2015

An Evidence-Based Approach to Prepare Interdisciplinary Team Members for Implementation of the ABCDE Bundle

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AN EVIDENCE-BASED APPROACH TO PREPARE INTERDISCIPLINARY TEAM MEMBERS FOR IMPLEMENTATION OF THE ABCDE BUNDLE

by

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Bachelor of Science in Nursing
Georgia College & State University, 2005

Submitted in Partial Fulfillment of the Requirements

For the Degree of Doctor of Nursing Practice in

Nursing Practice

College of Nursing

University of South Carolina

2015

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DEDICATION

To my husband, Andy,

who has encouraged, supported, and loved me every step of this journey.

You are my heart.

To my precious son, Tyler,

who has unknowingly sacrificed playtime so Mommy could finish her schoolwork.

You are my inspiration.

To my parents, Barry and Teresa,

who taught me to believe in myself and to never stop achieving.

You are my foundation.

To my brothers, Jonathan and Timothy,

who remind me to be positive, love life, and laugh.

You are my sanity.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude for my capstone committee. Dr. Joan Culley, thank you for your time, wisdom, guidance, and patience. Dr. Beverly Baliko, thank you for your time, knowledge, encouragement, and constant support throughout this journey. Dr. Stephanie Burgess, thank you for your time, dedication, and support in completing this project.

I am forever grateful to the medical-surgical intensive care unit interdisciplinary team at the Medical University of South Carolina. I am proud to be a part of such an amazing team of registered nurses, physicians, respiratory therapists, pharmacists, dieticians, and physical therapists. This project would not have been possible without their commitment and support.

ABSTRACT

Quality improvement projects contribute to the development of evidence-based management strategies for successful implementation of evidence-based practices in health care, thus reducing the risk of change implementation failure. This study assessed practice change implementation strategies for the awakening and breathing trial coordination, delirium assessment and management, early exercise and mobility (ABCDE) bundle. The ABCDE bundle is an evidence-based, interdisciplinary framework for managing pain, agitation, and delirium, reducing the duration of mechanical ventilation, and supporting early mobility in critically ill patients. The purpose of this study was to implement a nurse-driven initiative to design and put into place an evidence-based approach to prepare interdisciplinary team members in the medical-surgical intensive care unit (MSICU) at the Medical University of South Carolina for implementation of the ABCDE bundle. The study was guided by Raelin's Model of Work-Based Learning (2008). A pre-intervention survey assessed (a) individual learning preferences, (b) bundle familiarity, (c) communication and collaboration, (d) current bundle practices, and (e) unit processes. The intervention phase consisted of unit-specific educational interventions based on pre-intervention survey results. A post-intervention survey assessed (a) bundle knowledge, (b) effectiveness of educational methods, (c) perceived barriers and facilitators, (d) suggestions for implementation, and (e) ongoing educational needs.

Overall results revealed specific educational needs of specialties within the MSICU interdisciplinary team and demonstrated the importance of understanding unit-specific needs on both the individual and collective levels. Results indicated the need for additional education and training regarding early exercise and progressive mobility; therefore, complete and successful educational preparation of the MSICU interdisciplinary team was not achieved. This quality improvement project was the first step in the ABCDE bundle implementation process for the MSICU. Upon project completion, MSICU leaders continued progressing towards full bundle implementation by creating the interdisciplinary ABCDE bundle committee within the established shared governance practice council. The committee will support interdisciplinary team buy-in and ensure the dissemination and evaluation of continued bundle education along with more in-depth education regarding early exercise and progressive mobility. Evidence-based management strategies utilized in this study may be applied to future implementation efforts and may enhance the sustainment of future practice changes.

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CHAPTER 1

INTRODUCTION

Advancements in healthcare, highly sophisticated technology and increased life expectancy have compounded the care for the patient population and led to increased demands for critical care management and services. Critically ill patients are highly vulnerable, unstable, and complex with actual or potential life-threatening health conditions. Along with other invasive therapies, mechanical ventilation is often a necessary and life-sustaining therapeutic modality for this patient population. Prolonged mechanical ventilation combined with long-term use of continuous sedation is linked to delirium, immobility, and adverse clinical outcomes.

Significance of the Problem

More than 5 million critically ill patients are admitted to Intensive Care Units (ICUs) in the United States each year (Pronovost & Goeschel, 2005). Between 2000 and 2005, annual costs of critical care services increased from $56.6 to $81.7 billion (Halpern & Pastores, 2010). The average cost per day of ICU care has been estimated to range from $3000 to $3700 (Dasta, McLaughlin, Mody, & Piech, 2005). Mechanically ventilated patients account for approximately 40% of all ICU patients (Wunsch et al., 2013). In 2003, approximately $16 billion of the total annual hospital expenditure in the United States was utilized for the prolonged mechanical ventilation population (Zilberberg, Luippold, Sulsky, & Shorr, 2008). Daily cost of mechanical ventilation in

the ICU has been estimated at $1500 per day (Dasta, McLaughlin, Mody, & Piech, 2005). Zilberberg, de Wit, and Shorr (2012) have predicted that by the year 2050 the numbers of critically ill patients requiring prolonged mechanical ventilation will more than double from 300,000 to over 600,000 and will cost over $60 billion annually.

Delirium. Delirium is the most common psychiatric syndrome found in the general hospital population (Maldonardo, 2005) and is recognized as a major health problem among critically ill patients (Barr et al., 2013). Negative outcomes associated with delirium include prolonged mechanical ventilation, self-extubation, re-intubation, long-term cognitive impairment, increased length of stay in ICU and hospital, increased number of mechanically ventilated days, increased mortality, and increased cost of care (Barr et al., 2013). The estimated annual cost of delirium in the United States ranges from $4 to $16 billion (Milbrandt et al., 2004). On average, patients with delirium are hospitalized 10 days longer than non-delirious patients with similar medical conditions (Ely, Gautam, Francis, May, Speroff, Truman, Dittus, Bernard, & Inouye, 2001). Delirium affects up to 80% of mechanically ventilated patients (McNicoll et al., 2003), yet only one-third of patients exhibiting symptoms are adequately diagnosed and treated (Barr et al., 2013).

ICU-acquired weakness. ICU-acquired weakness is a frequent complication resulting from bed rest and immobility. An estimated 25% to 33% of critically ill patients experience ICU-acquired weakness after seven days of mechanical ventilation (Truong, Fan, Brower, & Needham, 2009). Approximately 20 additional ventilator days are necessary for mechanically ventilated patients who develop ICU-acquired weakness (Vasilevskis et al., 2010). ICU-acquired weakness is a contributing factor to delirium and

has been associated with prolonged mechanical ventilation, physical deconditioning, pressure ulcers, atelectasis, increased ICU and hospital length of stay, and post-discharge complications (Bassett, Vollman, Brandwene, & Murray, 2012; Truong et al., 2009). Activity limitations, substantial weakness, and sensory deficits lasting months to years after hospitalization are the most commonly reported post-discharge complications among patients with ICU-acquired weakness (Nordon-Craft, Moss, Quan, & Schenkman, 2012).

Background of the Problem

Mechanical ventilation is often necessary for patients experiencing respiratory failure. Common causes of respiratory failure include lung disease, severe heart disease, neurological conditions, acute chest injury, trauma, sepsis, and multisystem organ failure (Matthay et al., 2003). Approximately 800,000 hospitalized patients in the United States require mechanical ventilation each year (Wunsch et al., 2010). The goals of mechanical ventilation are to provide adequate ventilation and oxygenation in order to normalize arterial blood gas (ABG) levels and acid-base imbalances (Grossbach, Chlan, & Tracy, 2011). An ABG analysis is obtained by measuring the amount of free hydrogen (pH), the partial pressure of oxygen (PaO_2), the partial pressure of carbon dioxide ($PaCO_2$), the concentration of bicarbonate (HCO_3), and the level of base excess (BE) in arterial blood. Normal ABG values are presented in Table 1.1. Complications that may develop in patients receiving mechanical ventilation include ventilator-associated pneumonia (VAP), sepsis, acute respiratory distress syndrome (ARDS), pulmonary embolism, barotrauma, and pulmonary edema (National Healthcare Safety Network [NHSN], 2013). The

majority of patients are able to resume spontaneous, unassisted breathing; however, an estimated one-third requires prolonged mechanical ventilation (Zilberberg et al., 2012).

Table 1.1: *Reference Values for Arterial Blood Gases*

Acid-base	Range
pH	7.35-7.45
pO_2	80-100 mm Hg
$PaCO_2$	35-45 mm Hg
HCO_3	22-26 mEq/L
BE	± 2 mEq/L
Oxygen Saturation	<97%

Note. Reference values are given for adults and corrected to 37 degrees body temperature. pH = free hydrogen; $PaCO_2$ = partial pressure of carbon dioxide; HCO_3 = bicarbonate; BE = base excess. Adapted from "Laboratory Tests and Diagnostic Procedures with Nursing Diagnoses," by Corbett, J. (2008). Upper Saddle River, New Jersey: Pearson. Copyright 2008 by Pearson Education, Inc.

Prolonged mechanical ventilation. According to the Centers for Medicare and Medicaid Services, prolonged mechanical ventilation is defined as greater than 21 days of mechanical ventilation for at least six hours per day (MacIntyre et al., 2005). Many variables have been associated with prolonged mechanical ventilation including past medical history of obstructive or restrictive lung disease, diagnosis upon admission to the ICU (e.g. pneumonia, ARDS, neuromuscular disease, head trauma, or postoperative intracranial hemorrhage), location of patient prior to ICU admission (e.g. another ICU, hospital, or medical ward), and elevated Acute Physiology Score (APS) of the Acute Physiologic and Chronic Health Evaluation III (APACHE III) on the first day in the ICU (Miller & Han, 2014). In addition, abnormal laboratory values on the first day in the ICU have also been linked to prolonged mechanical ventilation. Values include, but are not

limited to, abnormal arterial carbon dioxide ($PaCO_2$), serum blood urea nitrogen, serum creatinine, arterial pH, white blood cell count, body temperature, respiratory rate, serum albumin, and ratio of arterial oxygen to fraction of inspired oxygen (Miller & Han, 2014). Relevant laboratory values are presented in Table 1.2.

Table 1.2: *Relevant Laboratory Values*

Laboratory	Range
$PaCO_2$	35-45 mm Hg
Blood urea nitrogen	8-25 mg/dL
Serum creatinine	0.6-1.5 mg/dL in men 0.6-1.1 mg/dL in women
pH	7.35-7.45
White blood cell count	4,500-11,000 mm^3
Body temperature	36.5°-37.2° C
Respiratory rate	12-16 breaths per minute
Serum albumin	3.1-4.3 g/dL
Ratio of arterial oxygen to fraction of inspired oxygen	300-500 mm Hg

Sedation. Sedative and analgesic medications are commonly used in conjunction with mechanical ventilation to prevent or relieve pain and anxiety (Jackson et al., 2010) and decrease excessive oxygen consumption (Kress, Pohlman, O'Connor, & Hall 2000). Some sedatives are administered in the form of intermittent boluses; however, more than one-half of mechanically ventilated patients receive sedatives through continuous intravenous infusion (Wunsch, Kahn, Kramer, & Rubenfeld, 2009). Sedative agents commonly administered in the ICU include propofol, haloperidol, chlorpromazine, midazolam, lorazepam, diazepam, morphine, fentanyl, alfentanil, remifentanil, and clonidine (Rowe & Fletcher, 2008). Although the continuous infusion of sedatives is necessary for many critically ill patients, there are significant risks. Potential negative

outcomes include oversedation, undersedation, ICU delirium, prolonged mechanical ventilation, and increased length of stay in the ICU and hospital (Berry & Zecca, 2012).

ICU delirium. The Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013) defines delirium as a disturbance of consciousness and cognition that develops over a short period of time (hours to days) and fluctuates over time. Symptoms associated with delirium include altered level of consciousness; reduced ability to focus, sustain, or shift attention; change in cognition; sleep disturbances; abnormal psychomotor activity; and emotional disturbances (Barr et al., 2013). Subtypes of delirium include hyperactivity (agitation and restlessness), hypoactivity (lethargy and decreased responsiveness), and a combination of both hyperactivity and hypoactivity. Medications commonly used in adult ICUs have been identified as precipitating risk factors for ICU delirium and may account for 12% to 39% of all delirium cases (Alexander, 2012). Medication classes associated with ICU delirium include opioids, anxiolytics, antidepressants, neuroleptics, antibiotics and corticosteroids (Barr et al., 2013). Furthermore, agents with an increased risk of delirium include, but are not limited to, dopamine, nitroprusside, diphenhydramine, and H_2 antagonists (Fraser, 2005). Delirium has been identified as a predictor of prolonged mechanical ventilation, contributing approximately 20 additional ventilator days (Garnacho-Montero, Amaya-Villar, Garcia-Garmendia, Madrazo-Osuna, & Ortiz-Leyba, 2005).

ICU-acquired weakness. ICU-acquired weakness is an acute onset of neuromuscular or functional impairment with no plausible etiology other than critical illness (Schweickert & Hall, 2007; Vasilevskis et al., 2010). Depending on the method and time of diagnosis, incidence rates for ICU-acquired weakness range from 30% to

90% (Sidiras et al., 2013). Research has shown immobility and prolonged bed rest to be non-beneficial, harmful, and contributing factors in the development of ICU-acquired weakness (Stevens et al., 2009). Additional factors include systemic inflammations (e.g. systemic inflammatory response syndrome, sepsis, and multisystem organ dysfunction), corticosteroid use, and elevated blood glucose levels (Schweickert & Hall, 2007). Adverse effects of ICU-acquired weakness include ventilator-acquired pneumonia, prolonged mechanical ventilation, and pressure ulcer development (Bolton, Gilbert, Hahn, & Sibbald, 1984).

Awakening and Breathing trial Coordination, Delirium assessment and management, Early exercise and mobility (ABCDE) bundle

Spontaneous breathing trials combined with spontaneous awakening trials, targeted sedation protocols, delirium assessment and management, and early exercise and mobility have been shown to dramatically improve outcomes for critically ill patients (Balas et al., 2012; DeGrado, Anger, Szumita, Pierce, & Massaro, 2011; Girard et al., 2008; McConville & Kress, 2012; Vollman, 2010). In 2013, the Society of Critical Care Medicine (SCCM) released *Clinical Practice Guidelines for the Management of Pain, Agitation, and Delirium in Adult Patients in the Intensive Care Unit.* The guidelines were created to assist in the development of integrated, evidence-based, and patient-centered protocols addressing the prevention and treatment of pain, agitation, and delirium in the critical care patient population (Barr et al., 2013).

The ABCDE bundle is a framework for putting the evidence-based guidelines recommended by the SCCM (2013) into practice. Three major components of the ABCDE bundle include (a) awakening and breathing trial coordination, (b) delirium

assessment and management, and (c) early mobility and exercise. Multi-professional collaboration is the key component of the bundle, as it is founded on the principles of improving communication and collaboration among members of the critical care team, standardizing care processes, and breaking the cycle of oversedation and prolonged mechanical ventilation (Balas et al., 2012).

Awakening and breathing trial coordination. Awakening and breathing trial coordination (ABC) is a component of the ABCDE bundle that addresses both sedation and ventilation. Also known as the Wake Up and Breathe protocol, ABC combines spontaneous awakening and spontaneous breathing trials. Spontaneous awakening and spontaneous breathing trial coordination has been shown to decrease hospital length of stay by four days and reduce 1-year mortality rates in mechanically ventilated patients by 32% (Girard et al., 2008). The overall goal of the ABC component is to minimize patient sedation as much as possible to facilitate efforts to safely wean, or decrease, ventilator support. Administering the appropriate type and amount of sedation, safely allowing the patient to wake, and safely evaluating the patient's ability to breathe independently requires effective collaboration and cooperation among physicians, nurses, respiratory therapists and pharmacists. The Wake Up and Breathe algorithm is provided in Appendix A.

A spontaneous awakening trial is a period of pharmacological sedation cessation used to determine a patient's need for sedation. The process involves an initial safety screen performed by the bedside nurse. If the patient fails the safety screen, no further steps are taken and rescreening will take place the following day. If the patient passes the safety screen, the spontaneous awakening trial is performed. Spontaneous awakening

trial failure occurs if the patient shows signs of anxiety, agitation, pain, increased respiratory rate (greater than 35 breaths per minute), decreased oxygen saturation (less than 88%), respiratory distress, or acute cardiac arrhythmias (Barr et al., 2013). If the patient fails the spontaneous awakening trial, sedation is restarted at half of the previous dose. If the patient passes the spontaneous awakening trial, progression to the spontaneous breathing trial should take place.

A spontaneous breathing trial is used to determine when a patient can successfully breathe without assistance and involves periods of minimal or no ventilator support. The process involves an initial safety screen performed by the respiratory therapist. If the patient fails the safety screen, no further steps are taken and rescreening will take place the following day. If the patient passes the safety screen, ventilator settings are reduced to minimal support. Spontaneous breathing trial failure occurs if the patient's respiratory rate becomes greater than 35 breaths per minute or less than 8 breaths per minute, oxygen saturation less than 88%, respiratory distress, mental status change or acute cardiac arrhythmias (Barr et al., 2013). If the patient fails the spontaneous breathing trial, previous ventilator settings should be resumed. If the patient passes the spontaneous breathing trial, extubation should be considered.

Delirium assessment and management. Delirium assessment and management is the third component of the ABCDE bundle. The SCCM (2012) recommends that critically ill patients be routinely monitored, at least once per nursing shift, for delirium using valid and reliable assessment tools. It has been estimated that delirium goes undetected in more than 65% of ICU patients in the absence of a valid and reliable assessment tool. When determining the presence of delirium in critically ill patients, the

patient's level of consciousness must first be assessed. The Richmond Agitation-Sedation Scale (RASS) is a validated sedation/arousal assessment tool for measuring the quality and depth of sedation in adult ICU patients (Barr et al., 2013). RASS scoring, terms, and procedures are provided in Appendix B. The second step in delirium assessment involves evaluating for signs of delirium. The Confusion Assessment Method for the ICU (CAM-ICU) is a delirium monitoring tool recommended by the SCCM (2012) that evaluates mental status, inattention, level of consciousness and disorganized thinking in adult critically ill patients.

Early exercise and mobility. Early exercise and mobility of the critically ill patient can reduce potential complications of immobility and bed rest; however, early mobilization may be difficult during the critical phases of an acute illness. Progressive mobility programs offer exercise and mobility options for conscious and unconscious patients. Progressive mobility has been defined as "a series of planned movements in a sequential manner beginning at a patient's current mobility status with a goal of returning to his/her baseline" (Vollman, 2010). Options for the unconscious patient include elevation of the head of the bed, continuous lateral rotation therapy, manual turning and repositioning, and passive range of motion exercises. As consciousness is regained, progression to active resistance physical therapy and sitting position may be appropriate. Further progression would involve sitting on the side of the bed and transferring out of the bed to a chair. Ultimately, active range of motion exercises and ambulation may be achieved. Progressive mobility programs require effective communication and collaboration among all members of the critical care team.

Setting

Evidence-based practice is widely accepted as the "key to delivering the highest quality of healthcare and ensuring the best practice outcomes" (Melnyk & Fineout-Overholt, 2011). Effective care for critically ill patients requires collaboration among the healthcare team and an alignment of processes and technology. There is a compelling amount of evidence supporting the use of combined spontaneous awakening and breathing trials, delirium monitoring and management, and early mobility protocols to improve patient outcomes. Unfortunately, consistent and accurate use of such protocols by critical care staff is found to be lacking (Balas et al., 2012). Significant barriers to evidence-based practice adoption include lack of knowledge or skills, negative attitudes, and lack of organizational support (Cabana et al., 1999).

This evidence-based practice project took place in the medical-surgical ICU of an academic medical center located in Charleston, South Carolina. The particular ICU is structured as a "closed" critical care model in which all ICU patients are under the direct care of an attending physician with other physicians consulting based on patient condition. The critical care physician team is comprised of pulmonary and anesthesia attendings, residents, and critical care fellows. Attending physicians rotate weekly and residents rotate monthly. The nurse to patient ratio is generally 1:2. The patient population consists of high-risk or critically ill patients 13 years or older requiring continuous pre and post-operative care.

The nurse manager, attending physicians, clinical nurse leaders, and respiratory therapy managers sought to implement the ABCDE bundle in the medical-surgical ICU; however, several challenges existed. The ICU had experienced significant staff turnover

and management changes within the past year. In addition, the unit educator position had been dissolved. Unit leaders recognized the importance of evidence-based practice changes, but they lacked structured implementation strategies to educate and engage team members. Furthermore, the unit had no educational program in place specifically addressing the ABCDE bundle. Setting and sample details are further discussed in chapter three.

Purpose

The particular unit's need for a tailored educational program presented an opportunity for a nurse-led initiative to design and put into place an evidence-based approach to prepare interdisciplinary team members for implementation of the ABCDE bundle. The purposes of this project were to (a) conduct a review of the literature for best practices related to educational strategies among critical care interdisciplinary teams, (b) compare the best strategies for interdisciplinary education in order to identify the most effective strategies that can be utilized to prepare interdisciplinary teams for implementation of a practice change, and (c) design, implement, and evaluate an educational program addressing the ABCDE bundle practice change.

Raelin Model of Work-Based Learning

The Raelin Model of Work-Based Learning (2008) served as a framework to guide this project's design. The model identifies three key elements to use when developing work-based learning programs: (a) learning is acquired in the midst of action and dedicated to the task at hand, (b) knowledge creation and utilization is a collective activity where learning becomes everyone's job, and (c) learners demonstrate a learning-

to-learn aptitude, which frees them to question underlying assumptions of practice. Project interventions were developed based on these elements.

Raelin's first element addresses the concept that individuals learn from experience. Experiential learning is a continuous process that occurs throughout the healthcare professional's career. Effective utilization of experiential learning in the workplace allows individuals to take ownership in their own learning, identify professional development needs, and engage in reflection in and on practice.

Raelin's second element focuses on the importance of a culture of learning. Organizational learning cultures are strengthened by leadership that is supportive of continuous learning and committed to teamwork, collaboration, and adaptability. Successful learning organizations prioritize ongoing individual and team learning, training, and development thus allowing for refinement of organizational operations and processes. In addition, strong learning cultures embrace change and support individual professional development. Ultimately, successful workplace learning occurs when the goals and interests of the individual and the workplace are shared.

The concept of lifelong learning is presented in Raelin's third element. Continued education is necessary throughout the healthcare professional's career due to increasing scientific knowledge, technology advances, and healthcare reform. In general, healthcare professionals have a desire to provide competent, up-to-date, evidence-based care. In order to provide this level of care, healthcare professionals must embrace the notion of lifelong learning.

PICO Question

Asking evidence-based clinical questions in PICOT format (i.e., P: population of interest; I: intervention or issue of interest; C: comparison of interest; O: outcome of interest; T: time for the intervention to achieve the outcome) facilitates well-constructed searches and assists in finding the right evidence and applying the evidence within the context of a particular clinical setting (Melnyk & Fineout-Overholt, 2011). This evidence-based practice project addressed the following PICO question: Among the critical care interdisciplinary team, what is the best strategy to prepare team members for implementation of the ABCDE bundle practice change? The chosen population of interest (P) included critical care interdisciplinary team members in an adult medical-surgical ICU. The intervention of interest was an educational program/strategy to prepare interdisciplinary team members for ABCDE bundle implementation. The comparison intervention was no current educational strategy to prepare interdisciplinary team members for ABCDE bundle implementation. The outcome of interest was successful educational preparation of the interdisciplinary team for implementation of the ABCDE bundle practice change.

Table 1.3: *Evidence-Based Clinical Question*

Population	Intervention	Comparison Intervention	Outcome
Critical care interdisciplinary team in an adult Medical-Surgical ICU	Best educational strategy to prepare team members for implementation of the ABCDE bundle practice change	No current educational strategy to prepare interdisciplinary team members for ABCDE bundle implementation	Successful educational preparation of the interdisciplinary team for implementation of the ABCDE bundle practice change

PICO Definitions and Descriptions

- Critical care- Specialized, multidisciplinary approach to the management of patients with life-threatening conditions or diseases; critically ill patients generally require continuous monitoring and comprehensive care in intensive care units
- Critical care interdisciplinary team- Registered nurses, physicians, acute care nurse practitioners, physicians assistants, respiratory therapists, physical therapists, and pharmacists directly involved in the care of critically ill patients
- Strategy- A plan or method for achieving a particular goal over a period of time (Merriam-Webster's Dictionary)
- Preparedness- The state of being ready or prepared for something (Merriam-Webster's Dictionary)
- Implementation- The process of putting a decision or plan into effect; carrying out a plan or method (Collins English Dictionary)
- Bundle- A set of three to five evidence-based practices that improve patients' outcomes when performed collectively and reliably (Resar, Griffin, Haraden, & Nolan, 2012)
- ABCDE- Acronym for Awakening and Breathing trial Coordination, Delirium assessment and management, Early exercise and progressive mobility
- ABCDE bundle- A set of evidenced-based interventions that prevent adverse consequences related to delirium, immobility, sedation/analgesia, and ventilator management

Summary

Prolonged mechanical ventilation, long-term use of sedation medications, delirium, and immobility are significantly common problems among critically ill patients. These problems can result in adverse clinical outcomes, substantial costs, increased length of stay in the ICU and hospital, and increased morbidity and mortality rates. Practice guidelines and recommendations set forth by the SCCM (2012) have led to the development of the ABCDE bundle of care. Multi-professional collaboration and effective communication among critical care team members is required for successful implementation of the bundle. Accurate and consistent use of the ABCDE bundle can improve patient outcomes, reduce costs, decrease ICU and hospital length of stay, and lower morbidity and mortality rates.

The purpose of this project was to implement a nurse-led initiative to design and put into place an evidence-based approach to prepare interdisciplinary team members for implementation of the ABCDE bundle. The literature has been reviewed and compared for best practices related to education among critical care interdisciplinary teams. Based on the evidence, an educational intervention related to the ABCDE bundle practice change was developed, implemented, and evaluated. Chapter one has provided a thorough description of the background and significance of prolonged mechanical ventilation, ICU delirium, and ICU-acquired weakness. In addition, a description of the ABCDE bundle practice change has been discussed. Chapter two provides a thorough description of the literature search process, identification of relevant literature, and an analysis and synthesis of the literature.

CHAPTER 2

LITERATURE REVIEW

The purposes of this project were to (a) conduct a review of the literature for best practices related to practice change readiness among critical care interdisciplinary teams, (b) compare the best strategies for practice change preparation in order to identify the most effective strategies that can be utilized to prepare interdisciplinary teams for implementation of a practice change, and (c) develop and incorporate a formal strategy to prepare interdisciplinary teams for implementation of the ABCDE bundle practice change. In order to effectively address these purposes, a search for the best evidence to support the quality improvement project was conducted. Furthermore, the evidence obtained from the search process has been critically appraised. Chapter two provides a thorough description of the literature search process, identification of relevant literature, and an analysis and synthesis of the literature.

Search Process

The quality improvement project clearly expanded beyond one specific profession. In order to find reliable, accurate, and consistent evidence relevant to interdisciplinary teams, multiple scholarly databases were searched. The initial literature review included a systematic search of the following databases: CINAHL Complete, PubMed, Ovid MEDLINE, and grey literature. Search terms and results are listed in Table 2.1.

Table 2.1: *Search Results with Key Words*

Key Words	**CINAHL Complete**	**PubMed**	**Ovid MEDLINE**
AACN roadmap for change	0	0	0
AACN AND unit gap analysis	0	0	0
ABCDE bundle	7	7	7
Acute care AND interdisciplinary team AND practice change preparation	0	0	0
Acute care interdisciplinary team AND quality improvement	2	53	0
Acute care interdisciplinary team AND practice change AND education	0	8	0
Critical care AND interdisciplinary team AND practice change	3	15	1
Critical care AND practice change implementation	5	214	0
Critical care AND interdisciplinary team AND practice change AND preparation	0	0	0
Critical care AND interdisciplinary team AND gap analysis	0	0	0
Critical care interdisciplinary team AND practice change preparation	0	0	0
Critical care interdisciplinary team AND quality improvement	2	47	0
Critical care unit AND gap analysis	0	99	0
Intensive care interdisciplinary team AND quality improvement	3	37	0
Intensive care AND interdisciplinary team AND practice change preparation	0	0	3
Intensive care AND unit gap analysis	0	0	0
Interdisciplinary team AND practice change	0	38	0

implementation			
Interdisciplinary AND education AND practice change	29	71	8
Interprofessional AND education AND practice change	42	287	13
Interprofessional education AND evaluation AND practice change	4	88	2
Interprofessional education AND critical care practice change AND evaluation	0	11	0
Multi professional education	45	169	20
Multi professional education AND acute care	0	14	0
Multi professional education AND critical care	2	12	0
Multi professional education AND intensive care	0	10	0
Practice change preparation AND critical care unit	0	9	0
Practice change preparation AND evaluation	0	87	0
Practice change readiness AND critical care	0	10	0
Knowledge translation AND evidence-based practice	272	734	123
Knowledge translation AND evidence-based practice AND critical care	13	62	6
Staff development AND evidence-based practice	524	508	89
Staff development AND evidence-based practice AND critical care	55	61	2
Staff development AND education AND critical care	227	252	43
Staff development AND education AND evidence-based practice	7	340	68
Staff development AND education AND practice change	37	190	6
Work-based learning	67	79	50
Work-based learning AND critical care	2	14	1
Work-based learning AND implementation	11	14	8
Disseminating evidence AND implementation	16	49	13

Interprofessional AND learning theories	15	28	16
On-the-job-training AND practice change	3	690	0

Retrieved information was limited to English language studies, human species, and those published between 2008 and the present. Few studies have focused on methods of education and implementation of the ABCDE bundle. As a result, it was necessary to expand the literature review to include articles related to methods of education and implementation of evidence-based guidelines. The literature search revealed a total of 11 articles pertinent to the subject of this project. Of these, two articles (Balas et al., 2013; Carrothers et al., 2013) specifically addressed implementation of the ABCDE bundle. Final inclusion criteria included articles that addressed one or more of the following: implementation strategies, implementation facilitators and/or barriers, interdisciplinary collaboration strategies, and continuing interprofessional educational programs. Furthermore, chosen articles included those with study samples consisting of health care professionals practicing in the clinical setting.

Evidence Evaluation

Articles obtained from the search were placed into an evidence synthesis table (Table 2.2) for further evaluation and grading. The selection of the evidence synthesis table headings was guided by Melnyk and Fineout-Overholt's (2011, pp. 521-522) evaluation table template. Evaluation of each article included evidence rating, purpose, design, sample, outcome, and concepts significant to this project. Ultimately, 11 articles were chosen. Articles included two literature reviews, four cross-sectional studies, two before and after studies, one non-randomized control trial, and two case-control studies. The following search terms yielded the most significant results in CINAHL Complete and Ovid MEDLINE: work-based learning, critical care, implementation, disseminating evidence, learning theories, on-the-job training, and practice change.

The Scottish Intercollegiate Guidelines Network (SIGN) Critical Appraisal Notes and Checklists tool was used to evaluate the reliability and validity of the articles in the evidence synthesis table 2.2. Evidence ratings were based on the SIGN 50 rating system (2011). The SIGN 50 rating system (Appendix C) provided a method of evaluation where each article was given a numerical value based on the level of evidence. A rating of 1 was applicable to meta-analyses, systematic reviews and randomized control trials. A rating of 2 was applicable to case control or cohort studies. A rating of 3 was applicable to non-analytic studies. A rating of 4 was applicable to expert opinion. Risk of bias was indicated based on the following: (++) very low risk of bias; (+) low risk; or (-) high risk.

Of the 11 articles used as evidence to support this project, 8 were rated as 2+ and 3 were rated as 3. The overall strength of the evidence was found to be relatively low. This is likely due to the overall limited amount of health research specifically focused on implementation strategies. Fortunately, the field of implementation research is growing due to the need to further understand how implementation strategies support the delivery of health services, programs, and policies.

The concept of interprofessional education in the workplace is increasing across healthcare organizations, yet the quality of underpinning evidence was found to be limited. The available evidence discussed in this chapter covers a range of education and implementation interventions in a variety of clinical settings using an array of outcome measures. Three important philosophies found to be consistent throughout the review include individual learning from experience, learning in an organizational culture of

learning, and lifelong learning. Interventions for this quality improvement project were based on the three philosophies and are discussed in chapter three.

Learning in the Workplace

The Institute of Medicine (IOM) report, *Redesigning Continuing Education in the Health Professions*, recommends: "Continuing education efforts should bring health professionals from various disciplines together in carefully tailored learning environments. As team-based healthcare delivery becomes increasingly important, such interprofessional efforts will enable participants to learn both individually and as collaborative members of a team, with a common goal of improving patient outcomes" (IOM, 2010, p. 3). Workplace learning, in theory and practice, has grown in recent years and is now widely recognized as a key to sustainable competitive advantage (American Association of Colleges of Nursing [AACN] & Association of American Medical Colleges [AAMC], 2010). Cultural and economic shifts have led to increased utilization of workplace learning in various areas such as business, industry, and healthcare. For purposes of this project, workplace learning is defined as "the way in which individuals or groups acquire, interpret, reorganize, change or assimilate a related cluster of information, skills and feelings" (AACN & AAMC, 2010, p. 21).

A review of approaches used to improve the effectiveness of workplace learning found that multifactorial educational interventions are most useful for inducing and sustaining practice changes. On-the-job training methods utilize a variety of educational strategies such as one to one training, videos, demonstrations, written and online materials, and coaching (Carrothers et al., 2013). Train-the-trainer models generally involve training delivered by a professional instructor that creates a team of trainers who

are capable of providing education to others (Lane & Mitchell, 2013). Traditional methods of education, such as classroom-based learning and skills days, have been found to have a questionable effect on professional development and patient outcomes (Williams, 2010). One study found that providing on-the-job training for interdisciplinary team members across four adult ICUs achieved higher levels of ABCDE bundle compliance at a much faster pace compared to train-the-trainer models and traditional approaches (Carrothers et al., 2013). In the same study, the train-the-trainer model achieved higher bundle compliance at a faster pace compared to the traditional approach. The particular study utilized an on-the-job training model where one nurse champion was pulled out of staffing to train colleagues one at a time using videos, demonstrations, written and online materials, and coaching. The train-the-trainer model used in the study (Carrothers et al., 2013) involved educational sessions led by unit super users; whereas, the traditional model involved interdisciplinary education sessions and skills days.

Multiple strategies should be considered when developing and implementing evidence-based practice changes in the clinical setting. One study (Rangachari, Rissing, & Rethemeyer, 2013) demonstrated that awareness of evidence-based practices alone does not translate into implementation. Workplace learning occurs within the context of ever-changing, complex systems of practice. Many hospitals have experienced change implementation failure resulting from top-down communication strategies in the forms of policy mandates and guidelines. Inflexible systems often cause healthcare professionals to view continuing education as another task to accomplish. The AACN and AAMC (2010) collaboratively recognize that "continuing education methods should embrace

clinical systems, and complexity concepts using the best available evidence and its provision demonstrate a high level of innovation, accessibility, effectiveness, timeliness, and relevance to healthcare practice and to the learner" (p. 15). One study (Rashotte, Thomas, Gregoire, & Ledoux, 2008) suggested the utilization of a bundle of strategies including an educational intervention, unit-based champions and context specific tools, and resources.

A better understanding of implementation methods and strategies may lead to more effective uptake and application of evidence-based practice changes in the clinical setting. It is important to recognize that selection of a single theory or framework may be insufficient for the complexities of interprofessional education and workplace learning (Owen et al., 2014). Balas et al. (2014) observed that future implementation efforts would benefit from intense and sustained interprofessional education, coordination, and cooperation. One study (Rangachari, Rissing, & Rethemeyer, 2013) recognized a significant gap in what is known and what is consistently done, thus recommending further studies in the field of implementation research. The literature shows that scientific evidence is insufficiently used to support and guide practice change processes (Josefsson, Kammerlind, & Sund-Levander, 2012).

Williams (2010) has suggested that work-based learning should be based on the three key elements introduced by Raelin (2008) and include the belief that "learning is acquired in the midst of action and dedicated to the task at hand; knowledge creation and utilization is a collective activity where learning becomes everyone's job; and learners demonstrate a learning-to-learn aptitude, which frees them to question underlying assumptions of practice" (p.2). Interventions in the quality improvement project were

based on these elements; therefore, it is important to discuss each element in further detail.

Individual learning from experience

Healthcare professionals are individual learners who possess different and unique experiences. Learning from experience is a continuous process and is recognized as the cornerstone of work-based learning (Williams, 2010). As Kolb et al. (1995) and Raelin (1997) have suggested, individuals are predisposed to one of four learning types: conceptualization, experimentation, experience, and reflection. Utilization of all four types creates a solid foundation for workplace learning, thus achieving the most learning in the shortest amount of time. An individual's ability to reflect on previous experiences may contribute to quicker and more effective learning (Raelin, 1997).

Several studies (Balas et al., 2013; Carrothers et al., 2013; Jansson, Ala-Kokko, Ylipalosaari, Syrjala, & Kyngas, 2013) have identified knowledge deficits as a significant barrier in the implementation process. This may be attributed to the use of insufficient learning strategies. Educators should not rely on a single learning strategy when implementing practice changes. Recognizing that individuals learn differently, multiple learning strategies should be utilized. As suggested by Williams (2010), the implementation process requires careful planning and consideration of learning cultures, described below.

The use of multiple educational strategies throughout the entire implementation process (i.e. pre-implementation, implementation, post-implementation) may lead to effective adoption of a practice change. Sustained and frequent educational efforts have been identified as factors contributing to successful bundle implementation (Balas et al.,

2013). One study (Radtke et al., 2012) found that extended repetitive training sessions for interdisciplinary teams in three adult surgical ICUs led to more consistent long-term use of sedation, pain and delirium assessment tools and improved patient outcomes than one-time training alone. Extended training sessions on the ABCDE bundle practice change may enable higher long-term implementation rates that may lead to improved patient outcomes.

Based on the evidence, this quality improvement project used multiple learning strategies. In order to use the most effective and appropriate learning strategies, an assessment was performed to identify the various learning types of the individuals included in the sample medical-surgical ICU. The learning assessment is further discussed in chapter three.

Learning culture

Learning cultures should be considered throughout the development and implementation of evidence-based practice changes. Successful workplace learning occurs when the goals and interests of the individual and the workplace are shared. Organizations with strong learning cultures are characterized by non-hierarchical, team-based learning structures that prioritize learning, empower change, involve staff on all levels, and embrace suggestion and innovation (Williams, 2010). Studies have identified specific variables contributing to change implementation, including leadership, organizational learning, communication, teamwork, staff engagement, and culture of safety (Balas et al., 2013; Carrothers et al., 2013; Rangachari, Rissing, & Rethemeyer, 2013). Culture and characteristics of individual units and organizations have an effect on evidence-based practice implementation. Therefore, facilitators and barriers specific to

the unit and organization should be identified when developing and implementing evidence-based practice changes.

Teamwork and collaboration are essential elements that contribute to optimal implementation. Owen et al., (2014) recognized learning as an integral activity occurring during work and practice that can be improved by understanding how interprofessional teams practice, work, and learn together. Carrothers et al. (2013) identified two significant barriers to ABCDE bundle implementation, including staff morale issues and lack of respect among disciplines. Balas et al. (2013) has suggested that teams can reduce these barriers through communication and coordination strategies such as interdisciplinary team rounds and engagement of key implementation leaders.

Based on the evidence, the quality improvement project used communicative and collaborative strategies. In order to use the most effective and appropriate strategies, an assessment was performed to identify the current level of teamwork and collaboration in the sample medical-surgical ICU. The assessment is further discussed in chapter 3.

Lifelong learning

Lifelong learning has been defined as "the voluntary and self-motivated pursuit of knowledge for either personal or professional reasons" (AACN & AAMC, 2010, p. 27). In general, healthcare professionals embrace the notion of lifelong learning as they desire to provide competent, up-to-date, evidence-based care. Increasing scientific knowledge, technology advances, and healthcare reform have made continued education necessary throughout the health professional's career. The process of lifelong learning allows the learner the ability to utilize one's practice to determine learning needs, search and critically appraise evidence, apply evidence to practice, manage changing evidence, and

evaluate one's competencies and practice (AACN & AAMC, 2010). When this process is applied, learners are able to challenge the assumptions that underpin their everyday practice.

Adoption and sustainment of a practice change requires more than education alone. Interdisciplinary teams need to understand the significance of the practice change. If team members do not understand the significance of a practice change, its uptake may be viewed as unnecessary and lead to inconsistent practices. Simply informing heath care professionals of EBP does not ensure clinical uptake and adequate implementation. EBP implementation is complex and strategies should be developed based on individual unit needs. Thomas et al. (2010) recognized that sustaining practice changes across an interprofessional team is difficult and suggested the use of ongoing audits with feedback to staff in a timely manner. Providing audits and feedback allows staff members to understand the significance of the practice change on patient outcomes. Strategies for the sustainment of EBP changes include: visibility of assessment tools, ongoing audits and feedback in a timely manner, bedside coaching, and unit contests and games. Utilization of individual, experiential, and team learning theories throughout the development and implementation of EBP changes can result in positive provider perceptions and higher levels of commitment.

The concept of lifelong learning was evident throughout the quality improvement project. Awareness of the ABCDE bundle practice change alone does not ensure adoption and sustainment of the practice change. As a result, this project aimed to use multiple learning strategies, learning culture, and lifelong learning to promote the

adoption and sustainment of the ABCDE bundle practice change in the sample medical-surgical ICU.

Summary

A review of literature for best practices related to practice change readiness among interdisciplinary teams revealed strategies that can be utilized to prepare interdisciplinary teams for implementation of a practice change. Interventions used in the quality improvement project were guided by Raelin's Model of Work-Based Learning (2008) and focused on the concepts of individual learning from experience, learning in an organizational culture of learning, and lifelong learning. Chapter two has described the search process and provided an analysis and synthesis of significant literature related to the quality improvement project. Chapter three provides a description of the interventions for the quality improvement project.

Table 2.2: *Evidence Synthesis Table*

Evidence Level	Brief Citation	Purpose	Design	Sample	Outcome	Concepts Significant to Project
2+	Balas et al. (2013)	To identify facilitators and barriers to ABCDE bundle adoption and to evaluate the extent to which bundle implementation was effective, sustainable, and conducive to dissemination	Prospective, before-after, mixed-methods study	Interprofessional ICU team members working in five adult ICUs, a medical/surgical step-down unit, and a hematology/ oncology special care unit in a 624 bed, Midwestern, academic medical center	Factors found to facilitate bundle implementation included: 1) the performance of daily, interdisciplinary rounds, 2) engagement of key implementation leaders, 3) sustained and diverse educational efforts, and 4) the bundle's quality and strength. Barriers identified included: 1) intervention related issues (e.g. timing of trials, fear of adverse events), 2) communication and	Culture and characteristics of individual units and organizations have an effect on EBP implementation. Therefore, facilitators and barriers specific to the unit and organization should be identified when developing and implementing EBP changes.

					care coordination challenges, 3) knowledge deficits, 4) workload concerns, and 5) documentation burden.	
2+	Carrothers et al. (2013)	To identify which contextual factors facilitate/hinder the implementation of the ABCDE bundle	Study included document review, planned site visits (including interviews and observations), a brief online contextual factors survey, and self-reported process and outcome data.	Four San Francisco Bay Area ICUs	Factors found to facilitate ABCDE bundle implementation included structural characteristics of the ICU, an organizational-wide patient safety culture, and ICU culture of quality improvement, implementation planning, training/support, and prompts/documentation. Barriers identified included excessive turnover,	Culture and characteristics of individual units and organizations have an effect on EBP implementation. Therefore, facilitators and barriers specific to the unit and organization should be identified when developing and implementing EBP changes.

					staff morale issues, lack of respect among disciplines, knowledge deficits, and excessive use of registry staff.	
2+	Diedrick, Schaffer, & Sandau (2011)	To determine if a consistent communication strategy for implementation of EBP, developed with input from staff nurses, improved staff nurse satisfaction with communication of practice changes.	Quasi-experimental single group before-after design	Non-randomized convenience sample of 214 staff nurses of a level III neonatal ICU	A consistent strategy can improve nurse satisfaction with communication of EBP changes.	Consistent communication strategies should be used when developing and implementing EBP changes.
2+	Jansson et al. (2013)	To explore critical care nurses' knowledge of, adherence to and barriers towards evidence-based	Quantitative cross-sectional survey	101 critical care nurses in a single academic center in Finland	Barriers towards evidence-based guidelines were inadequate resources and disagreement with the results as well	The following barriers should be taken into consideration when developing and implementing EBP changes:

		guidelines for prevention of VAP.			as lack of time, skills, knowledge and guidance.	inadequate resources, disagreement with results, lack of time, skills, knowledge and guidance.
2+	Josefsson, Kammerlind, & Sund-Levander (2012)	To describe factors that facilitate or hinder the application of EBP in the clinical context.	Quantitative study with questionnaire	Healthcare staff employed in the County Council of Jonkoping	Scientific evidence for healthcare is not used sufficiently as a base for decisions in daily practice as well as for changing practice.	Development and implementation of EBP changes should be scientifically based.
2+	Radtke et al. (2012)	To compare the effectiveness of two different training strategies on the implementation rate of scoring instruments on the ICU.	Experimental cohort study	Three adult surgical ICUs	A modified extended training strategy for ICU monitoring tools (sedation, pain, delirium) leads to higher intermediate and long-term implementation rates and is associated with improved patient outcome.	Extended training strategies can enable higher long-term implementation rates that may lead to improved patient outcomes.

2+	Rangachari et al. (2014)	To examine associations between QI interventions and communication context and frequency, and to examine associations between communication content and frequency and outcomes at the unit level. Identify evidence-based management strategies for positive practice change at the unit level.	Prospective case-control	12 attending physicians, 89 nurses, 79 residents, and 6 managers at a medical ICU and pediatric ICU within an academic health center	Communication content and frequency at the front lines can be modified by periodic QI interventions and modifying communication content and frequency can enable positive practice change at the unit level.	Frequent and consistent communication enables positive practice change at the unit level.
3	Rangachari, Rissing, & Rethemeyer (2013)	To generate incremental, context-sensitive, evidence-based	Literature review	N/A	Awareness of EBPs alone does not translate to implementation	Simply informing heath care professionals of EBP does not ensure clinical

		management strategies for the successful implementation of EBPs.				uptake and adequate implementation. EBP implementation is complex and strategies should be developed based on individual unit needs.
3	Thomas et al. (2010)	To reduce inconsistent practices, improve patient outcomes related to comfort, and enhance collaboration among health care team members caring for critically ill children	Descriptive study	Interprofessional team in the pediatric ICU at the Children's Hospital of Eastern Ontario.	Sustaining change in collaborative practices across a variety of health care team members is difficult. When a practice change is not seen as having a significant and direct positive patient outcome, its uptake is not viewed as an imperative within unit practices. Suggestions for	Strategies for the sustainment of EBP changes include: visibility of assessment tools, ongoing audits and feedback in a timely manner, bedside coaching, and unit contests and games.

					improvement include visibility of assessment tools throughout units, ongoing audits with feedback to staff in a timely manner, bedside coaching with practitioners, and unit contests and gaming activities.	
2+	Owen et al. (2014)	To describe a process of design, implementation, and evaluation of continuing interprofessional education (CIPE) program through the application of 3 explicit theories related to CIPE and workplace learning: 1)	Quantitative study	Interprofessional team consisting of physicians, nurses, APRNs, and respiratory therapists at the University of Virginia	Positive changes in provider perceptions of and commitment to team-based care were achieved using a theory-based approach.	Utilization of individual, experiential, and team learning theories throughout the development and implementation of EBP changes can result in positive provider perceptions and higher levels of commitment.

		social identity theory, 2) reflective and experiential learning, and 3) learning within communities of practice.				
3	Williams (2010)	To critically review the work-based learning literature and explore implications of the findings for the development of work-based learning programs.	Literature review	N/A	A change in culture from classroom to work-based learning requires careful planning and consideration of learning cultures.	Learning cultures should be considered throughout the development and implementation of EBP changes.

CHAPTER 3

METHODS

Introduction

The purpose of this project was to implement a nurse-led initiative to design and put into place an evidence-based approach to prepare interdisciplinary team members in the Medical Surgical ICU (MSICU) for implementation of the ABCDE bundle practice change. The quality improvement project was supported by the evidence provided in the literature review and interventions were guided by Raelin's Model of Work-Based Learning (2008). Chapter three describes the research methodology used for this project. The setting, sample, outcomes to be measured, intervention, and strategies to reduce barriers and increase support are discussed.

Design

Raelin's Model of Work-Based Learning (2008) provided a structure for the quality improvement project. Raelin's Comprehensive Model of Work-Based Learning (Figure 3.1) shows the integration of work and learning occurring at both the individual and collective levels. With the understanding that learning modalities are dependent on various conditions (e.g. readiness to learn, facilitator strengths and preferences, and/or organizational and unit culture) the model does not require a set sequence of steps to merge work-based learning theory and practice (Raelin, 2008). Instead, the model allows

for a more tailored approach to work-based learning in which the learning needs of individuals and teams can be met simultaneously. Three key concepts are consistent throughout the work-based learning process and include (a) experiential learning, (b) learning culture, and (c) lifelong learning. Interventions for the quality improvement project were selected based on the concepts and are discussed below.

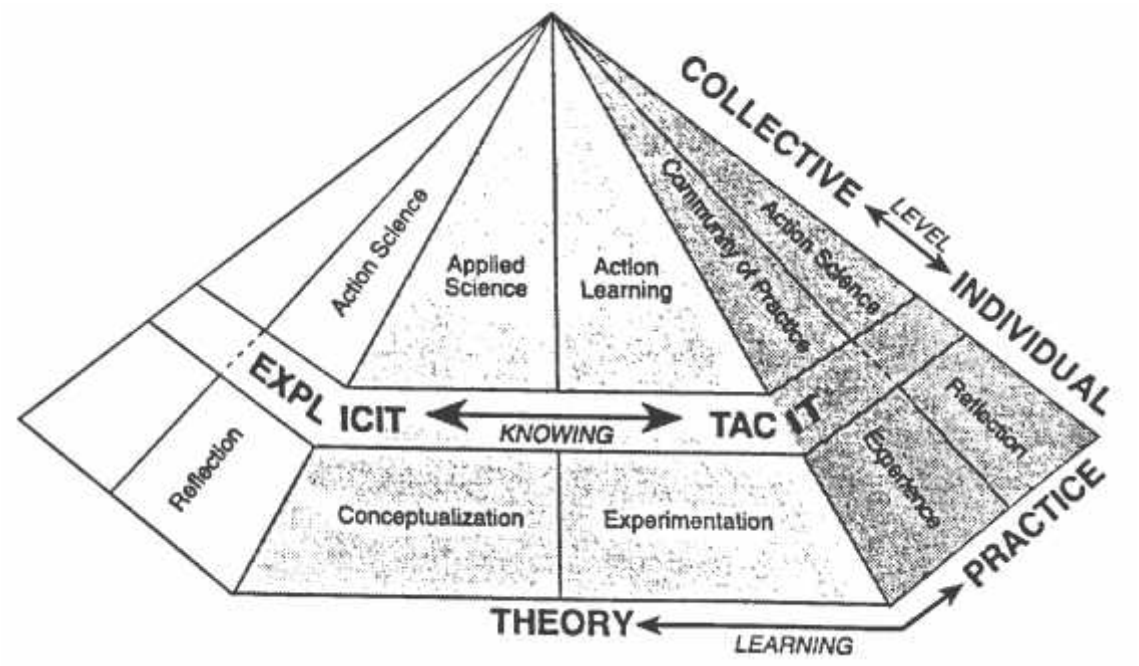


Figure 3.1: *Raelin's Comprehensive Model of Work-Based Learning*

Setting

The quality improvement project took place in the MSICU at the Medical University of South Carolina. The MSICU is an 18-bed adult critical care unit. The particular ICU is structured as a "closed" critical care model in which all ICU patients are under the direct care of an attending physician with other physicians consulting based on patient condition. An attending faculty member of the Department of Anesthesia and Perioperative Medicine serves as the MSICU Medical Director and is responsible for the overall function of the unit. The patient population consists of high-risk or critically ill

patients 13 years or older requiring continuous pre- and post-operative care. Common diagnoses among patients include, but are not limited to: gastrointestinal cancer, hepatic disease, pancreatic and biliary disorders, functional bowel disorders and disease, nutritional disorders, motility disorders, esophageal disorders, bariatric surgery, islet cell transplants, acute and chronic leukemia, Hodgkin's lymphoma, non-Hodgkin's lymphoma, and breast cancer. The nurse to patient ratio in the MSICU is generally 1:2 and may change based on patient acuity.

The MSICU interdisciplinary team consists of registered nurses, attending physicians, critical care fellows, resident physicians, respiratory therapists, clinical pharmacists, and managers. The critical care physician team is comprised of pulmonary and anesthesia attendings, critical care fellows, and resident physicians. Attending physician coverage rotates weekly. Critical care fellows and resident physicians rotate monthly. At the initiation of this project, 60% of the ICU nurses are Critical Care Registered Nurse certified. While the institution employs critical care clinical nurse educators, the participating unit does not have a specifically assigned clinical nurse educator. Additionally, the institution does employ advanced practice registered nurses (APRNs); however, APRNs have never been assigned to the MSICU. Respiratory therapists are assigned to ICUs based on predicted workload and assigned to clinical areas outside the ICU if workload is lower than expected. One full time pharmacist is assigned to the MSICU. The unit does not have an assigned physical therapist. Instead, physical therapy consults must be ordered for patients to receive physical therapy evaluations and treatments.

At the time of this project, communication methods utilized by the MSICU interdisciplinary team included monthly shared governance council meetings, unit webpage on the hospital intranet, weekly unit updates sent via electronic mail from the unit nurse manager, and shift huddles. In 2014, the MSICU initiated a shared governance model with the following professional practice domains: practice, quality, leadership, and recruitment and retention. At the time of this project, councils were in place for each of the five domains. Councils held meetings each month. Council meetings were in a conference room on the unit to allow for greater accessibility for all interdisciplinary team members. All members of the MSICU interdisciplinary team were welcomed to attend the meetings and council participation was encouraged. Minutes from each council meeting were compiled and disseminated to all interdisciplinary team members through electronic communication. In addition, council meeting minutes were made accessible on the MSICU intranet webpage.

In December 2014, upgrades to the hospital-wide intranet allowed for the development of unit-specific webpages. At the time of this project, the MSICU webpage was accessible to all members of the unit's interdisciplinary team. The webpage was also accessible by interdisciplinary teams in the hospital's five additional adult critical care units. These units included Medical ICU, Surgical-Trauma ICU, Cardiothoracic ICU, Coronary Care Unit, and Neurovascular ICU. Information placed on the MSICU webpage was approved by the unit councils, nurse manager, and medical director. Information included, but was not limited to, unit council information, educational opportunities and resources, professional development resources, hospital and unit policies and procedures, and unit news. The webpage was managed by one of the

MSICU clinical nurse leaders. Information was uploaded to the webpage and disseminated to interdisciplinary team members in a timely manner.

The MSICU nurse manager communicated with the interdisciplinary team on a weekly basis by electronically mailing "MSICU Weekly Updates" each Monday. The updates generally included weekly reviews of unit happenings, staff recognition, safety information, and hospital pillar goals. Reminders of unit-specific practice changes and mandatory staff requirements were also included in the weekly updates.

Huddles were another method of communication utilized in the MSICU. One page huddle scripts were developed weekly by the unit nurse manager and contained important information to be disseminated to team members in a consistent and timely manner. Charge nurses were responsible for leading unit huddles prior to the change of each shift. Huddles occurred twice daily at approximately seven o'clock in the morning and seven o'clock in the evening. Huddles generally lasted between five to seven minutes. The one page scripts were read to on-coming team members by the off-going charge nurse. All interdisciplinary team members were welcome to participate in huddles; however, timing of the huddles presented a challenge for many members to attend. Most often, huddle participants included nurses, clinical nurse associates, and unit secretaries. A hard copy of each huddle script was placed in a binder located at the nurses' station on the unit. In addition, huddle scripts were sent electronically to all interdisciplinary team members.

Methods generally used to disseminate practice change information and education to the MSICU interdisciplinary team and evaluate competency may have contributed to inadequate and inconsistent practices. At the time of this project, the Medical University

of South Carolina used Combined Access Training Tracking System (CATTS) for mandatory compliance training. The web-based training system allowed users to view slide presentations and answer multiple choice questions related to the presentation content. Users were required to answer 80% of the questions correctly in order to be considered competent in the subject matter of the presented material. This training system is likely to be most effective when used in conjunction with other training methods. Unfortunately, CATTS was often the only training method provided to MSICU interdisciplinary team members. Examples of recent training through CATTS included, but were not limited to, responding to a patient with suspected Ebola, stroke recognition, central line associated blood stream infections, and catheter associated urinary tract infections. As evidenced in Rangachari, Rissing, and Rethemeyer's study (2013), raising awareness of evidence-based practice changes through mandated educational programs does not always result in successful implementation of practice changes.

The nurse manager, attending physicians, clinical nurse leaders, and respiratory therapy manager sought to implement the ABCDE bundle in the MSICU. However, the unit lacked structured implementation strategies to educate and engage team members. The unit's need for a tailored educational program specifically addressing the ABCDE bundle presented an opportunity for this author to lead an implementation team that would design and put into place an evidence-based approach to prepare interdisciplinary team members for implementation of the ABCDE bundle. As the implementation team leader, this author utilized the aforementioned communication strategies already in place within the unit to communicate with interdisciplinary team members throughout the

project. Specific details of these strategies, along with communication methods supported by the literature review, are discussed below.

Evidence-based practices were not consistently applied in the MSICU. Current educational strategies and methods of evidence dissemination may have contributed to the inconsistency. This quality improvement project did not include implementation of the ABCDE bundle or evaluation of the ABCDE bundle practice change. Instead, the project focused on assessing the unit's readiness to support implementation of the ABCDE bundle practice change. This included assessing the climate and receptivity of the unit, addressing barriers to implementation, providing the necessary information and education to team members, and ensuring that the information has been received. Results from this project may potentially lead to full implementation of the ABCDE bundle and may be applied to generate evidence-based management strategies for future practice changes in the MSICU.

Participants

All members of the MSICU interdisciplinary team were invited to participate in the quality improvement project. Invited participants included all full and part-time registered nurses (N=62), attending physicians (N=10), critical care fellows (N=2), resident physicians (N=10), respiratory therapists (N=12), pharmacists (N=1), and managers (N=2) directly impacting patient care in the MSICU. These interdisciplinary team members were purposely chosen because of their critical care expertise and essential role in the ABCDE bundle.

Outcomes to be measured

A pre- and post-intervention assessment of the MSICU's organizational infrastructure and readiness to support effective implementation of the ABCDE bundle practice change was conducted. As evidenced by Owen et al., (2014), the culture and characteristics of individual units have an effect on implementation of evidence-based practices. The pre-intervention assessment examined the culture and characteristics of the MSICU and helped to identify and address facilitators and barriers to change within the unit. The survey used for the pre-intervention assessment included the American Association of Critical Care Nurses (AACN) Unit Gap Analysis and Change Readiness Assessment (AACN, 2012). These were developed by the AACN specifically for critical care bundle implementation, and were based on the Agency for Healthcare Research and Quality (AHRQ) Quality Indicators Toolkit (Agency for Healthcare Research and Quality, 2014). The Unit Gap Analysis and Change Readiness Assessment tools are available through the AACN and may be reproduced as needed without requesting individual permission from AACN. Demographic measurements of participants included profession, years of critical care experience, and length of time on the unit. Additionally, participants were asked to share their opinion on (a) perceived facilitators and barriers to practice change implementation, (b) culture and characteristics of the MSICU, and (c) concerns and suggestions for ABCDE bundle implementation. Data collected from the pre-intervention assessment provided information to be used for the development of unit-specific intervention strategies to prepare MSICU interdisciplinary team members for implementation of the ABCDE bundle. Implementation details are discussed below.

Upon completion of the unit-specific educational interventions, a post-intervention assessment was conducted. The post-intervention assessment was an essential component of this quality improvement project. The assessment provided participants the opportunity to (a) evaluate educational interventions, (b) self-reflect on individual learning, and (c) re-evaluate unit culture and characteristics. Data from each of the surveys was analyzed to determine if the educational interventions had positively impacted unit readiness to support effective implementation of the ABCDE bundle practice change.

Data Collection

Data for the quality improvement project was collected using the Research Electronic Data Capture (REDCap™) survey tool. REDCap™ is a secure web application developed to support data capture for research studies. The tool provides an interface for validated data entry, audit trails, automated export trails, and procedures for importing data (Harris et al., 2009). Researchers can use the tool to send emails and track responders/non-responders.

The pre- and post-intervention assessments were entered into the REDCap™ application. Using the REDCap™ interface, assessments were electronically mailed to MSICU interdisciplinary team members' hospital email accounts. REDCap™ allows users to schedule automatic survey reminders and length of survey availability. The assessment surveys were made available to participants for one week. Survey reminders were electronically mailed to participants at the midpoint of the survey week.

The REDCap™ survey tool provides researchers the option to keep participant responses anonymous. Participant responses for this quality improvement project

remained anonymous. Additionally, minimal demographic information was collected and included profession, experience, and length of time on the unit. Participant consent was implied by voluntary completion of the assessment surveys.

Data Analysis

Quantitative data from the pre- and post-intervention assessments was analyzed using SAS software. In addition to the Likert scale responses in the pre- and post-intervention assessments, quantitative data consisted of participant profession, years of experience, and length of time in MSICU. Qualitative data included participant opinion on (a) perceived facilitators and barriers to practice change implementation, (b) culture and characteristics of the MSICU, and (c) concerns and suggestions for ABCDE bundle implementation.

Description of Intervention

As evidenced by Thomas et al. (2010), unit champions have the potential to play a crucial role in the success of this practice change initiative. Champions were members of the MSICU interdisciplinary team who (a) were well-versed in the ABCDE bundle practice change, (b) understood the rationale and evidence to support the ABCDE bundle practice change, (c) were considered credible experts by MSICU staff, and (d) were committed to ABCDE bundle implementation. Prior to the initiation of this project, unit champions were identified by the MSICU interdisciplinary team and included two attending physicians, two clinical nurse leaders, one pharmacist, and one respiratory therapist. Charge nurses also played an important role in this practice change initiative. Weekly huddle scripts were utilized to disseminate information and reminders throughout this project. This author met with unit charge nurses during the January leadership

council meeting to discuss the practice change, their role in successful implementation, and answer any questions that arose. ABCDE bundle information packets were distributed to the unit champions, charge nurses, nurse manager, attending physicians, clinical nurse leaders, clinical pharmacist, and respiratory therapy manager.

ABCDE bundle and project information were presented at the January MSICU education, leadership, and practice council meetings. Following the meetings, the pre-intervention assessment of the MSICU's organizational infrastructure and readiness to support effective implementation of the ABCDE bundle practice change were electronically mailed through REDCap™ to all MSICU interdisciplinary team members. The assessment was available to participants for one week and reminders were sent at the midpoint of the week.

Pre-intervention assessment results revealed the need to modify educational interventions. Results of the pre-intervention assessment were presented to the implementation team (MSICU unit champions, respiratory therapy manager, and unit manager). The implementation team determined the necessary modifications to the educational interventions. Educational interventions began February 6, 2015 and continued through March 1, 2015. Table 3.1 provides a timeline with the educational interventions, in connection to the Raelin (2008) model and supporting evidence.

Educational packets were distributed to all members of the MSICU interdisciplinary team. Customized specifically for the MSICU, the packets included the following: (a) introduction to all components of the ABCDE bundle, (b) current pain, agitation, and delirium guidelines recently adopted in the MSICU, (c) script for interdisciplinary communication during daily rounds, (d) frequently asked questions, (e)

badge reminders, (f) pocket references, and (g) additional resources for further information. Packets were developed by this author using a compilation of information from leading experts on the ABCDE bundle. The Vanderbilt ICU Delirium and Cognitive Impairment Study Group holds copyright for CAM-ICU and its educational materials. The group allows for unrestricted access and written permission is not required for use of materials. Additionally, the group encourages institutions to tailor information based on individual unit needs. Copyright lines were included on badge reminders and pocket references. Educational information obtained from the AACN did not require written permission.

Following the completion of the educational interventions, a post-intervention assessment was electronically mailed through REDCap™ to all MSICU interdisciplinary team members. The assessment was available to participants for one week and reminders were sent at the midpoint of the week. Quantitative and qualitative data from the pre- and post-assessments was analyzed to determine if the intervention had positively impacted the sample unit's readiness to support effective implementation of the ABCDE bundle practice change.

Table 3.1: *Timeline for Educational Interventions with Supports*

Timeline	**Strategy**	**Connection to Raelin's Model of Work-Based Learning (2008)**	**Supporting Evidence**
Completed by MSICU interdisciplinary team prior to project	Identify unit champions • 2 attending physicians • 2 clinical nurse leaders • 1 pharmacist • 1 respiratory therapist	Experiential Learning	Balas et al. (2013)
January 26	Disseminate educational packets to interdisciplinary team leaders	Learning Culture	Balas et al. (2013); Diedrick, Schaffer, & Sandau (2011); Rangachari et al. (2014)
January MSICU Shared Governance meeting	ABCDE bundle presentation and project overview	Learning Culture	Diedrick, Schaffer, & Sandau (2011); Rangachari et al. (2014)
January 30- February 6	Pre-intervention assessment and data analysis	Experiential Learning; Learning Culture	Balas et al. (2013); Carrothers et al. (2013); Jansson et al. (2013); Rangachari, Rissing, & Rethemeyer (2013); Owen et al. (2014); Williams (2010)
Weekly	Meet with unit champions	Learning Culture	Balas et al. (2013); Rangachari et al. (2014)
February 6- March 1	Visual reminders in unit: • Bulletin Board • Unit Flyers • Posters	Learning Culture	Carrothers et al. (2013); Thomas et al. (2010)

	Educational Packets		
	Team huddles (each shift)	Experiential Learning; Learning Culture	Diedrick, Schaffer, & Sandau (2011); Rangachari et al. (2014)
	Educational information uploaded to MSICU webpage		Rangachari et al. (2014); Thomas et al. (2010)
	Unit-based in-services • Three 10-minute sessions overlapping shifts, weekly	Learning Culture	Diedrick, Schaffer, & Sandau (2011); Radtke et al. (2012); Rangachari et al. (2014)
	Bedside teaching rounds	Experiential Learning; Learning Culture	Balas et al. (2013); Radtke et al. (2012); Rangachari et al. (2014)
	Email reminders	Learning Culture	Diedrick, Schaffer, & Sandau (2011); Rangachari et al. (2014)
March 1-8	Post-intervention assessment and data analysis	Experiential Learning; Learning Culture; Lifelong Learning	Carrothers et al. (2013); Jansson et al. (2013); Rangachari, Rissing, & Rethemeyer (2013); Owen et al. (2014); Williams (2010)
March MSICU Shared Governance meetings	Follow-up presentation	Learning Culture	Balas et al. (2013); Carrothers et al. (2013); Diedrick, Schaffer, & Sandau (2011); Rangachari et al. (2014)

Strategies to Reduce Barriers and Increase Support

Prior to the initiation of this quality improvement project, leaders within the MSICU interdisciplinary team began discussions on future implementation of the ABCDE bundle practice change. Aware of the need for structured implementation strategies to educate and engage team members, interdisciplinary team leaders provided support for this quality improvement project. This author gained continued support through frequent communication with leaders throughout the project.

Engagement of MSICU interdisciplinary team members was vital to the success of ABCDE bundle practice change and adoption. Awareness of the ABCDE bundle practice change alone did not ensure clinical uptake and adequate adoption; therefore, individual needs of the MSICU were assessed (Rangachari, Rissing, & Rethemeyer, 2013). Unit needs were assessed before and after the interventions.

As recommended by Diedrick, Schaffer, and Sandau (2011), consistent communication was evident throughout this project. Communication strategies included hard copy and electronic education packets, presentations at council meetings, visual aids, unit-based in-services, team huddles, uploaded information placed on MSICU webpage, and emails. Participants were asked to share their opinions on potential barriers, facilitators, concerns, and suggestions in regards to bundle implementation. This took place before and after the educational interventions in order to overcome barriers prior to full implementation of the bundle.

Summary

As the implementation team leader, this author collaborated with the MSICU interdisciplinary team to design and put into place an evidence-based approach to prepare team members for implementation of the ABCDE bundle. Methods for the quality improvement project have been described and were supported by the evidence presented in the literature review and Raelin's Model of Work-Based Learning (2008). The sample unit's organizational infrastructure and readiness to support effective implementation of the ABCDE bundle practice change were evaluated. Pre- and post-intervention data results are presented in chapter four. Results from this project may potentially lead to full implementation of the ABCDE bundle and may be applied to generate evidence-based management strategies for future practice changes in the MSICU.

CHAPTER 4

RESULTS

The purpose of this evidence-based quality improvement project was to implement a nurse-led initiative to design and put into place an evidence-based approach to prepare interdisciplinary team members for implementation of the ABCDE bundle. The project was guided by Raelin's Model of Work-Based Learning (2008). The model allowed for the integration of work and learning at both the individual and collective levels. The project involved three phases: pre-intervention, intervention, and post-intervention. During the pre-intervention phase, a survey was conducted to assess (a) individual learning preferences, (b) ABCDE bundle familiarity, (c) communication and collaboration, (d) current practices specifically related to the ABCDE bundle, and (e) unit processes. The intervention phase consisted of unit-specific educational interventions. During the post-intervention phase, a survey was conducted to assess (a) ABCDE bundle knowledge, (b) effectiveness of educational methods, (c) perceived barriers and facilitators, (d) suggestions for implementation, and (e) ongoing educational needs. Chapter four presents the project results and how the results were analyzed.

Participants

All members of the MSICU interdisciplinary team (n=100) were invited to participate in the quality improvement project. Invited team members consisted of registered nurses (n=53), medical physicians (n=26), respiratory therapists (n=17), managers (n=2), pharmacist (n=1), and dietician (n=1). The managers, pharmacist, and

dietician were merged into one group (other, n=4) in order to ensure anonymity of survey participants throughout the data collection process. Table 4.1 provides the breakdown of study participants in both the pre- and post-intervention surveys.

Table 4.1: *Breakdown of Study Participants*

		Pre-intervention Survey		Post-intervention Survey	
Profession	N	n	%	n	%
Registered Nurses	53	40	75.5	45	85
Physicians	17	9	53	12	70
Respiratory Therapists	26	12	46.2	15	57.7
Other	4	4	100	4	100
Total	100	65	65	76	76

Pre-Intervention Phase

Prior to this practice change initiative, seven unit champions were identified by the MSICU interdisciplinary team. The unit champions included two attending physicians, two clinical nurse leaders, one pharmacist, one respiratory therapist, and this author. Unit champions were utilized throughout this project and were crucial to successful dissemination of information and education to the MSICU interdisciplinary team. In addition to unit champions, charge nurses played an important role in this project. Charge nurses were responsible for leading shift huddles and acting as liaisons between unit champions and nurses. As project leader, this author met with charge nurses on a weekly basis throughout the project to ensure consistent communication.

ABCDE bundle information packets were distributed to unit champions, charge nurses, nurse manager, attending physicians, clinical nurse leaders, clinical pharmacists, and the respiratory care manager. ABCDE bundle and project information was presented at the January MSICU education, leadership, and practice council meetings. Following

the meetings, the pre-intervention assessment of the MSICU's organizational infrastructure and readiness to support effective implementation of the ABCDE bundle practice change was electronically mailed through RedCap™ to all MSICU interdisciplinary team members. The assessment survey was available for one week and reminders were sent to participants at the midpoint of the week. The RedCap™ survey tool allowed for participant responses to remain anonymous.

The Raelin (2008) model emphasizes the importance of understanding individual and collective learning cultures prior to determining educational interventions. In accordance with the model, a pre-intervention survey was used to assess the learning culture of the MSICU. The pre-intervention survey examined the culture and characteristics of the MSICU and helped identify existing facilitators and barriers to change within the unit. The survey assessed (a) individual learning preferences, (b) ABCDE bundle awareness, (c) communication and collaboration among interdisciplinary team members, (d) current practices specifically related to the ABCDE bundle, and (e) unit processes. The pre-intervention survey response rate was 65%. Survey respondents included 40 (75.5%) registered nurses, 9 (53%) respiratory therapists, 12 (46.2%) physicians, and 4 (100%) other. Table 4.2 provides a breakdown of participants based on years of experience and affiliation with the MSICU. The majority of survey respondents (n=32, 49.2%) have been in their current profession for more than five years. Additionally, the majority of survey respondents (n=23, 35.4%) have been affiliated with the MSICU for one to three years.

Table 4.2: *Participant Years of Experience and Affiliation with the MSICU*

	Years in current profession		Years affiliated with MSICU	
Years	n	%	n	%
< 1 year	2	3.1	11	16.9
1– 3 years	17	26.2	23	35.4
3 – 5 years	14	21.5	14	21.5
> 5 years	32	49.2	17	26.2

Learning preference. Participants were asked to identify the workplace learning method(s) they felt were most effective. The majority of participants preferred multiple learning methods (n=30, 46.2%) and in-person learning methods such as bedside teaching rounds, in-services, and one-to-one training (n=28, 43.1%). Less preferred methods included traditional classroom-based (n=5, 7.7%), computer-based (n=1, 1.5%), visual reminders (n=1, 1.5%), educational packets (n=0, 0.0%), and electronically mailed information (n=0, 0.0%).

ABCDE bundle awareness. Participants were asked to rate their level of familiarity with the ABCDE bundle using a 4-point Likert scale. Levels of familiarity included "very familiar", "somewhat familiar", "slightly familiar", and "no familiarity". Results revealed that 21.5% (n=14) of participants reported being "very familiar" with the bundle, 32.3% (n=21) reported being "somewhat familiar", 23.1% (n=15) reported being "slightly familiar", and 23.1% (n=15) reported "no familiarity".

Communication and collaboration. Seven questions were included in the pre-intervention survey that specifically addressed communication and collaboration in the MSICU. Overall, 84.6% (n=55) of participants reported that communication breakdowns occur occasionally in the MSICU and lead to delays in the delivery of care to patients. Participants were asked to identify how often they experience good collaboration with different professions within the interdisciplinary team ("always", "sometimes", or

"never"). Respiratory therapists received the highest ratings with 84.6% (n=55) of participants reporting "always" experiencing good collaboration. Furthermore, 81.5% (n=53) of participants reported "always" experiencing good collaboration with pharmacists, while 75.4% (n=49) reported "always" experiencing good collaboration with nurses. Physicians received the lowest rating as only 52.3% (n=34) of participants reported always experiencing good collaboration with physicians. Additionally, 60% (n=39) of participants reported that the MSICU interdisciplinary team works together as a well-coordinated team. Detailed results are displayed in Table 4.3.

Table 4.3: *Communication and Team Collaboration in the MSICU*

	Yes/ Always		Occasionally/ Sometimes		No/ Never	
	n	%	n	%	n	%
Communication breakdowns that lead to delays in delivery of care are common in the MSICU.	7	10.8	55	84.6	3	4.6
Registered Nurse	6	9.2	33	50.8	1	1.5
Respiratory Therapist	1	1.5	7	10.8	1	1.5
Physician	0	0	11	16.9	1	1.5
Other	0	0	4	6.2	0	0
I experience good collaboration with physicians in the MSICU.	34	52.3	31	47.7	0	0.0
Registered Nurse	17	26.2	23	35.4	0	0
Respiratory Therapist	6	9.2	3	4.6	0	0
Physician	7	10.8	5	7.7	0	0
Other	4	6.2	0	0	0	0
I experience good collaboration with nurses in the MSICU.	49	75.4	16	24.6	0	0.0
Registered Nurse	30	46.2	10	15.4	0	0
Respiratory Therapist	8	12.3	1	1.5	0	0
Physician	7	10.8	5	7.7	0	0
Other	4	6.2	0	0	0	0
I experience good collaboration with respiratory therapists in the MSICU.	55	84.6	10	15.4	0	0.0
Registered Nurse	33	50.8	7	10.8	0	0

Respiratory Therapist	8	12.3	1	1.5	0	0
Physician	10	15.4	2	3.1	0	0
Other	4	6.2	0	0	0	0
I experience good collaboration with pharmacists in the MSICU.	53	81.5	10	15.4	2	3.1
Registered Nurse	29	44.6	9	13.8	2	3.1
Respiratory Therapist	8	12.3	1	1.5	0	0
Physician	12	18.5	0	0	0	0
Other	4	6.2	0	0	0	0
Interdisciplinary rounds are commonly performed in the MSICU.	47	72.3	17	26.2	1	1.5
Registered Nurse	29	44.6	10	15.4	1	1.5
Respiratory Therapist	7	10.8	2	3.1	0	0
Physician	8	12.3	4	6.2	0	0
Other	3	4.6	1	1.5	0	0
The MSICU interdisciplinary team (e.g. physicians, nurses, respiratory therapists, pharmacists, dieticians, managers, etc.) works together as a well-coordinated team.	39	60.0	26	40.0	0	0.0
Registered Nurse	23	35.4	17	26.2	0	0
Respiratory Therapist	5	7.7	4	6.2	0	0
Physician	7	10.8	5	7.7	0	0
Other	4	6.2	0	0	0	0

ABCDE bundle components in MSICU. Sixteen questions were included in the pre-intervention survey to identify ABCDE bundle components currently in place in the MSICU and to identify areas where improvement was needed. Using a 4-point Likert scale, ABCDE bundle components that were assessed included spontaneous awakening trials, spontaneous breathing trials, coordination and choice of sedation, delirium assessment and management, and early exercise and progressive mobility. Questions specifically addressed protocol presence, validated tool usage, frequency of assessments, and inclusion in daily rounds. Table 4.4 provides detailed assessment results of the ABCDE bundle components in the MSICU.

Table 4.4: *ABCDE Bundle Components and Unit Processes in the MSICU*

	Yes/ Always		Occasionally/ Sometimes		No/ Never		I don't know	
	n	%	n	%	n	%	n	%
The MSICU has a sedation and analgesia protocol in place.	43	68.3	12	19.0	4	6.3	4	6.3
Registered Nurse	25	38.5	8	12.3	4	6.2	3	4.6
Respiratory Therapist	7	10.8	0	0	0	0	2	3.1
Physician	8	12.3	3	4.6	1	1.5	0	0
Other	3	4.6	1	1.5	0	0	0	0
Pain and sedation assessments are routinely performed on all patients in the MSICU using a validated tool.	36	56.3	25	39.1	0	0.0	3	4.7
Registered Nurse	22	33.8	17	26.2	0	0	1	1.5
Respiratory Therapist	6	9.2	1	1.5	0	0	2	3.1
Physician	6	9.2	6	9.2	0	0	0	0
Other	2	3.1	2	3.1	0	0	0	0
Spontaneous Awakening Trials (SATs, "sedation vacations") are performed daily on all patients receiving sedation in the MSICU.	20	31.3	40	62.5	3	4.7	1	1.6
Registered Nurse	9	13.8	28	43.1	3	4.6	0	0
Respiratory Therapist	3	4.6	5	7.7	0	0	1	1.5
Physician	6	9.2	6	9.2	0	0	0	0
Other	2	3.1	2	3.1	0	0	0	0
The MSICU has a standardized protocol for performing Spontaneous Awakening Trials (SATs, "sedation vacations").	36	56.3	12	18.8	7	10.9	9	14.1
Registered Nurse	18	27.7	9	13.8	6	9.2	7	10.8
Respiratory Therapist	6	9.2	0	0	1	1.5	2	3.1
Physician	8	12.3	3	4.6	0	0	1	1.5
Other	4	6.2	0	0	0	0	0	0
All patients in the MSICU are assessed daily for the presence of delirium.	45	70.3	15	23.4	0	0.0	4	6.3
Registered Nurse	33	50.8	6	9.2	1	1.5	0	0
Respiratory Therapist	2	3.1	3	4.6	0	0	4	6.2
Physician	6	9.2	6	9.2	0	0	0	0

Other	4	6.2	0	0	0	0	0	0
The MSICU uses a validated tool to assess for the presence of delirium (CAM-ICU, ICDSC, pCAM-ICU).	53	81.5	6	9.2	0	0.0	6	9.2
Registered Nurse	39	60	1	1.5	0	0	0	0
Respiratory Therapist	3	4.6	1	1.5	0	0	5	7.7
Physician	8	12.3	4	6.2	0	0	0	0
Other	3	4.6	0	0	0	0	1	1.5
The MSICU has a standardized delirium management protocol.	28	43.1	18	27.7	11	16.9	8	12.3
Registered Nurse	22	33.8	8	12.3	9	13.8	1	1.5
Respiratory Therapist	2	3.1	2	3.1	0	0	5	
Physician	2	3.1	7	10.8	2	3.1	1	1.5
Other	2	3.1	1	1.5	0	0	1	1.5
Delirium is a problem frequently experienced by patients in the MSICU.	44	67.7	20	30.8	0	0.0	1	1.5
Registered Nurse	34	52.3	6	9.2	0	0	0	0
Respiratory Therapist	1	1.5	3	4.6	0	0	5	7.7
Physician	8	12.3	4	6.2	0	0	0	0
Other	1	1.5	3	4.6	0	0	0	0
Delirium negatively effects patients in the MSICU.	50	76.9	13	20.0	0	0.0	2	3.1
Registered Nurse	37	56.9	3	4.6	0	0	0	0
Respiratory Therapist	4	6.2	3	4.6	0	0	2	3.1
Physician	8	12.3	4	6.2	0	0	0	0
Other	1	1.5	3	4.6	0	0	0	0
I am confident in my ability to use the CAM-ICU tool to screen for delirium.	44	67.7	12	18.5	6	9.2	3	4.6
Registered Nurse	33	50.8	7	10.8	0	0	0	0
Respiratory Therapist	1	1.5	2	3.1	3	4.6	3	4.6
Physician	7	10.8	3	4.6	2	3.1	0	0
Other	3	4.6	0	0	1	1.5	0	0
The MSICU has a protocol for early exercise and progressive mobility for all patients.	17	26.6	18	28.1	21	32.8	8	12.5
Registered Nurse	15	23.1	11	16.9	11	16.9	3	4.6
Respiratory Therapist	0	0	4	6.2	1	1.5	4	6.2
Physician	2	3.1	2	3.1	7	10.8	1	1.5

Other	0	0	1	1.5	3	4.6	0	0
Immobile patients in the MSICU receive passive range of motion regularly, if tolerated.	11	16.9	38	58.5	10	15.4	6	9.2
Registered Nurse	10	15.4	25	38.5	5	7.7	0	0
Respiratory Therapist	0	0	3	4.6	1	1.5	5	7.7
Physician	1	1.5	6	9.2	4	6.2	1	1.5
Other	0	0	4	6.2	0	0	0	0
The MSICU has the necessary support equipment to safely assist with patients' increased mobility.	20	30.8	26	40.0	15	23.1	4	6.2
Registered Nurse	13	20	18	27.7	9	13.8	0	0
Respiratory Therapist	2	3.1	2	3.1	2	3.1	3	4.6
Physician	5	7.7	3	4.6	3	4.6	1	1.5
Other	0	0	3	4.6	1	1.5	0	0
Respiratory therapists and physical therapists are available to assist with implementing early exercise and progressive mobility protocols in the MSICU.	18	27.7	35	53.8	11	16.9	1	1.5
Registered Nurse	12	18.5	20	30.8	8	12.3	0	0
Respiratory Therapist	2	3.1	6	9.2	0	0	1	1.5
Physician	4	6.2	7	10.8	1	1.5	0	0
Other	0	0	2	3.1	2	3.1	0	0
Mobility is addressed during daily rounds in the MSICU.	18	27.7	40	61.5	3	4.6	4	6.2
Registered Nurse	13	20	25	38.5	1	1.5	1	1.5
Respiratory Therapist	1	1.5	5	7.7	0	0	3	4.6
Physician	3	4.6	8	12.3	1	1.5	0	0
Other	1	1.5	2	3.1	1	1.5	0	0

Unit processes. Four questions were included in the pre-intervention survey to assess unit processes in the MSICU. Specific processes that were assessed included level of staffing, clarity of current protocols and guidelines, satisfaction with current methods used to implement practice changes, and satisfaction with current methods used to provide work-place education. Results are displayed in Table 4.5.

Table 4.5: *MSICU Processes*

	Yes/ Always		Occasionally/ Sometimes		No/ Never	
	n	%	n	%	n	%
The level of staffing in the MSICU is sufficient for handling the number and acuity of patients.	25	38.5	39	60.0	1	1.5
Registered Nurse	12	18.5	27	41.5	1	1.5
Respiratory Therapist	3	4.6	6	9.2	0	0
Physician	7	10.8	5	7.7	0	0
Other	3	4.6	1	1.5	0	0
Protocols and guidelines used in the MSICU are clear and easy to understand.	26	40.6	33	51.6	5	7.8
Registered Nurse	15	23.1	21	32.3	4	6.2
Respiratory Therapist	5	7.7	3	4.6	1	1.5
Physician	4	6.2	8	12.3	0	0
Other	2	3.1	2	3.1	0	0
I am satisfied with the current methods used to implement practice changes in the MSICU.	16	24.6	39	60.0	10	15.4
Registered Nurse	8	12.3	24	36.9	8	12.3
Respiratory Therapist	4	6.2	4	6.2	1	1.5
Physician	4	6.2	7	10.8	1	1.5
Other	0	0	4	6.2	0	0
I am satisfied with the current methods used to provide work-place education to interdisciplinary team members in the MSICU.	18	27.7	39	60.0	8	12.3
Registered Nurse	10	15.4	23	35.4	7	10.8
Respiratory Therapist	3	4.6	5	7.7	1	1.5
Physician	5	7.7	7	10.8	0	0
Other	0	0	4	6.2	0	0

Intervention Phase

The intervention phase took place over the course of three weeks. Results of the pre-intervention survey were used to develop educational interventions specifically tailored to meet the individual and collective needs of the MSICU interdisciplinary team. As recommended by Raelin's (2008) model, three concepts served as the foundation for

this project's interventions. The concepts included experiential learning, learning culture, and lifelong learning. Each educational intervention used in this project reflects one or more of the Raelin (2008) concepts.

Results from the pre-intervention survey indicated that multiple educational methods along with in-person educational methods were preferred by the MSICU interdisciplinary team. Based on these results, emphasis was placed on providing educational interventions that would meet these preferences. Upon completion of the pre-intervention survey, educational packets were distributed to all members of the MSICU interdisciplinary team. In addition, visual reminders (e.g. bulletin boards, unit flyers, posters) were placed in the unit and educational information was uploaded to the MSICU webpage. During the three week intervention phase, team huddles took place at the beginning of each shift and email reminders were mailed weekly in the nurse manager's "MSICU Weekly Updates".

As previously noted, 43.1% (n= 28) of participants preferred in-person teaching methods. To meet this identified need, unit-based in-services occurred triweekly at ten minute sessions that overlapped shifts. The in-service sessions covered general ABCDE bundle information and allowed for team members to ask questions and provide input. In addition, bedside teaching rounds took place weekly. Bedside teaching rounds were led by unit champions and provided education on each component of the ABCDE bundle.

Post-Intervention Phase

In order to determine the effectiveness of this evidence-based practice change initiative, a post-intervention survey was conducted to assess (a) ABCDE bundle knowledge, (b) effectiveness of educational methods, (c) perceived barriers and

facilitators, (d) suggestions for implementation, and (e) ongoing educational needs. The post-intervention assessment survey took place immediately following the completion of the three week intervention phase and was electronically mailed through RedCap™ to all MSICU interdisciplinary team members. The assessment survey was available for one week and reminders were sent to participants at the midpoint of the week. The post-intervention assessment survey response rate was 76%. The breakdown of post-intervention survey participants is provided in Table 4.1.

ABCDE bundle knowledge and perceived benefit. Post-intervention ABCDE bundle knowledge was assessed through five multiple choice questions. Knowledge assessment results revealed a mean score of 94.5%. The 15 incorrect responses related to the questions addressing frequency of evaluation and assessment of delirium and progressive mobility needs. Participants were asked if they believed that implementation of the ABCDE bundle would benefit patients in the MSICU. Results indicated that 96% (n=73) reported "yes", 0% (n=0) reported "no", and 4% (n=3) reported "not sure".

Effectiveness of educational strategies. Overall effectiveness of the educational strategies utilized for this project was assessed with seven 4-point Likert scale questions. Questions specifically addressed the following educational methods: team huddles, educational packets, MSICU webpage, visual reminders in the unit, unit-based in-services, bedside teaching rounds, and electronically mailed information.

The registered nurses reported team huddles, unit-based in-services, bedside teaching, and visual reminders to be effective educational strategies. Team huddles, educational packets, and unit-based in-services were reported to be effective by the respiratory therapists. Visual reminders, unit-based in-services, and bedside teaching

were reported to be effective by the physicians. Least effective educational strategies reported by all specialties included MSICU webpage and emailed information. Detailed results are provided in Table 4.6.

Table 4.6: *Effectiveness of Educational Strategies*

	Not at all		Slightly		Very		Extremely	
	n	%	n	%	n	%	n	%
Team Huddles	8	10.5	16	21.0	33	43.4	19	25.0
Registered Nurse	0	0	11	14.5	16	21.1	56	73.7
Respiratory Therapist	0	0	1	1.3	13	17.1	1	1.3
Physician	8	10.5	4	5.3	0	0	0	0
Other	0	0	0	0	4	5.3	0	0
Educational Packets	3	3.9	34	44.7	32	42.1	7	9.2
Registered Nurse	1	1.3	26	34.2	17	22.4	2	2.6
Respiratory Therapist	1	1.3	4	5.3	9	11.8	1	1.3
Physician	2	2.6	4	5.3	4	5.3	2	2.6
Other	0	0	0	0	2	2.6	2	2.6
MSICU webpage	39	51.3	34	44.7	3	3.9	0	0.0
Registered Nurse	25	32.9	18	23.7	1	1.3	0	0
Respiratory Therapist	12	15.8	3	3.9	0	0	0	0
Physician	1	1.3	11	14.5	0	0	0	0
Other	1	1.3	2	2.6	2	2.6	0	0
Visual reminders in unit	4	5.2	41	53.9	21	27.6	10	13.1
Registered Nurse	1	1.3	29	38.2	9	11.8	6	7.9
Respiratory Therapist	1	1.3	8	10.5	5	1.3	1	1.3
Physician	0	0	5	6.6	5	6.6	2	2.6
Other	0	0	1	1.3	2	2.6	1	1.3
Unit-based in-services	2	2.6	16	21.0	48	63.2	10	13.2
Registered Nurse	0	0	9	11.8	28	36.8	8	10.5
Respiratory Therapist	1	1.3	4	5.3	8	10.5	2	2.6
Physician	1	1.3	2	2.6	9	11.8	0	0
Other	0	0	1	1.3	3	3.9	0	0
Bedside teaching	0	0.0	9	11.8	15	19.7	52	68.4
Registered Nurse	0	0	5	6.6	5	6.6	35	46.1
Respiratory Therapist	0	0	2	2.6	3	3.9	10	13.2
Physician	0	0	2	2.6	4	5.3	6	7.9

Other	0	0	0	0	3	3.9	1	1.3
Emailed information	30	39.5	46	60.5	0	0.0	0	0.0
Registered Nurse	23	30.3	22	28.9	0	0	0	0
Respiratory Therapist	5	6.6	10	13.2	0	0	0	0
Physician	2	2.6	10	13.2	0	0	0	0
Other	0	0	4	5.3	0	0	0	0

Further education. Participants were asked to identify whether or not specific areas of the ABCDE bundle required further education. Five questions were presented to participants using a 3-point Likert scale. All specialties reported the need for further education regarding early exercise and progressive mobility. Additionally, registered nurses reported the need for further education regarding interdisciplinary team communication and collaboration. Results are provided in Table 4.7.

Table 4.7: *Further Educational Needs*

	Yes		No		Not Sure	
	n	%	n	%	n	%
Spontaneous Awakening Trials (SATs)	15	19.9	53	69.7	8	10.5
Registered Nurse	6	7.9	35	46.1	4	5.3
Respiratory Therapist	4	5.3	10	13.2	1	1.3
Physician	4	5.3	7	9.2	1	1.3
Other	1	1.3	1	1.3	2	2.6
Spontaneous Breathing Trials (SBTs)	12	15.8	55	72.3	9	11.8
Registered Nurse	4	5.3	37	48.7	4	5.3
Respiratory Therapist	4	5.3	10	13.2	1	1.3
Physician	3	3.9	7	9.2	2	2.6
Other	1	1.3	1	1.3	2	2.6
Delirium Assessment and Management	14	18.4	45	59.2	17	22.4
Registered Nurse	3	3.9	34	44.7	8	10.5
Respiratory Therapist	7	9.2	5	6.6	3	3.9
Physician	3	3.9	5	6.6	4	5.3
Other	1	1.3	1	1.3	2	2.6
Early Exercise and Progressive Mobility	31	40.8	30	39.5	15	19.7
Registered Nurse	15	19.7	21	27.6	9	11.8
Respiratory Therapist	10	13.2	3	3.9	2	2.6
Physician	3	3.9	6	7.9	3	3.9
Other	3	3.9	0	0	1	1.3
Interdisciplinary Team Communication	21	27.6	45	59.2	10	13.2

and Collaboration						
Registered Nurse	12	15.8	29	38.2	4	5.3
Respiratory Therapist	3	3.9	11	14.5	1	1.3
Physician	5	6.6	4	5.3	3	3.9
Other	1	1.3	1	1.3	2	2.6

Barriers and facilitators. Participants were asked to provide the extent to which they view potential barriers in regards to implementation of the ABCDE bundle. Specific barriers included coordination of care (e.g. "timing" of SATs and SBTs), interdisciplinary team knowledge and skills deficits, documentation, interdisciplinary team communication, inadequate resources, lack of time and workload concerns. Participants identified barriers as "not a barrier", "somewhat of a barrier", "moderate barrier", or "extreme barrier".

Registered nurses reported coordination of care, documentation, interdisciplinary team communication, inadequate resources, and lack of time as moderate to extreme barriers. Respiratory therapists reported coordination of care, inadequate resources, and lack of time as moderate to extreme barriers. Physicians reported interdisciplinary team communication, inadequate resources, and lack of time as moderate to extreme barriers. Results are provided in Table 4.8.

Table 4.8: *Participant View of Potential Barriers*

	Not a barrier		Somewhat of a barrier		Moderate barrier		Extreme barrier	
	n	%	n	%	n	%	n	%
Coordination of care (example: "timing" of SATs and SBTs)	0	0	12	15.8	22	28.9	42	55.3
Registered Nurse	0	0	2	2.6	10	13.2	33	43.4
Respiratory Therapist	0	0	2	2.6	6	7.9	7	9.2
Physician	0	0	7	9.2	4	5.3	1	1.3
Other	0	0	1	1.3	2	2.6	1	1.3
Interdisciplinary team knowledge and skill deficits	15	19.7	40	52.6	19	25	2	2.6
Registered Nurse	6	7.9	25	32.9	13	17.1	1	1.3

Respiratory Therapist	4	5.3	7	9.2	3	3.9	1	1.3
Physician	3	3.9	6	7.9	3	3.9	0	0
Other	2	2.6	2	2.6	0	0	0	0
Documentation	0	0	23	30.3	45	59.2	8	10.5
Registered Nurse	0	0	8	10.5	30	39.5	7	9.2
Respiratory Therapist	0	0	5	6.6	9	11.8	1	1.3
Physician	0	0	8	10.5	4	5.3	0	0
Other	0	0	2	2.6	2	2.6	0	0
Interdisciplinary team communication	0	0	18	23.7	36	47.4	22	28.9
Registered Nurse	0	0	8	10.5	24	31.6	13	17.1
Respiratory Therapist	0	0	4	5.3	4	5.3	7	9.2
Physician	0	0	4	5.3	6	7.9	2	2.6
Other	0	0	2	2.6	2	2.6	0	0
Inadequate resources	0	0	5	6.6	20	26.3	51	67.1
Registered Nurse	0	0	0	0	7	9.2	38	50
Respiratory Therapist	0	0	1	1.3	4	5.3	10	13.2
Physician	0	0	3	3.9	7	9.2	2	2.6
Other	0	0	1	1.3	2	2.6	1	1.3
Lack of time/ Workload concerns	0	0	2	2.6	28	36.8	46	60.5
Registered Nurse	0	0	0	0	9	11.8	36	47.4
Respiratory Therapist	0	0	0	0	5	6.6	10	13.2
Physician	0	0	2	2.6	10	13.2	0	0
Other	0	0	0	0	4	5.3	0	0

Participants were asked an optional open-ended question regarding additional barriers and/or concerns for implementation of the ABCDE bundle. In response, eight participants expressed concern over the potential harm to patients. For example, one participant stated “patients who fail the trials may experience psychological distress if I restart sedation at only one-half of the previous rate”. Another participant expressed concern that “the rate of self-extubation in the MSICU would increase”. In regards to concern of the patients’ family members, one participant wrote “The families are already highly stressed. When they see their loved-one awake and uncomfortable on the

ventilator, I won't be able to provide any sedation for the patient. This will cause additional stress for the families."

Participants were asked to provide their view on how helpful potential facilitators may be in regards to implementation of the ABCDE bundle. Specific facilitators included designated timing of spontaneous awakening and spontaneous breathing trials (night shift or day shift), mandatory bundle education and training for new staff and residents rotating through the MSICU, designated area for bundle documentation in patient assessment, and addressing bundle components in daily interdisciplinary rounds. Participants identified facilitators as "not helpful", "somewhat helpful", "moderately helpful", or "extremely helpful".

Registered nurses and respiratory therapists reported designated timing of spontaneous awakening and spontaneous breathing trials, mandatory bundle education for new staff and residents rotating through the MSICU, and addressing bundle components in daily interdisciplinary rounds as moderately to extremely helpful potential facilitators. Physicians identified mandatory bundle education for new staff and residents rotating through the MSICU and addressing bundle components in daily interdisciplinary rounds as moderately to extremely helpful potential facilitators. Results are provided in Table 4.9.

Table 4.9: *Participant View of Potential Facilitators*

	Not helpful		Somewhat helpful		Moderately helpful		Extremely helpful	
	n	%	n	%	n	%	n	%
Designated timing of SAT and SBT trials (night shift or day shift)	0	0	15	19.7	19	25	42	55.3
Registered Nurse	0	0	7	9.2	11	14.5	27	35.5
Respiratory Therapist	0	0	0	0	5	6.6	10	13.2

Physician	0	0	6	7.9	2	2.6	4	5.3
Other	0	0	2	2.6	1	1.3	1	1.3
Mandatory bundle education/ training for new staff and residents rotating through the MSICU	0	0	11	14.5	15	19.7	50	65.8
Registered Nurse	0	0	5	6.6	5	6.6	35	46.1
Respiratory Therapist	0	0	3	3.9	4	5.3	8	10.5
Physician	0	0	2	2.6	5	6.6	5	6.6
Other	0	0	1	1.3	1	1.3	2	2.6
Designated area for bundle documentation in patient assessment (EPIC)	0	0	21	27.6	46	60.5	9	11.8
Registered Nurse	0	0	17	22.4	23	30.3	5	6.6
Respiratory Therapist	0	0	0	0	11	14.5	4	5.3
Physician	0	0	2	2.6	10	13.2	0	0
Other	0	0	2	2.6	2	2.6	0	0
Addressing bundle components in daily interdisciplinary rounds	0	0	18	23.7	19	25	39	51.3
Registered Nurse	0	0	11	14.5	10	13.2	24	31.6
Respiratory Therapist	0	0	4	5.3	6	7.9	5	6.6
Physician	0	0	2	2.6	2	2.6	8	10.5
Other	0	0	1	1.3	1	1.3	2	2.6

Participants were asked an optional open-ended question regarding additional facilitators for implementation of the ABCDE bundle. Three participants responded to the open-ended question. One participant suggested additional staffing during the initial implementation phase of the ABCDE bundle. The remaining two participants suggested the placement of a designated physical therapist in the MSICU.

Ongoing education. Participants were asked two questions regarding ongoing ABCDE bundle education. The first question allowed participants to identify methods they felt were most appropriate for providing bundle education. Options included online modules, case studies placed on bulletin boards in the unit, huddle reminders, and educational binders placed in the unit. Multiple selections were allowed for this question.

Results indicated that educational binders were preferred by 77.6% (n=59), case studies were preferred by 72.3% (n=55), huddle reminders were preferred by 68.4% (n=52), and online modules were preferred by 44.7% (n=34) of participants.

The second question asked participants to identify how often ongoing bundle education should occur. Options included "weekly", "monthly", "annually", and "no further education is needed". Results indicated that 55.3% (n=42) of participants prefer monthly, 36.8% (n=28) prefer annually, 7.9% (n=6) prefer weekly ongoing ABCDE bundle education.

Summary

All members of the MSICU interdisciplinary team were invited to participate in this quality improvement project. A pre-intervention assessment was conducted to identify (a) individual learning preferences, (b) ABCDE bundle familiarity, (c) communication and collaboration, (d) current practices specifically related to the ABCDE bundle, and (e) unit processes. Guided by the Raelin (2008) model, results from the pre-intervention assessment were used to develop unit-specific educational interventions. Upon completion of the educational interventions, a post-intervention assessment was conducted to assess (a) ABCDE bundle knowledge, (b) effectiveness of educational methods, (c) perceived barriers and facilitators, (d) suggestions for implementation, and (e) ongoing educational needs. MSICU interdisciplinary team assessment results have been presented in this chapter. Conclusions and recommendations will be discussed in chapter five.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The MSICU's need for an educational program to prepare interdisciplinary team members for implementation of the ABCDE bundle presented an opportunity for this author to conduct a unique quality improvement project. The Raelin Model of Work-Based Learning (2008) served as a framework to guide this project's design. Utilizing an evidence-based approach, a review of literature for best practices related to educational strategies among critical care interdisciplinary teams was conducted and the most effective strategies were identified. An educational program addressing the ABCDE bundle practice change was designed, implemented, and evaluated. Chapter five presents this author's conclusions and recommendations for practice, research, policy, and education.

Limitations

There are several limitations to this quality improvement project. The project was conducted at single, academic medical center and included interdisciplinary team members from one medical-surgical intensive care unit, thus limiting generalizability. Another limitation is that the majority of participants were registered nurses. Registered nurses play the largest role in the ABCDE bundle implementation process; however, increased involvement from physicians, respiratory therapists, physical therapists, and

dieticians may have provided more insight to the overall culture of improvement. Furthermore, the educational intervention phase took place over three weeks. It is possible that an extended educational intervention phase may increase ABCDE bundle knowledge and further support interdisciplinary team engagement.

Implications for Practice

This quality improvement project aimed to prepare MSICU interdisciplinary team members for implementation of the ABCDE bundle practice change. Prior to the initiation of educational interventions, a unit gap analysis and needs assessment was performed in order to better understand the unit culture and identify unit-specific needs. Results allowed for a tailored educational program that met the individual unit's needs. This strategy can be applied to any future practice changes.

The MSICU identified potential barriers and facilitators to implementation of the ABCDE bundle. Potential barriers included coordination of care, documentation, interdisciplinary team communication, workload concerns, self-extubation, and family concerns. Prior to full implementation of the ABCDE bundle, the identified barriers should be addressed.

MSICU leaders should consider a designated time for spontaneous awakening and spontaneous breathing trials to occur. The unit may decide to trial several different times to determine one that best suits patient and interdisciplinary team needs. Each time may be trialed for a set period of time, such as two weeks. Following the trial periods, the interdisciplinary team can be surveyed to determine the time most preferred.

Interdisciplinary team communication should be further explored in order to identify and eliminate communication issues. Team communication is an essential

component of high quality and effective patient care; therefore, importance should be placed on this identified need. The unit may benefit from interdisciplinary team-building workshops and education specifically addressing team communication.

Workload concerns should be further explored to identify unit needs, such as additional staffing. At the time of this quality improvement project, five full-time employee registered nurse positions were vacant. Filling the vacant positions would alleviate some of the workload concerns. After the positions have been filled, staffing concerns should be re-examined. If additional staffing is necessary, a proposal should be submitted to the service line administrator to request the allotment of additional full-time positions in the MSICU. Additional workload issues may be resolved by streamlining workflow processes. For example, the unit may benefit from designating a time for interdisciplinary rounds to take place. This may allow for more efficient communication throughout each shift.

The addition of a Doctor of Nursing Practice (DNP) position would be valuable to the MSICU interdisciplinary team. The DNP possesses skills in leadership, policy, and evaluation that would allow for the sustainment and progression towards full ABCDE bundle implementation, ultimately leading to improved patient outcomes and potential related economic benefits. Additionally, the DNP would continue educational awareness within the unit and would further support the alignment of unit and organizational goals.

Documentation barriers were identified by the MSICU interdisciplinary team as another potential barrier to implementation of the ABCDE bundle. At the time of this project, the MSICU interdisciplinary team members utilized EPIC Enterprise® for electronic medical record documentation. However, plans were in place to upgrade to the

newer version, EPIC Hyperspace®, later in the year. The upgrade should allow for the designation of a specific area for interdisciplinary team members to document the components of the ABCDE bundle. After the upgrade takes place, MSICU leaders should evaluate whether or not documentation barriers remain.

Participants were concerned for the potential risk of patient self-extubation and the additional stress on families. Both concerns may be addressed through staff and family education. Patients require close monitoring during the spontaneous awakening trials and spontaneous breathing trials in order to prevent adverse outcomes, such as self-extubation. Therefore, interdisciplinary team members should be educated on the additional monitoring required during the trials. A potential solution to the monitoring concern is to have the primary nurse or respiratory therapist remain at the patient's bedside during the spontaneous awakening and spontaneous breathing trials. In addition to ensuring patient safety, this may allow an opportunity for ABCDE bundle education to be provided to family members in the patient's room. Bundle education can be provided and questions or concerns can be addressed by the primary nurse or respiratory therapist at the patient's bedside. Coordination of care and effective communication among the interdisciplinary team will be imperative for this solution to be successful. In order to reduce effects on staffing concerns, the MSICU charge nurse can be available to assist with duties while the primary nurse closely monitors the patient.

The MSICU may benefit from implementation of the identified potential facilitators. Potential facilitators included designated timing of spontaneous awakening and spontaneous breathing trials, mandatory bundle education and training for new staff and residents rotating through the MSICU, and addressing bundle components in daily

interdisciplinary rounds. Implementation of the facilitators would support full implementation of the ABCDE bundle.

Analysis of the results revealed several areas of potential practice improvement. Areas varied based on specialty. Results indicated that registered nurses and physicians did not feel that pain and sedation assessments were routinely performed on all patients in the MSICU using a validated tool. Registered nurses, physicians, and respiratory therapists did not feel that spontaneous awakening trails were performed on all patients receiving sedation in the MSICU. Additionally, registered nurses, physicians, and respiratory therapists did not feel that patients in the MSICU were assessed daily for the presence of delirium. The results indicate the need for further interdisciplinary team education in regards to the routine performance of pain, sedation, and delirium assessments.

The overall knowledge, routine assessment, and support of early exercise and progressive mobility for patients in the MSICU revealed potential areas of improvement for the entire interdisciplinary team. At the time of this quality improvement project, an early exercise and progressive mobility protocol was not in place in the MSICU. Specific areas in need of improvement include routine performance of passive range of motion on qualified patients, obtainment of the necessary equipment to safely assist with patients' increased mobility, availability of support staff to assist with mobility, and addressing mobility during daily rounds in the MSICU.

Implications for Research

A better understanding of implementation methods and strategies may lead to more effective uptake and application of evidence-based practice changes, such as the

ABCDE bundle, in the critical care setting. Further research is needed specifically focusing on critical care interdisciplinary teams. This quality improvement project involved participants from one critical care unit in a single, academic medical center. Large-scale studies involving critical care units across multiple academic medical centers may provide greater insight on effective implementation strategies for interdisciplinary teams.

Additional research is also needed to explore how and why different implementation strategies work or do not work. In-person training methods (e.g. bedside teaching, unit-based in-services, team huddles) were the most preferred educational strategies by all specialties. However, educational preferences were found to vary among specialties. This study found that registered nurses preferred to receive education through team huddles, whereas respiratory therapists preferred educational packets. Emailed information and the unit webpage were the least preferred educational strategies by all specialties.

Further research is needed regarding patient outcomes after full implementation of the ABCDE bundle. Specific outcomes (e.g. morbidity, mortality, cost, and length of stay) should be evaluated. In addition, a follow-up assessment of the interdisciplinary team should take place after full implementation of the bundle has occurred. Specific areas to be assessed should include overall satisfaction with bundle implementation, identification of facilitators and barriers, and further educational needs. A thorough assessment of these areas may assist with bundle compliance and sustainability.

Implications for Policy

Evidence-based policies and protocols promote the dissemination of best practices in the clinical setting. The MSICU does not have a policy in place that addresses all components of the ABCDE bundle; therefore, it is recommended that an ABCDE bundle policy be adopted. Additionally, the MSICU does not have a mobility protocol. It is recommended that a mobility protocol be adopted.

Results from this project indicated that some participants were unclear of current policies and protocols. Focus should be placed on ensuring that all members of the interdisciplinary team are aware of current policies and protocols. This may be accomplished by providing policy and protocol education to all members of the interdisciplinary team. For policies and protocols already in place, an educational needs assessment of the interdisciplinary team would be beneficial to identify knowledge gaps. Based on the identified knowledge gaps, an educational intervention can be developed and implemented. When introducing new policies and protocols, emphasis should be placed on providing thorough education to interdisciplinary team members. As with this quality improvement project, multiple educational methods should be utilized. Following any educational interventions, a knowledge assessment should be performed to identify any further educational needs. Additionally, potential facilitators and barriers should be identified and addressed prior to implementing new policies and protocols.

Implications for Education

Sustainment of ABCDE bundle education will be imperative to successful adoption and application of the bundle. Education should continue at the interdisciplinary team level, yet be tailored to meet the needs of each specialty. Results from this project indicated a difference among specialties regarding preferred and

effective educational strategies. All specialties preferred in-person educational methods (e.g. bedside teaching, unit-based in-services) and reported them as most effective. Registered nurses identified team huddles as an effective educational method. Respiratory therapists identified educational packets as an effective educational method. Physicians identified visual reminders as an effective educational method. Future educational efforts may benefit by optimizing each specialty's identified learning methods.

Results indicated the need for further education on existing policies within the MSICU. Analysis of the results revealed that educational needs varied based on specialty. Further education needs identified specifically for registered nurses included knowledge of the existing sedation and analgesia protocol, knowledge of the existing delirium management protocol, utilization of the CAM-ICU screening tool, and the development of an early exercise and progressive mobility protocol. Further education needs identified specifically for physicians included knowledge of the existing delirium management protocol, and the development of an early exercise and progressive mobility protocol. Further education needs identified specifically for respiratory therapists included knowledge of the existing delirium management protocol, utilization of the CAM-ICU screening tool, and the development of an early exercise and progressive mobility protocol.

The MSICU leaders cultivated the initial interdisciplinary team buy-in by promoting this quality improvement project in the established shared governance structure. Continued team engagement will be imperative to the successful implementation of the ABCDE bundle. Effective communication, audits with timely

feedback, and continued bundle education will support continued interdisciplinary team buy-in. Upon completion of this quality improvement project, MSICU leaders decided to continue moving towards full bundle implementation by creating the ABCDE bundle committee within the established shared governance practice council. Committee members include the ABCDE bundle unit champions established prior to the initiation of this quality improvement project (two attending physicians, two clinical nurse leaders, one pharmacist, and one respiratory therapist). The committee will ensure the dissemination and evaluation of continued ABCDE bundle education along with more in-depth education regarding early exercise and progressive mobility.

Summary

The outcome of interest for this quality improvement project was successful educational preparation of the MSICU interdisciplinary team for the implementation of the ABCDE bundle practice change. Results indicated the need for additional education and training regarding early exercise and progressive mobility; therefore, complete and successful educational preparation of the MSICU interdisciplinary team was not achieved. This project was the first step in the ABCDE bundle implementation process for the MSICU interdisciplinary team. Continued buy-in will be supported by the MSICU shared governance structure. Overall results revealed specific educational needs of specialties within the MSICU interdisciplinary team. Findings from this study demonstrated the importance of understanding unit-specific needs on both the individual and collective levels. Strategies utilized in this study may be applied to future implementation efforts and may enhance the sustainment of future practice changes.

REFERENCES

Agency for Healthcare Research and Quality. (2014). QI™ Toolkit Roadmap: AHRQ Quality Indicators™ Toolkit for Hospitals. Agency for Healthcare Research and Quality, Rockville, MD.

Alexander, E. (2009). Delirium in the intensive care unit: Medications as risk factors. *Critical Care Nurse*, *29*(1), 85-87.

American Association of Colleges of Nursing and Association of American Medical Colleges. (2010). Lifelong learning in medicine and nursing: Final conference report.

American Psychiatric Association. (2013). Diagnostic and statistical manual of mental disorders. (5th ed.). Arlington, VA: American Psychiatric Publishing.

Balas, M., Burke, W., Gannon, D., Cohen, M., Colburn, L., Bevil, C., Franz, D., Olsen, K., Ely, E., & Vasilevskis, E. (2013). Implementing the ABCDE bundle into everyday care: Opportunities, challenges and lessons learned for implementing the ICU pain, agitation and delirium (PAD) guidelines. *Critical Care Medicine, 41*(9), S116-S127.

Balas, M., Vasilevskis, E., Burke, W., Boehm, L., Pun, B., Olsen, K., Peitz, G., & Ely, E. (2012). Critical care nurses' role in implementing the "ABCDE Bundle" into practice. *Critical Care Nurse, 32*(2), 35-46.

Barr, J., Fraser, G., Puntillo, K., Ely, E., Gelinas, C., Dasta, J., … Jaeschke, R. (2013). Clinical practice guidelines for the management of pain, agitation, and delirium in adult patients in the intensive care unit. *Critical Care Medicine, 41*(1), 263-306.

Bassett, R., Vollman, K., Brandwene, L., & Murray, T. (2012). Integrating a multidisciplinary mobility programme into intensive care practice (IMMPTP): A multicenter collaborative. *Intensive and Critical Care Nursing, 28*(2), 88-97.

Berry, E., & Zecca, H. (2012). Daily interruptions of sedation: A clinical approach to improve outcomes in critically ill patients. *Critical Care Nurse, 32*(1), 43-51.

Blackwood, B., Alderdice, F., Burns, K., Cardwell, C., Lavery, G., & O'Halloran, P. (2012). Protocolized versus non-protocolized weaning for reducing the duration of mechanical ventilation in critically ill adult patients (Review). *The Cochrane Library, 11*.

Bolton, C., Gilbert, J., Hahn, A., & Sibbald, W. (1984). Polyneuropathy in critically ill patients. *Journal of Neurology, Neurosurgery & Psychiatry, 47*(11), 1223-1231.

Cabana, M., Raad, C., Powe, N., Wu, A., Wilson, M., Abboud, P., & Rubin, H. (1999). Why don't physicians follow clinical practice guidelines? A framework for improvement. *JAMA, 282*, 1458-1465.

Carrothers, K., Barr, J., Spurlock, B., Ridgely, S., Damberg, C., & Ely, E. (2013). Contextual issues influencing implementation and outcomes associated with an integrated approach to managing pain, agitation, and delirium in adult ICUs. *Critical Care Medicine, 41*(9), S128-S135.

Corbett, J. (2008). Laboratory Tests and Diagnostic Procedures with Nursing Diagnoses. Upper Saddle River, New Jersey: Pearson.

Dasta, J., McLaughlin, T., Mody, S., & Piech, C. (2005). Daily cost of an intensive care unit day: the contribution of mechanical ventilation. *Critical Care Medicine, 33*(6), 1266-1271.

DeGrado, J., Anger, K., Szumita, P., Pierce, C., & Massaro, A. (2011). Evaluation of a local ICU sedation guideline on goal-directed administration of sedatives and analgesics. Journal of Pain Research, 4, 127-134. doi:10.2147/JPR.S18161

Fraser, G. (2005). *Behavioral effects of ICU medications.* Paper presented at the Society of Critical Care Medicine's thirty third and thirty forth Critical Care Congresses, Orlando, FL & Phoenix, AR.

Garnacho-Montero, J., Amaya-Villar, R., Garcia-Garmendia, J., Madrazo-Osuna, J., & Ortiz-Leyba, C. (2005). Effect of critical illness polyneuropathy on the withdrawal from mechanical ventilation and the length of stay in septic patients. *Critical Care Medicine, 33*(2), 349-354.

Girard, T. & Ely, W. (2008). Protocol-driven ventilator weaning: Reviewing the evidence. *Clinical Chest Medicine, 29*, 241-252.

Girard, T., Kress, J., Fuchs, B., Thomason, J., Schweickert, W., Pun, B., …Ely, E. (2008). Efficacy and safety of a paired sedation and ventilator weaning protocol for mechanically ventilated patients in intensive care (Awakening and Breathing Controlled trial): A randomized controlled trial. *The Lancet, 371*, 126-134.

Grossbach, I., Chlan, L., & Tracy, M. (2011). Ventilatory support and management of patient- and ventilator-related responses. *Critical Care Nurse, 31*(3), 30-44.

Halpern, N., & Pastores, S. (2010). Critical care medicine in the United States 2000-2005: An analysis of bed numbers, occupancy rates, payer mix, and costs. *Critical Care Medicine, 38*(1), 65-71.

Hanbury, A., Farley, K., Thompson, C., Wilson, P., & Chambers, D. (2012). Challenges in identifying barriers to adoption in a theory-based implementation study: Lessons for future implementation studies. *BCM Health Services Research, 12*, 422-430.

Harris, P., Taylor, R., Thiekle, R., Payne, J., Gonzalez, N., & Conde, J. (2009). Research electronic data capture (REDCap) – A metadata-driven methodology and workflow process for providing translational research informatics support. *Journal of Biomedical Informatics, 42*(2), 377-381.

Hooper, M., & Girard, T. (2009). Sedation and weaning from mechanical ventilation: Linking spontaneous awakening trials and spontaneous breathing trials to improve patient outcomes. *Critical Care Clinics, 25*, 515-525.

Implementation. (n.d.). *Collins English Dictionary-Complete & Unabridged 10 Edition*. Retrieved from Dictionary.com website: http://dictionary.reference.com/browse/implementation

Institute of Medicine. (2010). *Redesigning continuing education in the health professions.* Washington DC: National Academy Press.

Jackson, J., Girard, T., Gordon, S., Thompson, J., Shintani, A., Thomason, J., …Ely, E. (2010). Long-term cognitive and psychological outcomes in the awakening and breathing controlled trial. *American Journal of Respiratory and Critical Care Medicine, 182*, 183-191.

Josefsson, K., Kammerlind, A., & Sund0Levander, M. (2012). Evidence-based practice in a multiprofessional context. *International Journal of Evidence-Based Healthcare, 10*, 117-125.

Kolb, D., Osland, J., & Rubin, I. (1995). *Organizational Behavior: An Experiential Approach*. Englewood Cliffs, NJ: Prentice-Hall.

Kress, J., Pohlman, A., O'Connor, M., & Hall, J. (2000). Daily interruption of sedative infusions in critically ill patients undergoing mechanical ventilation. *The New England Journal of Medicine, 342*(20), 1471-1477.

Lane, A., & Mitchell, C. (2013). Using a train-the-trainer model to prepare educators for simulation instruction. *The Journal of Continuing Education in Nursing, 44*(7), 313-317.

LeBlanc, J., Kane-Gill, S., Pohlman, A., & Herr, D. (2012). Multiprofessional survey of protocol use in the intensive care unit. *Journal of Critical Care, 27*, 738.e9-738.e17.

MacIntyre, N., Epstein, S., Carson, S., Scheinhorn, D., Christopher, K., & Muldoon, S. (2005). Management of patients requiring prolonged mechanical ventilation: Report of a NAMDRC consensus conference. *Chest, 128*(6), 3937-3954.

Marsick, J., & Watkins, E. (1990) *Informal and Incidental Learning in the Workplace*. Routledge, London & New York.

Matthay, M., Zimmerman, G., Esmon, C., Bhattacharya, J., Coller, B., Doerschuk, C., Harabin, A. (2003). Future research directions in acute lung injury NHLBI workshop summary. *American Journal of Respiratory and Critical Care Medicine, 167*, 1027-1035.

McConville, J., & Kress, J. (2012). Weaning patients from the ventilator. *The New England Journal of Medicine, 367*(23), 2233-2239.

McNicoll, L., Pisani, M., Zhang, Y., Ely, E., Siegel, M., & Inouye, S. (2003). Delirium in the intensive care unit: Occurrence and clinical course in older patients. *Journal of American Geriatric Society, 51*(5), 591-598.

Melnyk, B., & Fineout-Overholt, E. (2011). Evidence-based practice in nursing and healthcare: A guide to best practice. Philadelphia: Lippincott Williams & Wilkins.

Milbrandt, E., Deppen, S., Harrison, P., Shintani, A., Speroff, T., Stiles, R., … Ely, E. (2004). Costs associated with delirium in mechanically ventilated patients. *Critical Care Medicine, 32*(4), 955-962.

Miller, M., & Han, M. (2014). Management and prognosis of patients requiring prolonged mechanical ventilation. UpToDate. Available from www.uptodateonline.com

National Healthcare Safety Network. (2013). Ventilator associated event protocol clarifications July 2013. Retrieved from www.cdc.gov/nhsn/PDFs/pscManual/10-VAE_FINAL.pdf

Nordon-Craft, A., Moss, M., Quan, D., & Schenkman, M. (2012). Intensive care unit-acquired weakness: Implications for physical therapist management. *Physical Therapy Journal, 92*(12), 1494-1506.

O'Rourke, A. & Booth, A. (2000). *Critical appraisal and using the literature*. ScHARR Guides. School of Health and Related Research, University of Sheffield.

Owen, J., Brashers, V., Littlewood, K., Wright, E., Childress, R., & Thomas, S. (2014). Designing and evaluating an effective theory-based continuing interprofessional

education program to improve sepsis care by enhancing healthcare team collaboration. *Journal of Interprofessional Care, 28*(3), 212-217.

Preparedness. (n.d.). In *Merriam-Webster's online dictionary*. Retrieved from http://www.merriam-webster.com/dictionary/preparedness

Pronovost, P., & Goeschel, C. (2005). Improving ICU care: It takes a team. *Healthcare Executive, 20*(2), 14-22.

Radtke, F., Heymann, A., Franck, M., Maechler, F., Drews, T., Luetz, A., Nachtigall, I., Wernecke, K., & Spies, C. (2012). How to implement monitoring tools for sedation, pain and delirium in the intensive care unit: an experimental cohort study. *Intensive Care Medicine, 38*(12), 1974-1981.

Raelin, J. (1997). A model of work-based learning. *Organizational Science, 8*(6), 563-578.

Rangachari, P., Madaio, M., Rethemeyer, K., Wagner, P., Hall, L., Roy, S., & Rissing, P. (2014). *Quality Management in Healthcare, 23*(1), 43-58.

Rangachari, P., Rissing, P., & Rethemeyer, K. (2013). Awareness of evidence-based practices alone does not translate to implementation: Insights from implementation research. *Quality Management in Healthcare, 22*(2), 117-125.

Resar, R., Griffin, F., Haraden, C., Nolan, T. (2012). Using care bundles to improve health care quality. IHI Innovation Series white paper. Cambridge, Massachusetts: Institute for Healthcare Improvement.

Rowe, K., & Fletcher, S. (2008). Sedation in the intensive care unit. *Continuing Education in Anaesthesia, Critical Care & Pain, 8*(2), 50-55. doi: 10.1093/bjaceaccp/mkn005

Schweickert, W., & Hall, J. (2007). ICU-acquired weakness. *Chest, 131*(5), 1541-1549.

Scottish Intercollegiate Guidelines Network. (2011). *Annex B: Key to Evidence Statements and Grades of Recommendations. SIGN 50: A Guideline Developer's Handbook*. Edinburgh: Scottish Intercollegiate Guidelines Network. Retrieved from http://www.sign.ac.uk/pdf/sign50.pdf

Sidiras, G., Gerovasili, V., Patsaki, I., Karatzanos, E., Papadopoulos, E., Markaki, V… Nanas, S. (2013). Short and long term outcomes of ICU acquired weakness. *Health Science Journal, 7*(2). 188-200.

Stevens, R., Marshall, S., Cornblath, D., Hoke, A., Needham, D., de Jonghe, B., Ali, N., & Sharshar, T. (2009). A framework for diagnosing and classifying intensive care unit-acquired weakness. *Critical Care Medicine, 37*(10), S299-S308.

Strategy. (n.d.). In *Merriam-Webster's online dictionary*. Retrieved from http://www.merriam-webster.com/dictionary/strategy

Thomas, M., Dhanani, S., Irwin, D., Writer, H., & Doherty, D. (2010). Development, dissemination and implementation of a sedation and analgesic guideline in a pediatric intensive care unit… It takes creativity and collaboration. *Canadian Association of Critical Care Nurses, 21*(4), 16-25.

Truong, A., Fan, E., Brower, R., & Needham, D. (2009). Bench-to-bedside review: Mobilizing patients in the intensive care unit - from pathophysiology to clinical trials. *Critical Care, 13*(4). doi:10.1186/cc7885

Vasilevskis, E., Ely, E., Speroff, T., Pun, B., Boehm, L., & Dittus, R. (2010). Reducing iatrogenic risks: ICU-acquired delirium and weakness - Crossing the quality chasm. *Chest, 138*(5), 1224-1233.

Vollman, K. (2010). Introduction to progressive mobility. *Critical Care Nurse, 30*(2), S3-S5.

Williams, C. (2010). Understanding the essential elements of work-based learning and its relevance to everyday clinical practice. *Journal of Nursing Management, 18*, 624-632.

Wunsch, H., Kahn, J., Kramer, A., & Rubenfeld, G. (2009). Use of intravenous sedation among mechanically ventilated patients in the United States. *Critical Care Medicine, 37*(12), 3031-3039.

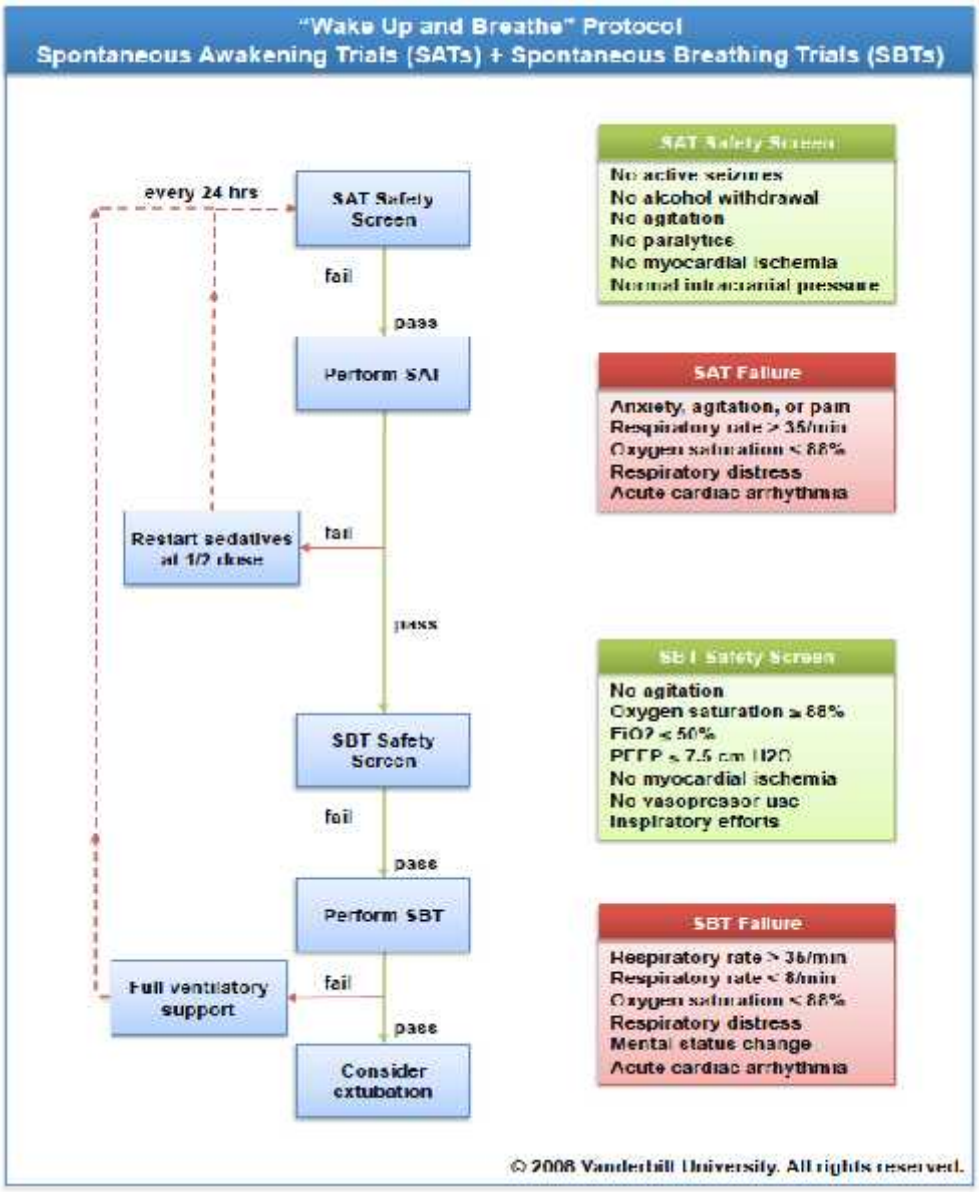
Wunsch, H., Linde-Zwirble, W., Angus, D., Hartman, M., Milbrandt, E., & Kahn, J. (2010). The epidemiology of mechanical ventilation use in the United States. *Society of Critical Care Medicine, 38*(10), 1947-1953.

Wunsch, H., Wagner, J., Herlim, M., Chong, D., Kramer, A., & Halpern, S. (2013). ICU occupancy and mechanical ventilator use in the United States. *Critical Care Medicine, 41*(11).

Zilberberg, M., de Wit, M., & Shorr, A. (2012). Accuracy of previous estimates for adult prolonged acute mechanical ventilation volume in 2020: Update using 2000-2008 data. *Critical Care Medicine, 40*(1), 18-20.

Zilberberg, M., Luippold, R., Sulsky, S., & Shorr, A. (2008). Prolonged acute mechanical ventilation, hospital resource utilization, and mortality in the United States. *Critical Care Medicine, 36*(3), 724-730.

APPENDIX A: WAKE-UP AND BREATHE ALGORITHM



APPENDIX B: RICHMOND AGITATION AND SEDATION SCORE

Richmond Agitation Sedation Scale (RASS) *

Score	Term	Description	
+4	Combative	Overtly combative, violent, immediate danger to staff	
+3	Very agitated	Pulls or removes tube(s) or catheter(s); aggressive	
+2	Agitated	Frequent non-purposeful movement, fights ventilator	
+1	Restless	Anxious but movements not aggressive vigorous	
0	Alert and calm		
-1	Drowsy	Not fully alert, but has sustained awakening (eye-opening/eye contact) to *voice* **(≥10 seconds)**	Verbal Stimulation
-2	Light sedation	Briefly awakens with eye contact to *voice* **(<10 seconds)**	Verbal Stimulation
-3	Moderate sedation	Movement or eye opening to *voice* **(but no eye contact)**	Verbal Stimulation
-4	Deep sedation	No response to voice, but movement or eye opening to *physical* stimulation	Physical Stimulation
-5	Unarousable	No response to *voice or physical* stimulation	Physical Stimulation

Procedure for RASS Assessment

1. Observe patient
   a. Patient is alert, restless, or agitated. **(score 0 to +4)**
2. If not alert, state patient's name and *say* to open eyes and look at speaker.
   b. Patient awakens with sustained eye opening and eye contact. **(score –1)**
   c. Patient awakens with eye opening and eye contact, but not sustained. **(score –2)**
   d. Patient has any movement in response to voice but no eye contact. **(score –3)**
3. When no response to verbal stimulation, physically stimulate patient by shaking shoulder and/or rubbing sternum.
   e. Patient has any movement to physical stimulation. **(score –4)**
   f. Patient has no response to any stimulation. **(score –5)**

* Sessler CN, Gosnell M, Grap MJ, Brophy GT, O'Neal PV, Keane KA et al. The Richmond Agitation-Sedation Scale: validity and reliability in adult intensive care patients. Am J Respir Crit Care Med 2002; 166:1338-1344.

* Ely EW, Truman B, Shintani A, Thomason JWW, Wheeler AP, Gordon S et al. Monitoring sedation status over time in ICU patients: the reliability and validity of the Richmond Agitation Sedation Scale (RASS). JAMA 2003; 289:2983-2991.

APPENDIX C: SIGN 50 RATING SYSTEM

Scottish Intercollegiate Guidelines Network **Grades of recommendations**	
Grade	**Criteria**
A	At least one meta-analysis, systematic review, or RCT rated as 1++, and directly applicable to the target population; or A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results
B	A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1++ or 1+
C	A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 2++
D	Evidence level 3 or 4; or Extrapolated evidence from studies rated as 2+

(Scottish Intercollegiate Guidelines Network, 2011)