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Systematic Review of Physiologic Assessment Measures for Mobility Readiness of Adult Patients in Critical Care

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Abstract

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Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

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Abstract

Nurses play a significant role in mobility management, an essential element of care for critically ill adults. However, the current practice of mobility management comes from patient orders without the adoption of an evidence-based physiologic assessment guide to support safe patient mobility resulting in unreliable outcomes. Physiologic stability may change during mobility and unsafe patient mobilization can result in negative patient outcomes that increase patient recovery time. The purpose of this systematic review was to look at the current practice of physiologic assessment measures and then use the findings to influence safe patient mobility practices in intensive care units. The practice focused questions for this doctoral project focused on investigating how research and quality improvement studies on mobilization in critical care address physiologic stability in decisions to mobilize critically ill adults and if there is a consistent safe best practice. The Johns Hopkins Evidence-Based Practice model was used as a framework to guide this review. Transitions theory was used to link theory and practice. The sources of data were gathered from Medline, PubMed, CINAHL, Joanna Briggs Institute, Cochrane Database, and Google Scholar. This review included 37 studies and identified a gap between use of mobility readiness assessments and early mobility practice. Findings also showed addressing the gap between mobility readiness assessments and early mobility practice improved the safety, care, and outcomes of critically ill patients impacting positive social change and nursing practice.

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Dedication

I dedicate this work to God and my family who have granted me the strength, faith, courage, and perseverance to pursue a DNP degree. I also dedicate this work to my husband, who has been there to support me. You are greatly appreciated for all your work and patience.

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Section 1: Nature of the Project

Introduction

Mobility is a necessary element of care provided to critically ill adults. Safe patient mobility helps to ensure a patient does not experience complications due to immobility. Patient mortality increases with complications. Patient safety and clinical risk management is an element of clinical governance and includes identifying the circumstances and opportunities that put patients at risk of harm and acting to prevent or control risk (Asefzadeh et al., 2013). Early progressive mobilization of critically ill patients is feasible, safe, and results in benefits including functional outcomes, and reduced intensive care unit (ICU) and hospital length of stay (Hodgson et al., 2014). However, weakness begins with serious illness, and effects from immobility and weakness are associated with prolonged mechanical ventilation, ICU length of stay, and 1-year mortality (Latronico et al., 2017). Physical activity may mitigate weakness and muscle damage from critical illness, but critically ill patients may have limits to their activity tolerance (Amidei, 2012a). Despite knowledge of the harmful effects of immobility on multiple body systems, the ICU is a challenging and difficult environment where many barriers exist to mobilizing critically ill patients (Adler & Malone, 2012).

At the practicum site for which this Doctor of Nursing Practice (DNP) project was completed, critically ill patients' mobility management orders would come from a collaboration between the healthcare team on daily rounds based on the priority placed on mobility, a process which led to inconsistent practice and patient outcomes.

Attending to the mobility of critically ill patients is challenging. The tenuous dynamic status of critically ill patients and their physiological derangements can result in adverse hemodynamic responses to activity and mobility (Adler & Malone, 2012). It is not uncommon for deconditioned critically ill patients with limited physiologic reserve to respond to activity and exertional stress with changes in hemodynamic status. Patient changes include activity intolerance as fainting, changes in blood pressure and heart rate, and inability to support their body weight (Amidei, 2012a). As such, this project sought to identify evidence-based practices addressing enhanced and safe mobility in critically ill patients.

Physiologic Stability and Functional Capacity

The physiologic stability and functional capacity of critically ill patients impact mobility readiness and level. Nursing strives to incorporate levels of safe mobility in care based on multiple assessments including physiologic concerns (Amidel, 2012a). Professionals in nursing and health care endeavor to decrease the length of stay in the ICU and hospital, increase positive patient outcomes, and decrease costs associated with care. Guidelines have the potential to facilitate patient care decisions and the implementation of evidence-based practice concerning safe patient mobility, but due to inconsistent adoption in clinical practice guidelines have limited impact and present a health system challenge (Kastner et al., 2011). Having an evidence-based patient guideline or tool for physiologic assessment measures for mobility readiness in critical care at the practicum site may support collaborative efforts of critical care nurses and the healthcare team to provide quality care and safe, effective mobility measures.

Problem Statement

Local Nursing Practice Problem

The current practice of mobility management comes from patient orders without the adoption of an evidence-based physiologic assessment guide to support safe mobility. Patient mobility management is affected by many variables, including patient physiologic stability, alertness, and strength, and the experience and skill level of staff caring for the patient. The current local nursing practice problem is that mobility assessment and management differ based on the healthcare team members caring for patients and the ICUs where patients receive care. The project site has assessment tools for nurses to address some aspects of mobility management; however, comprehensive nursing guidelines, including physiologic assessment, are not currently in use. The nursing staff feel pressured to ambulate critically ill patients and have difficulty in balancing the patient's need to ambulate versus the benefit and safety of ambulation in the presence of hemodynamic intolerance. The need to address safe mobility and physiologic assessment of patients before ambulation at the clinical site is evident due to the negative impact of immobility on patient outcomes. The purpose of this systematic review is to look at the current practice of physiologic assessment measures and then utilize the findings to influence safe patient mobility in the ICU.

Local Relevance

Safe prescription of patient mobility includes comprehensive preassessment and diagnostic information evaluation to improve outcomes and meet patient mobility goals (Amidei, 2012b). However, mobilization therapy does not consistently address the

physiologic readiness of a patient when prescribing activity regimens (Eakin et al., 2015). Hence, it is important to understand critical factors as physiologic stability to implement and sustain safe mobility in critically ill patients successfully.

Multiple assessments and methods determine the severity of illness, care requirements, and the efficacy of mobility treatments. Nursing strives to incorporate appropriate levels of mobility in care based on multiple assessments and exclusions for physiologic concerns (Amidei, 2012b). Physiologic stability may change during mobility, and unsafe patient mobilization results in adverse patient outcomes that increase patient recovery time. There are inherent complications related to physiologic stability, patient safety, and functional outcomes associated with the mobilization of critical care patients (Adler & Malone, 2012). For safe mobilization to occur in the ICU, with minimal risk of adverse events, assessment of patient physiologic stability should occur before mobilization (Hodgson et al., 2014). Assessment of the right time and readiness for mobilization includes a review of a patient's physiologic and functional capacity (Eakin et al., 2015). Physiologic stability and functional capacity of critically ill patients also help determine mobility readiness and appropriate mobility levels (Amidei, 2012b).

Purpose Statement

Incongruence exists in the literature and practice about when to use mobilization, who should perform mobilization, and to what extent to apply mobilization. The purpose of this systematic literature review is to examine and summarize the benefits of evidence-based practice tools for physiologic assessment and stability in the mobilization of

critically ill patients. Also, to evaluate tools that are published and can improve the mobilization of critically ill patients by nursing and other disciplines. A review of the current body of evidence on physiologic assessment and stability in the mobilization of critically ill patients will answer how research and quality improvement studies on the mobilization of critically ill patients address physiologic stability in decisions to mobilize patients and if there is a consistent, safe best practice. Additionally, this project may contribute to the enhancement of better patient outcomes by identifying optimal critical care patient populations that would benefit from physiologic assessment for mobility readiness.

Gap in Practice

Evidence-based practice is the standard nurses use to provide effective clinical care. The gap in practice is that the ICU does not have a consistent, evidence-based approach to assess or determine a patient's readiness for mobilization, despite the benefits of safety and quality outcomes associated with evidence-based practice. Based on current practice, it is apparent that a clinical practice gap exists in determining a critically ill patient's readiness and safety for mobilization activities. This DNP project may provide nurses and other disciplines with physiologic assessment measures to determine critically ill patients' mobilization readiness. A nurse-driven mobility readiness assessment included in mobility management will support the provision of safe, efficient care and assessment in the management of critically ill patient mobility.

Practice-Focused Questions

The purpose of this systematic literature review is to examine and summarize the benefits of evidence-based practice tools for physiologic assessment and stability in the mobilization of critically ill patients. The three questions were:

- What mobility patient interventions or assessments are initiated based on physiologic assessment measures in comparison to the normal routine for mobility assessment?
- What is the effect of using physiologic assessment measures on determining patient readiness for safe mobility?
- What is the effect of using physiologic assessment measures on the incidence and safety of patient mobility events?

The following parameters guided the focus in answering the practice-focused questions:

- Population: Critically ill Adults 18 years and older
- Intervention: Systematic review of the literature for Physiologic Assessment Measures for Mobilization Readiness
- Comparison: The normal routine for Mobility Assessment
- Outcome: In critically ill adults 18 years and older, does the intervention of physiologic assessment measures for mobilization provide safe and effective patient physiologic assessment measures for readiness for mobilization therapy?

The systematic literature review evaluated whether adapting and implementing an evidence-based practice assessment tool or guideline has been found to enhance nursing

practice related to mobilization of critically ill patients. The design of this systematic review included the synthesis of the literature review research for systematic reviews, quantitative studies, qualitative studies, and pilot studies.

Addressing the Gap in Clinical Practice

Currently, the nursing practice of critically ill patient mobilization relies on provider order, or clinical judgment and experience. Providing a summary of current research and quality improvement on physiologic assessment can guide nursing practice and other disciplines in addressing the gap in clinical practice of critically ill patients' readiness for mobilization. Also, findings may guide nursing practice, improve patient outcomes and safety, decrease unnecessary costs, and support nurses in making assessments and decisions based on evidence. Findings from the systematic literature review may encourage nurse participation in evidence-based clinical practice by demonstrating how nurse-driven measures can positively impact patients at the unit, organization, and system level. The optimal timing and progression of mobility and factors influenced the ability to mobilize affect positive patient outcomes (Winkleman et al., 2012). The systematic review may provide additional benefits to the critically ill adult populations in other organizations' nursing staff and other disciplines through summarizing research on evidence-based physiologic assessments for mobility readiness of critically ill patients.

Nature of the Doctoral Project

The nature of this DNP project was to provide a systematic review of evidence-based research patient guidelines or tools for physiologic assessment measures for

mobility readiness in critical care. The project goal was to provide a guide for critical care nurses in safe mobility assessments and decisions in the ICU. This DNP project can lead to positive social change in nursing practice by identifying physiologic assessment measures that support patients' readiness for mobility measures and safety during mobility activities. The review of safe early mobility management also identifies physiologic assessment measures to determine early mobility readiness and management effectiveness, which can influence the care and mobility of critically ill adult patients. Accordingly, this project can improve nursing practice, decrease the adverse effects of patient immobility while promoting better outcomes, and create positive social change.

Sources of Evidence

Evidence-based mobility practice increases patient safety, improves clinical outcomes, reduces healthcare-related costs, and decreases variations in patient outcomes and care (SCCM, n.d.). The project focus included collecting current evidence on physiologic assessment measures for patient mobility readiness in ICUs that support safe patient handling and decrease adverse events. Sources included textbooks, critical care, and nursing journals, and peer-reviewed journals presenting articles on patient mobility, including the *Journal of Critical Care, Intensive and Critical Care Nursing, Physical Medicine & Rehabilitation Journal, Critical Care Research and Practice,* and the *Journal of Safe Patient Handling & Movement.* Using Walden Library resources, peer-reviewed articles also came from online databases like Medline, Cochrane, PubMed, CINAHL, and Google Scholar. Official websites accessed included the Society for Critical Care Medicine, the American Association of Critical Care Nurses, the Agency

for Healthcare Research and Quality, and the Institute for Healthcare Improvement. Nurses, physical therapists, respiratory therapists, and providers provided additional resource information including seminal work from 2016-2020.

The decision for patient mobility avoids immobility and includes patient assessments from admission to discharge. Immobility may affect a patient's state of health, and impaired health affects a patient's physiologic and functional capacity limiting the ability to mobilize (Amidei, 2012). A patient's participation in mobility depends on resources to support ambulation, changes in sedation to enable patient participation, and patient assessments to determine the level of activity and ability to mobilize (Eakin et al., 2015). Conditions caused by immobility are as disabling as the patient's admitted condition and mobility limits these conditions. Assessing the efficacy of early mobility of patients with and without mechanical ventilation is predicated on establishing a culture of mobility in the ICU (Corcoran et al., 2017). However, cultures that support patient mobility continue to have variations in assessment, intensity, and frequency of patient mobility (Corcoran et al., 2017). An early mobility bundle, including physiologic patient readiness assessment tools for mobility on every patient every day, lessens immobility complications and decreases variations in care (SCCM, n.d.). Individualized mobility assessments are essential for safe patient mobilization.

The patient's functional and physiologic status improves with mobility and declines with immobility. ICU patients lose approximately 2% of muscle mass every 24 hours (Doherty & Steen, 2010). As a result, the patient experiences a significant reduction in skeletal muscle force, indicating the assessment of physiologic and

functional capacity is an important step before mobilizing (Doherty & Steen, 2010). Determining the optimal timing and progression of mobility and factors influencing the ability to mobilize affect the safe, functional recovery of critically ill adults (Winkleman et al., 2012). Early mobilization restores function, and passive movement is appropriate when a patient's physiologic assessment identifies limitations to active involvement in mobility (Stockley et al., 2012). Functional and physiologic capacity mobility assessments vary and include the use of exclusion criteria, family reports of previous mobility levels, and the use of a variety of balance and strength assessments to determine a patient's readiness for mobilization (McWilliams et al., 2015). Despite evidence supporting early mobility benefits to a patient's recovery, timing, frequency, and application of mobility vary, affecting a patient's recovery.

Approach

The John Hopkins Evidence-based Practice model (JHNEBP) was the developmental framework for this systematic review. The JHNEBP model is an effective problem-solving approach to clinical decision-making using healthcare evidence (Dang & Dearholt, 2017). Accordingly, the generation of research evidence that is effective, feasible, appropriate, and meaningful to specific populations helps identify and address patient's health care needs (Dang & Dearholt, 2017.). The JHNEBP approach ensures research findings and best practices in evidence-informed patient care (Dang & Dearholt, 2017). The JHNEBP model is in congruence with holistic nursing care delivery and balances scientific and humanistic characteristics of health and its importance (Dang & Dearholt, 2017). The JHNEBP model integrates the best scientific

evidence with the best patient and practitioner evidence, considers internal and external influences on practice, and encourages clinical reasoning in the application of evidence to care of patients and populations (White et al., 2016). The model also ensures research findings and best practices in evidence-informed care, including clinical assessment measures, guidelines, protocols, or tools, which are solutions for translating research into practice (Dang & Dearholt, 2017).

The organization and beginning analysis of the DNP project literature review involved the creation of a synthesis matrix. The synthesis matrix provided an overview of the current research and quality improvement projects relevant to the selected topic. A synthesis matrix facilitated the examination of multiple articles and how they relate to themes in the research or quality improvement (Clark & Buckley, 2017). Synthesized information supported the integration of evidence-based physiologic assessment measures into mobility readiness practice.

A logic model was used to interpret the information obtained on readiness assessments for mobility. The logic model promoted system thinking by highlighting relationships of mobility readiness details to the whole process of patient mobility along with congruencies and inconsistencies (Anderson et al., 2011). The model was used to scope the review, define and conduct the review, and facilitate the review relevant to practice (Anderson et al., 2011). The model facilitated the synthesis of current knowledge on physiologic assessment measures for mobility readiness and early mobility management

Identifying the scope of the review included the use of databases and search engines to find outcomes and research; databases included the Cochrane Database for Systematic Reviews and the Joanna Briggs Institute EBP database. Available evidence searches engines to find evidence included PubMed, CINAHL Plus, Medline, and ProQuest Health & Medical Collection. Key search terms and combinations of these terms for further searches included *activity, mobilization, functional capacity, physiologic stability, rehabilitation, critical care, ICU, recovery, exercise,* and *movement*. The study considered peer-reviewed primary sources from 2010-2020 for inclusion in the doctoral project prospectus and systematic review.

Connecting current evidence to the practice questions requires a detailed review of sources to determine applicability (Walden University, 2017b). After searching and evaluating evidence, an additional search ensured all points of view from available peer-reviewed sources were included that apply to the DNP project questions. The search was exhaustive by using various search terms and phrase combinations that cover the practice-focused questions and the target population. Plans included methods to identify the integrity of evidence, including approaches to outliers, missing information, and statistical analysis procedures used in the doctoral project to address the practice-focused questions. Analysis and synthesis included identifying gaps that exist in the current literature and the strengths and weaknesses of existing literature. Established standards were applied to appraise study quality, to assemble all relevant sources, and to identify the basis of knowledge (Walden, 2017b). Clinical practice improvement

recommendations for patient mobility decisions came from the interpretation and synthesis of the evidence.

Resources needed to complete the doctoral project included time and the support of the writing center, library, and my DNP supervisory committee chair. Additionally, the use of the DNP capstone resources and the DNP project mentoring course provided the support needed to obtain data and resources needed to complete the DNP project. Planning for protected daily time for my DNP project facilitated the completion of my systematic review DNP scholarly project.

Significance

Nursing Practice

This DNP project holds significance to the field of critical care and nursing practice, as it may help establish and motivate the local site to adopt evidence-based measures for physiologic assessment to determine the mobility readiness of critically ill patients. This DNP project also addresses the problem of the lack of and use of consistent, evidence-based measures to assess and determine mobility readiness for critically ill patients that would support a nurse-driven mobility guideline or tool. In the project site, this issue has affected patient safety, patient outcomes, the patient's length of stay, and hospital costs. Nursing practice is universally affected. The project may help identify physiologic assessment measures that can guide clinical practice, nursing care, empower decisions based on evidence, improve patient outcomes, decrease the negative outcomes from immobility, and decrease unnecessary health care costs.

A review of published scholarly articles for this DNP project may help establish physiologic assessment measures for critically ill patients' mobilization. Also, the literature review may help establish physiologic assessment measures for mobilization of critically ill patients at the local practicum site. An example of an organization's attempts to address physiologic assessment includes a pilot in a surgical/trauma ICU using Stiller's safety mobilization guidelines for ICU clinicians and the Borg Rate of Perceived Exertion scale (Zomorodi et al., 2012). A multidisciplinary team developed a mobilization protocol comprised of activity events twice a day till discharge, documenting heart rate, blood pressure, and oxygen saturation at baseline, 5 minutes, and 15 minutes after mobility (Zomorodi et al., 2012). The flowchart and decision tree matched the outcomes assessed by physical therapy, and the pilot concluded the severity of illness affects mobility progression and participation contributed to patients' length of stay, healthcare cost, and ventilator-free days (Zomorodi et al. 2012). The pilot demonstrated there were significant physiologic changes associated with immobility and critical illness to consider when mobilizing critically ill patients (Zomorodi et al., 2012). The establishment of a guideline containing evidence-based measures for physiologic patient assessment for readiness for mobilization may allow nurses at the local site to make informed decisions and advocate for their patients. Additionally, a guideline may provide optimal patient care management that will improve patient outcomes and decrease the occurrence of complications from immobility and unsafe mobility activities. Accordingly, this may lead to decreased length of stay in the hospital and ICU and increased nursing autonomy,

as nurses may feel their assessments and interventions surrounding mobility are positively impacting patient care and outcomes.

Stakeholders

In the ICU, critically ill patients admitted conditions caused by immobility are disabling and limit mobility. Nurses provide care to these patients that include the management of mobilization to limit the effects of immobility and achieve optimum patient outcomes. The challenges of early progressive mobility of critically ill patients include the assessment of physiologic stability and readiness for mobility activities, of which there is a lack of a gold standard to guide clinical practice.

The results of this DNP project may affect multiple stakeholders by addressing the lack of evidence-based physiologic mobility assessment measures to determine mobility readiness and nurse-driven practice implementation of these measures. Stakeholders include nurses, physical therapists, occupational therapists, respiratory therapists, nursing assistants, nurse practitioners, physician assistants, and physicians who provide care to critically ill patients. Additional members of the healthcare team that may be affected include nurse educators, unit and professional governance council committees, the mobility wellness bundle committee, organization practice boards, and nursing and administrative management. Stakeholders also include the patient, their caregivers, and family. Including them in the experience of care and individualized plan of care development can improve care delivery as well as allow for collaboration with the healthcare team. The nursing staff may gain new insight, assessment skills, and practice knowledge in the management of patient mobility, activities associated with mobility,

and patient care. Patient impact includes decreased complications from immobility and deconditioning. The systematic literature review provided the local organization with the potential to improve patient outcomes, decrease costs and complications associated with immobility, and reduce critical care and hospital length of stay.

Contribution of the Doctoral Project

The project contributes to nursing practice by enhancing knowledge and skill and by providing effective physiologic assessment measures for mobility readiness of critically ill patients prior to, during, and after mobility. The outcomes of this review may also improve patient safety and outcomes, reducing ICU and hospital stay. The American Association of Colleges of Nursing (2006) indicates the essentials of the DNP are to design, implement, and evaluate therapeutic interventions based on nursing science (p.16). The systematic literature review of physiologic assessment measures for early mobility readiness and management of adult patients in critical care encompasses the DNP Essentials I, II, III, VI, VIII. It allowed me to analyze, collaborate with intraprofessional and interprofessional teams during the integration of evidence-based measures into practice. My DNP project synthesized the literature to provide recommendations. It can guide, mentor, and support nurses to achieve excellence in nursing during collaborations with the healthcare team about patient-specific mobility measures for optimum outcomes (AACN, 2006). Additionally, the cost-effectiveness of this practice initiative accounts for risk, safety, and improvement of health care outcomes, including the decreased cost associated with adverse outcomes from immobility and increased length of stay in the ICU and hospital (AACN, 2006).

Transferability

Evidence-based practice (EBP) is the integration of clinical expertise, patient values, and needs, and the best evidence into the decision-making process for patient care (White et al., 2016). The gap between recommended EBP and what is implemented can lead to poor outcomes; therefore, the ability to integrate evidence into practice is key in ensuring quality health care practice (White et al., 2016). EBP supports clinical decision making because it offers solutions to improve health care quality and provide cost-effective care (Tucker, 2017). Physiologic assessment measures for mobility readiness of adult patients in critical care may improve the safety and management of critically ill patients mobilizing in ICUs with similar practice problems. The findings of the systematic review can be shared with other critical care units locally within the health care organization and system, as well as locally within the state with other ICUs. The DNP project provides an evidence-based practice evaluation for knowledge transfer for nursing and other disciplines throughout all hospitals with ICUs in the state of the project site.

Social Change Implication

The DNP project can create positive social change within the project site by encouraging nurses to improve clinical practice through evidence-based practice education and implementation. Evidence-based practice based on current research improves patient outcomes and decreases health care costs. Adopting and supporting nurse-driven measures for physiologic assessment for mobility readiness can enhance nurse autonomy, as the measures identified empower nurses to collaborate with practical,

safe decision making in the mobilization of critically ill patients in the ICU. A systematic literature review can also improve the safety and patient outcomes at the local practicum site. The physiologic assessment measures may improve patient care and outcomes related to mobility at the site, and measures can be potentially used globally in the mobilization of critically ill patients in ICUs. Incorporating new evidence-based measures will facilitate change in the decision-making process surrounding the mobilization of critically ill patients in the ICU. Nurse-drive assessment measures for mobility management improve nurse autonomy and satisfaction, improve patient safety, decrease mechanical ventilation, and hospital and ICU length of stay (Corcoran et al., 2017). Accordingly, nurses can use assessment measures to determine mobility readiness guided by evidence.

Summary

Immobility and unsafe mobility practices can lead to poor outcomes in patient care practice. Effective physiologic assessment measures and management of mobilization is essential for improving ineffective mobilization practices in the ICU. Because of unsafe and poor patient outcomes that result from ineffective physiologic and mobility assessment measures for critically ill patients, there is a need for evidence-based guidelines to facilitate effective mobilization activities and decrease the incidence of immobility that facilitate the best results for patients. Also, evidence-based guidelines provides nurses with measures they can use when making clinical decisions in the care of critically ill patients to decrease the negative effects of immobility. Evidence suggests the use of a nurse-driven protocol to guide decisions with patient readiness criteria for

mobilization, the step-wise progression of mobility, and behavioral safety for out-of-bed progressive mobilization is effective leading to sustained improvement in patients' level of mobility (Klein et al., 2018). Also, a nurse-driven early progressive mobility protocol can sustain improvement in length of unit and hospital stay, depression, anxiety, and hostility levels (Klein et al., 2018). With a summary of the evidence-based physiologic assessment measures and methods to determine a critically ill patient's readiness for mobilization, intensive care nurses may possess the latest best practice measures. Evidence-based best practice knowledge on early mobility management may assist nurses in managing patient mobilization activities based on current evidence. Nurses may no longer rely just on personal judgment and experience when managing decisions surrounding mobilization activities of critically ill patients. The systematic literature review facilitates the use of evidence-based best practice measures in clinical practice surrounding critically ill patient physiologic assessment to determine mobilization readiness that improves patient safety.

Section 2: Background and Context

Introduction

Nursing care incorporating evidence-based practice will positively impact patients, outcomes, and social change. Evidence-based practice is an innovative approach to problem-solving in the care of patients, and the health care delivery system's complexity challenge nurses and other disciplines to identify and use evidence to guide practice (White et al., 2016). Management of critically ill patients' progressive mobility is a complex process affected by many variables. The practice problem at the practicum site was the current practice of mobility management comes from patient orders without the adoption of an evidence-based physiologic assessment guide to support collaboration between health care team members. Clinical practice may also vary based on the individual nurse and disciplines caring for the patient. Evidence on early progressive mobility demonstrated sustained improvement in patients' level of mobility, length of ICU and hospital stay, depression, anxiety, functional status, and survivability (Klein et al., 2018). However, mobilization therapy does not consistently address the physiologic readiness of a patient during the prescription of activity regimens (Eakin et al., 2015). Understanding the assessment of physiologic stability is needed to implement and sustain safe mobility in critically ill patients successfully.

This doctoral project included three focused practice questions:

1. What mobility patient interventions or assessments are initiated based on physiologic assessment measures in comparison to the normal routine for mobility assessment?

2. What is the effect of using physiologic assessment measures on determining patient readiness for safe mobility?
3. What is the effect of using physiologic assessment measures on the incidence and safety of patient mobility events?

In critically ill adults 18 years and older, does the intervention of physiologic assessment measures for mobilization provide safe and effective patient physiologic assessment measures for readiness for mobilization therapy? The intent of this DNP project, a systematic review of the literature, examined and summarized evidence-based practice measure guidelines that can improve the nursing practice and interdisciplinary collaboration of early progressive mobility of critically ill patients.

Concepts, Models, and Theories

The concept of EPB in nursing is the basis of this DNP project. EPB in this project includes the nurse applying knowledge to find a solution for a problem by critically analyzing and applying current evidence to achieve a better understanding of clinical decision making regarding critically ill patients' mobilization in the ICU (Terry, 2018). The practicum site does not currently have an evidence-based physiologic assessment measures guideline or protocol to determine critically ill patients' readiness for mobility, only an assessment for possible mobility level. Another concept included in the systematic review is practice-based evidence, the knowledge generated from practice as well as from research, which includes the importance of the environment in determining practice recommendations (McEwen & Wills, 2014).

The JHNEBP model was the developmental framework for this systematic literature review. The JHNEBP model is an effective problem-solving approach to clinical decision-making using healthcare evidence in a systematic literature review (Dang & Dearholt, 2017). Accordingly, the generation of research evidence that is feasible, appropriate, and meaningful to specific populations helps identify and address a patient's health care needs (Dang & Dearholt, 2017). The model also ensures research findings and best practices in evidence-informed care, including clinical assessment measures, guidelines, protocols, or tools, which are solutions for translating research into practice (Dang & Dearholt, 2017). The model incorporates the use of available evidence as a core component within the domains of professional nursing: nursing practice, education, and research (Gawlinski & Rutledge, 2008). It is an appropriate model for understanding the different forms of knowledge, and the guidelines for the model reflect the "PET" process: practice question, evidence, and translation (Gawlinski & Rutledge, 2008). Evidence comes from the search and review of literature, literature is rated, and recommendations for changes in processes of care are identified (Gawlinski & Rutledge, 2008). The JHNEBP model is in congruence with holistic nursing care delivery and balances scientific and humanistic characteristics of health and its importance (Dang & Dearholt, 2017). JHNEBP model goals include but are not limited to the use of evidence to promote optimal outcomes, support rational decisions that reduce inappropriate deviation, create a culture of critical thinking, and grow an environment where the evidence supports clinical and administrative decisions (White et al., 2016). JHNEBP model was developed by nurses to support EBP integration.

My DNP project included transitions theory, a middle range and situation-specific theory. Meleis developed the theory encompassing the transition experience (Im, 2014). The theory's purpose is to describe, explain, and predict an individual's experiences in various types of transition (Im, 2014). The theory assumes all nursing phenomena involve a type of transition (Im, 2014). Transitions theory includes understanding the nature of and responses to change, facilitating the experience and responding to its different phases, and prompting dynamic balance in health before, during, and at the end of a change event (Im, 2014). Transitions theory assumes nursing should play a central role in facilitating smooth and successful transitions for those experiencing change (Im, 2014). Transitions Theory includes the intervention made to facilitate transitions and promote health and mastery of health-illness consequences (Im, 2014). Transitions Theory also includes understanding the transition experience and that transitions may exacerbate responses impacting health (Im, 2014).

Theory can guide and link practice to evidence. The theory knowledge gap exists when the body of knowledge is unknown, accessible, or used as it should be in practice (McEwen & Wills, 2014). Nursing practice can validate the theory, and the theory can be a guide for making informed decisions that are grounded by practice (McEwen & Wills, 2014). In today's challenging health care environments, nurses must continually seek to evaluate, inform, and improve their practice by the integration of appropriate best evidence (White et al., 2016). Evidence-based practice includes the integration of the best evidence, clinical expertise, and patient preferences for clinical decision making (White et al., 2016). The goal of this DNP project was to reduce clinical practice variation or

lack of physiologic assessment for evaluation of mobilization readiness of critically ill patients.

Related Synthesis

The evidence-based model facilitates the application of evidence into clinical practice and achieving best practice (Melnyk & Fineout-Overholt, 2015). The model applications include clinical practice, quality improvement, and education aspects of nursing, and the model's goal is to ensure the latest evidence and best practices quickly and appropriately integrate into care (Melnyk & Fineout-Overholt, 2015). Assessing the need for change or identifying a clinical practice gap includes an evaluation of the existing evidence, synthesis, and integration of evidence into practice (Melnyk, Fineout-Overholt, 2015). The JHNEBP model was used to implement a daily ambulation checklist for specified mobilization and venous thromboembolism (VTE) orders for high to moderate risk patients (Anthony et al., 2017). Patients who experience less mobilization and prolonged immobility experience less optimal outcomes (Anthony, Bernard, & Butler, 2017). Surgery patients are at risk for VTE, and patients tend to limit mobilization due to pain that may predispose them to venous stasis (Anthony et al., 2017).

Transitions theory outcomes and potential for nursing therapeutics include the patterns of response of the patient, which is fundamental to nursing (McEwen & Wills, 2014). Nursing therapeutics encompasses the assessment of readiness, preparation for the transition, and role supplementation, the use of education and practice to facilitate health-illness concerns (McEwen & Wills, 2014). The concept of situation-specific transition

theory on the transition to adult day health services, included the development of inhibitors that included a mismatch between the elder's functional ability and interests and the activities available impacting mobility goals (Im, 2014). Additionally, the situation-specific transitions theory was used as a framework to guide interventions including mobility for people with heart failure and determine the effect of heart failure education on knowledge and readmission (Im, 2014). The situation-specific, transitions theory was appropriate for this systematic review of physiologic assessment measures for mobility readiness of adult patients in critical care.

Clarification of Terms

The following terms provide clarity to this DNP project:

Mobilization: An interdisciplinary, goal-directed therapy used to facilitate movement and improve outcomes that expends energy and includes physical and psychological domains as well as various activities (Amidei, 2012-b).

Movement: A type of activity that is a functional pattern that allows individuals to control their environment (Amidei, 2012-b). The capacity for movement is composed of purposefulness, awareness of self, and continuity (Amidei, 2012-b).

Physiologic stability: A dynamic state, including the variability of physiological parameters and their ability to regulate maintaining balance after exposure to a disruptive element (Lebel, Alderson, & Aita, 2014).

Evidence-based nursing: A term that is used interchangeably with evidence-based practice (White, Dudley-Brown, & Terhaar, 2016).

Evidence-based practice (EBP): "A paradigm and lifelong problem-solving approach that involves the conscientious use of the best available evidence, with clinical expertise and patient values and preferences to improve patient outcomes" (Melnyk & Fineout-Overholt, 2015, p. 604).

Relevance to Nursing Practice

History of the Broader Problem in Nursing Practice

Evidence-based practice is fundamental to decision-making in clinical practice. Organizations developing and supporting initiatives to promote the advancement of evidence-based practice include Sigma Theta Tau International, the American Association of Critical-Care Nurses, the Institute of Medicine, and the Magnet Recognition Program of the American Nurses Credentialing Center. Because of the gap between new knowledge and implementation of that knowledge to improve patient care the American Association of Critical-Care Nurses provides resources for clinicians including practice alerts and a hierarchal rating system for levels of evidence for nurses to determine the strength of research studies, assess findings, and evaluate the evidence for integration into best practice (Peterson et al., 2014). By the year 2020, 90% of clinical decisions will come from accurate, timely, and up-to-date clinical information reflecting the best available evidence (Institute of Medicine, 2009).

A systematic literature review of physiologic assessment measures for mobility readiness of adult patients in critical care may change nurse-driven mobilization practices locally, which could lead to a state-level change. Integrating the current science and best evidence on physiologic assessment measures can reduce the unpredictable outcomes of

mobilization practices related to physiologic stability, patient functional capacity, and patient safety (Adler & Malone, 2012). Acquiring evidence-based physiologic assessment measures to determine mobility readiness for critically ill adult patients can facilitate safe clinical decisions around patient mobility level, readiness, and frequency. Evidence-based practice is an essential nursing competency (IOM, 2010). Integrating evidence-based practice continues to be the challenge.

The Society of Critical Care Medicine published the ABCDEF, Bundle E, addressing the physical effects of immobility critically ill patients face and strategies for implementation of early mobility programs in any ICU (SCCM, n.d.). Bundle E provides tools for comprehensive management of critically ill patients' mobility, including a mobility pathway with exclusion criteria for physiologically unstable patient types (SCCM, n.d.). However, physiologic assessment measures are not present in the pathway for patient mobility. Evidence identifies a lack of expert consensus and recommendations on physiologic safety criteria for active mobilization (Hodgson et al., 2014). Evidence-based physiologic assessment measures are overlooked by health care staff when making mobility decisions.

Currently, the process to determine readiness for mobilization of critically ill patients is specific to the organization, provider practice, physical therapist, or nurse. Standardized evaluation of a patient's mobility throughout hospitalization is necessary to determine progression or regression and to ensure avoidance of further physical debilitation (Anderson, Sparbel, Barr, Doerschug, & Corbridge, 2018). Using an evidence-based protocol coupled with up-front staff education leads to staff

empowerment, a sense of security, confidence, and ownership of the practice which sustains adherence to and practice of the program (Anderson et al., 2018). At the University of Michigan, a standardized mobility protocol incorporated safe patient handling and mobility pre-assessment guidelines, mobility standards, equipment guidelines, and documentation tools to get patients moving (Dickinson, Taylor, & Anton, 2018). The protocol adjusted for all patient populations by modifying the inclusion and exclusion criteria, and the activities are grounded in evidence to prevent complications, promote mobilization, and prevent patient and staff harm (Dickerson et al., 2018). A multidisciplinary team developed and implemented a mobility order set with an embedded algorithm to guide the nursing assessment of mobility potential in ICU and Intermediate Care settings at a large community hospital (Drolet et al., 2013). The protocol assessments empowered the nurse to consult physical therapy or occupational therapy for patient mobilization (Drolet et al., 2013). The nurse-driven assessments resulted in an increased rate of patient ambulation in the first 72 hours of a hospital stay (Drolet et al., 2013). Many studies recommended further studies of nurse-drive mobilization management of critically ill patients

Current Nursing Practice for Mobilization of Critically Ill Patients

The current state of nursing practice and assessment measures for readiness for mobilization includes a provider request or order and the nurse's or respiratory therapist's clinical experience and observation of patient's during activity. There is inconsistent evidence to guide the ICU staff with clinical problems related to the patient's functional capacity, tolerance, and dynamic stability. There is a need for nursing practice

improvement in physiologic assessment measures to guide safe patient mobility practice, which could guide nurses in the multidisciplinary collaborative decision-making process involved in patient mobility management and associated patient care. Physiologic stability and functional capacity should be incorporated in the decision to mobilize a patient and in determining the appropriate mobility level (Amidei, 2012; Eakin et al., 2015). Determining the progression of mobility and factors influencing the ability to mobilize affect the safe, functional recovery of adults (Winkleman et al., 2012). Cultures that support patient mobility continue to have variations in assessment, intensity, and frequency of patient mobility (Corcoran et al., 2017). The recommendation is an early mobility bundle containing physiologic assessment measures for mobility on every patient every day to lessen immobility complications and decrease variability in care (SCCM, n.d.). Implementing physiologic assessment measures that incorporate evidence-based practice is an effective approach in helping nurses and other professions with decision-making on mobility readiness and level (SCCM, n.d.). Management of mobility is complex and requires a consistent approach to application and timing to maximize mobility benefits in a patient's recovery.

Previous Strategies

Evidence shows critically ill patients are at risk for muscle weakness that often results from the treatment the health care team is implementing to save a patient's life and the associated immobility. Immobility frequently results in reduced venous blood flow in the pockets of venous valves, promoting inflammation and hypercoagulability and risk for venous thrombosis (Engers et al., 2014). Mobility measures are

fundamentally important areas of critical care practice, and the adult clinical practice guidelines from the Society of Critical Care Medicine, Bundle E, addresses early mobility and exercise (SCCM, n.d.). The Bundle E element identifies strategies for successful implementation of early mobility and prevention of physical deficits associated with immobility (SCCM, n.d.). There are a variety of approaches used to avoid patient immobility and muscle weakness based on physician preference, the resources available, and the assessment of providers, nursing staff, and physical therapy. Guidelines for mobility and assessment are beneficial in critically ill adult patient care delivery and outcomes.

ICU patients lose approximately 2% of muscle mass every 24 hours (Doherty & Steen, 2010). As a result, the patient experiences a significant reduction in skeletal muscle force, indicating the assessment of physiologic and functional capacity is an important step before mobilizing (Doherty & Steen, 2010). Determining the optimal timing and progression of mobility and factors influencing the ability to mobilize affect the safe, functional recovery of critically ill adults (Winkleman et al., 2012). Early mobilization restores function, and passive movement is appropriate when a patient's physiologic assessment identifies limitations to active involvement in mobility (Stockley, Morrison, Rooney, & Hughes, 2012). Functional and physiologic capacity mobility assessments vary and include the use of exclusion criteria, family reports of previous mobility levels, and the use of a variety of balance and strength assessments to determine a patient's readiness for mobilization (McWilliams et al., 2015). Despite evidence supporting early mobility benefits to the patient's recovery, timing, frequency,

and application of mobility vary, affecting a patient's recovery. A nurse-driven guideline or protocol that facilitates comprehensive physiologic assessment to determine mobility readiness is needed to address the gap in determining patient readiness and safety.

Local Background and Context

Summary of Local Evidence

The practicum site for this project serves as a large academic teaching facility in an urban area on the west coast. It consists of multiple critical care units on two campuses. Due to the varied opportunities for experiences in critical care, educational advancement, and translation of evidence into practice nursing and health care staff from the United States and other countries seek opportunities to be part of the health care team. Despite evidence-based practice and utilization of the latest evidence available to provide patient care quality, consistent, evidence-based patient mobility practice, including physiologic readiness assessment, remains an issue, and needs improvement. An identified need is a consistent nurse-driven physiologic assessment to determine patients' readiness for mobility and mobility management. There is also a pressing need to adapt nurse-driven physiologic assessment guidelines to determine mobility readiness and management to support patient safety and the use of the latest available best practices while enhancing nursing practice.

Institution Context

The practicum site provides health care services to adult, pediatric, and neonates with acute and chronic conditions. The vision of the practicum site is to be the number one health care provider on the west coast, providing quality evidence-based, innovative

care to patients, families, and the community. The practicum site believes in patient advocacy, and evidence-based care focused on quality outcomes and patient and staff safety. The unit for this DNP project's intent is a 24-bed adult critical care unit. Safe early mobility is essential for 100% of the critically ill adult patients admitted to the unit to help facilitate the management of their underlying condition and minimize muscle weakness and promote quality outcomes.

State/Federal Context

The Evidence-based Practice Center Programs of the Agency for Healthcare Research and Quality explore clinical issues focus on improving healthcare quality, safety, efficiency, and effectiveness by synthesizing evidence and facilitating the translation of evidence-based research findings (AHRQ, 2020). In 2019 two programs exist on the west coast near my practicum site. Information from AHRQ's research is available to support informed healthcare decisions, improve the quality of healthcare services, and to provide technical assistance to facilitate quality improvement tools (AHRQ, 2020). Each state's nurse practice act helps ensure the safe delivery of nursing care. The safety and delivery of nursing care will improve by complying with the State Board of Nursing Practice Act and using evidence-based practice.

Role of the DNP Student

Student Professional Context

I practice as an advanced practice nurse and nursing leader in an adult critical care unit at a large academic teaching facility. My role includes but is not limited to assessing, mentoring, collaborating, and providing leadership to promote the delivery of

quality care to adult critical care patients. My role provides me with the opportunity to promote the physiologic assessment of patients to determine mobility readiness that promotes the health and wellbeing of patients and improved patient outcomes while supporting safe patient mobility. Promoting evidence-based practice and change to improve quality patient care is a key role of a leader and an advanced practice nurse (AACN, 2006). The project took place at a large academic teaching facility on the west coast. The population served at this site includes critically ill adult patients with various diseases requiring care in an intensive care unit, conditions related to medical complications and surgery. The practicum site and DNP project have no relationship to my employment.

Student's Role in the Doctoral Project

My goal and focus during this DNP project were to investigate the current best practices in literature for early mobility readiness assessments to facilitate the safe mobility of critically ill patients. Additionally, what are the best evidence-based practices available for the practicum's site use that may improve mobility readiness assessment, nursing confidence in collaboration with healthcare team on mobility management, and safe mobility practices. Based on the evidence and information reviewed, the summary of the evidence and recommendations may help enhance and improve nursing patient mobility practice and assessment at the practicum site. Collaboration and stakeholder buy-in are goals of this DNP project as well as facilitating change that will improve patient care quality concerning patient mobility outcomes.

Student Motivation

As a leader and advanced practice nurse, I seek to used advanced communication skills and collaboration to foster evidence-based practice change, which improves patient care quality and also mentors and inspires others to be change agents valuing best practice improvements. As both a clinical nurse specialist and leader, my role includes utilizing evidence-based practice managing the care of complex and vulnerable populations while educating and supporting interprofessional staff. My passion for physiologic assessment needs to determine a patient's early mobility comes from a need expressed by my peers, colleagues, and my practice for a standard that maintains patient safety during mobility management. This need instilled a desire to seek what current evidence is known about the problem to help identify best practices for mobility management for adult critically ill populations.

Potential Biases

Melnyk and Fineout-Overholt (2015) indicate bias is possible at any point during a study, and positive results are more likely to be published than studies with negative or inconclusive results. Bias prevents objective consideration reinforcing the need to be aware of possible sources of bias. Potential bias for this DNP project is for this student to note and consider stakeholder opinions and values about early mobility management.

Summary

Nurses care for patients with competence and diligence to provide excellent care advocacy for patients. An evidence-based practice model facilitated the literature review of physiologic assessment measures to determine patient mobility readiness and safe

early patient mobility management. The DNP project may result in the adoption of a nurse-driven guideline for nurses to guide their assessment and practice around early patient mobility. The following section will discuss and include the of evidence used to guide the synthesis of the systematic literature review. The analysis and synthesis of evidence for this DNP project will also be addressed in this section.

Section 3: Collection and Analysis of Evidence

Introduction

Early mobility management in the critically ill adult population is challenging because multiple assessments and methods determine the severity of illness, care requirements, and the efficacy of mobility treatments. The objective of this DNP project was to investigate and synthesize evidence that can be used as a recommendation to adopt a standardized mobility readiness assessment as part of early mobility management in the ICU. During this project, I reviewed and identified evidence-based physiologic assessments and approaches for early mobility management of critically ill adults and the nurse's role with regards to mobility management. The nursing staff at the site were often overwhelmed when making decisions about whether patients are ready for mobility or if they can be safely participating in the activity. Patients and families depend on nurses to provide evidence-based care focused on quality outcomes healing one patient at a time. This DNP project assists nurses in providing the safest care to patients surrounding early mobility while collaborating with the healthcare team. In this section, I provided the sources of evidence and an overview of the methodology used in evidence searches, such as the process of selecting and exclusion criteria, as well as analysis and synthesis of the system used to organize and record the evidence obtained.

Practice-Focused Questions

The current practice of mobility management at the practice site comes from patient orders without the adoption of an evidence-based physiologic assessment to guide to patient mobility management. Patients may be negatively affected by the lack of

evidence-based mobility readiness measures. The practice-focused questions for this doctoral project include:

1. What mobility patient interventions or assessments are initiated based on physiologic assessment measures in comparison to the normal routine for mobility assessment?
2. What is the effect of using physiologic assessment measures on determining patient readiness for safe mobility?
3. What is the effect of using physiologic assessment measures on the incidence and safety of patient mobility events?

Population: Critically ill Adults 18 years and older

Intervention: Systematic review of the literature for Physiologic Assessment Measures for Mobilization Readiness

Comparison: The normal routine for Mobility Assessment

Outcome: In critically ill adults 18 years and older, does the intervention of physiologic assessment measures for mobilization provide safe and effective patient physiologic assessment measures for readiness for mobilization therapy?

The project is significant to practice, as it is expected to reduce the variation in physiologic assessment measures to determine early mobility readiness and management for nursing and the health care teams' practice with recommendations provided from the systematic literature review.

Clarifying the Purpose

The purpose of this doctoral project was to evaluate and synthesize EBP on physiologic assessment measures to determine early mobility readiness and management best practice to make recommendations for adoption of a nurse-driven early mobility management guideline in adult critical care. The approach aligned with the practice-focused questions, as the evidence that was collected provided information that supports a recommendation for EPB guidelines in the clinical nursing practice for physiologic assessment measures to determine mobility readiness and management in the critical care unit. The evidence-based data can provide a standard, already validated measures for a nurse-driven early mobility physiologic assessment to determine mobility readiness and management. As a result, this review can be implemented and used as the best practice in early mobility management.

Sources of Evidence

The purpose of this DNP project included evaluating and synthesizing the best available evidence relevant to nurse assessment for physiologic readiness for patient early mobility and mobility management for recommendations to improve the existing nursing and health care team practice surrounding the care of critically ill adult patients. The source of evidence used to address the practice-focused questions was current literature. A review of the literature indicated that physiologic assessment to determine early mobility readiness and management is a worldwide challenge in healthcare. The systematic review of literature included textbooks, both primary and secondary sources of peer-reviewed journal articles and published guidelines from CINHAL, PubMed,

Cochrane Library, Joanna Briggs Institute, and Medline. I used Walden Library and Google scholar to identify resources in these databases. Available evidence addressing the context of the systematic review includes the ICU Liberation, ABCDEF bundle E on early mobility and exercise. Bundle E focuses on the physical deficits that ICU survivors face and strategies for implementation of early mobility programs in any ICU (SCCM, n.d.). Resources and reports from clinical specialty organizations, such as the American Association of Critical Care Nurses, the Society of Critical Medicine, the Agency for Healthcare Research and Quality, and the Institute for Healthcare Improvement, were also reviewed for relevant information. Nurses, physical therapists, respiratory therapists, and providers provided additional resource information. The evidence included qualitative, quantitative, and mixed methods studies.

Relationship of Evidence to the Purpose

The purpose of this DNP project was to evaluate and synthesize the best available evidence to recommend a nurse-drive mobility guideline and assessment. The evidence gathered from the literature provided the information needed to guide the recommendation of the assessment and guideline. Multiple strategies assess mobility readiness and help manage the early mobility of critically ill adults. An essential literature search was exhausted to seek validation for the best practice concerning early mobility readiness assessment measures and management.

Evidence to Address the Practice-Focused Questions

The collection and analysis of evidence facilitates the approach to decision-making in evidence-based nursing practice. The articles selected came from a strategy

search. Keywords included early mobility, early ambulation, early mobilization, early rehabilitation, assessment tools, assessment methods, assessing, guidelines, protocols, practice guidelines, bundle, physiologic assessment, nurse-drive early mobility management, ICU patient activity, hemodynamic stability, and evidence-based guidelines for early mobility in critical care, early mobility patient interventions and assessments, the effects of physiologic assessment measures on early patient mobility, and physiologic assessment measures supporting safe patient mobility. Synthesizing all evidence gathered will be crucial to obtaining information needed to answer the practice-focused questions. The search procedure resulted in a total of 37 articles used for this systematic review. The search procedure began by using CINAHL, and the search keyword used was early mobility or early ambulation or early mobilization or early rehabilitation.

Databases and Search Engines

The Peer-reviewed articles were accessed from on-line databases, such as CINAHL, Google Scholar, Walden Library, Joanna Briggs Institute, Medline, Cochrane Database, and PubMed. Also, official websites such as the Society of Critical Care Medicine, the American Association of Critical Care Nurses, the Agency for Healthcare Research and Quality, and the Institute for Healthcare Improvement were assessed for additional resources and evidence.

Key Search Terms and Combinations of Search Terms

Additional search terms included keywords such as critically ill patients' mobility and activity, hemodynamic stability mobility assessment, ICU Liberation, ICU patient

mobility management, nurse-driven mobility bundles or guidelines in ICU, physiologic stability assessment measures before mobility in ICU, safe patient mobility in ICU, evidence-based guidelines for early mobility in ICU, and early mobility in adult ICUs.

The Scope of this Review

Gathering relevant sources of information from the literature search relating to critically ill adult patients' physiologic stability assessment measures and early mobility management provide evidence for the recommendation for nurse-driven evidence-based guideline. The searches considered peer-reviewed primary sources from 2010-2021 for inclusion in the systematic review. Article selection criteria included if the author(s) addressed early mobility management and assessment for mobility. Also, the selection considered articles relevant to the management of critically ill adult patients' safe early mobility. Articles were excluded if the articles were not relevant to early mobility management, articles were not full-text articles, they were published before 2010, and if they were not relevant to physiologic assessment measures or criteria to determine safe early mobility.

Search Exhaustive and Comprehensive

The search was exhaustive, using various search terms and phrase combinations that cover the practice-focused question and the target population. A review of abstracts and articles' reference lists occurred to ensure the search was exhaustive. The articles selected were read in full to determine inclusion and exclusion based on the selection criteria.

Institutional Review Board

The project is a systematic literature review, and the protection of human rights is not an issue. An application for approval of the institutional review board from Walden University was obtained to ensure that all rights are protected, 01-29-21-0758434.

Analysis and Synthesis

Systems used for Recording, Tracking, Organizing, and Analyzing the Evidence

Evidence was manually organized and documented in a Microsoft Word matrix table. Table columns for each article include year published, author(s), title, purpose, sample, design, and conclusions (see Appendix A). The project's data organization utilized the levels of evidence Melnyk hierarchy pyramid (Melnyk & Fineout-Overholt, 2011; see Appendix B for illustration). The search procedure began by using CINAH and Medline, and the initial search keyword used was early mobility or early ambulation or early mobilization or early rehabilitation. The initial search resulted in a total of 3599 articles, narrowed down to 614 full text articles, narrowed down to 150 references available, and further narrowed to 129 articles for publication years from 2010-2020. Review of the 129 articles for relevance to the project's practice questions, and inclusion criteria resulted in 37 relevant articles. A PRISMA flowchart diagram will show an illustration of the article's selection procedure (see Appendix C).

Analysis Procedure

The analysis procedure used in this DNP project resulted in the evidence obtained and will be categorized based on the strength of the evidence. The strongest available evidence was selected to recommend a nurse-driven early mobility management

guideline. Data analysis will support the recommendation of a nurse-driven early mobility management guideline, including physiologic assessment measures to determine early mobility readiness. The JHEBP evidence level and quality guide was used to grade the strength of reviewed evidence (Dang, et al., 2022).

Summary

A review of the current body of evidence on physiologic assessment and stability in the mobilization of critically ill patients will answer how research and quality improvement studies on mobilization in critical care address physiologic stability in decisions to mobilize patients and if there is a consistent, safe best practice. The goal of this DNP project is to provide recommendations that can assist in addressing the lack of nurse-driven early mobility management guidelines and physiologic assessment to determine safe early mobility readiness of critically ill adult patients. Patient outcomes and nursing practice in critical care units advanced by the evidence identified in this systematic literature review. The DNP project addressing physiologic assessment measures to determine early mobility readiness of critically ill adults and nurse-driven safe patient early mobility management can improve safety in the healthcare organization once implemented. The next section will include findings and recommendations from the systematic literature review and their implications for the practice-focused questions.

Section 4: Findings and Recommendations

Introduction

Nurses play a vital role in assessment and management of early mobility of patients in the ICU. Early mobility management can be affected by multiple variables including the experience level of the healthcare staff, assessment measures used to assess mobility readiness, the level of nursing skills, as well as the patient's physiologic and hemodynamic response and status. The importance of EBP to the care nurse provide includes improving the delivery of nursing care and patient outcomes. The gap between implemented EBP and what occurs in practice can lead to poor outcomes; therefore, the ability to integrate evidence into practice is key in ensuring quality health care practice (White et al., 2016).

EBP supports clinical decision making because it offers solutions to improve health care quality and provide cost-effective care (Tucker, 2017). The absence of evidence-based safe mobility guidelines and mobility readiness assessments affects patient care decisions and outcomes. Guidelines have the potential to facilitate patient care decisions, but due to inconsistent adoption in clinical practice guidelines have limited affect and present a health system challenge (Kastner et al., 2011). Fundamental to the practicum site to facilitate quality outcomes is evidence-based nursing practice aligned with the latest research. Evidence-based guidelines also provide a variety of structures that help ensure safe effective nursing care delivery. Evidence-based nursing practice enhances knowledge sharing and collaboration across disciplines in solving complex patient problems and decisions. Providing a summary of current research and

quality improvement on physiologic assessment guides nursing practice and other disciplines in addressing the gap in clinical practice of critically ill patients' readiness for mobilization. A gap in nursing practice exists when an evidence-based readiness assessment and practice guideline to support nursing practice in the management of early mobility is not available. The purpose of this project was to examine and summarize the benefits of evidence-based tools for physiologic assessment and stability in the mobilization of critically ill patients. Synthesis of evidence relevant to physiologic assessment to determine mobility readiness and nurse-driven early mobility management was completed to a improve the existing nursing practice of early mobility management in the practicum site ICU.

The practice focused questions used to facilitate this DNP project included:

1. What mobility patient interventions or assessments are initiated based on physiologic assessment measures in comparison to the normal routine for mobility assessment?
2. What is the effect of using physiologic assessment measures on determining patient readiness for safe mobility?
3. What is the effect of using physiologic assessment measures on the incidence and safety of patient mobility events?

Primary and secondary sources such as peer-reviewed evidence was used to support this systematic literature review. Primary and secondary sources of peer-reviewed journal articles and published guidelines were retrieved from Medline, PubMed, CNHAL, Cochrane Library, and Joanna Briggs Institute. Available evidence used for the content of

the systematic review included the ICU Liberation, ABCDEF bundle E on early mobility and exercise. Official websites of the Society of Critical Care Medicine, the American Association of Critical Care Nurses, the Agency for Healthcare Research and Quality, and the Institute for Healthcare Improvement were accessed for additional resources and evidence. The systematic review also included textbooks. Articles meeting the inclusion criteria were used in the review.

The key word search terms used were *early mobility, early ambulation, early mobilization, early rehabilitation, assessment tools, assessment methods, assessing, guidelines, protocols, practice guidelines, bundle, physiologic assessment, nurse-driven early mobility management, ICU patient activity, hemodynamic stability, and evidence-based guidelines for early mobility in critical care, early mobility patient interventions and assessments, the effects of physiologic assessment measures on early mobility,* and *physiologic assessment measures supporting safe patient mobility*. Other key words included in the search included *critically ill patients' mobility and activity, hemodynamic stability mobility assessment, ICU Liberation, ICU patient mobility management, nurse-driven mobility bundles or guidelines in the ICU, physiologic stability assessment measures before mobility in the ICU,* and *early mobility in adult ICUs*.

Findings and Implications

The literature resulted in a total 3599 articles; 2985 were excluded due to lack of full text; however, abstracts were reviewed for relevant information. From the screening process, 464 articles were removed for lack of available references. The eligibility involving the recent timeframe yielded 150 articles, which were further narrowed to a

publication timeframe 2010 to 2021. The analysis resulted in (N = 37) articles meeting criteria for the review selection procedure (see Appendix C). The inclusion criteria for this systematic literature review included full-text articles addressing physiologic assessment measures for mobility and articles relevant to early mobility guidelines and protocols and barriers. Walden Library was contacted to explore access for full-text data.

Systematic Reviews were included in this literature review. Adler and Malone (2012) conducted a systematic review of 15 studies on early mobilization in the ICU using Sackett's Levels of Evidence to rate the strength of the research of which one study was Level 1 evidence, four were Level 2, one was Level 3, and nine were Level 4. The studies included prospective and retrospective design of which included randomization. The systematic review identified six criteria summarized from the literature for terminating a PT/OT mobilization session. Termination criteria included parameters concerning heart rate, pulse oximetry, blood pressure, respiratory rate, mechanical ventilation, and alertness/agitation and patient symptoms (Adler & Malone, 2012). Alaparthi et al. (2020) reviewed 56 studies in order to summarize the different aspects of mobilization in the ICU of patients with or without mechanical ventilation. The review identified safety measures including criteria for respiratory, cardiovascular, neurological considerations, and others for early mobilization in the ICU. Other considerations were identified as no unstable fractures or bony instability, not on continuous dialysis, no deep vein thrombosis, body temperature <38.5, and no active bleeding (Alaparthi et al., 2020). Alaparthis et al. (2020) also complied from studies red and green signals for active mobilization of mechanically ventilated patients identifying which were for were for

exercises in bed and which were for exercise out of bed. Hodgson et al. (2014) reviews analyzed safety criteria for active mobilization of mechanically ventilated critically ill adults resulting in expert consensus using a red, yellow, green coding system to operationalize adverse event risk. Red indicated significant risk during mobilization, yellow indicated mobilization after measuring risk versus benefit, and green mobilization could be performed with a low risk (Hodgson et al., 2014). The review also summarizes strategies for overcoming barriers including hemodynamic instability as a barrier with strategy being a stepwise approach (Alaparthis et al., 2020). Costa et al. (2017) reviewed 49 studies after analysis identified four barriers to ABCDE implementation for adult patients in the ICU: patient related (instability and safety concerns), clinician-related (lack of knowledge and staff safety concerns), protocol-related (unclear and cumbersome protocols), and ICU contextual barriers (interprofessional team coordination). Patient instability and safety concerns included hemodynamics, treatment-related adverse events, and physiologic patient issues (Costa et al., 2017). Patient safety issues considered issues as diarrhea, fatigue, leaking wound, patient weight or size, confusion, agitation, and imminent death (Costa et al., 2017). Costa et al. (2017) identified use of the domains as a potential differential diagnosis for implementation of the ABCDE bundle. Dubb et al. (2016) synthesized data from 40 studies to identify barriers to early mobilization and strategies to overcome barriers. The most common patient related barrier was hemodynamic instability identified in 20 (50%) studies then vascular access devices, tubes, and drains in 18 (45%) studies (Dubb et al., 2016). Strategies to address patient related barriers for early mobilization included defining inclusion and exclusion criteria

for mobility, development and implementation of protocols, and interdisciplinary collaboration (Dubb et al., 2016). Parry et al. (2017) analysis of 89 papers identified five major themes patient physical and psychological ability to perform physical activity, safety influences hemodynamic and respiratory physiologic stability culture and team influences, motivation and beliefs about physical activity from patients, family, and health care providers, and environmental influences (Parry et al., 2017). Development of physiological stability guidelines for rehabilitation helped enable patient safety and mobility (Parry et al., 2017). Reviews recommended protocols and a structured approach or assessment to physiologic barriers to mobility using inclusion and exclusion criteria based on patient assessment.

The remaining studies address the benefits of early mobility on patient outcomes and patient mobility readiness measures. A non-randomized experimental pilot using a mobility readiness protocol had eleven patients who passed and thirty-five patients who failed the protocol for hemodynamic parameters including twenty-four with heart rate above 120 beats per minute, seventeen with PEEP above 10cm H2O, and seventeen with a PAO2 to FIO2 ratio smaller than 250 mmHg (Comradie et al., 2017). The readiness protocol was found to be too strict when used to identify patients who could tolerate an upright position using mean arterial pressure and oxygen consumption via venous oxygen saturation (Comradie et al., 2017). Cooper et al. (2021) study of 105 patients in a medical intensive care out of 191 orally intubated were eligible for out of bed activities using criteria based on hemodynamic stability found mobility practice still nonexistent. All mobility readiness criteria must be met prior to out of bed activities including RASS

score, mean arterial pressure, FIO2, Spo2, systolic blood pressure, no titration of inotropic medications, and PEEP (Cooper et al., 2021). Colwell et al. (2018) used a severity of illness scale from one to four to determine mobility readiness, achieved mobilization in more than 50% of the patients, and mobility complications included transient desaturation, tachypnea, and emesis. Staff reported the most significant mobility implementation barrier was the perception of physiologic instability and the additional staff need for mobility activities (Colwell et al., 2018). Drolet et al. (2013) study included eall patients were screened for mobility readiness and exclusion criteria to determine mobility readiness was incorporated on order sets with defined criteria to prevent patient desaturation and excessive work of breathing.

Safe patient handling is elemental to many study guidelines and protocol when determining readiness and activities. Dickinson et al. (2018) study of integrating a mobility program and safe patient handling included patients being evaluated for inclusion in the mobility protocol and exclusion criteria are used to determine the need to withhold mobility. Mobility program assessment questions guide staff on mobility phase and safe patient handling equipment use (Dickinson et al., 2018). Eakin et al. (2015) described overcoming safety and mobility barriers including hemodynamic instability, rising vasopressor requirements, accidental removal of an endotracheal tube, and line loss using a model that includes engaging, educating, executing, and evaluating. Engel et al. (2013) from a retrospective analysis of data indicated mobility and treatment starts by identifying if there are exclusion criteria present and if yes assess ability to tolerate and participate in mobility activities and if no assessment criteria determine mobility level.

Hickmann e al. (2016) an observational study on mechanically ventilated patients and non-mechanically ventilated used a mobility protocol with levels zero to four taking into account RASS, Glascow, and muscular strength and mobility provided at least once in 81% of all patients within 24 hours of ICU admission. Limiting factors for the study included instability for 709 patients during bed to chair mobilization with severe physiological in 42, hemodynamic in 21, respiratory in 5 and neurological in 16 (Hickmann et al., 2016). Hodgson et al. (2014) a prospective observational study on an ICU mobility scale from existing studies and the John Hopkins scale adding more levels of mobilization and the levels of assistance required found the maximum level of mobility not achieved by the cohort and measures to determine stability and readiness were no included. John Hopkins Early Mobility Toolkit Your Work Plan for Translating Evidence into Practice (2020) includes a medical screening algorithm to evaluate patients for mobility beginning with the ability to open eyes to verbal stimulation and assessment for mobility to occur within 24 hours of admission including neurologic, respiratory, and cardiovascular elements.

Klein et al. (2018) a prospective longitudinal study includes an early progressive mobility protocol to guide nursing decisions with patient readiness criteria for identified stepwise mobility progression including four progressive mobility milestones from 16 mobility levels. Krupp et al. (2019) an exploratory descriptive study looked at factors nurses in the ICU consider when making decisions about patient mobility and concluded mobility programs should begin as soon as the patient demonstrates physiologic stability and observations of patient's strength, mental status, and physiologic response to activity

influence maintaining or progressing mobility. An additional prospective study with a nonexperimental design used a contrasted-group approach, inter-rater assessments, and expert agreement approach to assess the Banner Mobility Assessment Tool (BMAT) for Nurses in use provided evidence the tool is valid in assessing a patient's mobility status (Boynton et al., 2014). When consulted physical therapists guide the mobility plan of care and progress completing mobility and gait assessments creating a disconnect between actionable items for nursing and the desire to increase mobility (Boynton et al., 2014). Lin et al. (2018) a prospective observational study of an early mobilization protocol identified discontinuation of mobilization criteria was also a criterion for readiness including hemodynamic and respiratory parameters as symptomatic heart rate, blood pressure, arrhythmias, oxygen saturation, respiratory rate and mechanical ventilator asynchrony. Respiratory, cardiac, and consciousness parameters were identified for advancing the protocol and the incidence of adverse events for all sessions was 2.2% out of 587 (Lin et al., 2018).

Mobility goals should be included for patients eligible for activities. Messer et al. (2015) a correlational descriptive study identified exclusion mobility readiness criteria including unstable hemodynamic status, two or more vasopressors, neuromuscular blockade, physician order for bedrest, and end of life. Dangling was the only specific activity after nursing education that increased despite a goal of all patients who met inclusion criteria receive a level of intervention besides turning (Messer et al., 2015). Milano et al. (2014) used a decision tree flow chart after a physician gave medical clearance to start mobility progression by a nurse or physical therapist using care boards

to document why, how it is done, and what the patient needs to do. Perme et al. (2014) describes a mobility score assessment tool including potential mobility barriers as bed mobility, transfers, gait, endurance, and functional status with high scores indicating few mobility barriers and decreased assistance. Patients on low levels of vasopressors were five times as likely to be mobilized and those on moderate doses were twice as likely to be mobilized (Perme et al., 2014). Rebel et al. (2019), in their retrospective cohort study, found patients were mobilized on one-third of vasoactive days found in 195 episodes of mobilization patients were more likely to experience an adverse event with a low mean arterial pressure, higher SpO2 and higher FiO2. The Society of Critical Care Medicine, ICU Liberation Bundle E (2013) identifies maximal activity includes hemodynamic stability, an awake patient, and a patient that was walking before admission and absolute contraindication to is hemodynamic instability defined as a patient on escalating doses or multiple vasopressors. Sommers et al. (2016 a prospective observational reliability and validity study indicated the assessment of patients in the ICU is complicated by pulmonary and hemodynamic conditions needing medications and invasive equipment with changing medical situations and the ability to perform mobility activities changes within an hour due to fatigue and exertion. Whelan et al. (2018) a quasi-experimental study used ten domains to measure physical function using the Chelsea critical care physical assessment (CPAx) tool in the ICU graded zero to five to identify problems and address. The CPAx tool is an outcome measure that responds to change designed to assess physical ability, respiratory function, cough, bed mobility, supine to sitting on the edge of the bed, dynamic sitting, sit to stand, standing balance, transferring from bed to

chair, and stepping and grip strength (Whelan et al., 2018). Zomorodi et al. (2012) completed a pilot study included a mobility decision tree flow chart beginning with is patient hemodynamically stable and if no mobility is not indicated and if yes evaluate if vital signs stable in bed with rolling for bed linens changes and hygiene then begin activity. Stiller's safety for mobilization guidelines beginning with level one with six total activity events and during mobility activities nurse's role included monitoring blood pressure, heart rate, oxygen saturation, and lines and tube safety (Zomorodi et al., 2012).

Evidence-based programs for mobility support quality outcomes. The Agency for Healthcare Research and Quality for Advancing Excellence in Healthcare Safety Program for Mechanically Ventilated Patients, Nurse Driven Early Mobility Protocol (2019) contains an ICU mobility screen with exclusion criteria and mobility to begin when the patient meets criteria including follows the keys to prevent excessive work of breathing and desaturation. Balas et al. (2012) indicates parameters used to assess patients' readiness for mobility include neurologic, respiratory, circulatory, and central line contraindications and patients not eligible or have activity halted for an adverse event are reassessed every day and thus eligible begin activity. Boyton et al. (2014) looked at clinical practice guidelines for mobility without determination criteria for patient readiness and noted staff injuries decreased after implementation and increased nurse use of mobility guidelines in patient activity. Clinical practice guideline for mobility along with a mobility champion providing knowledge of the impact of immobility can support a seven progressive step mobility plan for patients (Bruce & Forry, 2018). Campbell et al. (2015) included contraindications for initiating and continuing mobility along with

detailed steps to prepare for mobility and offered evidence that high fidelity simulation builds confidence in early mobility collaborations around patients that can occur during mobility events.

Barriers, patient assessments, and patient conditions limit mobility activities. Costa et al. (2017) identified ABCDE barriers including patient instability and safety concerns, clinician related including staff safety concerns, lack of knowledge, protocol related, and ICU contextual barriers. Patient related issues include hemodynamics, treatment related adverse events, and physiologic patient issues (Costa et al., 2017). Costa et al. (2017) Identified barriers, grouped into four domains as a differential diagnosis checklist to assess barriers to ABCDE implementation. Engel et al. (2013) three medical center's quality improvement mobility projects identified patient assessment for exclusion criteria and if patient able to properly attend to tasks and inclusion if patient verbal or manual stimulation with an identified RASS and further considerations include patient remains alert, demonstrates trunk control, and vital signs are acceptable. Klein et al. (2018) a quasi-experimental a quality improvement project used an inpatient algorithm combining the John Hopkins Highest Level of Mobility Scale and the Activity Measure for Post-Acute Inpatient Mobility Short Form to guide the nursing team on setting mobility goals. The Activity Measure for Post-Acute Inpatient Mobility Short form six questions quantify functional limitations based on direct observation or clinical judgement of needed from another during activities as turning, sitting on the edge of the bed, transfer from bed to chair, standing from chair, walking in the room, and climbing three to five steps (Klein et al., 2018). McWilliams et al. (2015)

identified mobility for ventilated patients should include sitting on side of bed when appropriate within the first five days allows assessment of sitting balance, exercise capacity and physiological stability with six exclusion criteria and five restrictions to edge sitting. Before beginning activity, the protocol assessed for RASS score and/or presence of contraindications to determine use of passive or active mobility measures (McWilliams et al., 2015). Schallom et al. (2020) a staggered quality improvement project using the American Association of Critical Care early mobility protocol begins with step one screening for safety and evaluating patients every 12 hours for myocardial and oxygenation stability, vasopressor use, vascular access, engaging to voice, and neurological/ortho/wound stability findings included increased mobility levels. The four mobility levels included goals at each level and measurements during phase one of the project included CAM-ICU twice daily and the highest and lowest RASS score in 24hours (Schallom et al., 2020). Hemodynamic instability is one of the most common perceived patient-related barriers limiting the practice of early mobilization (Alaprrthi et al., 2020). Physiologic assessment to determine mobility readiness is a clinical risk assessment focusing on improving quality and safety by identifying circumstances that put patients at risk (Asefzadeh et al., 2013). Conradie et al. (2017) a nonrandomized experimental pilot evaluated the feasibility of a protocol using hemodynamic parameters, mean arterial pressure, and central venous oxygen saturation of eleven patients in the baseline line position and then again at 0.3 and 10 minutes in a therapeutic upright position found the protocol was to strict. One hundred and thirty-eight patients were screened with 10 excluded for logistical reasons, 82 patients excluded based on exclusion

criteria, and 35 failed the protocol (Conradie et al., 2017). Reasons for failing the protocol included a heart rate above 120 beats per minute (*n* = 24), PEEP above 10cmH2O (n-17), and PaO2/FiO2 ratio smaller than 250mmHg (*n* = 17) (Conradie et al., 2017).

Limitations/Potential Impact on Findings

Most of the studies resulted in improvement in patient's outcomes with the exception of a study where 35 patients failed the protocol and the most prevalent reason was a heart rate above 120 beats per minute (n=24), a PEEP above 10cm H20 (n=17), and a PAO2/FiO2 ratio smaller than 250 mmHg (n=17) (Comadie et al., 2017). Krupp et al. (2019) also found variations in nursing practice including hesitancy to be the first to mobilize a patient and most critically ill patients did not have a mobility goal, and decisions to mobilize were based on a nurse's decision instead of an established standard of care along with nurse education about mobility does not increase the frequency of patient mobility. Messer et al. (2015) study identified after education of MSICU nurses the 39% of the 75 potential mobility events resulted in some type of mobility increased to only 60% of the 85 potential and the goal of all patients who met inclusion criteria receive some level of intervention besides turning was not met. Moraes et al. (2019) found resistance to change until the proposed concept is consistent and reproducible in low sample size and effect size. Zomorodi et al. (2012) a pilot study with a sample size of three limited the interpretation of the results even though the study helped identify efficacy of the protocol.

Implication for Social Change

This systematic literature review supports the need for available evidence-based nurse driven readiness assessment and guideline for nurses to collaborate with the healthcare team in the management of safe early patient mobility. An adaption of a mobility readiness assessment and evidence-based early mobility practice guideline will result in the enhancement of nursing practice supporting quality patient outcomes. Nurses will be able to monitor, assess, and measure the effects of interventions in the patient's care guided by evidence (White et al., 2016). This systematic literature review addresses the gap between mobility readiness assessments and early mobility practice which will ultimately improve the safety and out comes at the local clinical practicum site. This will impact positive social change and nursing practice.

Recommendations

After analyzing and synthesizing the data collected in this systematic literature review for the project it was concluded the project will have an influence on the nursing practice at the project site. The recommendations concluded from this systematic literature review revealed the need for additional studies on comprehensive mobility readiness measures and management to be conducted using the adult critically ill patient population. Further studies will help validate the implication of mobility readiness assessments and safe early mobility management in the care of critically ill adult population.

Plan to Extend Beyond the DNP Project

The DNP project will be continued post the doctoral phase in collaboration with the health care team and local IRB office to operationalize early mobility readiness assessment and a nurse-driven guideline for early mobility for critically ill adult patients. Furthering the project will require time and collaboration with key stakeholders. Next steps will include piloting the project and evaluating the effectiveness of the project prior to full implementation estimating six months to a year from pilot to full implementation and continued follow thereafter.

Strengths and Limitations of the Doctoral Project

Knowledge gained throughout the project process is a strength of the doctoral process. A large source of evidence and data with positive outcomes was found in the literature in the critical ill adult population on early mobility and mobility readiness including barriers. There is less evidence in the literature regarding the impact of mobility readiness assessments impact on early mobility management in the adult critically ill patient population. Benefits of the project include sharing of information with stakeholders and frontline nursing staff as well as the leadership team within the project site and critical care nursing associations. The project summary can be used to help nursing leadership and healthcare staff with decision making on mobility initiatives in improving clinical practice and patient care. Limitations of the project include the lack of research studies on mobility readiness assessments impact on patient outcomes and delays in mobility in the critically ill patient population. This project benefit is validated in the adult critically ill patient ICUs beyond the project site ICU.

Recommendations for Future Projects

This review identified the need for more studies on the impact of mobility readiness assessment on critically ill patient outcomes with mobility guidelines. The analysis and synthesis of the project found several studies demonstrated the lack of evidence in early mobility management patient assessment for readiness to mobilize. The results of the review concluded the adoption of an evidence-based practice mobility guideline including readiness assessment improves positive patients' outcomes and nursing practice. Further research is needed in mobility readiness criteria since this review produced lack of comprehensive guidelines in the adult critically ill population in the ICU and studies comparing comprehensive guidelines.

Section 5: Dissemination Plan

EBP is essential in nursing practice and researching incidence and validity of early mobility management can help identify plans to effectively disseminate new knowledge and information. Quality patient outcomes are dependent on translating new knowledge into practice. Early mobility readiness assessments included in early mobility guidelines is challenging due to limited published literature and the lack of consistent nursing practice concerning early mobility. The purpose of this project was to evaluate and synthesize evidence on mobility readiness assessments and nurse-driven early mobility management, which could lead to a recommendation that would improve early mobility management in the ICU. The findings of this project were intended to inform nursing and healthcare leadership and provide recommendations for adopting EBP for management of early mobility and mobility readiness assessment. The synthesis of this project's results can be disseminated to the practicum site leaders through the literature review project.

Audiences for Dissemination

The nursing staff and healthcare team at the practicum site are the primary audience for this project dissemination. Stakeholders involved in this project include the Vice President of Nursing, the Director of Nursing, and the practicum site mentor. An oral PowerPoint presentation will be used to disseminate the project findings and recommendations to the intended nursing staff and leadership. Findings from the project may promote and support early mobility management and other changes in nursing practice for the practicum site ICU. Collaboration and sharing knowledge learned from

the findings of this project with other ICU units includes a future poster presentation and submission of an abstract to several critical care journals of interest.

Analysis of Self

My experience in the DNP program started with a need to grow and continue lifelong learning postmasters, and a need to continue on a journey for self-improvement and as a champion of EBP. Sharing and promoting EBP is a passion which ultimately improves nursing practice and patient outcomes. Critical thinking and problem solving is grounded in EBP. Collaboration with the healthcare team and nursing colleagues helped identify my DNP project focus as I heard areas of concern and practice needs around patient readiness assessment and mobility management. I have gained great appreciation for EBP from my previous experience as a clinical nurse specialist and realize evidence-based practice is not part of many nurses' clinical practice. My DNP program experiences have reinforced the importance of EBP throughout. My doctoral program journey has provided growth for me professionally and personally.

My professional role in nursing is an advanced practice nurse and leader of an ICU and an Intermediate Care Unit. Over the years of my career, I have worked as a staff nurse in both ICU and PACU, a clinical nurse specialist in Critical Care, and as a nurse leader. Each role has shaped my career and prepared me for where I am in nursing today as a professional and nurse leader. My goal through this program was to analyze existing EBP concerning mobility management and patient readiness assessments for mobility to adapt an evidence-based mobility management practice guideline that may assist in decreasing variations in practice for adult critically ill patients. Resistance to change is an

ongoing issue in clinical practice and a challenge I anticipated because adopting EBP has barriers despite improving patient outcomes. During DNP practicum experiences and courses, I have learned and been exposed to strategies to address resistance to change. My leadership experience has provided many opportunities to successfully implement EBP.

Summary

Safe early mobility management is challenging yet essential component of care for the adult critically ill patient population within the ICU. Patient outcomes and complications depend on decreasing immobility and the deconditioning associated with immobility in the ICU. During this project, I conducted a systematic literature review to examine and summarize evidence that can be used to recommend a nurse-driven guideline including readiness assessment for early mobility of critically ill adults in the ICU. This systematic literature review can provide nurses with a tool useful in the collaboration with the healthcare team to efficiently manage early patient mobility. Research should be conducted to confirm these findings as well as to determine the relationship between using evidence-based nurse driven assessment for mobility readiness, early mobility guidelines, and patient outcomes. As the recommendations of the project findings are provided to the practicum site, it rests with the practicum site to implement the project.

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Appendix A: Matrix of Evidence

Analysis and Synthesis of Evidence

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
Adler, J. & Malone, D. (2012)	Early Mobilization in the Intensive Care Unit: A Systematic Review	Systematic Review	15 Studies	Criteria for terminating a PT/OT mobilization session grouped under sic headings with physiologic responses and patient complaints.	Negative activity events due to exceeding the predetermined criteria for patient safety.	Small body of evidence, randomized control trails include 171 patients limit the strength of evidence.	Level III, Good Quality
Agency for Healthcare Research and Quality Advancing Excellence in Health Care (AHRQ) (2019)	AHRQ Safety Program for Mechanically Ventilated Patients, Nurse driven Early Mobility Protocols	Evidence-based mobility program	ICU	Initiate mobility protocol when the patient is hemodynamically stable. Nursing staff mobilize patient one to two times in addition to physical therapy. Used a nurse-driven protocol for mobility.	Mobility status is part of handover report between nurses and transfers to and from the unit. ICU mobility screening tool with exclusion criteria. ICU early mobility protocol starts when patient meets the mobility screening algorithm.	Keys to prevent excessive work of breathing, desaturation noted on early mobility protocol. Mobility techs increased percentage of patients mobilized at 24, 48, and 72hours.	Level 5, High Quality
Alaparthi, G. K., Gatty, A., Samuel, S. R., & Amaravadi, S. K. (2020)	Effectiveness, Safety, and Barriers to Early Mobilization in the Intensive Care	Systematic Review	ICU	Fifty-six studies on aspects of early mobilization including effectiveness of mobilization, newer techniques, outcome measures for physical function, safety, practice, and barriers. Summary of criteria for termination from studies and barriers to early mobilization. Summary of strategies for overcoming barriers included process-related,	Scoring systems specific to ICU used to quantify patients' status at different intervals of time. Articles included Intensive Care units included Surgical, Cardiac Intensive and Neurological. Green and red signals for active mobilization of	Safety Measures respiratory considerations, cardiovascular, neurological ,and other considerations as unstable fracture or bony instability, not on continuous hemodialysis, no deep vein	Level III, High Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
				structural, cultural, patient -related.	mechanically ventilated patients from studies.	thrombosis, no active bleeding, and temperature less than 38.5.	
Balas, M. C., Vasilevskis, E. E., Burke, W. J., Boehm, L, Pun, B. T., Olson, K…. M.Ely, E. W. (2012)	Critical Care Nurses' Role in Implementing the "ABCDE Bundle" into Practice	Expert Opinion criteria from evidence supporting early mobility	ICU	Parameters used to assess patients' readiness for mobility include neurologic, respiratory, circulatory and central line contraindications. Criteria for halting mobility includes hemodynamic and pulse oximetry changes indicating patient distress.	Agency for Healthcare Research and Quality protocol patient assessed on admission to ICU and those qualifying begin mobility procedures.	Not eligible patients are assessed every day and those that have mobility halted due to an acute event are reevaluated till protocol can resume.	Level IV, Good Quality
Boynton, T., Kelly, L., Perez, A., Miller, M., An, Y., & Trudgen, C. (2014)	Banner Mobility Assessment Tool for Nurses Instrument Validation	Clinical Practice Guidelines	4 observers simultaneously completing assessments on same group of patients	BMAT has adequate construct validity and is able to discriminate differences between patient groups, evidence valid instrument for assessing patients' mobility status.	After implementation at Banner staff injuries decreased after implementation of BMAT, suggesting an association with an increase in more consistent use of safe patient handling practices	The associated did not account for patient characteristics and only brings awareness to the patients' mobility level.	Level IV, Good Quality
Bruce, R. & Forry, C. (2018)	Integrating a Mobility Champion in the Intensive Care Unit	Clinical Practice Guidelines	Intensive Care	Early Progressive Mobility Protocol with seven progressive steps used by mobility champion three times a day.	Mobility champion provided knowledge of critically ill patients and conditions limiting mobility and understand the negative cognitive and physical impact of bedrest and immobility on	Requires creative staffing solutions including availability, required training, budgetary considerations.	Level IV, Good Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
					overall patient outcomes.		
Campbell, M. R., Fisher, J., Anderson, L., & Kreppel, E. (2015)	Implementation of Early Exercise and Progressive Mobility: Steps to Success	Clinical Practice Guidelines	Intensive Care	Critical appraisal/synthesis of literature used to develop mobility protocol. Contraindications for initiating and continuing. Plus detailed steps to prepare for mobility	High -fidelity simulation-built confidence in early mobility collaboration around patient changes that can occur during mobility events	Changes in documentation, staff education, and orientation required. Unit champions and rounding used to support practice changes.	Level IV, Good Quality
Colwell, B. R. L., Williams, C. N., Kelly, S. P., & Ibsen, L. M. (2018)	Mobilization Therapy in the Pediatric Intensive Care Unit: A Multidisciplinary Quality Improvement Initiative	Mobilization Protocol	Pediatric Intensive Care	A multidisciplinary, multi-professional, goal directed mobilization protocol achieved goal mobilization in more than 50% of patients.	Protocol used a severity of illness from one to four with description. No serious adverse events observed in the unit after implementation. Complications among all encounters during mobilization included transient desaturation, tachypnea, and emesis.	Survey of staff found most significant pre-implementation barrier were perception of physiologic instability and lack of additional staff to help with mobilization.	Level IV, Good Quality
Conradie, E., Fourie, C.E., & Hanekom, S.D. (2017)	Investigating the clinical feasibility of an adapted early mobility readiness protocol for critical ill patients: A non-randomized experimental pilot	Mobility Readiness Protocol	Respiratory and Surgical Units	35 patients failed the protocol and the most prevalent reason included heart rate above 120 beats per minute (n=24), PEEP above 10cmH2O (n=17), and PAO2/FIO2 ratio smaller than 250mmHG (n=17).	The adapted early mobility readiness protocol provides an interim tool to identify patients who would tolerate a therapeutic upright position. Evaluated mean	Only 11 passed the early readiness mobility protocol. The tool was found to be too strict and study was terminated.	Level III, Low Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
					arterial pressure and oxygen consumption via the venous oxygen saturation.		
Cooper, D., Gasperini, M., & Parkosewich (2021)	Nurses Perceptions of Barriers to Out of Bed Activities Among patients receiving Mechanical Ventilation	Mobility Readiness criteria Oral Endotracheal Intubation Patients	Medical Intensive Care	There were 105 out of 191 patients were eligible for out of bed activities. A Rothman index trend indicating an improving or stable clinical course were found in 62% of the patients. Physicians' orders to get out of bed existed for 12.4% of patients.	Clear criteria is defined for patients who could be gotten out of bed. Criteria included a RASS score between 2 and -2, FIO2< or equal to 0.6, PEEP < or equal to 10cm H2O, Spo2 > or equal to 90% or at baseline, MAP> or equal to 60. mmHg or at baseline, and SBP < or equal to 200Hg.	All criteria must be met before ambulating out of bed. Also, no titration of inotropic medications for 12 hours or more. Mobility practices nonexistent despite patients' readiness. Unit culture most support mobility and collaboration with the interdisciplinar y team on mobility practice is essential.	Level IV, High Quality
Costa, D. K., White, M. R., Ginier, E., Manpjlovich, M., Govindan, S., Iwashyna, T. J.,,,,Sates, A. E. (2017)	Identifying Barriers to Delivering the Awakening and Breathin Coordination, Delerium, and Early Exercise/Mobility Bundle to Minimize Adverse Outcomes for Mechanically Ventilated Patients	Bundle E Early exercise/mobili ty bundle	Intensive Care	Four classes ABCDE barriers identified. Patient related barriers included patient instability and safety concerns. Clinician related barriers included staff safety concerns and lack of knowledge. Protocol related barriers included unclear protocol criteria.	Patient related issues included hemodynamics, treatment-related adverse events, and physiologic patient issues. Patient status issues included diarrhea, fatigue, leaking wounds,	Protocol related barriers included cumbersome protocols difficult to interpret and use. There were ICU contextual barriers including	Level II, High Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
					patient weight and size, confusion, agitation, and imminent death.	collaborative team coordination. Identified barriers, 4 domains as a differential diagnosis checklist to assess barriers to ABCDE use.	
Dickinson, S., Taylor, S., & Anton, P. (2018)	Integrating a Standardized Mobility Program and Safe Patient Handling	Foundational Mobility Protocol that incorporates Safe Patient Handling	ICUs and generalized to the healthcare system	On admission each patient is evaluated for inclusion in the mobility protocol and if included patients start at level zero. When patients tolerate level zero, they are advanced to level two and three accordingly. Possible exclusion criteria are used as possible reasons to withhold mobility.	The foundational ICU protocol can be adapted to other patient populations by changing the exclusion and inclusion criteria. Mobility assessment questions were added to guide staff on each mobility phase. Safe patient handling equipment identified for each phase of mobility.	Barriers include time, with the project taking 8 years from development to implementation . The program grew from mobility in the ICUs to all units throughout the health system and incorporating worker safety and patient assessment of mobility levels.	Level V, High Quality
Drolet, A., Dejuilio, P., Harkless, S., Henricks, S., Kamin, E., Leddy, E.,…Williams, S. (2013)	Move to Improve: The feasibility of Using an Early Mobility Protocol to Increase Ambulation in the Intensive and Intermediate Care Settings	Early Mobility Protocol	Intensive Care and Intermediate Care	The rate of patient ambulation during the first 72 hours of a hospital stay can be significantly increased using a nurse driven protocol.	Mobility exclusion criteria was used on order sets. Also, there were defined criteria to prevent desaturation and excessive work of breathing.	Study was at only one hospital and looked only at the initial ambulation and lacked detailed information on patient status. However, all patients were screened for	Level II, Good Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
						appropriateness for mobility. Inconsistent practices around sedation affected patient mobility.	
Dubb, R., Nydahl, P., Hermes, C., Schwabbauer, N., Toonstra, A., Parker, A. M.,…Needham (2016)	Barriers and Strategies for Early Mobilization of Patients in Intensive Care Units	Systematic Review	Intensive Care Units	Twenty-eight barriers identified from 40 studies: 14 (50%) patient related, 5 (18%) structural, 4 (14%) process related. Three contraindications to mobility included surgical and orthopedic issues, active hemorrhage or coagulation issues, and cognitive impairment as coma.	Most common patient-related barrier was hemodynamic instability (n=20, 50% of studies), followed by vascular access devices, tubes, and drains (n=18, 45%). The definition of hemodynamic instability is subjective, without any clear consensus for thresholds of vasopressor doses. Use of unit-specific protocols developed may help systematically address.	Successful early mobility is dependent on patient status, ICU-related processes, structure, and culture.	Level III, Good Quality
Eakin, M.N., Ugbah, L., Arnautovic, T., Parker, A. M., & Needham D.M. (2015)	Implementing and sustaining an early rehabilitation program in a medical intensive care unit: A qualitative analysis	Early Rehabilitation Program	Medical Intensive Care	Overcoming perceived safety and mobility barriers, of critically ill including hemodynamic instability, rising vasopressor requirements, potential extubations, and line loss using a a 4-E model (engaging,	Provides guidance for implementing and sustaining and early rehabilitation program in the ICU. Changed ICU culture and important constructs include necessary	Study occurred in one medical ICU and sample was small. Multiple providers involvement required schedule coordination,	Level III, High Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
				educating, executing, and evaluating).	components, implementation strategies, perceived barriers, and positive outcomes from mobility.	team communication for complex patients.	
Engel, H. J., Needham, D. M., Morris, P. E., & Gropper, M. A. (2013)	ICU Early Mobilization: From Recommendation to Implementation at Three Medical Centers	Three Quality Improvement Mobility Projects	Three Medical Centers ICUs	Detailed mobilization guides beginning with evaluation for exclusion criteria for mobility. Inclusion does patient open eyes to verbal or manual stimulation (t +1 > or equal to RASS >-2)	Detailed steps include does patient appropriately attend to tasks if no limit. activity. Advance if attends to tasks to a sitting and standing assessment.	Keep mobility considerations include does patient remain alert, demonstrate trunk control, and vital signs acceptable.	Level 5, High Quality
Engel, H. J., Tatebe, S., Alonzo, P. B., Mustille, R. L., & Rivera, M. J. (2013)	Physical Therapist-Established Intensive Care Unit Mobilization Program: Quality Improvement Project for Critical Care at the University of California San Francisco Medical Center	Retrospective Analysis of a Intensive Care Unit Early Mobilization Program	Medical Surgical Intensive Care Unit	Guideline for daily mobility and treatment starts by identifying if there were exclusion criteria present if yes provider to assess ability to tolerate and participate in mobility. If no, then assessment criteria determine mobility level. The development of physiologic stability guidelines for rehabilitation is an enabler.	The average length of stay in the ICU and hospital decreased, patients distance walked in ICU increased by 100 feet, percent of patients ambulating increased by 7 percent, and number of days to physical therapy decreased from 3 to 1.	Study limitations include staffing, reliance on retrospective analysis of data from 6 collectors rather than one researcher, inability to control for confounding variables as nursing interventions and case management, and no physical therapist on weekends.	Level V, Good Quality
Hickmann, C. E., Castanares-Zapatero, D., Bialais, E., & Dugernier, J. (2016)	Teamwork enables high level of mobilization in critically ill patients	Observational Study	Mixed ICU	Early mobility protocol with contraindications defined, levels 0-4 included levels of RASS,	Both non-mechanically ventilated patients and mechanically	Limiting factors instability for 709 patients during bed to	Level II, High Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
				Glascow, and muscular strength. Mobility provided at least once in 81% for all patients within 24 hours of ICU admission.	ventilated were included.	chair mobilization, included severe physiological 42, hemodynamic 21, respiratory 5, and neurological 16.	
Hodgson, C., Needham, D., Bailey, M., Young, P., Buhr, H., Higgins, A.,…Berney, S. (2014)	Feasibility and inter-rater reliability of the ICU Mobility Scale	Prospective Observational Study	Two Intensive Care Units	Physicians, physical therapists, and nurses developed scale using existing studies and John Hopkins scale adding more levels of mobilization and the levels of assistance required.	ICU mobility scale level zero nothing, lying in bed to ten walking independently without a gait aid. Feasibility reported 90% of clinicians identified it would take less than a minute to complete with adequate definitions and appropriate length. Maximum level of mobility not achieved by cohort.	Reliability assessment, two large ICUs with surgical, trauma, and medical patients administered with good agreement between nurses and physical therapists and excellent between physical therapists. Did not include measures to determine stability and readiness.	Level II, High Quality
Hodgson, C. L., Stiller, K., Needham, D. M., Tipping, C. J., Harrold, M., Baldwin, C. E.,…Webb, S. A. (2014)	Expert consensus and recommendations on safety criteria for active mobilization of mechanically ventilated critically ill adults	Systematic literature review followed by consensus recommendations from 17 physiotherapists, 5 intensivists, and a nurse	Adult ICU setting	Safety recommendations at assisting in the assessment of adult mechanically ventilated patients to determine if and when active mobilization, out of bed could begin. Safety considerations included respiratory, cardiovascular, neurological, and other considerations including	Active mobilization is any activity where the patient assists with the activity using their own muscle strength and control, and possible need of assistance from staff or equipment.	Green identified low risk of adverse events and proceed, yellow potential risk and consequence of an adverse event. Clarify precaution or contraindication	Level V, High Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
				lines and surgical and medical conditions. The administration of vasoactive drugs was not an absolute contraindication to mobilization.	Red category includes patients with PO<90% and femoral sheaths. The panel was unable to reach consensus regarding the dose of vasoactive drugs and any combinations of these drugs that would allow safe mobilization in the ICU.	prior to mobility and if proceeding with mobility do so gradually. Red is significant potential risk or consequence of adverse event. Do not proceed unless advised by physician and physiotherapist. Appropriatenes s of mobilization influenced by the absolute dose of vasoactive drug, the change in dose, and irrespective of the dose whether or not the patient is clinically well-perfused.	
John Hopkins Medicine Armstrong Institute For Patient Safety and Quality (2020)	Early Mobility Toolkit, Your Work Plan for Translating Evidence into Practice	Early Mobility Toolkit	ICU	Medical screening algorithm to evaluate patients for mobility beginning with patient's ability to open eyes to verbal stimulation. Failure of basic assessment patient starts on level one and if passes begins level two.	Nursing early mobility protocol activity screening to occur within 24 hours of admission. Basic assessment includes neurologic, respiratory, and cardiovascular.	Four levels of body positioning. Activity and OT and PT consultations based on assessment.	Level IV, Good Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
Klein, K. E., Bena, J. F., Mulkey, M., & Albert, N. M. (2018)	Sustainability of a nurse-driven early progressive mobility protocol and patient clinical and psychological health outcomes in a neurological intensive care unit	Prospective, longitudinal, comparative study	Neurological ICU	Early progressive mobility protocol to guide nurses' decisions with patient readiness criteria for mobility and identified stepwise mobility progression. Four progressive mobility milestones from 16 mobility levels.	Milestone 1 consisted of levels one to seven and reflected the ability of patients to tolerate head of bed elevations greater than 30 degrees. Milestone 2 consisted of levels eight to 12 and reflected patients' ability to sit at the side of the bed with a assistance or sitting in a chair. Milestone 3 consisted of levels 13 and 14 and reflected patients' ability to stand and pivot to a chair. Milestone 4 consisted of levels 15 and 1 6 and reflected patients ability to walk independently,	A single center and unit study. Patients had short Neurological ICU stays preventing mobility progression. Comorbidities were assessed using the 19-item Charlson Comorbidity Index, a validated tool reflecting risk of mortality over time.	Level II, Good Quality
Klein, L. M., Young, D., Feng, D., Lavezza, A., Hiser, S., Daley, K. N.,…Hoyer, E. H. (2018)	Increasing patient mobility through individualized goal-centered hospital mobility program: A quasi-experimental quality improvement project	Quasi-experimental quality improvement project	Two Adult Acute Care Units	Novel mobility activity measure for Post-Acute Care Inpatient Mobility algorithm to guide the nursing team on setting SMART mobility goals for each patient. The algorithm combined two mobility tools the John Hopkins Highest Level of Mobility Scale and the Activity Measure for Post-	The AM-PAC IMSF includes six questions that quantify functional limitations based on direct observation or clinical judgement of needed assistance from another during activities: turning,	Due to direct observation mobility events may have been missed. Some patients were on bedrest. Project focused on nursing-team mobility so the data may have	Level V, Good Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
				Acute Care Inpatient Mobility Short Form (AM-PAC IMSF).	sitting at edge of bed, transfer from bed to chair, standing from chair, walking in the room, and climbing three to five steps. Scores from high of 24 no assistance to a low of 6 total dependence.	underestimated that patients performed with physical and occupational therapy. Lack of a consistent standardized approach to patient mobility for nursing.	
Krupp, A. L., Ehlenbach, W. J., & King, B. (2019)	Factors Nurses in the Intensive Care Unit Consider when Making Decisions about Patient Mobility	Exploratory Descriptive Study	2 ICU units at Different Hospitals	In-bed and chair based activates, low level mobility support patients in completing ADLs or assist with repositions allow assessment of patient strength and ability. Mobility information gathered at shift report and from patient and family. Nurse education about mobility does not increase the frequency of patient mobility.	Mobility programs in the ICU should began as soon as the patient demonstrate physiologic stability. Observation of patient's strength, mental status, and physiologic response to activity influenced maintaining or progressing mobility.	Variations in nursing practice, hesitancy to be the first to mobilize a patient, most critically ill patients did not have a mobility goal, and decisions to mobilize were based on a nurse's decision and not an established standard of care.	Level III, Low Quality
Liu, K., Ogura, T., Takahashi, K., Nakamura, M., Ohtake, H., Fujiduka, K.,…Mato, T. (2018)	The safety of a novel early mobilization protocol conducted by ICU physicians: a prospective observational study	Prospective Observational Study	Closed Mixed ICU	Discontinuation of mobilization criteria included hemodynamic parameters: HR>130 or <40, systolic BP <180 or <80, symptomatic orthostatic hypotension, arrhythmias except pre-existing, MI associated symptoms, oxygen saturation<88%, Abnormal	The mobilization protocol was created after input from physicians, ICU nurses, and physical therapists and review of the literature. Physician order on admission for mobilization and	Respiratory, Cardiac, and consciousness parameters identified for advancing the protocol. If parameters not met no mobilization, Level1. The	Level II, Good Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
				respiratory rate >40 or <5, Mechanical ventilator asynchrony, bleeding, cardiac arrest, and unexpected removal of medical devices. Study patients had arterial lines, ECMO jugular and femoral, feeding tubes, chest tubes, abdominal drains, mechanical ventilators. Endotracheal tubes, tracheostomy tubes, hemodialysis catheters, central venous catheters, and peripheral venous catheters.	physician's monitor the hemodynamic and respiratory status at all levels. Level one a physical therapist provides the session. Level two a physical therapist and nurse provide. Level three a three-person team an ICU physician, a charge nurse, and a physical therapist provide the session.	incidence of adverse events among all sessions was 2.2% for 587 sessions. There were no serious adverse events requiring additional treatment such as increase in vasopressor, cardiac arrest, increase in fraction inspired oxygen, or additional analgesia. Patients with certain diseases were excluded because they have been immobilized for a long time.	
McWilliams, D., Weblin, J., Atkins, G., Bion, J., Williams, J., Elliot, C.,…Snelson, C. (2015)	Enhancing rehabilitation of mechanically ventilated patients in the intensive care unit: A quality improvement project	Quality improvement of an structured early mobility protocol	ICU	Patients sedated and/ or paralyzed were confined to daily passive movements and positioning. Physiologically stable and awake patients begin more active mobilization and first assessment sitting on edge of bed. New supportive rehabilitation team associated with significant: increase in mobility at ICU discharge, reduction in ICU LOS,	Sitting on side of bed when appropriate within first 5 days allowed assessment of, sitting balance, exercise capacity and physiological stability. Six exclusion criteria and five restrictions to edge sitting criteria. Protocol	Improved critical care communication helps ensure collaborative weaning plans and to facilitate mobility. No formal study pre-admission functional status assessment. Focus was on patients	Level V, Low Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
				ventilator days, and in-hospital mortality.	assessment for RASS score and/or presence of a reason not to mobilize.	ventilated for at least five days.	
Messer, A., Corner, L., & Forst, S. (2015)	Implementation of a Progressive Mobilization Program in a Medical Surgical Intensive Care	Correlational, descriptive study	Medical-Surgical ICU	Mobility goals included 100% of eligible patients participate in the program. Exclusion criteria physician order for bedrest, severely unstable hemodynamic status, 2 or more vasopressors, neuromuscular blockade, end of life, and no exclusion is absolute.	After education of MSICU nurses the 39% of the 75 potential mobility events resulted in some type of mobility increased to 60% of the 85 potential. Leadership and coaching are essential and help guide and sustain mobility programs.	The goal of all patients who met inclusion criteria receive some level of intervention besides turning was not met. Dangling was the only specific mobility activity that increased. Nurses were shown mobility activities and no verification of correct performance.	Level VI, Low Quality
Milano, M., Prestemon, H., Topley, D., & Zacharias (2014)	Let's Move It	Early Mobility Protocol Implementation	Surgical ICU and Acute Care Setting	Utilized a peer reviewed mobility decision tree flow chart. MD gives medical clearance for a patient to start mobility progressions. Mobility progression can be started by and RN does not have to wait for PT consult. Cost savings with outcomes improvement over $200,000.	Care boards on acute care to check off mobility activities. Patient information on Let's Move It: meaning, why, how it is done, and what they need to do. Outcome measures improving DVT, ventilator days, VAP, and pressure ulcers.	Staffing needs: increased physical therapy presence in SICU six days a week, addition of mobility champions. Processes adapted from an original pilot study in the SICU only. The SICU protocol was adapted to acute care with	Level V, Good Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
						physical therapy. Patients could move quickly through the protocol.	
Miranda Rocha, A. R., Martinez, B. P., Maldaner da Silva, V. Z., & Forgiarini Junior, L. A. (2018)	Early mobilization: Why, what for and how?	Systematic Review	ICU	A mobility safety flowchart for mobility safety: review history for past or current signs of cardiovascular and respiratory changes, medications that may affect the response to mobilization, and previous level of mobility and exercise capacity. Mechanical ventilation patients' mobility protocol: level one unconscious, level two conscious advance to level three when moving arm against gravity and move to level four when moving leg against gravity.	Evaluation of cardiovascular and respiratory reserve prior to mobilization. Mobility protocol for patients on mechanical ventilation foundation includes progression of mobility according to conscious and unconscious, cardio respiratory stability and muscle strength in the arms and legs.	Barriers to mobility include symptoms and conditions of hemodynamic instability, management of sedation levels with dose allowing participation in mobility, adequate analgesia, and early recognition and management of delirium. Time and necessary staff to mobilize is a barrier. Barriers for the first 24hrs of ICU stay include active bleeding, unstable pelvic fracture, acute myocardial infarction, increased ICP with instability of same, and	Level III, Good Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
						discontinuation of therapy.	
Moraes, F., Marengo, L., Silva, M., Bergamaschi, C., Lopes, L., Moura, M.,…Barberato, S.-Filho, S. (2019)	ABCDE and ABCDEF care bundles: A systematic review protocol of the implementation process in intensive care units	Systematic Review Protocol	ICU	Protocol and guidelines are tools guide planning, delivery, evaluation and allow the improvement of quality. Implementation methods vary depending on the implementation complexity.	In ICU practice there is resistance to change until the proposed concept is consistent and reproducible.	Studies with low sample size and effect size.	Level III, Low Quality
Parry, S. M., Knight, L. D., Connolly, B., Baldwin, C., Puthucheary, Z., Morris, P., …Granger, C. L. (2017)	Factors influencing physical activity and rehabilitation in survivors of critical illness: a systematic review of quantitative and qualitative studies	Systematic Review	ICU	Safety influences on physical activity in the ICU include physiological stability and concern for lines. Early physical activity associated with good sedation and delirium practice.	Studies assessing barriers or enablers to those participating in physical activity interventions. Adequate sleep recognized as a facilitator for patient engagement in physical activity. Poor choices of line location and unnecessary lines were barriers.	Hemodynamic and respiratory physiologic stability were significant influences on patient safety during physical activity. The development of physiologic stability guidelines was an enabler.	Level III, Good Quality
Perme, C., Nawa, R. K., Winkelman, C., & Masud, F. (2014)	A tool to asses Mobility Status in Critically Ill Patients: The Perme Intensive Care Unit Mobility Score	Perme Intensive Care Unit Mobility Score Assessment Tool	CVICU	Tool includes mental status, potential mobility barriers, bed mobility, transfers, gait, endurance, and functional strength to determine mobility status of ICU patients at a specific moment in time. Designed to reflect the immobility of patients in ICU. Nurse-led mobilization almost double that of physiotherapists. Most common bed-chair activity.	High scores indicate few mobility barriers and decreased assistance. Low scores more potential barriers and assistance needed. Tool reliability is high and its clinical use acceptable. Developed with input from intensivist, physical and	Tool was completed by two physical therapists in the CVICU unit one observed and one assessed. A small sample size with 35 patients. Based on progression of activates used by physical therapists.	Level IV, Good Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
					occupational therapists, registered nurses, and a statistician. Patients on low levels of vasopressors were five times as likely to be mobilized.	Patients on moderate doses of vasopressors were twice as likely to be mobilized as those on high doses.	
Rebel, A., Marzano, V., Green, M., Johnston, K., Wang, J., Neeman, T.,… Bisett, B. (2019)	Mobilization is feasible in intensive care patients receiving vasoactive therapy: An observational study	Retrospective cohort study	Medical, Surgical, Trauma ICU	Intensity ICU mobilization quantified using the ICU Mobility Scale (IMS). Early cessation occurred in ten episodes as a result of transient physiological changes: SpO2 desaturation, hypotension, bradycardia, nausea and vomiting, a positional cuff leak, and agitation. Vasoactive therapy is not an absolute contraindication to mobilization.	In 195 episodes of mobilization the adverse event rate was 7.8% (n=15). Patients were more likely to experience an adverse event were those with a low mean arterial pressure, higher SpO2, and higher FIO2. Patients were safely mobilized on approximately one-third of vasoactive days, with a low rate of adverse events.	High intensity mobilization done by PT, rarely done by nurses in this single center site. Lack of documentation of a reason to mobilize occurred in 24% of the cases. There was a small sample size. Adverse events during mobilization were almost entirely due to reversible hypotension.	Level III, Good Quality
Schallom, M., Tymkew, H., Vyers, K., Prentice, D., Sona, C., Norris, T.,…Arroyo, C. (2020)	Implementation of an Interdisciplinary AACN Early Mobility Protocol	Quality Improvement Project with Retrospective Review	Medical, Surgical, Burn, Trauma Intensive Cares	Step 1 was to screen for safety and evaluate patients every 12 hours for myocardial stability, oxygenation stability, vasopressor use, vascular access, engaging to voice, and neurological/ortho/wound stability.	Safety screen performed during spontaneous awaking breathing trials. Bedside data collection and morning and evening mobility goals, complications, and reason goal not	AACN 4-level mobility protocol with modifications to activity based on goal. Measurements in phase 1 and 2 included frequency of activity. Phase	Level V, High Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
					achieved were documented.	1 included RASS and CAM-ICU as screening. Adverse events were minimal.	
Society of Critical Medicine, ICU Liberation (2013)	Early Mobility and Exercise	Bundle E	Study of 1449 activity-related events <1% adverse events. In 2009 study one adverse event in 498 mobility sessions.	Keys for successful early progressive mobility include program tailored toward specific ICU needs and strong nursing mobility program with general guidelines to consistently promote early mobility. Mobility should be a vital sign including activity tolerance daily and gradual progression of activity.	In bed mobility includes turning, passive range of motion, sitting on side of bed, and active strengthening exercise. Out of bed mobility includes standing at bedside, sitting in a regular or cardiac chair, and walking.	Maximal mobility activity includes hemodynamic stability, an awake patient, and a patient walking before admission. Absolute activity exclusion includes hemodynamic instability defined as escalating dose or multiple vasopressors.	Level IV, High Quality
Sommers, J., Vredeveld, T., Lindeboom, R., Nollet, F., Engelbert, E. H. H., & van er Schaaf, M. (2016)	De Morton Mobility Index is Feasible, reliable, and Valid in Patients with Critical Illness	Prospective, observational reliability and validity study	ICU and M-ICU	Physical assessment in patients in ICU is complicated by pulmonary and hemodynamic conditions needing medications and invasive equipment with changing medical situations. The International Classification of Functioning, Disability and Health (ICF) consists of three core domains: body functions and structures, activities, and particpation.	The mobility index provides the physical therapists with accurate and reliable information on the level of mobility in patients in the ICU. The functional status of patients should be measured at each stage of critical illness to physical therapy goal setting and	The ability to perform mobility activities changed within an hour due to fatigue and exertion.	Level III, Good Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
					evaluation of the recovery process.		
Whelan, M., Van Aswegen, H., & Corner, E. (2018)	Impact of Chelsea critical care physical assessment (CPAx) tool on clinical outcomes of surgical and trauma patients in an intensive care unit: An experimental study	Single-centered pre-post quasi experimental study	Trauma ICU and Surgical ICU	CPAx (10 domains) used to measure physical function in ICU graded zero to five. Intervention group received daily or twice daily physiotherapy. A historical control group was stable enough to participate in early mobilization. Physical function improved in all from admission to discharge.	Use of CPAx as a method of ensuring problem treatment plans and measure change in physical function. Changes in functional ability greater for trauma than surgical group and the surgical group demonstrated significantly better physical function at discharge.	High turnover of patients and assessments were done every other day. Existing culture minimizes sedation and early mobilization. Small sample size five surgical and five traumas. Duration of stay in ICU and hospital not influenced by CFAx tool when compared to historical control.	Level II, Good Quality
Zomorodi, M., Topley, D. & McAnaw, M. (2012)	Developing a Mobility Protocol for Early Mobilization of patients in the Surgical/Trauma ICU	Pilot study to evaluate an early mobilization protocol safety and feasibility for mechanically ventilated patients.	Surgical/Trauma ICU	Mobility decision tree flow chart, is patient hemo-dynamically stable in bed and if no not a mobility candidate and if yes advance, is vital signs stable in bed with rolling for bed linen changes and hygiene yes start activity and if no do not.	Included Stiller's safety mobilization guidelines for ICU clinicians. Beginning with level 1, 6 total activity events. Mobility progression initiated by the bedside nurse twice a day till discharge. RN role monitoring BP, HR, and oxygen saturation	Small sample size of three limited the interpretation of the results. The pilot study helped identify efficacy of the protocol. Decision tree matched the outcomes assessments of physical therapists.	Pilot Study, Low Quality

Author(s) and Date	Title	Evidence Type	Sample, Sample Size, Setting or Not Applicable	Findings that help answer the EBP questions	Observable Measures	Limitations	Evidence Level, Quality
					and lines and tubes safety.		

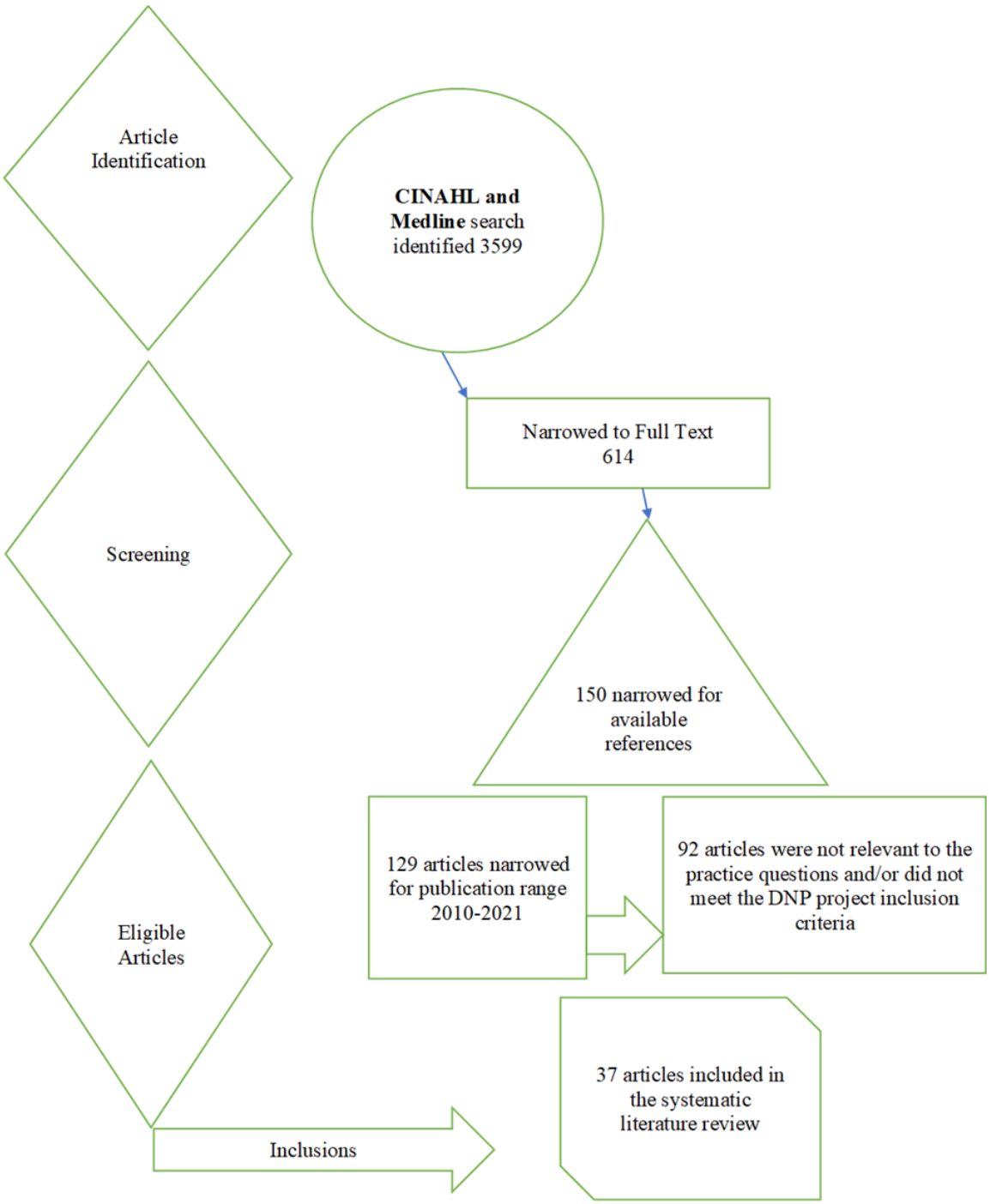
Appendix B: Level of Evidence Hierarchy

Level of Evidence Pyramid Hierarchy

Level	*Description of evidence*
I	*Systematic review and meta-analysis of randomized controlled trials*
II	*One or more randomized controlled trials*
III	*Controlled trials (no randomization)*
IV	*Case-control or cohort study*
V	*Systematic review of descriptive and qualitative studies*
VI	*Single descriptive or qualitative study*
VII.	*Expert opinion*

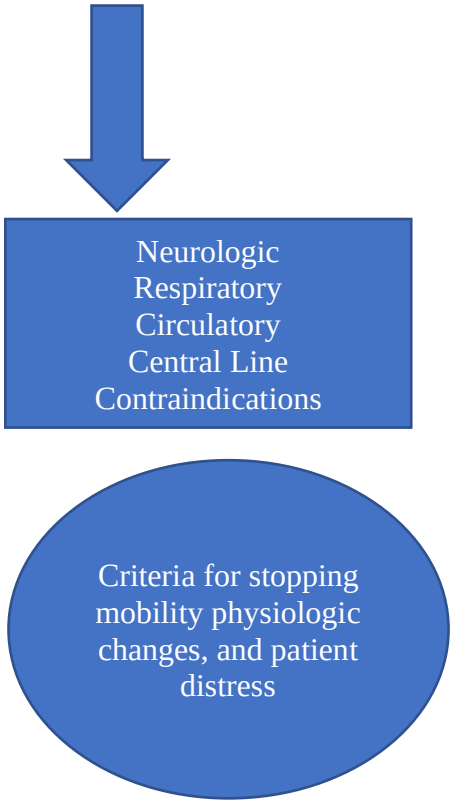
Note. Melnyk and Fineout-Overholt (2011) designed this level of evidence hierarchy.

Appendix C: Flowchart Search Results



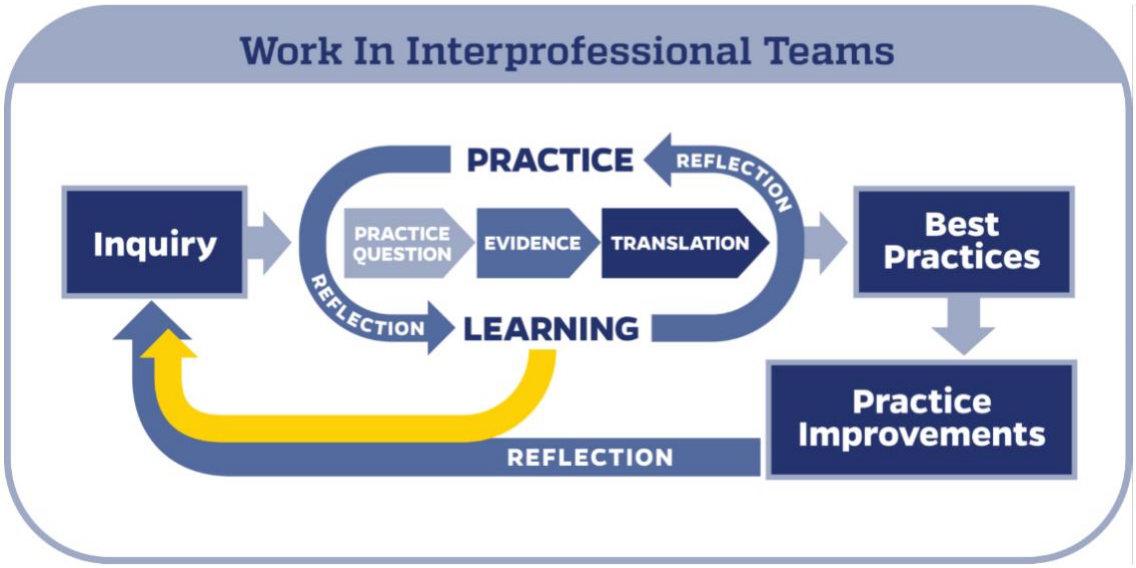
Appendix D: Logic Model

1. Physical Function Measures
2. Complications of physical functioning affecting physiologic stability
3. Scoring systems to determine safe mobility
4. Parameters used to asses mobility readiness and mobility progression



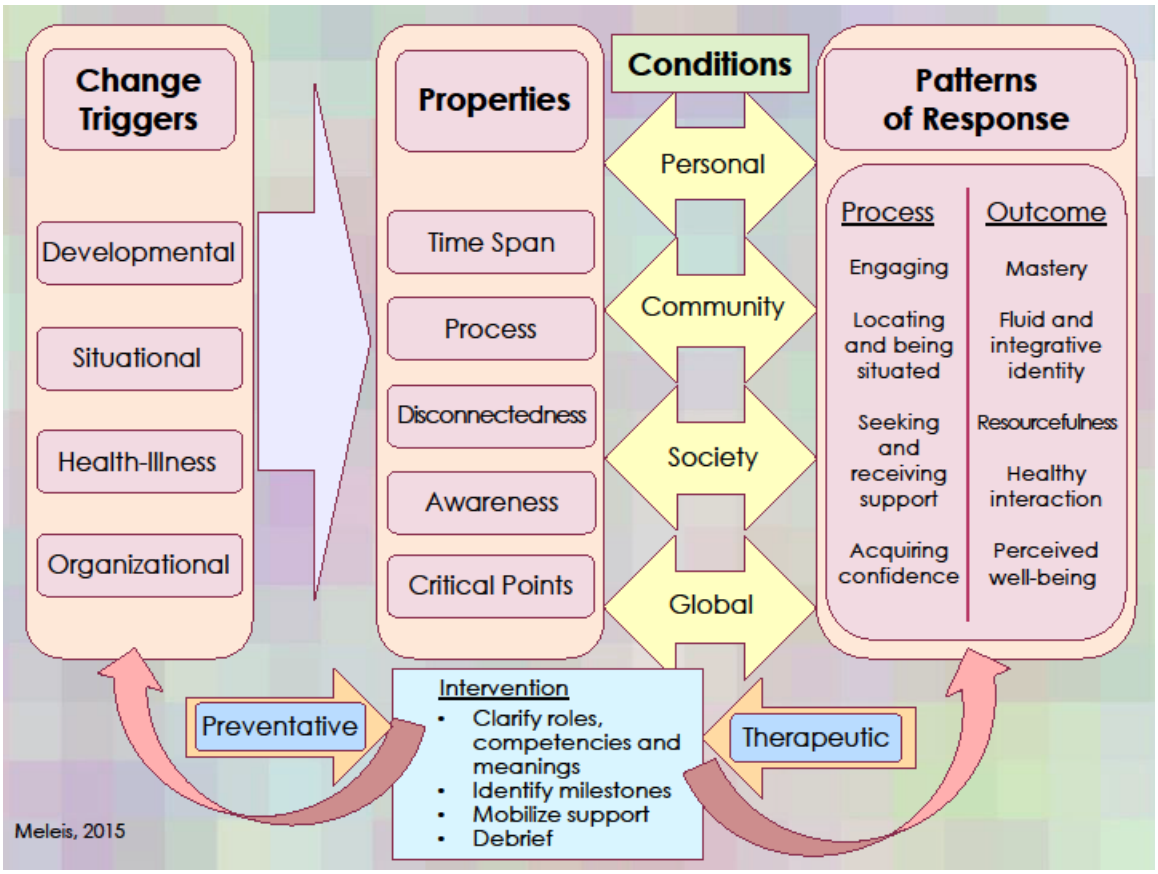
Appendix E: Johns Hopkins Evidence-Based Practice Model

Dang, D., & Dearholt, S. (2017). *John Hopkins nursing evidence-based practice model and guidelines (3rd ed.).* Indianapolis, IN: Sigma Theta Tau International.



Dang, D., Dearholt, S., Bissett, K., Ascenzi, J., & Whalen, M. (2022). *Johns Hopkins evidence-based practice for nurses and healthcare professionals: model and guidelines* (*4th ed.*). Indianapolis, IN: Sigma Theta Tau International

Appendix F: Transitions Theory



Note. From "Transitions Theory," by A. I. Meleis, in Smith, M. C., & Parker, M. (Eds.). *Nursing Theories and Nursing Practice* (4th Ed, p. XX), 2015, FA Davis Co.