. *Respir Res* 2001;2(4):216–224. [PubMed: 11686887]

10. Yende S, Waterer GW, Tolley EA, et al. Inflammatory markers are associated with ventilatory limitation and muscle dysfunction in obstructive lung disease in well functioning elderly subjects. *Thorax* 2006;61(1):10–16. [PubMed: 16284220]
11. De JB, Sharshar T, Lefaucheur JP, et al. Paresis acquired in the intensive care unit: a prospective multicenter study. *JAMA* 2002;288(22):2859–2867. [PubMed: 12472328]
12. Khan J, Burnham EL, Moss M. Acquired weakness in the ICU: critical illness myopathy and polyneuropathy. *Minerva Anesthesiol* 2006;72(6):401–406. [PubMed: 16682908]
13. Leijten FS, de Weerd AW. Critical illness polyneuropathy. A review of the literature, definition and pathophysiology. *Clin Neurol Neurosurg* 1994;96(1):10–19. [PubMed: 8187376]
14. Leijten FS, Harinck-de Weerd JE, Poortvliet DC, de Weerd AW. The role of polyneuropathy in motor convalescence after prolonged mechanical ventilation. *JAMA* 1995;274(15):1221–1225. [PubMed: 7563512]
15. Davidson TA, Caldwell ES, Curtis JR, Hudson LD, Steinberg KP. Reduced quality of life in survivors of acute respiratory distress syndrome compared with critically ill control patients. *JAMA* 1999;281(4):354–360. [PubMed: 9929089]
16. Clini E, Ambrosino N. Early physiotherapy in the respiratory intensive care unit. *Respir Med* 2005;99(9):1096–1104. [PubMed: 16085211]
17. Bailey P, Thomsen GE, Spuhler VJ, et al. Early activity is feasible and safe in respiratory failure patients. *Crit Care Med* 2007;35(1):139–145. [PubMed: 17133183]
18. Chiang LL, Wang LY, Wu CP, Wu HD, Wu YT. Effects of physical training on functional status in patients with prolonged mechanical ventilation. *Phys Ther* 2006;86(9):1271–1281. [PubMed: 16959675]
19. Zanotti E, Felicetti G, Maini M, Fracchia C. Peripheral muscle strength training in bed-bound patients with COPD receiving mechanical ventilation: effect of electrical stimulation. *Chest* 2003;124(1):292–296. [PubMed: 12853536]
20. Kalisch BJ. Missed nursing care: a qualitative study. *J Nurs Care Qual* 2006;21(4):306–313. [PubMed: 16985399]
21. Krishnagopalan S, Johnson EW, Low LL, Kaufman LJ. Body positioning of intensive care patients: clinical practice versus standards. *Crit Care Med* 2002;30(11):2588–2592. [PubMed: 12441775]
22. Gosselink R, Bott J, Johnson M, et al. Physiotherapy for adult patients with critical illness: recommendations of the European Respiratory Society and European Society of Intensive Care Medicine Task Force on Physiotherapy for Critically Ill Patients. *Intensive Care Med*. 2008
23. Chaboyer W, Gass E, Foster M. Patterns of chest physiotherapy in Australian Intensive Care Units. *J Crit Care* 2004;19(3):145–151. [PubMed: 15484174]
24. Norrenberg M, Vincent JL. A profile of European intensive care unit physiotherapists. *European Society of Intensive Care Medicine. Intensive Care Med* 2000;26(7):988–994. [PubMed: 10990117]
25. Schweickert WD, Pohlman MC, Pohlman AS, et al. A randomized trial of early physical and occupational therapy in the management of critically ill patients undergoing mechanical ventilation. *American Journal of Respiratory and Critical Care Medicine* 2008;177:A817.
26. Martin UJ, Hincapie L, Nimchuk M, Gaughan J, Criner GJ. Impact of whole-body rehabilitation in patients receiving chronic mechanical ventilation. *Crit Care Med* 2005;33(10):2259–2265. [PubMed: 16215380]
27. Jones C, Skirrow P, Griffiths RD, et al. Rehabilitation after critical illness: a randomized, controlled trial. *Crit Care Med* 2003;31(10):2456–2461. [PubMed: 14530751]

Appendix 1

Scenario 1

A patient is admitted to the intensive care unit of your hospital with a major stroke. Due to an inability to protect his airway, he was intubated and placed on mechanical ventilation. Patient is alert, able to follow commands, and presents with right upper and lower extremity

weakness. After two weeks, the patient is still in the ICU on mechanical ventilation and still weak in their right arm and leg.

1a. As a physical therapist in your hospital, what is the likelihood that you would be asked to help care for this patient?

- a. <25% of the time
- b. 25–50% of the time
- c. 51–75% of the time
- d. >75–90% of the time

1b. If you were asked to see this patient, how many days per week would a physical therapist work with this patient in your hospital?

- a. 1–2 days per week
- b. 3–5 days per week
- c. 6–7 days per week

1c. If you were asked to see this patient, what is the likelihood that you would be performing the following tasks for this patient?

a. Chest physiotherapy

Very unlikely Very likely

1 2 3 4 5 6 7

b. Passive Range of Motion Exercises

Very unlikely Very likely

1 2 3 4 5 6 7

c. Positioning for prevention of wounds or contractures

Very unlikely Very likely

1 2 3 4 5 6 7

d. Therapeutic exercise (aerobic or resistive)

Very unlikely Very likely

1 2 3 4 5 6 7

e. Functional Mobility Retraining

Very unlikely Very likely

1 2 3 4 5 6 7

f. Functional Electrical Stimulation

Very unlikely Very likely

1 2 3 4 5 6 7

1d. In your opinion, what type of physical therapy would have the most positive impact on the outcome of the patient? (circle only one answer)

- a. chest physiotherapy
- b. passive range of motion exercises
- c. positioning
- d. therapeutic exercise (aerobic or resistive)
- e. functional mobility retraining
- f. functional electrical stimulation

All questions outlined above were the same for all scenarios

Scenario 2

A patient is admitted to the intensive care unit of your hospital with severe COPD and respiratory failure. The patient is intubated. The doctors think that it will be difficult to get this patient off of the ventilator. After two weeks, the patient is still in the ICU, has had a tracheostomy performed, and still requires mechanical ventilation. The patient is alert and able to follow commands and is diffusely weak (3+ to 4 out of 5) muscle strength throughout.

Scenario 3

A patient is admitted to the intensive care unit of your hospital after a motor vehicle accident. The patient has a cervical fracture (C6) with paraplegia. On the first day in the ICU, the patient had a tracheostomy performed and is on mechanical ventilation. The patient is fully alert with 3/5 muscle strength in the shoulder muscle groups and the elbow flexors. No sensation or motor control is noted below the C6 level. After two weeks, the patient is still in the ICU and required mechanical ventilation. The patient is alert and able to follow commands with no significant change in sensation or movement.

Scenario 4

A patient is admitted to the intensive care unit of your hospital with a large myocardial infarction (heart attack). The patient has been intubated and placed on mechanical ventilation because of congestive heart failure. The patient has already been to the cath lab and had two stents placed. The patient is slowly recovering but still remains on mechanical ventilation. The patient is alert and able to move all extremities. After two weeks, the patient is still in the ICU and requires mechanical ventilation. The patient is alert and able to follow commands and is diffusely weak (3+ to 4 out of 5) muscle strength throughout.

Scenario 5

A patient is admitted to the intensive care unit of your hospital with a severe pneumonia. The patient is intubated and on mechanical ventilation. The patient has a complicated hospital course involving renal failure. After two weeks, the patient is still in the ICU, has had a tracheostomy performed, and still requires mechanical ventilation. The patient is alert and able to follow simple commands. The patient is diffusely weak (3+ to 4 out of 5) muscle strength throughout.

Scenario 6

A patient is admitted to the intensive care unit of your hospital after a motor vehicle accident. The patient has multiple broken ribs and a liver laceration. Luckily, the patient has no signs of head trauma. The patient is intubated and placed on mechanical ventilation. The patient has a complicated hospital course requiring several operations. After two weeks, the patient is still in the ICU, has had a tracheostomy performed, and still requires mechanical ventilation. The patient is alert and able to follow commands and diffusely weak (3+ to 4 out of 5) muscle strength throughout.

Table 1

Reliability of the Survey of Acute Care Physical Therapists

Scale	Cronbach's Alpha	Range of Factor Loadings
Entire Survey	0.843	
Likelihood to Care (11a, 12a, 13a, 14a, 15a, 16a)	0.839	.593 – .760
How soon after Admission (11b, 12b, 13b, 14b, 15b, 16b)	0.831	.489 – .761
How many days a week (11c, 12c, 13c, 14c, 15c, 16c)	0.938	.772 – .891
Chest Physiotherapy	0.974	.897 – .897
Passive Range of Motion	0.898	.397 – .907
Positioning for the prevention of wounds and contractures	0.923	.716 – .847
Therapeutic Exercise	0.872	.696 – .796
Functional Mobility Re-training	0.856	.490 – .853
Functional Electrical Stimulation	0.755	.582 – .856
Best Impact	0.897	.665 – .847

Table 2

Frequency of Physical Therapy Stratified by Primary Diagnosis

Type of Acute Respiratory Failure	Routine Use of Acute Care Physical Therapy	Physical Therapy Performed	
		1–5 days/week	6–7days/week
Neurological			
Cerebral Vascular Accident	87% (84–90%)	62% (58–66%)	38% (34–42%)
C6 fracture with quadraplegia	78% (82–88%)	62% (57–67%)	38% (32–43%)
Trauma			
MVA with liver laceration	80% (76–84%)	66% (62–70%)	34% (30–38%)
Medical			
COPD exacerbation	68% (64–72%)	72% (68–76%)	28% (24–32%)
Sepsis and pneumonia	63% (60–68%)	74% (70–78%)	26% (22–30%)
Myocardial infarction/heart failure	65% (62–70%)	69% (65–72%)	31% (27–35%)

Mean ±SD of the Likelihood of Performing Various Types of Physical Therapy based on a Likert Scale from 1 (Very unlikely) – 7 (Very Likely)

Table 3

Type of Acute Respiratory Failure	Chest Physiotherapy	Passive ROM	Positioning	Therapeutic Exercises	Functional Mobility Retraining	Electrical Stimulation
Neurological						
Cerebral Vascular Accident	1.46 ± 1.28	4.79 ± 2.27	5.47 ± 1.77	6.17 ± 1.35	6.28 ± 1.33	1.46 ± 0.91
C6 fracture with quadriplegia	1.60 ± 1.53	5.98 ± 1.70	6.14 ± 1.45	5.95 ± 1.61	5.64 ± 1.82	1.59 ± 1.23
Trauma						
MVA with liver laceration	1.43 ± 1.27	3.19 ± 2.30	4.67 ± 2.00	6.32 ± 1.11	6.41 ± 1.14	1.10 ± 0.44
Medical						
COPD exacerbation	1.57 ± 1.43	2.96 ± 2.27	4.63 ± 2.03	6.27 ± 1.23	6.39 ± 1.09	1.16 ± 0.56
Sepsis and pneumonia	1.60 ± 1.55	2.87 ± 2.19	4.48 ± 2.05	6.23 ± 1.20	6.34 ± 1.21	1.08 ± 0.35
Myocardial infarction/heart failure	1.41 ± 1.15	2.76 ± 2.16	4.26 ± 2.09	6.20 ± 1.24	6.35 ± 1.22	1.08 ± 0.35

Table 4

Effect of Patient Scenario on the Likelihood of Using Different Types of Physical Therapy

	Chest Physiotherapy	Passive ROM	Positioning	Therapeutic Exercises	Functional Mobility Retraining	Electrical Stimulation
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
C6 vs PNEU	1.052 (0.750–1.476)	12.486 (9.642–16.169) ^a	5.520 (4.307–7.075) ^a	0.826 (0.642–1.062)	0.453 (0.351–0.583) ^a	5.852 (3.806–8.998) ^a
COPD vsPNEU	1.137 (0.819–1.578)	1.070 (0.850–1.347)	1.138 (0.910–1.422)	1.095 (0.850–1.410)	1.056 (0.811–1.375)	1.843 (1.144–2.967) ^b
MI vs PNEU	0.874 (0.620–1.232)	0.915 (0.725–1.155)	0.821 (0.656–1.026)	0.951 (0.741–1.222)	1.021 (0.784–1.329)	1.010 (0.592–1.721)
MVA vs PNEU	0.752 (0.528–1.071)	1.287 (1.023–1.619) ^b	1.176 (0.941–1.470)	1.125 (0.873–1.449)	1.119 (0.857–1.460)	1.185 (0.708–1.983)
Stroke vsPNEU	0.873 (0.620–1.230)	4.535 (3.591–5.727) ^a	2.488 (1.981–3.125) ^a	0.987 (0.769–1.268)	0.991 (0.763–1.288)	5.682 (3.707–8.709) ^a

^aNote. p < 0.0001,

^bp < 0.05

Table 5

Type of Physical Therapy Considered to have the Most Positive Impact on Outcome

Type of Acute Respiratory Failure	Functional Mobility Retraining	Therapeutic Exercises	Other
Neurological			
Cerebral Vascular Accident	84% (80–88%)	13% (10–16%)	3% (1–5%)
C6 fracture with quadriplegia	43% (37–48%)	30% (26–34%)	28% (24–32%)
Trauma			
MVA with liver laceration	77% (73–81%)	22% (18–26%)	1% (0%–2%)
Medical			
COPD exacerbation	65% (61–69%)	32% (28–36%)	3% (1–5%)
Sepsis and pneumonia	68% (64–72%)	28% (24–32%)	4% (2–6%)
Myocardial infarction/heart failure	63% (59–67%)	35% (31–39%)	2% (1–3%)