



University of Kentucky  
UKnowledge

---

DNP Projects

College of Nursing

---

2017

## Post Evaluation of a Nurse Driven Early Mobility Program

Paula Halcomb

*University of Kentucky*, [paula.halcomb@uky.edu](mailto:paula.halcomb@uky.edu)

[Right click to open a feedback form in a new tab to let us know how this document benefits you.](#)

### Recommended Citation

Halcomb, Paula, "Post Evaluation of a Nurse Driven Early Mobility Program" (2017). *DNP Projects*. 129.  
[https://uknowledge.uky.edu/dnp\\_etds/129](https://uknowledge.uky.edu/dnp_etds/129)

This Practice Inquiry Project is brought to you for free and open access by the College of Nursing at UKnowledge. It has been accepted for inclusion in DNP Projects by an authorized administrator of UKnowledge. For more information, please contact [UKnowledge@lsv.uky.edu](mailto:UKnowledge@lsv.uky.edu).

Final DNP Project Report  
Post Evaluation of a Nurse Driven Early Mobility Program

Paula Halcomb MSN, RN

University of Kentucky

College of Nursing

Spring 2017

Melanie Hardin-Pierce, DNP, RN, APRN, ACNP-BC- Committee Chair

Chizimuzo T.C. Okoli, RN, PhD- Committee Member

Andrew Bernard, MD- Clinical Mentor

Peter Morris, MD - Clinical Mentor

## Dedication

I dedicate my DNP final project to my husband and son who have supported me throughout my academic endeavors. They have been by my side through the last fifteen years while I have worked toward a Bachelor's, Master's and now Doctoral degree. I would have never been able to accomplish what I have without their unconditional love and support. This is definitely their DNP also!

## **Acknowledgements**

I am so thankful for the many wonderful faculty, clinical mentors, staff nurses, nursing care techs and multidisciplinary partners that have supported and encouraged me throughout this study and my entire DNP program. The University of Kentucky college of Nursing and UK HealthCare have enabled me to obtain a doctoral degree while following my passion for working with the critically ill trauma patient population.

I was fortunate to have an outstanding Doctoral Committee. Dr. Hardin-Pierce you have been a friend and mentor for years and I so appreciate you taking me on as an advisee so that I could pursue my passion of obtaining my DNP looking at clinical issues. You have encouraged and supported me as I have progressed through the program and my career and I thank you sincerely. I could never have asked for a better committee chair. Dr. Chizimuzo Okoli you have been an excellent mentor. You helped me tremendously with my writing and data analysis. I am definitely a better writer because of your influence. I was lucky enough to have not one but two wonderful clinical mentors. Dr. Andrew Bernard you are a great friend and mentor. I really appreciate your passion for mobility and commitment to excellence. You always make time to help me and are willing to do anything to help improve patient care. Dr. Peter Morris you were willing to jump right in and be a clinical mentor for my early mobility project right after you returned to UKHC. You offered wonderful insights and have answered many questions and given me great suggestions for my study and subsequent work.

I would also like to thank some faculty members and staff from the College of Nursing, UK HealthCare and the Center for Translational Science who mentored me and provided much needed support. Dr. Amanda Wiggins (statistician), Andrew McLaughlin (statistician), Whitney

Kurtz-Ogilvie (writing specialist), Bethany Benton and Mitchell Edelman (UK HealthCare Finance) and Kathy Collins (Graduate Student Affairs Officer).

Finally, Dr. Lisa Fryman you have been my mentor, coworker and friend. You knew I needed a project and knew me well enough to know that this mobility project was tailor made for me! You have supported and encouraged me throughout this process. You have made my DNP and my daily work not only meaningful but also fun. I love working with you! Thank you so much!

## Table of Contents

Acknowledgements .....	iii
List of Tables .....	vi
Abstract.....	1
Introduction/Project Overview.....	3
Problem Statement and Review of Literature.....	4
Background and Significance .....	5
Description of the Nurse Driven Early Mobility Program .....	6
Objectives .....	7
Methods.....	7
Results.....	11
Discussion.....	11
Conclusion .....	17
Appendix A: Comprehensive Literature Review Table .....	24
Appendix B: Evidence Grading Criteria.....	38
Appendix C: UK HealthCare Mobility Scale .....	39
References.....	40

## List of Tables

Table 1. Logic Model.....	18
Table 2. Evaluation Plan .....	19
Table 3. Sample Characteristics .....	20
Table 4. Outcomes of TSSNDEMP .....	22

## Abstract

The goal of this study was to evaluate the effectiveness of a recently implemented nurse driven early mobility program on patients in two Trauma Surgical Intensive Care Units at the University of Kentucky HealthCare (UKHC). The purpose of this study was to evaluate the effectiveness of a recently implemented nurse driven early mobility program (NDEMP) on patients in two Trauma Surgical Intensive Care Units at the University of Kentucky HealthCare (UKHC). Nursing staff are responsible for mobilizing patients to their maximum ability twice daily in addition to any therapy provided by Physical and Occupational Therapists. The study was an uncontrolled before and after design using retrospective data analysis. UKHC employs a mobility score, a tool developed by a UKHC multidisciplinary team including nurses and physical therapists. The mobility score was chosen because the nurse can quickly assess the patient's mobility level in a quick, easy and reproducible manner. The mobility score in the ICU had a statistically significant increase in the pre-intervention mobility score of 5.7 to a post-intervention mobility score of 7.9. Hospital mobility score showed an increase of 7.5 pre-intervention to a 7.9 post-intervention score, which was also statistically significant. Ventilator mean days decreased from 2.2 pre-intervention to 1.9 post-intervention and pneumonia decreased from 7.3% pre-intervention to 5.7% post-intervention. This was not statistically significant but it did trend in the right direction. The VTE rate increased (pre = 3.0% vs. post = 4.8%) but was a non-statistically significant increase. Mean days in the ICU increased from pre-intervention of 5.7 mean days to 5.8 mean days post-intervention but was not statistically significant. A non-significant decrease in discharge to home (pre = 98.3% vs. post = 96.5%) was also found. There were no appreciable decreases in length of stay. Within a very short time frame, the TSSNDEMP showed a reduction in ventilator days and pneumonia as well as a

significant increase in ICU and hospital discharge mobility scores. No adverse events occurred during the study. The success of this program supports the ability of nursing to mobilize patients safely utilizing the existing multidisciplinary team rather than adding staff.

*Keywords:* early mobility, immobility, critical illness neuropathy

## Post Evaluation of a Nurse Driven Early Mobility Program

### **Introduction/Project Overview**

The purpose of this study was to evaluate the effectiveness of a recently implemented nurse driven early mobility program (NDEMP) on patients in two Trauma Surgical Intensive Care Units at the University of Kentucky HealthCare (UKHC). The study was an outcome evaluation using an uncontrolled before and after design with retrospective data analysis. Measures of effectiveness include patient clinical outcomes and patient throughput. The study, relevant background, literature and implications will be discussed.

### **Problem Statement and Review of Literature**

#### **Search Description**

A comprehensive literature search utilizing PubMed, MEDLINE, CINAHL, Cochrane and EBSCOhost databases was performed. Search terms included early mobility, immobility, complications of immobility in intensive care, critical illness neuropathy and safety of early mobility. The timeframe for the search was January 2003 through May 2016. Inclusion criteria were human adult subjects (age greater than or equal to 18), animal studies, intensive care unit patients, acute care patients, articles published in or translated to English. Exclusion criteria were: pediatric subjects (under age 18), studies not translated to English, and studies published before 2003.

#### **Evidence**

The consistently common themes noted in the literature were that any immobility is detrimental, many patients suffer lifelong negative effects after periods of immobility during hospitalization and early mobility activities are beneficial and safe. Appendix A contains a

## POST EVALUATION OF A NURSE DRIVEN EARLY

summary of all relevant research reviewed, as well as animal studies and non-research scientific articles.

Historically, critically ill patients have been cared for utilizing strict bed rest and deep sedation and analgesia. Animal studies have shown that immobilization alone creates significant polyneuropathy and joint contractures, effects are additive when combined with inflammatory processes (Fink et al, 2008; Wong, Trudel & Laneuville, 2015). Research and systematic reviews consistently demonstrated the negative effects of immobility on all body systems. Critically ill patients are especially susceptible to critical illness neuromuscular abnormalities (CINMA). CINMA patients had higher in hospital mortality rates as well as prolonged ventilator days and increased length of stay (LOS). Post hospitalization up to 45% of CINMA patients retain polyneuropathy and functional disability (Stevens et al., 2007). Clavet, Herbert, Fergusson, Doucette and Trudel (2008) noted that 36% of patients in a tertiary ICU had joint contracture in at least one joint post discharge, 34% of the contractures were severe enough to impair physical function and 50% of those patients still had contractures 7 weeks post discharge. A large percentage of older adults develop functional decline between hospital admission and discharge (Covinsky et al., 2003). This is particularly important as the mean age of our population of ICU patients is steadily increasing. The proportion of adults aged 65 years and older in Kentucky is projected to be over 25% by 2030 and greater than 56% of Kentucky residents aged 75 and older have some form of disability prior to a major hospital stay (Institute for Aging, 2015).

Sample size varies greatly in the literature, however evidence consistently indicates that patients receiving early mobility initiatives have decreased ICU and hospital LOS, decreased ventilator days, lower mortality and readmission rates (Morris et al., 2008, 2010; Clark,

## POST EVALUATION OF A NURSE DRIVEN EARLY

Lowman, Griffin, Matthews & Reiff, 2009; Dong, Yu, Sun, Fang & Li, 2014; Engel, Needham, Morris & Gropper, 2013; Fraser, Spiva, Forman, & Hallen, 2015; Hopkins, Mitchell, Thomsen, Schafer & Brown, 2016; Klein, Mulkey, Bena & Albert, 2015). Although many patients and nurses perceive that early mobility activities could be detrimental and a risk to the patient, mobility activities in the ICU are safe. It is important to educate patients, staff and family members that vital sign changes such as increased heart rate, respiratory rate and blood pressure during exertion are normal and expected just as they are with the non-hospitalized population. Significant decreases in vital signs during activity are much more concerning (Stiller, 2007). No significant adverse events with any effect on patient outcome have been noted in the mobility literature to date (Sricharoenchai et al., 2014; Zomorodi, Topley & McAnaw, 2012; Winkelman & Peerboom, 2010; Parker & Needham, 2013; Ross & Morris, 2010; Lee, Suh, Yang, Park & Chung, 2015; Lima, DsSilva, Park & Pires-Neto, 2015).

### **Background and Significance**

The trauma patient population is a cohort that can suffer significant disability post injury and hospitalization. Many survivors of trauma and other illnesses requiring intensive care unit stays never return to their baseline pre illness functional level. Significant portions of survivors of critical illness have physical and/or cognitive impairments that permanently prevent their return to work and other societal functions (Hopkins, Mitchell, Thomsen, Schafer, Link & Brown, 2016). Although these patients have traditionally been on bedrest, at UK HealthCare the Trauma Surgical Service (TSS) service line decided to implement a nurse driven early mobility program (NDEMP) in an attempt to improve patient outcomes and reduce post hospitalization disability in the trauma and surgical population. A NDEMP was selected because it did not require addition of staff or a request for funding new positions from the institution, although

## POST EVALUATION OF A NURSE DRIVEN EARLY

much of the evidence regarding early mobility does cite the use of extra personnel specifically for mobility activities. A mobility program workgroup consisting of a clinical nurse specialist (CNS), physician champion, nursing service line director, assistant patient care manager, physical and respiratory therapy leadership, physical therapists, staff nurses and nurse care technicians was formed. The workgroup identified necessary stakeholders: administrative nursing and physician leadership for the service line, staff nurses and nurse care technicians, physical and respiratory therapist partners and physical medicine and rehabilitation physicians.

The mobility program workgroup partnered with Stryker to adapt their evidence based early ICU mobility program to an entire service line NDEMP, including all levels of care. One way to generate excitement among the staff was to have a contest for a slogan to name the mobility program. The winning slogan was “Walking the Road to Recovery”. The Stryker educator and the TSS CNS rolled out education for the entire service line including nurses, nursing care technicians, pharmacists, physical and respiratory therapists and physicians including residents. In order to maintain excitement and reward staff for great work, the mobility program leadership group gave “secret shopper” prizes to staff that went beyond the daily expectation mobilizing their patients. The winners and their photos were featured in the service line’s end of week notes. The UK HealthCare Trauma Program Office provided financial support for the t-shirts and prizes; no additional funding was needed for development or staff education.

### **Description of the NDEMP**

The program consists of an assessment of the patient’s mobility score within 24 hours of admission to the service line. All patients are verticalized immediately as soon as blood pressure permits by elevating the head of bed at least 30 degrees or by placing patients with spinal

## POST EVALUATION OF A NURSE DRIVEN EARLY

precautions in reverse Trendelenburg position. Mobilization activities begin upon stabilization of hemodynamic and respiratory parameters with emphasis on core engagement and weight bearing. This frequently begins within 24-48 hours of intensive care admission. Nursing staff are responsible for mobilizing patients to their maximum ability twice daily in addition to any therapy provided by Physical and Occupational Therapists. Multidisciplinary team collaboration is integral to this process and all team members including nurses, nurse care technicians, mobility techs, management, clinical nurse specialists, physicians and respiratory therapists participate in mobility activities. See Appendix C for Mobility activities.

### **Objectives**

The purpose of this study was to evaluate the effectiveness of the UK HealthCare Trauma Surgical Services Nurse Driven Early Mobility Program (TSSNDEMP) “Walking the Road to Recovery. Specific objectives are as follows:

1. Explore the relationship between the TSSNDEMP and ICU and hospital LOS.
2. Explore the relationship between the TSSNDEMP and pneumonia and venous thromboembolism (VTE) incidence in the ICU population.
3. Explore the relationship between the TSSNDEMP and patient mobility scores at ICU and hospital discharge.
4. Explore the relationship between the TSSNDEMP and patient disposition at discharge.

### **Methods**

#### **Study Design**

The study was an outcome evaluation using an uncontrolled before and after design with retrospective data analysis of patient data obtained from the electronic medical record (EMR) from December 2014 through April 2016. Data points were electronically extracted by the

## POST EVALUATION OF A NURSE DRIVEN EARLY

University of Kentucky's Center for Translational Science department and then confirmed by the principle investigator examining the patients EMR as necessary.

Patients were divided into pre and post- implementation groups. The pre-implementation group consisted of 232 patients the post-implementation group consisted of 228 patients. The intervention began August 1, 2015.

### **Sample and Setting**

This program evaluation was conducted at the University of Kentucky Healthcare, which is a Level One Trauma Center licensed for 945 inpatient beds. UK Healthcare has 8 Adult Intensive care units with 110 beds. Service lines include Trauma Surgical Service, Neurology, Neurosurgery, Medicine/Pulmonary, and Cardiothoracic. The sample for this study was 460 patients admitted to one of two trauma/surgical ICUs at UKHC. Each unit has 12 beds with patient populations managed predominately by the Trauma Surgical Service (TSS) Physicians and subspecialty services. TSS ICUs admit approximately 1700 ICU patients annually. Patient diagnoses include complex multiple-system trauma and burns, emergency general surgery, abdominal solid organ transplant, and other subspecialty surgical services.

Data were collected from December 1, 2014 through April 30, 2016 on patients admitted to one of two TSS ICUs who were over 18 years of age.

### **Inclusion and Exclusion Criteria**

Inclusion criteria for the program evaluation study sample was all patients that are admitted to TSS ICUs eight months prior to and eight months after implementation of the TSSNDEMP (December 2014 through April 2016). Exclusion criteria will include:

1. Non-weight bearing on bilateral lower extremities
2. Unstable spine fractures

## POST EVALUATION OF A NURSE DRIVEN EARLY

3. Patients that expired in the ICU within 1 week of admission
4. Patients with profound terminal injuries at the time of admission.
5. Patients with continuous renal replacement therapy (CRRT)
6. Patients with an open abdominal wall
7. Patients with profound inability to follow commands and work cooperatively with staff

### **Data Sources**

#### **The sources for data collection included:**

- a. Sunrise Clinical Manager (SCM) electronic medical record
- b. Finance reports to determine length of stay data
- c. Infection Prevention and Control

### **Sample Demographics**

The demographic data included, but was not limited to age, gender, ethnicity, body mass index (BMI), ICU LOS, ICU readmission, and vasopressor use.

### **Outcomes and Evaluation**

The outcome evaluation used an uncontrolled before and after design to examine patient outcomes.

### **Outcome Evaluation**

The outcome evaluation examined the effect of the TSSNDEMP on the following outcomes:

- a. Intensive care unit (ICU) and overall length of stay (LOS)
- b. ICU readmissions
- c. Ventilator days
- d. Pneumonia

## POST EVALUATION OF A NURSE DRIVEN EARLY

- e. Venous Thromboembolism (VTE)
- f. Disposition at discharge (home, outpatient rehabilitation, acute rehabilitation, long term care facility (LTAC))
- g. Mobility score at ICU and hospital discharge

Outcomes were evaluated pre and post program implementation.

### **Definition of Variables**

Diagnosis of pneumonia and VTE was obtained by including patients who had a positive diagnosis noted in the physician problem list. Mobility scores were the highest score of the day that the patient was discharged from the ICU or the hospital. Discharge disposition was pulled from the patient's discharge summary. ICU admissions were determined to be when a patient changed from an acute or progressive level of care to an ICU level of care. A trip to the OR from the ICU where the patient returned to the ICU was not counted as a separate admission. ICU LOS was obtained from the EHR and included all ICU days from that admission. Hospital LOS was obtained from the EHR and included all days during that admission. Mortality within 1 week of admission was obtained from the patients "notification of death" in the EHR.

### **Data Analysis**

Sample demographics were described using frequencies and percentages (for categorical and ordered categorical variables) and means and standard deviations (for continuous variables). Differences in sample demographics before and after the intervention were examined using chi-square analyses for categorical/ordered-categorical variables and paired sample t-tests for continuous variables. An independent sample t-test was used to assess the differences in pre and post intervention groups on the LOS, ventilator days, and mobility scores at ICU, and at hospital discharge. Chi square analyses were used to examine differences in pre and post

## POST EVALUATION OF A NURSE DRIVEN EARLY

intervention groups on pneumonia rates, VTE rates and hospital discharge disposition (home or to another facility) pre and post intervention facility.

### **Institutional Review Board**

An exempt level of IRB approval was obtained.

## **Results**

### **Sample Description**

The sample was comprised of mostly male (58.7%) and Caucasian (94.8%) participants. The mean age was 54.4 years (sd = 16.0) and average BMI was 29.7 kg/m<sup>2</sup> (sd = 9.3). There were no differences in demographic variables between the pre and post samples (see Table 3).

### **The Effect of TSSNDEMP on Patient Outcomes**

Table 4 presents the analysis of the effect of the TSSNDEMP on selected patient outcomes. ICU mobility score (pre mean score = 5.5 vs. post mean score = 7.1) and hospital mobility scores (pre mean score = 7.5 vs. post mean score = 7.9) at discharge significantly increased. There was a non-statistically significant increase in VTE (pre = 3.0% vs. post = 4.8%) and ICU days (pre mean days = 5.7 vs. post mean days = 5.8), and a non-significant decrease in discharge to home (pre = 98.3% vs. post = 96.5%). In addition, there was a non-significant decrease in pneumonia (pre = 7.3% vs. post = 5.7%) and in ventilator days (pre mean days = 2.2 vs. post mean days = 1.9). There were no appreciable decreases in LOS.

## **Discussion**

The purpose of this program evaluation was to determine the effectiveness of the UK HealthCare Trauma Surgical Services Nurse Driven Early Mobility Program (TSSNDEMP) “Walking the Road to Recovery”. A retrospective analysis of patient data obtained from the

## POST EVALUATION OF A NURSE DRIVEN EARLY

electronic medical record (EMR) from December 2014 through April 2016 was performed to evaluate the specific outcomes of the TSSNDEMP.

There were no significant changes in length of stay for the ICU or hospital, which is consistent with several other studies (Burtin et al, 2009, Clark et al., 2013, Fraser et al., 2015). Several studies that found significant decreases in hospital and ICU LOS performed their evaluations over a longer period of time and/or had larger sample sizes (Morris et al., 2008, McWilliams et al., 2015, Klein, Mulkey, Bena & Albert, 2015 Hopkins et al., 2016). The ICU discharge and hospital discharge mobility scores significantly increased post-implementation of the TSSNDEMP. Based on mobility scores, patients were out of bed and ambulating much sooner. Several studies also had similar results with reduced ventilator days and earlier mobilization (Dong, Yu, Sun, Fang & Li, 2014, Engel, Needham, Morris & Gropper, 2013, Fraser et al., 2015, Hopkins et al., 2016, Needham et al., 2010). This increase in mobility could translate into less post intensive care disability, a quicker return to pre injury functional status, and improved quality of life.

There was a non-statistically significant decrease in pneumonia and ventilator days noted. Cost savings can be difficult to quantify, however at UK HealthCare a pneumonia diagnosis adds an additional \$16,931 to each patient encounter and ventilator days add an average of \$291 per day just for the ventilator (UK HealthCare Finance, 2016). Although this study did not specifically look at cost savings, it could be extrapolated from the figures obtained from UK HealthCare Finance that there are cost saving opportunities over \$8,000.00 with the 1.8% reduction in pneumonia and over \$400.00 with the 15% reduction in vent days. No adverse events associated with mobility occurred during the course of the study.

## POST EVALUATION OF A NURSE DRIVEN EARLY

### **Limitations**

It is important to recognize that in today's health care setting, multiple practice improvement projects and research studies are going on simultaneously at any given time. The short length of time, post implementation, for the evaluation was a limitation. This was a new program and there is a learning curve for staff to adjust to the program requirements; and it takes time to cement such a change into practice. T-shirts and "secret shopper" prizes, which were not available during the pre-intervention period, could have played a role in nurse compliance with the program during the introductory period. The period of inquiry was not long enough to sufficiently evaluate long-term outcomes of the program or to evaluate the effectiveness of nursing adoption of the program. Unforeseen complications with data mining resulted in a significant number of transplant and oncology surgery patients being included in the sample, which may have affected the LOS data; as these populations tend to have longer LOS for medication therapies and diagnostic exams. The plan is to repeat the evaluation after longer intervals and draw from a sample of strictly trauma patients.

### **Implications**

**Nursing leadership and financial implications.** Any program that can potentially reduce patient complications, length of stay and improve functional recovery post hospitalization is worthy of consideration by nursing leadership. The TSSNDEMP had a very minimal startup cost and required no additional staffing to implement. Although this study did not specifically look at cost savings, there are potential savings that can be extrapolated from the outcomes of the study. The evaluation at this Level One Trauma Center performed only eight months post TSSNDEMP implementation showed a decrease in pneumonia which would save an average of \$16,931 per encounter and decreased ventilator days with an average potential savings of \$291

## POST EVALUATION OF A NURSE DRIVEN EARLY

(UK HealthCare Finance, 2016) per day as well as significant increases in patient ICU and hospital discharge mobility scores. Reduction of hospital acquired conditions (HAC) are consistent areas of focus in health care institutions due to multiple factors which include financial concerns related to potential increased length of stay, lack of reimbursement and associated fines. Although this study did not show reduction in LOS, as discussed earlier the short evaluation time and patient population may have been a factor. Many early mobility studies have shown reductions in LOS (Morris et al., 2008, McWilliams et al., 2015, Klein, Mulkey, Bena & Albert, 2015, Hopkins et al., 2016). Although this study did not look at hospital acquired pressure injury (HAPI) incidence, evidence indicates that early mobility does impact HAPI rates. Patients with higher mobility scores have higher levels of independent functioning and movement which reduces time lying in bed and could increase the potential for lower rates of HAPI. Ogochukwu et al. (2016) noted a significant pressure ulcer reduction in a large sample early mobility study. Lord et al., (2013) developed a model of net financial savings related to a Johns Hopkins early mobility study and determined that cost savings based on LOS reduction data alone for ICU and acute care was over \$800,000.00 during the course of the study. The annual projection for savings was nearly 4 million dollars.

**Nursing practice and patient outcomes.** Mobility programs that are nurse driven empower nursing staff to evaluate and make recommendations for improvements in the patient's mobility plan. Although this study did not measure nursing staff satisfaction and involvement, many of the TSS nurses took special interest and ownership in the mobility plans and included family members and other disciplines in the patient care. Nursing involvement gave them a sense of ownership of patient outcomes and allows them to advocate for their patients. The staff initiated discussions among themselves and multidisciplinary team members regarding ways to

## POST EVALUATION OF A NURSE DRIVEN EARLY

improve the implementation of the mobility plan and to distribute the workload among all shifts. Several improvements were implemented after multidisciplinary team communication regarding the availability and timing of mobility tech help in the ICUs. The techs were employed by Physical Therapy Department and based on communication with nursing staff began making rounds at set times in the units to lend an extra hand for very complex or large patients. Again, although this study did not evaluate team collaboration and physician involvement, anecdotally after the TSSNDEMP implementation nursing staff satisfaction, patient mobility and multidisciplinary relationships improved. The mobility program also increased physician involvement in and communication regarding the daily mobility plan for the patients. This communication has increased nursing staff awareness of physical requirements/criteria for patients to determine the difference between pending discharge to home versus a skilled care facility.

Early mobility not only reduces or prevents deconditioning that can affect lifelong functioning, it also improves the morale for patients and family because they perceive the ability to mobilize and ambulate as a return to normalcy (Hopkins, Weaver, Collinridge, Parkinson, Chan & Orme, 2005). Patients that mobilize early in their hospital course have lower rates of post hospital depression, deconditioning and contractures, receive less sedation which leads to less ventilator days, have lower incidence of HACs, and less permanent functional disability after discharge (Clavet et al., 2008, Dong et al., 2014, Engel, Needham, Morris & Gropper, 2013, Herridge et al, 2003, Needham et al., 2010). As noted above, evidence shows reduced HAPI rates in patients with increased mobility (Ogochukwu et al, 2016). Patients that are stronger and can move themselves more independently have less shearing and friction injuries related to movement with draw sheets or patient lifts (Arnold, 2003).

## POST EVALUATION OF A NURSE DRIVEN EARLY

**Nursing education, scholarship and further clinical inquiry.** The findings of this evaluation provide evidence to support the safety and efficacy of early ICU mobility programs. In order to sustain the program, frequent updates regarding patient outcomes should be presented to the staff so that they can see the improvement resulting from their early mobility efforts. (Doody & Doody, 2011). Further sustainability could be achieved by including education regarding the TSSNDEMP as part of orientation for all new staff. It is very important that nurses think critically about early mobility and involve the patient and family in the plan from the beginning. Staff should be encouraged to read new evidence relating to early mobility and be offered enrichment activities including opportunities to participate in research to peak their interest (Doody & Doody, 2011).

Further study should look at nurse perceptions, perceived barriers, actual cost savings and adherence to early mobility programs as this study looked only at patient outcomes. Although no adverse events occurred as a result of mobility activities, it would be interesting to look at mortality data at intervals post discharge. This study should be repeated after a longer implementation time. This sample included quite a few patients that traditionally have longer hospital stays such as oncology and transplant surgery patients. It would be very interesting to look at specific populations individually. The trauma population is particularly important as there is little evidence published about early mobility in this population. Additional areas of interest in the trauma population are comparison of injury severity scores (ISS) and HAPI incidence. Much of the mobility literature is specific to pulmonary, medical and uncomplicated general surgery patients.

### **Conclusion**

The purpose of this study was to evaluate the effectiveness of a recently implemented nurse driven early mobility program on patients in two Trauma/Surgical Intensive Care Units at the UKHC. The ability to translate current evidence into practice is imperative in order to deliver optimum patient care and prevent harm. The old practices of bedrest for critically ill patients have proven to be detrimental. Evidence supports early mobilization of the most critically ill patients as soon as hemodynamic status allows. Early mobility activities are safe and no significant adverse events related to mobility activities have been documented in the literature. The TSSNDEMP provided a standardized, safe approach for mobilizing patients that did not require addition of staff for a mobility team. Multidisciplinary communication and education regarding the risks of immobility and safety of early mobility activities increased the nursing staff's comfort with the program. Within a very short time frame, the TSSNDEMP showed a reduction in ventilator days and pneumonia as well as a significant increase in ICU and hospital discharge mobility scores. No adverse events occurred during the study. The success of this program supports the ability of nursing to mobilize patients safely utilizing the existing multidisciplinary team rather than adding staff.

## POST EVALUATION OF A NURSE DRIVEN EARLY

Table 1: Logic Model

<b>Category</b>	<b>Components</b>
<b>Resources and Inputs</b>	Development of evidenced based practice nurse driven early mobility program; Physician, Leadership, and Staff engagement
<b>Process/Activities</b>	Development of program, education of staff and implementation of program.
<b>Outputs</b>	Patient outcomes.
<b>Short term effectiveness: Outcomes</b>	Increases in mobility scores and LOS reductions.
<b>Long term effectiveness: Impact</b>	Sustained improved patient outcomes: LOS, ventilator days, VTE rates, pneumonia rates and mobility score changes.

POST EVALUATION OF A NURSE DRIVEN EARLY

Table 2: Evaluation Plan

Evaluation	Aims/Objectives	Assessment and Evaluation	Data Sources	Outcome Measures
Outcome Evaluation	What is the effect of the NDERMP on patient outcomes?	ICU and overall LOS.	Hospital finance	Average LOS pre and post program initiation.
		Ventilator days	EHR	Average ventilator days
		Pneumonia rates	IPAC	Pneumonia rates pre and post intervention
		VTE	IPAC	VTE rate pre and post intervention
		Mobility Score	EHR	Average mobility score at ICU and Hospital discharge.
		Disposition at discharge	EHR	Percent of patients discharged home, inpatient rehabilitation and long term acute hospital (LTAC)

POST EVALUATION OF A NURSE DRIVEN EARLY

Table 3. Sample Characteristics

	Total		Pre		Post		Difference	
	N	%	n	%	n	%	Chi Square (DF)	P value
<b>Gender</b>							0.17 (1)	.681
Female	190	41.3	98	42.2	92	40.4		
Male	270	58.7	134	57.8	136	59.6		
<b>Ethnicity</b>							0.21 (1)	.643
Caucasian	436	94.8	221	95.3	215	94.3		
Non-Caucasian	24	5.2	11	4.7	13	5.7		
<b>Admitting Service</b>							3.19 (6)	.785
Trauma Surgery	147	32	71	30.6	76	33.3		
Transplant Surgery	39	8.5	21	9.1	18	7.9		

POST EVALUATION OF A NURSE DRIVEN EARLY

Vascular	125	27.2	60	25.2	65	28.9
Surgery						
Oncology	131	28.5	72	31	59	25.9
Surgery						
Burn	13	2.8	5	2.2	8	3.5
Plastic Surgery	5	1.1	3	1.3	2	0.9

	M	SD	M	SD	M	SD	T-test (DF)	P value
<b>Age</b>	54.4	16.0	54.3	17.0	54.5	15.0	.12 (458)	.909
<b>BMI</b>	29.7	9.3	29.9	9.3	29.5	9.2	.43 (456)	.670

Note. Differences in demographic variables were examined using chi square tests for categorical variables and independent sample t-tests (with Levene's test for equality of variances) for continuous variables.

POST EVALUATION OF A NURSE DRIVEN EARLY

Table 4. Outcome of TSSNDEMP

Patient	Total		Pre		Post		Difference	
Outcomes	N	%	n	%	n	%	Chi Square (DF)	P value
<b>Pneumonia</b>	30	6.5	17	7.3	13	5.7	0.50 (1)	.480
<b>VTE</b>	18	3.9	7	3.0	11	4.8	1.00 (1)	.318
<b>Home</b>	448	97.4	228	98.3	220	96.5	1.44 (1)	.230
<b>Discharge</b>								
	M	SD	M	SD	M	SD	T-test (DF)	P value
<b>Ventilator</b>	2.1	5.1	2.2	5.8	1.9	4.3	.31 (458)	.579
<b>Days</b>								
<b>ICU Days</b>	5.7	6.4	5.7	6.6	5.8	6.2	.01 (458)	.931
<b>ICU</b>	1.2	0.6	1.2	0.5	1.2	0.6	.00 (458)	.998
<b>Admissions</b>								
<b>ICU Mobility</b>	6.3	2.5	5.5	2.7	7.1	2.0	7.2 (408)	< .0001
<b>at Discharge</b>								

## POST EVALUATION OF A NURSE DRIVEN EARLY

---

<b>Mobility at</b>	7.7	1.1	7.5	1.5	7.9	0.5	3.6 (290)	< .0001
--------------------	-----	-----	-----	-----	-----	-----	-----------	---------

---

**Hospital**

**Discharge**

---

Note. Differences in demographic variables were examined using chi square tests for categorical variables and independent sample t-tests (with Levene's test for equality of variances) for continuous variables.

POST EVALUATION OF A NURSE DRIVEN EARLY

Appendix A

Comprehensive Literature Review Table

Author/Year	Level of Evidence	Study Design	Sample/Measures	Key Findings/Implications	Sustainability
Bailey, P. et al., (2007).	III	Prospective cohort study.	N=103. All mobility/activity events.	Majority of patients were able to ambulate .100 feet at discharge from the Resp ICU. Less than 1% adverse events were noted. None was life threatening.	Repeatable, generalizable.
Burtin, C. et al., (2009).	I	RCT	Patients admitted to the ICU N = 90	No difference in ICU LOS, quadriceps or berg balance scale.	Repeatable, generalizable.
Clark, D.E., Lowman, J.D., Griffin, R.L., Matthews, H.M. & Reiff, D.A. (2013).	III	Retrospective cohort study	Patients admitted to the TBICU Pre intervention N = 1,044 Post intervention N = 1,132	No statistically significant decrease in ICU or hospital LOS or vent days. No adverse events occurred related to mobility. There were statistically significant reductions in pneumonia and VTE.	Repeatable, generalizable.
Clavet, H., Hebert, P.C., Fergusson, D., Doucette, S. & Trudel, G. (2008).	III	Retrospective chart review of ICU patients looking at joint dysfunction at ICU discharge.	N=155 tertiary ICU patients with LOS 2 weeks or longer. Evidence of joint dysfunction.	At least 1 joint contracture noted in 36% patients, 34% had contractures documented that would impair function, 8 week or longer stay significantly associated with greater risk of contracture. 50% of patients still had significant contracture almost 7 weeks post ICU discharges.	Repeatable. Results somewhat generalizable.

POST EVALUATION OF A NURSE DRIVEN EARLY

				Steroids seemed to protect joints from contracture. Limb contractures impair ADLs	
Covinsky, K.E.et al., (2003).	III	Prospective observational study. Patients interviewed at admission (regarding 2 weeks prior to admission and at admission) and discharge regarding functional status. Looking at changes in functional status.	N=2293 Cognitive screen: Short Portable Mental Status Questionnaire. In depth interviews regarding functional status and ADLs	35% of patients had functional decline between discharge and admission. Greater age tends to come with greater decline. Up to 50% of patients 85 and older had significant decline.	Repeatable. Results generalizable to population.
De Jong, B. et al., (2007).	III.	Prospective observational	Patients in medical, surgical, and combined units in 3 hospitals. N = 116	Respiratory and limb muscle strength are altered after 1 week of mechanical ventilation. This is associated with delayed extubation.	Repeatable, generalizable
Dong, Z.H., Yu, B.X., Sun, Y.B., Fang, W. & Li, L. (2014)	I	RCT	Patients on mechanical ventilation > 48 hours N= 60	Out of bed 3.5 days sooner, vent days reduced 7.1 days, ICU LOS reduced by 2.5 days	Repeatable. Results generalizable to population
Engel, H.J., Needham, D.M., Morris, P.E. & Gropper, M.A. (2013).	III	Evaluation of quality improvement projects.	Patients admitted to the ICUs. Group 1 pre-intervention n =165, post intervention n = 165. Group 2 pre intervention n = 27, post intervention n= 30. Group 3 pre intervention n = 179, post intervention n = 294.	No adverse events noted. Decreased doses of sedatives, decreased ICU and hospital LOS, decreased delirium rates, increased distance walked in ICU and increased percent of patients discharged home instead of rehabilitation facility.	Repeatable. Results generalizable to population\

POST EVALUATION OF A NURSE DRIVEN EARLY

Fink, H., et al., (2008).	III	Prospective randomized experimental study. Animal study on rats.	N=55 Compared SIRs rats with health immobilized rats.	Inflammation and immobilization both independently lead to muscle weakness.	Repeatable. Results generalizable.
Fraser, D., Spiva, L., Forman, W. & Hallen, C. (2015).	III	Retrospective longitudinal study with pre and post sample.	Patients admitted to surgical, medical or coronary care ICU. n = 66 pre n = 66 post	Intervention group has a slightly longer LOS but the mean cost of the stay was lower. The intervention group had higher mobility score increases from ICU to hospital discharge and got out of bed 2.5 times more than the usual care group. Intervention group less likely to go to rehab facility than usual care group.	Small sample size at one hospital. Repeatable, generalizable
Herridge, M.S. et al., (2003).	IV	Longitudinal interview study of ARDS survivors.	Survivor interviews at 3, 6, and 12 months. N = 109	Survivors of ARDS have persistent functional disabilities one-year post discharge from the ICU. Muscle wasting and weakness are very common. These weaknesses may contribute to pulmonary symptoms as well.	Prevention of muscle deterioration may mitigate long-term disabilities. Further study needed.
Hopkins, R.O., Weaver, L.K., Collinridge, D., Parkinson, R.P., Chan, K.J. & Orme, J.F. (2005).	III	Evaluation of patients from an earlier RCT. Followed 2 years post original study.	ARDS patients that participated in a RCT. N = 66-year one N = 62-year two	ARDS survivors had 70% had neurocognitive sequel at hospital D/C, 46% at year one, 47% year two. Minimal depression and anxiety were noted at year 2.	ICU stay for ARDS can have significant impact on the survivor that is long lasting. This is an area that needs further study.

POST EVALUATION OF A NURSE DRIVEN EARLY

Hopkins, R.O., Mitchell, L., Thomsen, G.E., Schafer, M, Link, M. & Brown, S.M. (2016.).	III	Outcomes evaluation of early mobility program in pulmonary ICU, medical ICU, shock trauma ICU.	All patients admitted to the unit that met inclusion criteria	69.4% of patients ambulated 100 ft prior to ICU d/c. Time to extubation dropped as well as ICU LOS	Repeatable results generalizable
Jolley, S.E., Dale, C.R. & Hough, C.L. (2015).	III	Cross sectional interview study of nurse managers.	Managers of ICUs with ventilator patients. N = 47	Managers at ¾ of eligible hospitals reported early mobility in mechanically ventilated patients.	Hospitals with high volume and academic affiliation had higher levels of early mobility. Presence of written ICU activity protocol was associated with mobility being reported in more critical patients.
Klein, K., Mulkey, M., Bena, J.F. & Albert, N.M. (2015).	III	Prospective, pre-post cohort study	Neurologic ICU patients N = 637	Increase in ability to bear weight, pivot, Decreased ICU LOS by 2.55 days, decreased overall LOS by 5.06 days, 5% more likely to discharge home rather than other level of care.	Repeatable, generalizable.
Lee, H. et al., (2015).	III	Retrospective review	Medical ICU patients N = 99	No safety events that increased patient cost or LOS occurred.	Repeatable, generalizable.
Lee, N.P., DaSilva, G.M.C., Park, M. & Pires-Neto, R.C. (2015).	III	Retrospective chart analysis	ICU patients N = 275	No association between catheter related adverse events and mobilization in ICU.	Repeatable generalizable

POST EVALUATION OF A NURSE DRIVEN EARLY

McWilliams, D. et al., (2015).	III	Retrospective chart review of early mobility intervention with a rehab team.	Patients that were mechanically ventilated in a mixed ICU pre and post intervention. n = 290 pre n = 292 post	ICU rehab team was associated with a significant increase in mobility at ICU discharge, significant reduction in ICU LOS, vent days and hospital LOS as well as in hospital mortality.	Early mobility is beneficial and feasible.
Morris, P.E. et al., (2011).	I	RCT	Acute respiratory failure N = 258	Lack of early mobility was predictive of hospital readmission and increased mortality	Repeatable results generalizable
Morris, P.E. et al., (2008).	I	Prospective randomized cohort study	Acute respiratory failure ICU patients N = 330	Out of bed at 5 vs 11 days, Shorter ICU LOS by 1.4 days, Shorter overall LOS by 3.3 days	Repeatable results generalizable
Needham, D.M. et al., (2010).	III	Prospective pre and post quality improvement project.	Patients in a medical ICU. N = 57	Reduced benzodiazepine use and increased staffing of PT/OT for increased patient visits. Benzodiazepine use reduced by 50%, Reduced delirium, and 6 more PT/OT visits per patient than before intervention. ICU LOS decreased by 2.1 days and hospital LOS decreased by 3.1 days.	Early mobility safe and effective. Increased positive outcomes.
Ogochukwu, A. et al., (2016).	III	Evaluation of a quality improvement initiative.	N = 3,233 Evaluated effects of new mobility plan using wound care nurses and patient mobility assistants.	Pressure ulcer rate dropped significantly from 9.2 to 6.1%. Hospital readmission dropped, as well as ICU LOS.	

POST EVALUATION OF A NURSE DRIVEN EARLY

Pandullo, S.M. et al., (2015).	III	Retrospective analysis	Patients in a 24 bed ICU taking medical, surgical and trauma patients. N = 182	Delay of up to 2.5 - 16 hours noted between ICU discharge and first full ward day. Only 41% patients ambulated on the day of discharge. Patients that ambulated in the ICU has shorter LOS compared to those that did not.	Repeatable, generalizable
Perme, C., Nalty, T., Winkelman, C. Kenji Nawa, R. & Masud, F. (2013).	IV	Prospective observational study	n = 77 Observed for complications with physical therapy in patients with femoral catheters.	No evidence of any complications thrombotic or catheter malfunctions was observed.	Repeatable, generalizable.
Sricharoenchai, T., Parker, A.M., Zanni, J.M., Nelliott, A., Dinglas, V.D. & Needham, D.M. (2014).	II	Prospective evaluation	N = 1,110 medical intensive care unit patients that received physical therapy.	Out of more than 5,200 PT sessions, there was 1 fall, 2 feeding tube and one arterial line inadvertent removal. There were no lasting effects for any of the patients.	Repeatable, generalizable.
Schweickert, W.D. et al., (2009).	I	RCT. Daily sedation interruption with early mobilization and exercise vs daily sedation interruption with routine therapy as ordered by primary team. Patients recruited from 2 major medical centers.	Return to independent functional status AEB ability to walk independently and perform six ADLs: transfer from bed to chair, use toilet, eating, bathing, dressing and grooming. N=104	59% of patients in the intervention group returned to baseline status vs 35% in the usual care control group. Intervention group has less delirium, less vent days.	Repeatable. Results generalizable to population.
Zomorodi, M., Topley, D. & McAnaw, M. (2012).	III	Protocol development and pilot study. Is early an early mobility protocol safe and feasible in	Patients in a trauma/surgical ICU. Very small convenience sample of 3 patients. Convenience sample. (similar facility to UK)	LOS for participant's less than average SICU patients, VS remained stable and no self-removal of lines or tubes occurred. Next step RCT.	Small sample size limits generalizability of results.

POST EVALUATION OF A NURSE DRIVEN EARLY

		trauma /surgical patients? Does the early mobility protocol decrease ventilator days? What are the effects of an early mobility protocol on VS and perceived effort?	Patient demographics, admission diagnosis and co morbidities, VS, LOS, Borg Rate of perceived Exertion Scale, Ventilator <i>free</i> days.		
Winkelman, C. et al., (2012).	II	Prospective repeated measures study with control and intervention groups N = 20 control N = 55 intervention	5% of patients had concerning alteration in respiratory rate or peripheral oxygenation. No other adverse events occurred. Findings suggested that early progressive exercise reduced inflammation rates. The greater the duration of exercise the lower the inflammatory marker level was.		
Winkelman, C. & Peereboom, K. (2010).	IV	Descriptive study of staff perceptions regarding progressive early mobility. Nurses providing care to a sub sample of patients from a larger mobility study. N = 33	Nurses cited safety concerns related to vital sign changes, fear of inadvertent line or tube removal. Some cited sedation or agitation as barriers, PT consults did not affect the nurse's perceptions.	Staffing was not considered a barrier or facilitator.	Small convenience sample from one hospital.

POST EVALUATION OF A NURSE DRIVEN EARLY

Author/Year/ Journal/Title/Reference Information	Type of Literature/Design	Findings/Results/Evidence	Implications
Adler, J. & Malone, D. (2012).	Systematic review of literature	As technology improves and more patients survive, IVU survivors are experiencing higher rates of morbidity.	No serious adverse events were noted in over 1,449 activity sessions while in ICU. The most common event was desaturation, which is expected to a certain extent. Overall, early mobility showed positive gains on respiratory and physical strength and decreased time to meet physical mobility milestones.
Appleton, R. & Kinsella, J. (2012).	Review of definitions of CIP, CIM and CINM.	Review of Pathophysiology and risk factors. Critical Illness Polyneuropathy and Myopathy overlap. High dose steroids and neuromuscular blocking agents increase risk.	Early mobility absolutely vital. Maintaining euglycemia very important. FES of BLE may be helpful.
Dowdy, D.W., Eid, M.P., Sedrakyan, A., Mendez-Tellez, P.A., Pronovost, P.J., Herridge, M.S. & Needham, D.M. (2005).	Systematic review of literature.	ICU survivors have lower quality of life post discharge that persists during long-term follow up.	Early mobility is a vital step in reducing post discharge disability, which can be lifelong.
deJonghe, B., Lacherade, J.C., Sharshar, T. & Outin, H. (2009).	Review of causes and prevention strategies for ICUAW.	Risk factors for critical illness neuropathy include multiple organ failure, limb immobilization, deep sedation, Hyperglycemia, neuromuscular blocking agents and corticosteroid use.	ABCDE bundle reduces risk.

POST EVALUATION OF A NURSE DRIVEN EARLY

<p>Herridge, M.S., Batt, J. &amp; Hopkins, R.O. (2008).</p>	<p>Review of poor outcomes following critical illness.</p>	<p>Studies have noted long-term disabilities that persist up to 6 years post ICU stay. Critical illness polyneuropathy and myopathy are common. Often precipitated by hyperglycemia and inflammation from SIRS and sepsis. Neurogenic abnormalities can be precipitated by hypotension, hypoxemia, delirium, sedatives and analgesics.</p>	<p>Any intervention such as the ABCDE bundle that minimizes drug use, immobility and ICU stay could have positive benefits for the patient.</p>
<p>Hogdson, C.L., Stiller, K., Needham, D.M., Tipping, C.J., Harrold, M., Baldwin, C.E., Bradley, S., Berney, S., Caruna, L.R., Elliot, D., Green, M., Haines, K., Higgins, A.M., Kaukonen, K.M., Leditschke, I.A., Nickels, M.R., Paratz, J., Patman, S., Skinner, E.H., Young, P.J., Zanni, J.M., Denehy, L. &amp; Webb, S.A. (2014).</p>	<p>Recommendations for safety criteria. Literature review and meeting of ICU experts.</p>	<p>Respiratory, cardiovascular, neurological and other areas identified. Areas to consider were ventilator status, hemodynamics, dysrhythmias, LOC, delirium, ICP, lines and surgical or medical conditions. Used a traffic light approach to categorize risks.</p>	<p>Early mobility safe and feasible.</p>
<p>Hopkins, R.O., Suchyta, M.R., Farrer, T.J. &amp; Needham, D.M. (2012).</p>	<p>Effects of exercise on the brain.</p>	<p>Early activity may reduce delirium and improve neuropsychiatric function. Cognitive impairment is noted in up to 70% of ICU survivors. Causes are likely multifactorial and have synergistic effects. In multiple animal studies, early mobility is associated with reduces duration of delirium, improved physical function, decreased LOS and mortality.</p>	<p>Animal results should be generalizable to the human population.</p>

POST EVALUATION OF A NURSE DRIVEN EARLY

Hopkins, R.O., Spuhler, V.J. & Thomsen, G.E. (2007).	Tips for culture change.	Using the eight-stage change process: establish a sense of urgency, create a guiding coalition, create and communicate a vision, empower others to act, plan and create short term wins, consolidate improvements and facilitate more change and institutionalizing new approaches.	Multidisciplinary involvement is vital as well as support and buy in from administration.
Knight, J., Nigam, Y. & Jones, A. (2009).	Effects of bedrest on body systems.	Immobility effects every body system in a negative manner.	Early mobility activities in the critically ill population can prevent or mitigate the effects of bedrest.
Lord, R. K., Mayhew, C. R., Korupolu, R., Manthey, E. C., Friedman, M. A., Palmer, J. B. & Needham, D. M. (2013).	Review of Financial saving of an early mobility/rehabilitation program.	Studies demonstrate that early rehab decreases LOS.  Study looked at reduction in LOS post program, per day cost savings from decreased LOS, Costs of implementing the program, annual number of ICU admissions.	Johns Hopkins demonstrated a significant cost saving after initiating an early mobility program.
Hopkins, R.O.,& Spuhler, V.J. (2009).	Strategies for promoting mobility.	Prolonged immobilization leads to neuromuscular abnormalities, long-term functional disability, and ICU acquired weakness. Decline in physical status is noted more so than emotional or mental status.	Mobility in this population is safe and evidence based.
Morris, P.E. (2007).	Review of mobility issues.	ICU patients have 1-1.5% decline in skeletal muscle strength per day of bedrest. Patients with ARDS may lose	Immobility is detrimental.

POST EVALUATION OF A NURSE DRIVEN EARLY

		up to 18% during their hospitalization. Many ICU patients complain of severe physical limitations after hospitalization.	
Morris, P.E. & Herridge, M.S. (2007).	Review of current practice, problems and future directions.	Incidence of critical illness polyneuropathy is as high as 25%. Utilization of the ABCDE bundle is essential to increasing early mobility.	Early Mobility safe and effective
Needham, D. (2008).	Systematic Review	Healthy, well-nourished individuals lose 4-5% muscle strength for each week of bedrest. BR causes fluid shifts causing postural hypotension, tachycardia and decreased SV and CO, as well as insulin resistance and microvascular dysfunction. Typically, only approximately 20% of ICU patients receive PT or mobility therapy.	Reduction of heavy sedation and early mobility are key.
Parker, A. & Needham, D.M. (2013).	Review of literature regarding safety of and barriers to early mobility.	There is a very low incidence of accidental line removal with early mobility in the ICU. Early mobility increases the likelihood of return to independent functional status. Early mobility decreases LOS and vent days. Deep sedation is a definite barrier, inadequate staffing for mobility activities is another barrier.	Early Mobility safe and effective
Perme, C. & Chandrashekar, R. (2009).	Outline of plan and implementation for an	Four Phase program for mobilizing ICU patients	Early mobility safe and effective in the ventilated population.

POST EVALUATION OF A NURSE DRIVEN EARLY

	early ICU mobility intervention program.		
Ross, A.G. & Morris, P.E. (2010).	Safety of early mobility activities.	Most early mobility studies report few if any adverse events. Barriers include lack of adequate equipment, lack of coordination of personnel, and staff misperceptions regarding early mobility. Lack of administration buy in is also a factor.	Early Mobility safe and effective
Stevens, R.D., Dowdy, D.W., Michaels, R.K., Mendez-Tellez, P.A., Pronovost, P.J. & Needham, D.M. (2007).	Description of prevalence, outcomes and risk factors of critical illness neuromuscular abnormalities.	46% of ICU patients diagnosed with CINMA. Risks include poor glycemic control, SIRS, sepsis, MODS, CRRT, and catecholamine administration. . Mechanical vent and LOS were increased with CINMA.	Large prospective studies needed.
Stiller, K. (2007).	Review of safety issues with early mobility.	Note that HR, RR and blood pressure increases of up to 10-20% are expected. Temporary/transient desaturations Significant decreases are much more concerning. Concerning events are arrhythmias suggesting perfusion issues, angina or new onset arrhythmias. Active bleeding causing hemodynamic instability is a safety concern.	Mobilization improves resp. function increases LOC, increases functional independence, improves cardiovascular fitness, and psychological wellbeing. For critically ill patient it can shorten recovery time, decrease vent days and ICU and hospital LOS.
Stevens, R. D., Marshall, S. A., Cornblath, D. R., Hoke, A., Needham, D. M., de Jonghe, B., Ali, N. A. & Sharshar, T. (2009).	Description of syndrome of neuromuscular dysfunction related to	3 groups noted myopathy, polyneuropathy and prolonged pharmacologic neuromuscular blockade. Neuropathy may persist for weeks to months. Critical care acquired weakness	Consider risk factors, early mobility and minimization as possible of sedation and NMBAs key.

POST EVALUATION OF A NURSE DRIVEN EARLY

	critical illness and treatment.	is weakness in the absence of any other causative factor. Risk factors include sepsis, MSOF, mechanical ventilation, exposure to glucocorticoids or NMBA or poor glycemic control	
Vollman, K. M. (2013).	Review of current evidence about mobility and the critically ill patient.	Prolonged gravitational equilibrium (prolonged supine positioning). reduces plasma volume, increases insulin resistance, and promotes hemodynamic instability and lowered capacity to vasoconstrict in response to hemodynamic changes.	Patients should be screened within 8 hours of admission and at a minimum every 24 hours thereafter. Begin a lateral rotation schedule as soon as patient can tolerate it hemodynamically. Consider speed of turning to limit inner ear (pressure receptors) influences on cardiovascular response. Physiologic rest and preoxygenation can help when mobilizing critically ill patients.
Vollman, K. M. (2010).	Review of importance of early mobility.	Negative outcomes from reduced mobility include ventilator-associated pneumonia, longer ventilator days, pressure ulcers, diminished quality of life after discharge with significant functional limitations.	Early mobility interventions are safe and effective.
Winkelman, C. (2007).	Bedrest has significant detrimental effects	Largest organ in the body is skeletal muscle. Muscle is rapidly affected by disuse. Ambulation and turning are the most commonly missed nursing interventions in the hospital.	Early mobility is vital as deterioration of muscle begins within 4 hours of bedrest. Changes in skeletal muscle affect lung function and diaphragmatic endurance. Hemodynamic instability begins within 48 hours of bedrest as well as cytokine release and inflammation. Mood alterations such as anxiety, hostility and depression can occur.

POST EVALUATION OF A NURSE DRIVEN EARLY

Wong, K, Trudel, G., & Laneuville, O. (2015).	Prolonged immobility causes joint contractures.	Joint contractures cause pain, which further restricts mobility.	Contractures can be prevented by prescribed and implemented mobility activities including range of motion.
---	---	--	--

POST EVALUATION OF A NURSE DRIVEN EARLY

Appendix B

Evidence Grading Criteria

Evidence Level	Criteria
I	Randomized control trials. Includes quasi- randomized processes such as alternate allocation
II	Non-randomized control trial. A prospective study with predetermined eligibility criteria and outcome measures.
III	Observational studies with no controls. Includes retrospective, interrupted time studies, cohort studies with controls, and health services research that includes adjustment for likely confounding variables.
IV	Observational studies without controls. Cohort, case series and case control.

<http://www.ahrq.gov/>

Evidence Grade	Criteria
A	Consistent level 1 studies
B	Consistent Level 2 or 3 studies, or extrapolation from Level 1 studies
C	Level 4 studies, or extrapolation from Level 2 or 3 studies
D	Level 5 studies, or troublingly inconsistent or inconclusive studies from any level

CEBM: Grades of Recommendation

# POST EVALUATION OF A NURSE DRIVEN EARLY

## Appendix C

### UK HealthCare Mobility Scale

#### UK HealthCare Mobility Scale

Please reference General Mobility and Ortho/Trauma/Spine guidelines for specific instructions.

**Our Goal: Early Progression of Best Possible Mobility  
Based on Patients' Success with Previous Steps**

Score	Activity	Length of Time	How Often
<b>Patient Immobile</b>			
0	Patient completely immobile or prone	n/a	n/a
1	Turn depending on need. HOB less than 30 degrees	Every 1-2 hours	Every 1-2 hours
<b>Patient in Bed</b>			
2	HOB elevated 30 or greater and less than 45 degrees	5-10 minutes	2-3 times per day
3	Head of bed elevated 45 to 64 degrees; legs in dependent position.	10-20 minutes as tolerated	2-3 times per day
4	Head of bed elevated 65 degrees or greater; legs in dependent position (to be used when pt to chair with lift).	10-30 minutes, up to 1 hour as tolerated	2-3 times per day
<b>Patient - Sitting/ Standing</b>			
5	Patient positioned on edge of bed (EOB); legs dangling with assist for balance and safety. * (see note below)	5-15 minutes	1-2 times per day Note: Pt to sit on EOB with minimal assist (for balance) before advancing
6	Initiate standing/side stepping/ marching at EOB	1-5 minutes	1-2 times per day
7	Initiate stand-pivot or steps to chair (Reposition in chair every 30 min. Refer to #4 if using lift.)	2 hrs maximum	2-3 times daily as tolerated
<b>Patient Ambulating</b>			
8	Ambulation with assist as needed	Distance as tolerated	2-3 times daily as tolerated

\*Consider having 2 people to assist for scores/activities 3-6

## POST EVALUATION OF A NURSE DRIVEN EARLY

### References

- Adler, J. & Malone, D. (2012). Early mobilization in the intensive care unit: A systematic review. *Cardiopulmonary Physical Therapy Journal*, 23(1), 5-132.
- Appleton, R. & Kinsella, J. (2012). Intensive care unit acquired weakness. *Continuing Education in Anesthesia, Critical Care and Pain*, 12(2), 62-66. doi:10.1093/bjaceaccp/mkr057
- Arnold, M. (2003). Pressure ulcer prevention and management: The current evidence for care. *AACN Clinical Issues*, 14(4), 411-428.
- Bailey, P., Thomsen, G.E., Spuhler, V.J., Blair, R., Jewkes, J., Bezdjian, L., Veale, K., Rodriguez, L. & Hopkins, R.O. (2007). Early activity is feasible and safe in respiratory failure patients. *Critical Care Medicine*, 35(1), 139-145. doi: 10.1097/01.CCM.0000251130.69568.87
- Balas, M.C., Vasilevskis, E.E., Burke, W.J., Boehm, L., Pun, B.T., Olsen, K.M., Peitz, G.J., & Ely, E.W. (2012). Critical care nurses' role in implementing the "ABCDE Bundle" into practice. *Critical Care Nurse*, 32(2), 35-48. doi:10.4037/ccn2012229
- Burtin, C., Clerckx, B., Ferdinande, P., Langer, D., Troosters, T., Hermans, G., Decramer, M., Gosselink, R. (2009). Early exercise in critically ill patients enhances short-term functional recovery. *Critical Care Medicine*, 37(9), 2499-2505. doi 10.1097/CCM.0b013e3181a38937
- Clark, D.E., Lowman, J.D., Griffin, R.L., Matthews, H.M. & Reiff, D.A. (2013). Effectiveness of an early mobilization protocol in a trauma and burns intensive care unit: A retrospective study. *Physical Therapy*, 93(2), 186-189. Retrieved from <http://eds.a.ebscohost.com.ezproxy.uky.edu>

## POST EVALUATION OF A NURSE DRIVEN EARLY

- Clavet, H., Hebert, P.C., Fergusson, D., Doucette, S. & Trudel, G. (2008). Joint contracture following prolonged stay in the intensive care unit. *Canadian Medical Association Journal*, 178(6), 691-697. doi: 10.1503/cmaj.071056
- Covinsky, K.E., Palmer, R.M., Fortinsky, R.H., Counsell, S.R., Stewart, A.L., Kresevic, D., Burant, C.J. & Landefeld, C.S. (2003). Loss of independence in activities of daily living in older adults hospitalized with medical illnesses: Increased vulnerability with age. *Journal of the American Geriatric Society*, 51, 451-458. Retrieved from <http://eds.a.ebscohost.com.ezproxy.uky.edu>
- de Jonghe, B, Bastuji-Garin, S., Durand, M.C., Malissin, I., Rodrigues, P., Cerf, C., Outin, H. & Sharshar, T. (2007). Respiratory weakness is associated with limb weakness and delayed weaning in critical illness. *Critical Care Medicine*, 35(9), 2007-2015. Doi: 10.1097/01.CCM.0000281450.01881.d8
- de Jonghe, B., Lacherade, J.C., Sharshar, T. & Outin, H. (2009). Intensive care unit acquired weakness: Risk factors and prevention. *Critical Care Medicine*, (37)10, S309-S315. doi: 10.1097/CCM.0b013e3181b6e64c
- Dong, Z.H., Yu, B.X., Sun, Y.B., Fang, W. & Li, L. (2014) Effects of early rehabilitation therapy on patients with mechanical ventilation. *World Journal of Emergency Medicine*, 5(1), 48-52. doi:10.5847/wjem.j.issn.1920-8642.2014.01.008
- Dowdy, D.W., Eid, M.P., Sedrakyan, A., Mendez-Tellez, P.A., Pronovost, P.J., Herridge, M.S. & Needham, D.M. (2005). Quality of life in adult survivors of critical illness: A systematic review. *Intensive Critical Care Medicine*, 31, 611-620. doi: 10.1007/s00134-005-2592-6

## POST EVALUATION OF A NURSE DRIVEN EARLY

- De Jonghe, B., Lacherade, J., Sharshar, T., & Outin, H. (2009). Intensive care unit acquired weakness: Risk factors and prevention. *Critical Care Medicine*, 37(10), S309-S315. doi:10.1097/ccm.0b013e3181b6e64c
- Engel, H.J., Needham, D.M., Morris, P.E. & Gropper, M.A. (2013). ICU early mobilization: From recommendation to implementation at three medical centers. *Critical Care Medicine*, 41, S69-S80. doi:10.1097/CCM.0b013e3182a240d5
- Fink, H., Helming, M, Unterbuchner, C. Lenz, A., Neff, F., Martyn, J. & Blobner, M. (2008). Systemic Inflammatory response syndrome increases immobility-induced neuromuscular weakness. *Critical Care Medicine*, 36(3), 910-916. doi: 10.1097/CCM.0B013E3181659669
- Fraser, D., Spiva, L., Forman, W. & Hallen, C. (2015). Original research: Implementation of an early mobility program in an ICU. *American Journal of Nursing*, 115(12), 49-58. Retrieved from <http://eds.a.ebscohost.com.ezproxy.uky.edu>
- Herridge, M.S., Batt, J. & Hopkins, R.O. (2008). The pathophysiology of long-term neuromuscular and cognitive outcomes following critical illness. *Critical Care Clinics*, 24, 179-199. doi10.1016/j.ccc.2007.11.002
- Herridge, M.S., Cheung, A.M., Tansey, C.M., Matte-Martyn, A., Diaz-Granados, N., Al-Saidi, F., Cooper, A.B., Guest, C.B., Mazer, C.D., Mehta, S., Stewart, T.E., Barr, A., Cook, D. & Slutsky, A.S. (2003). One-year outcomes in survivors of the acute respiratory distress syndrome. *New England Journal of Medicine*, 348(8), 683-693. Retrieved from <http://eds.a.ebscohost.com.ezproxy.uky.edu>
- Hogdson, C.L., Stiller, K., Needham, D.M., Tipping, C.J., Harrold, M., Baldwin, C.E., Bradley, S., Berney, S., Caruna, L.R., Elliot, D., Green, M., Haines, K., Higgins, A.M., Kaukonen, K.M., Leditschke, I.A., Nickels, M.R., Paratz, J., Patman, S., Skinner, E.H., Young, P.J.,

## POST EVALUATION OF A NURSE DRIVEN EARLY

- Zanni, J.M., Denehy, L. & Webb, S.A. (2014). Expert consensus and recommendations on safety criteria for active mobilization of mechanically ventilated critically ill adults. *Critical Care, 18*, 658-667. doi:10.1186/s13054-014-0658-y
- Hopkins, R.O., Mitchell, L., Thomsen, G.E., Schafer, M., Link, M., & Brown, S.M. (2016). Implementing a mobility program to minimize post-intensive care syndrome. *AACN Advanced Critical Care, 27*(2)2, 187-203.
- Hopkins, R.O., Spuhler, V.J. & Thomsen, G.E. (2007). Transforming ICU culture to facilitate early mobility. *Critical Care Clinics, 23*, 81-96. doi: 10.1016/j.ccc.2006.11.004
- Hopkins, R.O., Suchyta, M.R., Farrer, T.J. & Needham, D.M. (2012). Improving post-intensive care unit neuropsychiatric outcomes. Understanding cognitive effects of physical activity. *American Journal of Respiratory and Critical Care Medicine, 186*(12), 1220-1228. doi:10.1164/rccm.201206-1022CP
- Hopkins, R.O., Weaver, L.K., Collinridge, D., Parkinson, R.P., Chan, K.J. & Orme, J.F. (2005). Two-year cognitive, emotional, and quality of life outcomes in acute respiratory distress syndrome. *American Journal of Respiratory Critical Care Medicine, 171*(4), 340-347. doi:10.1164/rccm.200406-763OC
- Institute for aging, (2015). The state of aging 2015 report of the institute for aging. Retrieved from <http://chfs.ky.gov/NR/rdonlyres/1FA4CD17-871A-435E-9750-086ABC3670C5/0/2015ReportoftheInstituteforAging.pdf>
- Klein, K., Mulkey, M., Bena, J.F. & Albert, N.M. (2015). Clinical and psychological effects of early mobilization in patients treated in a neurologic ICU: A comparative study. *Critical Care Medicine, 43*,4, 865-873. doi: 10.1097/CCM.0000000000000787

## POST EVALUATION OF A NURSE DRIVEN EARLY

Knight, J., Nigam, Y. & Jones, A. (2009). Effects of bedrest<sup>1, 2,3</sup>. *Nursing Times* retrieved on January 7, 2016 from <http://www.nursingtimes.net/>

Lee, H., Ko, Y.J., Suh, G.Y., Yang, J.H., Park, C.M., Jeon, K., Park, Y.H. & Chung, C.R. (2015). Safety profile and feasibility of early physical therapy and mobility for critically ill patients in the medical intensive care unit: Beginning experiences in Korea. *Journal of Critical Care*, 30, 673-677. doi:10.1016/j.jcrc.2015.04.012

Lima, N.P., da Silva, G.M.C., Park, M., Pires-Neto, R.C. (2015). Mobility therapy and central or peripheral catheter-related adverse events in an ICU in Brazil. *Journal of Brazilian Pneumology*, 41(3), 225-230.

Lord, R. K., Mayhew, C. R., Korupolu, R., Manthey, E. C., Friedman, M. A., Palmer, J. B. & Needham, D. M. (2013). ICU early physical rehabilitation programs: Financial modeling of cost savings. *Critical Care Medicine*, 41(3), 717-724. doi: 10.1097/CCM.0b013e3182711de2

McWilliams, D., Weblin, J., Atkins, G., Bion, J., Williams, J., Elloit, C. Whitehouse, T. & Snelson, C. (2015). Enhancing rehabilitation of mechanically ventilated patients in the intensive care unit: A quality improvement project. *Journal of Critical Care*, 30, 13-18. doi:10.1016/j.jcrc.2014.09.018

Morris, P.E. (2007). Moving our critically ill patients: Mobility barriers and benefits. *Critical Care Clinics*, 23(1), 1-20. Retrieved from <https://www.clinicalkey-com.ezproxy.uky.edu/>

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. (2008). Early intensive care unit mobility therapy in the treatment of acute respiratory therapy. *Critical Care Medicine*, 36,8, 2238-2243. doi: 10.1097/CCM.0b013e318180b90e

## POST EVALUATION OF A NURSE DRIVEN EARLY

Morris, P.E., Griffin, L., Berry, M., Thompson, C., Hite, R.D., Winkelman, C., Hopkins, R.O.,

Ross, A., Dixon, L., Leach, S., Haponik, E. (2011). Receiving early mobility during an intensive care unit admission is a predictor of improved outcomes in acute respiratory failure.

*The American Journal of Medical Sciences* 341(5), 373-377. Retrieved from

<http://eds.a.ebscohost.com.ezproxy.uky.edu>

Morris, P.E. & Herridge, M.S. (2007). Early intensive care unit mobility: Future directions.

*Critical Care Clinics*, 23(1), 97-110. Retrieved from [https://www.clinicalkey-](https://www.clinicalkey-com.ezproxy.uky.edu/)

[com.ezproxy.uky.edu/](https://www.clinicalkey-com.ezproxy.uky.edu/)

Needham, D.M. (2008). Mobilizing patients in the intensive care unit: Improving neuromuscular

weakness and physical function. *Journal of the American Medical Association*, 300(14),

1685-1689. Retrieved from <http://jama.jamanetwork.com/>

Needham, D.M., Korupola, R., Zanni, J.M., Pradhan, P., Colantuoni, E., Palmer, J.B., Brower,

R.G. & Fan, E. (2010). Early physical medicine and rehabilitation for patients with acute

respiratory failure: A quality improvement project. *Archives Physical Medicine and*

*Rehabilitation*, 91, 536-542. doi:10.1016/j.apmr.2010.01.002

Ogochukwu, A., Gammon, H., Burmeister, C., Frega, D., Nerenz, D., DiGiovine, B & Siddiqui,

A. (2016). Benefits of early active mobility in the medical intensive care unit: A pilot study.

*The American Journal of Medicine*, 129(8), 866-871. doi:10.1016/j.amjmed.2016.03.032

Parker, A. & Needham, D.M. (2013). The importance of early rehabilitation and mobility in the

ICU. *Society of Critical Care Medicine Critical Connections*, retrieved November 11, 2015

from <http://www.sccm.org/Communications/Critical->

[Connections/Archives/Pages/Importance-Early-Rehabilitation-Mobility-ICU.aspx](http://www.sccm.org/Communications/Critical-Connections/Archives/Pages/Importance-Early-Rehabilitation-Mobility-ICU.aspx).

## POST EVALUATION OF A NURSE DRIVEN EARLY

- Pandullo, S.M., Spilman, S.K., Smith, J.A., Kingery, L.K., Pille, S.M., Rondinelli, R.D. & Sahr, S.M. (2015). Time for critically ill patients to regain mobilization in the intensive care unit and transition to a general inpatient floor. *Journal of Critical Care*, 30(6), 1238-1242. doi:10.116/j.jcrc.2015.08.007
- Perme, C. & Chandrashekar, R. (2009). Early mobility and walking program for patients in intensive care units: Creating a standard of care. *American Journal of Critical Care*, 18(3), 212-221. doi: 10.4037/ajcc2009598
- Perme, C., Nalty, T., Winkelman, C. Kenji Nawa, R. & Masud, F. (2013). Safety and efficacy of mobility interventions in patients with femoral catheters in the ICU: A prospective observational study. *Cardiopulmonary Physical Therapy Journal*, 24(2), 12-17.
- Ross, A.G. & Morris, P.E. (2010). Safety and Barriers to Care. *Critical Care Nurse*, 30(2), S11-S13. Retrieved from <http://www.ccnonline.org>
- Schweickert, W.D., Pohlman, M.C., Nigos, C., Pawlik, A.J., Esbrook, C.L., Spears, L., Miller, M., Franczyk, M., Deprizio, D., Schmidt, G.A., Bowman, A., Barr, R., McCallister, K.E., Hall, J.B. & Kress, J.P. (2009). Early physical and occupational therapy in mechanically ventilated, critically ill patients: a randomized controlled trial. *Lancet*, 373, 1974-1882.
- Sricharoenchai, T., Parker, A.M., Zanni, J.M., Nelliott, A., Dinglas, V.D. & Needham, D.M. (2014). Safety of physical therapy interventions in critically ill patients: A single center prospective evaluation of 1110 intensive care unit admissions. *Journal of Critical Care*, 29, 395-400.
- Stevens, R.D., Dowdy, D.W., Michaels, R.K., Mendez-Tellez, P.A., Pronovost, P.J. & Needham, D.M. (2007). Neuromuscular Dysfunction acquired in critical illness: A systematic review. *Intensive Care Medicine*, 33(11), 1876-1891. doi: 10.1007/s00134-007-0772-2

## POST EVALUATION OF A NURSE DRIVEN EARLY

- Stevens, R. D., Marshall, S. A., Cornblath, D. R., Hoke, A., Needham, D. M., de Jonghe, B., Ali, N. A. & Sharshar, T. (2009). A framework for diagnosing and classifying intensive care unit-acquired weakness. *Critical Care Medicine*, 37(10), s299-s308. doi: 10.1097/CCM.0b013e3181b6ef67
- Stiller, K. (2007). Safety issues that should be considered when mobilizing critically ill patients. *Critical Care Clinics*, 23, 35-53. doi: 10.1016/j.ccc.2006.11.005
- Vollman, K. M. (2013). Understanding critically ill patient's hemodynamic response to mobilization. Using the evidence to make it safe and feasible. *Critical Care Nursing Quarterly*, 36(1), 17-27. doi: 10.1097/CNQ.0b013e3182750767
- Vollman, K. M. (2010). Introduction to progressive mobility. *Critical Care Nurse*, 30(2), S3-S5. doi: 10.4037/ccn2010803
- Winkelman, C. (2007). Inactivity and inflammation in the critically ill patient. *Critical Care Clinics*, 23, 21-34. doi: 10.1016/j.ccc.2006.11.002
- Winkelman, C., Johnson, K.D., Hejal, R., Gordon, N.H., Rowbottom, J., Daly, J., Peereboom, K. & Levine, A.D. (2012). Examining the positive effects of exercise in intubated adults in ICU: A prospective repeated measures clinical study. *Intensive Critical Care Nursing*, 28(6), 307-318. Retrieved from <http://ac.els-cdn.com.ezproxy.uky.edu>
- Winkelman, C. & Peereboom, K. (2010). Staff-perceived barriers and facilitators. *Critical Care Nurse*, 30(2), S13-S16. doi: 10.4037/ccn2010393
- Wong, K., Trudel, G. & Laneuveloe, O. (2015) Noninflammatory joint contractures arising from immobility: Animal models to future treatments. *Biomed Research International*, 1-6. doi: 10.1155/2015/848290

## POST EVALUATION OF A NURSE DRIVEN EARLY

Zomorodi, M., Topley, D. & McAnaw, M. (2012). Developing a mobility protocol for early mobilization of patients in a surgical/trauma ICU. *Critical Care Research and Practice*, 1-10.  
doi:10.1155/2012/964547