I, Julia K Eberwine, hereby submit this original work as part of the requirements for the degree of Doctor of Philosophy in Nursing Research.

It is entitled:
Methods Used to Assess Critical Care Nurses’ Ability to Detect the Deteriorating Patient and the Perceived Effectiveness of Those Methods

Student’s name: Julia K Eberwine

This work and its defense approved by:

Committee chair: Elaine Miller, Ph.D., R.N.

Committee member: Kimberly Johnson, Ph.D.
C.E.N.

Committee member: Jun Ying, Ph.D.
Methods Used to Assess Critical Care Nurses’ Ability to Detect the Deteriorating Patient and the Perceived Effectiveness of Those Methods

A dissertation submitted to the Graduate School of the University of Cincinnati in partial fulfillment of the requirements for the degree of Doctor of Philosophy in Nursing Research

Within the College of Nursing

Submitted by Julia K Eberwine PhD, RN, CCRN-K, PCCN-CMC
April 29, 2016

University of Phoenix Master of Science in Nursing, March 2002

Miami University Bachelor of Science in Nursing, May 1987 Associate Degree in Nursing, May 1983

Committee Chair Elaine T. Miller PhD, RN, CRRN, FAAN, FAHA
Abstract

Problem: Detection of critically-ill patient deterioration is an essential nursing skill that impacts healthcare costs and the mortality and morbidity of 128 deaths out of every 1,000 patients nationally. The ability to effectively assess skills in critical care nurses is often given to the critical care educator who has not been provided standardized tools that can accurately measure competence.

Purpose: The primary purpose of this descriptive correlational study was to identify the criteria and measurement methods critical care nurse educators use to assess nurses' ability to detect the early signs of patient deterioration and describe the perceived effectiveness of the measurement methods used. The secondary purpose was to explore the association of critical care nurse educators' characteristics, hospital characteristics, and geographic regions with the type of methods and perceived effectiveness in the evaluation.

Design: The critical care nurse educator population was accessed through the American Association of Critical Care Nurses (AACN). An invitation with a Survey Monkey link was provided in AACN’s weekly eNewsletter for persons to access and participate for a total of 4 weeks.

Results: The study received a total of 245 responses from the Survey Monkey. However, only 72 responses were considered valid based upon the criteria of answering all questions related to the key measurements of interest (specifically in Q’s 23-25). The reasons for this are unknown, but the survey did allow participants to skip questions. Sixty eight percent of participants showed education level at Masters prepared and above, higher than national level of 12% in similar studies. Both Classroom Education and Direct Observation were considered most frequently used methods among nursing educators. Most (72%) of the nursing educator also
considered the Direct Observation as the most effective method in education, higher than the second most effective method (28%) in Simulation (Live). Perceived effectiveness of all methods was examined found not affected by demographics, education and years of experience of nursing educators. Perceived effectiveness of most of the methods were also find not associated to nursing units, except that the perceived effectiveness of simulation methods were positively associated to the number of criteria used to detect deteriorating patients.

**Conclusions:** The lack of responses did not allow attaining rich data from all survey questions; but the 72 responses on the critical questions provided information that future research can be built upon. While the education for the educators is Masters prepared and above, it may not be appropriate to compare as national studies are looking at all nurses. Despite the popularity of simulation as an effective teaching method, direct observation remains a favored method and viewed as the most effective method. Simulation is also the method least used by the participants. There is literature supporting the use of simulation and how it facilitates learning; however these educators are not using it. This lack of use will be explored in future research designed to support the critical care educator in their role of assessment of nurses’ practice.
Acknowledgements

I would like to thank the following people:

My Dissertation Committee

Elaine T. Miller PhD, RN, CRRN, FAAN, FAHA
Dissertation Chair

Kimberly Johnson PhD, RN, CEN

Jun Ying, PhD

My Family,

in particular my father C. Donald Eberwine and my mother Marcella Eberwine

and the

University of Cincinnati, College of Nursing

for the support through this journey
# Table of Contents

Chapter 1 – Introduction ........................................................................................................ 11

Chapter 2 – A Review of the Literature .................................................................................. 19

Chapter 3 – Proposed Study .................................................................................................. 43

Article 1 - A Review of the Literature on Methods to Assess Critical Care Nurses’ Competency Evaluating Deteriorating Patients ..............................................................................57

Article 2 - Methods Used to Assess Critical Care Nurses’ Ability to Detect the Deteriorating Patient and the Perceived Effectiveness of Those Methods .................................................87

Article 3 - Translating Methods to Assess Critical Care Nurse Performance into Practice Using the Stevens Star Model of Knowledge Transformation ...........................................107

# List of Tables

Article 1 – Figure 1 – Search of the Literature ............................................................................ 77

Article 1 – Figure 2 – Additional Search of the Literature .......................................................... 79

Article 1 – Table 1 – Whittemore and Knafl’s Framework Stages ............................................. 81

Article 1 – Table 2 – Article Analysis Using Whittmore and Knafl ........................................... 83

Article 1 – Table 3 – Comparison of Score Components .............................................................. 85

Article 2 – Table 1 – Summary of Demographics of Critical Care Nurse Educators ......101

Article 2 – Table 2 – Summary of Nursing Characteristics ........................................................ 102

Article 2 – Table 3 – Summary of Characteristics of Nursing Unit ........................................... 103

Article 2 – Table 4 – Perceived Effectiveness of Methods vs. Number of Criteria Used to Detect a Deteriorating Patient .............................................................................................................104

Article 2 – Table 5 – Responses to Critical Questions ............................................................... 105

Article 3 – Diagram 1 – Stevens Star Model of Knowledge Transformation ............................ 117
Chapter 1
Introduction
Problem

Despite the increasing emphasis on healthcare organizations to evaluate the competency level of registered nurses, educators struggle with how to most effectively assess it. An even more frustrating issue is that educators are left with the task of measuring the competency at hand, without having tools that can appropriately measure competency outcomes. Determination of nursing competency is considered necessary in all settings, but especially in critical care. Moreover, detection of patient deterioration is a pivotal skill fueled by governing body’s standards along with the financial costs and mortality and morbidity.

The Joint Commission, one of the governing bodies, evaluates and accredits more than 18,000 healthcare organizations and programs in the United States and is the nation's oldest and largest standards-setting and accrediting body in healthcare. Their 2010 accreditation manual state that one of the established standards for organizations is to ensure that staff is competent to perform their responsibilities. Another governing body is the National Council of State Boards of Nursing (NCSBN, 2005), which acknowledged that competency was difficult to measure with the volume of practicing registered nurses. NCSBN identified that there is an evolution of practice from the new graduate nurse to the experienced nurse. Due to this evolution in practice, the evaluation of competency isn't a constant attribute of practicing nurses, but instead is on an evolving continuum. This creates difficulties for the critical care educator to determine what standards are required by each individual nurse, including the capability to identify and properly care for the deteriorating patient.

Currently, there are patient assessment scales that have been established to detect early deterioration of a critically ill patient. As part of the Institute for Health Improvement’s (IHI) 100,000 Lives Campaign, The Modified Early Warning Score (MEWS) was created to identify
an adult deteriorating patient in an effective manner (IHI, 2013). It is based on five factors which are systolic blood pressure, heart rate, respiratory rate, body temperature, and level of consciousness. Scoring is based on where on the continuum the patient’s signs fall, ranging from 0-3 for each parameter. A score of five or more is statistically linked to increased likelihood of death or admission to an intensive care unit (Hammond et. al., 2013). Since implementation of this tool, cardiac arrest rates, mortality rates, and lengths of stay in the intensive care unit (ICU) have decreased due to earlier identification of the adult deteriorating patient (NICE, 2007; Hammond et al., 2013). In response to the success of the MEWS, a pediatric version (PEWS) and obstetrical version (OBEWS) of the warning score have also been developed to help identify those deteriorating patient populations, as have those that address sepsis and ventilator-associated pneumonia (Deutschman et al., 2012,). Though these scales are known and are frequent appearing in the literature, what is missing from the literature is how the critical care educator assesses the nurse’s ability to detect the early signs of deterioration as well as how effective these methods are in accurately assessing the nurse’s ability.

**Significance**

Deterioration of a patient is costly, not only in the amount of monies that organizations have to pay, but in terms of lost lives. The ability to detect the deteriorating patient quickly and accurately allows the provision of care to address the underlying issues creating the deterioration. As many as eighty percent of hospitalized patients have physiological parameters outside normal ranges in the twenty-four hours prior to intensive care unit admission. In addition, up to three-fourths of such patients have at least one potentially life-threatening factor in the eight hours before ICU admission (Tarassenko, Hann & Young, 2006) with some signs occurring up to twenty-four hours prior to recognition of deterioration (Felton, 2012). When warning signs are
not recognized, the resulting delay in treatment leads to increased mortality and morbidity (Chalfin, Trzeciak, Likourezos, Baumann, & Dellinger, 2007). Between 2004 and 2006, Healthgrades (2008) reported that "failure to rescue" accounted for 128 deaths out of every 1,000 patients nationally. Additionally, the Agency for Healthcare Research and Quality has focused on improving the quality, safety, efficiency, and effectiveness of health care. One organization’s success included reducing its crash call rate in half, going from eight crash calls per 1,000 discharges to four by implementing the MEWS tool and appropriately caring for the patient (AHRQ, 2012). This success was attributed to the staff implementing the tool appropriately when recognizing deteriorating vital signs.

There is not one current evaluation standard for use by the educator to assess the critical care nurses’ competency to recognize early signs of patient deterioration, though simulation is frequently used to expose the critical care nurse to patient care scenarios in a safe environment. This descriptive correlational study will identify methods currently being used to assess the critical care nurses’ ability to detect the deteriorating patient and how the critical care nurse educators view their effectiveness. The knowledge created from this study will guide future actions in the development of standards for determining critical care nurses ability to detect patient deterioration in a timely manner.

**Purpose**

The primary purpose of this descriptive correlational study is to (a) identify the criteria and measurement methods critical care nurse educators use to detect the critical care nurses' ability to detect the early signs of patient deterioration and (b) describe the perceived effectiveness of the identified measurement methods. The secondary purpose of this study is to explore the associations of critical care nurse educators' characteristics, hospital characteristics,
and geographic regions with the type of methods and perceived effectiveness in evaluating the critical care nurses' ability to detect signs of patient deterioration.

**Conceptual Definitions**

Within this research study, several conceptual definitions will be used. *Clinical competency* will be defined in accordance with the NCSBN framework. NCSBN defines clinical competency as encompassing the ability to observe and gather information, recognize deviations from expected patterns, prioritize data, make sense of data, maintain a professional response demeanor, provide clear communication, execute effective interventions, perform nursing skills correctly, evaluate nursing interventions, and self reflect for performance improvement within a culture of safety (NCSBN, 2011). This performance will depend on one’s capacity to gain, understand, and integrate data with a focus of the patients’ needs and identify the clinical situation. For this particular study, the clinical competency will be focused on the identification of the deteriorating patient.

*Competency assessment* will be conceptually defined as the verification of a registered nurse’s ability to perform and apply knowledge, to integrate knowledge and skills, and established policies and procedures in a situation (McConnell, 2001). This concept will be operationalized by asking the educator to identify the criteria and methods used to assess the critical care nurses' ability to detect the early signs of patient deterioration.

*Patient deterioration* will be defined as a sudden deterioration in any of the physiological status components from the last recorded observations to the most recent. This deterioration is in light of on-going management of the patient's overall condition (Boyle, Smith & Archer, 2008). These physiological signs could include heart rate, respiratory rate, decreased systolic blood pressure or oxygen saturation, abnormal ECG, alteration in the level of consciousness,
decreased urine output, abnormal temperature, lactate, blood glucose, base deficit, or arterial pH, increased creatinine, as well as the concern of a staff member about the patient. The signs that the critical care nurse currently uses to determine deterioration will be gathered in this study.

The variables for this study are as follows:

**Critical care nurse educator characteristics** will be defined as the demographic data that defines each individual critical care nurse educator and makes each person unique. The demographic data to be collected in this study will be: years of experience in clinical practice; years serving as an educator in the current role; years in the role of assessing staff; number of employees responsible for; how many units responsible for; type of unit; education level; and types of certification possessed.

**Hospital characteristics** will be defined as the demographic data pertaining to the critical care educator’s employer. The data to be collected in this study will be: state of employment, size of institution (as determined by number of licensed beds), non profit vs. profit, urban vs. suburban, teaching vs. community, and magnet vs. non magnet certification.

**Geographic regions** will be defined as state and group of four regions in the United States with the states grouped according to their geographic position. These four areas and the states within them are:

- **West**: Alaska, Hawaii, California, Nevada, Arizona, New Mexico, Utah, Colorado, Wyoming, Montana, Idaho, Washington, Oregon
- **Mid-West**: North Dakota, South Dakota, Nebraska, Kansas, Missouri, Iowa, Minnesota, Wisconsin, Michigan, Ohio, Indiana, Illinois
South: Texas, Oklahoma, Arkansas, Louisiana, Mississippi, Alabama, Tennessee, Kentucky, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Florida


Methods are defined as the specific ways and/or tools that are utilized by the critical care nurse educator to assess the critical care nurse’s ability to detect a deteriorating patient. This information will be obtained having the critical care nurse educator indicate the methods used.

Perceived effectiveness The critical care nurse educator views the effectiveness of a method as how well does it assess the critical care nurse’s ability to detect a deteriorating patient. This variable will be measured by a developed Likert scale.

Assumptions

The study assumptions are that the critical care nurse educators will have the experience to provide insightful information in how they assess critical care nurses’ ability to detect deteriorating conditions. An additional assumption is that the critical care educators participating in the study will be willing to share the methods and organizational standards they currently use to assess the staff’s ability to detect the deteriorating patient as well as the perceived effectiveness of those methods.

Limitations

The limitations are several. This descriptive correlational study will utilize a convenience sample, with participants making the self determination if they want to participate. In addition, the data obtained with by subjective due to the self-reporting mechanism of the
survey. Another limitation is that the participating educators’ practice may not reflect the practice of all critical care educators. This limitation will be reduced by soliciting a national organization’s membership to participate in the study. This organization, American Association of Critical Care Nurses, has a membership currently over 100,000 throughout the US and other countries. As of March 2012, nurse educators comprise 2% of their membership, which is 2,000 nurses, however not all members choose to share their demographic information, including their job role.

Summary

The problem facing U.S. hospitals today is a consistent evaluation of registered nurses’ ability to detect early signs of patient deterioration, especially in critical care settings. A review of the literature demonstrates a lack of current standards and practices being used for this evaluation. Understanding what methods and criteria are currently being used to assess critical care nurse competency in detecting patient deterioration as well as how effective they are perceived will help guide future work to determine standards in evaluation.
Chapter 2

A Review of the Literature
Introduction

In this chapter, the literature pertaining to nurse educators’ assessment of the critical nurse’s competency in recognizing a deteriorating patient will be reviewed. Why is the subject of how a nurse recognizes a deteriorating patient important? Sixty percent of primary events, defined as deaths, cardiac arrests, and unplanned ICU admissions, were preceded by documented abnormal physiology, including decreasing blood pressure, alteration in level of conspicuous, and significant changes in heart rate (Bell, Konrad, Granath, Ekbom, & Martling, 2006; Kause et al., 2004). These primary events are not uncommon. Every year in the United States 370,000 - 750,000 in-hospital resuscitation attempts are made with the incidence of cardiac arrest ranging from 1-5 events per 1000 hospital admissions (Sandroni, Nolan, Carallaro, & Antonelli, 2007). If these events can be prevented by recognizing and treating the deteriorating patient, significant positive patient outcomes would result.

A literature review from 2000-2013 was performed using CIHAL and Pubmed databases to examine five areas specifically in preparation for development of a survey for the critical care educators. Clinical nursing competency will first be presented as a brief review to support the importance of this study. The other four areas apply to the essential elements of the proposed survey tool to determine the current methods utilized for evaluation of the critical care nurse’s ability to recognize the deteriorating patient and the perceived effectiveness of those methods. These four areas include: qualifications for the critical care nurse educator role, specific criteria used to determine patient deterioration, current methods used in the evaluation of a critical care nurse’s ability to detect a deteriorating patient, and the perceived effectiveness of assessment methods that are used to evaluate the critical care nurse’s ability to recognize the deteriorating patient.
1. General Definitions of Nursing Competency

Historically, competency has not been well defined conceptually or operationally, even though it is identified as being fundamental to quality and safe nursing practice. The evolution of competence in nursing began in 1978 through the work of del Bueno (1978). Del Bueno and colleagues (1980) defined competency in several ways as her work developed with her “base” definition always involving three main areas; interpersonal skills, technical skills, and critical thinking. This definition further evolved through the efforts of Johnson, Opfer, VanCura, and Williams (2000) who defined competency as actual performance in the real work situation and can only be assessed by observing job performance. They felt that current programs focus on task performance and pay little attention to critical thinking or resource utilization. Moreover, Jordan, Thomas, Evans, and Green (2008) contend that the ability to critically think and communicate is as important as clinical skills. While these beliefs present a different view, they all do apply to the issue of how the educator evaluates the critical care nurses’ ability to detect a deteriorating patient. The proposed study involves the critical care educator’s ability to think through situation and apply evidence based practice in the evaluation of the critical care nurses’ ability to recognize the deteriorating patient.

2. Qualifications for the Nurse Educator Role

The literature was examined to identify the minimum qualifications or attributes needed by a nurse serving in the critical care educator role. In order to gain understanding of the methods utilized by the critical care nurse educator to evaluate the critical care nurse, it is important to understand the established role and responsibilities of the critical care educator. There is a plethora of literature regarding the nurse educator role in the academic setting. The National League of Nursing (NLN), an organization with the focus on academic nursing faculty
and nursing education programs, established a nurse educator certification in 2009 for the academic educator (NLN, 2011). For this certification, NLN identified and defined eight core competencies academic faculty must possess. This researcher proposes that these same competencies are applied to the hospital based nurse educator. These core competencies are to facilitate learning, facilitate learner development and socialization, use assessment and evaluation strategies, participate in curriculum design and evaluation of program outcomes, function as a change agent and leader, pursue continuous quality improvement in the nurse educator role, engage in scholarship, and function within the educational environment (NLN, 2005).

American Association of Colleges of Nursing (AACN), has also established criteria and expectations for academic faculty. Jean Bartels, a past president of AACN, authored several articles concerning the educational requirements of nursing educators in the academic setting. She, representing the organization, stated that the preferred educational preparation for nursing faculty is the doctoral degree, with the minimum being a masters' in nursing degree and that the educator should have knowledge in the science of teaching (Bartels, 2005). AACN performed a study in 2008 which examined what were the essential skills needed for new academic faculty, as identified by deans of nursing programs. The five most important qualities for the new faculty to possess were identified as teaching skills; knowledge, experience, and preparation for the faculty role; curriculum/course development skills; evaluation and testing skills, and personal attributes that were strong in interpersonal and communication skills (Penn, Wilson, & Rosseter, 2008). In addition to AACN, NCSBN (National Council of State Boards of Nursing) recommended the same expectation of graduate level academic preparation as well as expertise in the area that they are responsible for teaching (NCSBN, 2008; AACN, 2008).
Davis, Stullenbarger, Dearman, and Kelley (2005) conducted a study to validate the expected competencies of a nurse educator in the academic setting. This study was performed during the development of a competency based educational model for nurse educators. An assumption was that if there are clear statements of expectations are provided and performed, ensuring quality and accountability in the nurse educator as a learner would occur. The study resulted in validating 37 competencies for the nurse educator which was divided into seven categories - professional education ideology; graduate education ideology; professional nursing values; graduate nursing education values; and the core knowledge and skills within the nurse educator role which was comprised of the teacher, scholar and collaborator roles. Several competencies within the teacher role were identified as the most important in terms of being performed by the educator. These competencies were to provide clinical supervision for learners; plan appropriate learning experiences based on the class objectives; use evaluation instruments that will accurately assess learning and achievement of goals; communicate effectively; and assess personal knowledge and skills and implement plans for ongoing professional development. Though these competencies were validated in the academic setting only, the authors felt that the competencies and categories were broad enough to apply to the nurse educator outside the academic work setting. Davis, Stullenbarger, Dearman, and Kelley’s conclusion of the research also stated that in order to perform these competencies adequately, a minimum of a masters’ in nursing degree with an emphasis in advanced nursing practice and education should be required.

Though many national organizations have established expectations for academic faculty, there is little literature regarding the determination of expectations for the hospital based nurse educator. Throughout the literature a single study is referenced in regards to the hospital based
nurse educator’s role. This study, conducted by Davies, Laschinger and Andrusyszyn (2006), examined empowerment, job tension, and job satisfaction in clinical educators based in staff development in the hospital setting. The role of the clinical educator was identified to encompass planning formal educational opportunities; teaching; coaching; counseling; facilitating; and utilizing research. This research team concluded multiple roles lead to role ambiguity; role conflict; role overload; job stress; and decreased job satisfaction. Even though this study was focused on the staff development educator role, Davies, Laschinger and Andrusyszyn concluded that this role is performed at the unit level. Moreover, they assert that job tension increases when multiple units are covered by one educator which creates their effectiveness to be diminished as well as visibility to the staff. Their analysis found that hospital educators were more empowered compared to college educators, with a positive relationship between empowerment and job satisfaction. They further suggested that the empowerment was due to having current and clear job definitions that are consistent throughout the organization. When these job definitions are considered in decision making, high empowerment and job satisfaction in the educator role occurs.

Adding to the clarification of the educator role, The Institute of Medicine (IOM) first released in 2003 the expectation that educators and organizations are responsible for ensuring that current employees develop and maintain competency in delivering patient centered care, working as part of interdisciplinary teams, practicing evidenced based care, focusing on quality improvement, and using information technology. Their 2010 report, The Future of Nursing: Leading Change, Advancing Health (IOM, 2010), still emphasized this expectation.

The third organization to be discussed, American Nurses Credentialing Center (ANCC), established the Magnet Hospital Recognition Program for Excellence in Nursing Services in
1990. This program has grown to 6.9% of all registered hospitals in the United States having achieved Magnet Recognition status (ANCC, 2013). This recognition program emphasizes the “forces” of magnetism, one being nurses as teachers. In this force, ANCC is looking for students being welcomed and supported and staff serving as faculty and preceptors.

It is readily apparent that a majority of the literature discussing the roles of the hospital based nurse educator are non-research based articles in non-peer reviewed journals. Dorin (2010), for instance, stated that the role of the clinical nurse educator was to instruct staff on whatever is needed for the unit to run properly. She emphasized that the educator had the responsibility of ensuring that the nursing staff was providing safe and effective patient care, as well as providing staff development sessions, orientation for new nurses, and meeting competency standards established by The Joint Commission. Dorin also coined the term “unit stabilizers” to encompass all of the roles that the nurse educator performs.

In literature, the nurse educator role has been described as documenting educational progress, evaluating training programs, preparing orientation, developing training courses, grant proposal writing, writing reports, researching subjects, participating in professional associations, developing new procedures, and ensuring quality control. The major attributes portrayed by the nurse educator should include being an effective communicator, understanding clinical practice, able to assess staff, develop programs and evaluate efficiency, integrate practice into new educational courses, and demonstrate leadership qualities. This is the only source that recommended that the masters in nursing degree be the standard for the hospital clinical educator role, as other sources only discussed educational level for academic educators.

American Association of Critical Care Nurses (AACN), did not define the role of the critical care nurse educator. They did define the standards of care and professional performance
for the critical care nurse. Standards of care for the critical care nurse state that the nurse has the ability to perform assessment, diagnosis, outcomes identification, planning, implementation, and evaluation with the standards of professional performance being quality of practice, professional practice evaluation, education, collegiality, ethics, collaboration, research/clinical inquiry, resource utilization, and leadership (AACN, 2008). Though they did not define what is required of a critical care nurse educator directly, the critical care educator needs to be able to assist and evaluate the individual critical care nurse in the standards of care and professional performance.

Upon review of the literature, this researcher has determined that it is essential to gather demographic information from the educator participants. The collected data will provide insight into the current makeup of the critical care educator; including the skills they possess to perform the task of evaluating a nurse’s ability to identify the deteriorating patient. As a result of the literature review, the demographic information this researcher would like to gather is: years of experience in clinical practice; years serving as an educator in the current role; years in the role of assessing staff; number of employees responsible for; how many units responsible for; type of unit; education level; and types of certification possessed. In addition to the individual characteristics, demographics regarding the critical care educator’s employer will also be asked as this will have an influence on a employee’s role and responsibilities (Paquet, Courcy, Lavoie-Tremblay, Gagnon, & Maillet, 2013). The demographic information will provide insight into the salient attributes of the current critical care nurse educator.

3. **Criteria Used to Determine Patient Deterioration**

   In 2007, National Institute for Health and Clinical Excellence (NICE) cited reasons why patient’s conditions deteriorate. The report listed several failures: failure to take observations, to recognize early signs of deterioration, to prioritize specific treatments, to implement procedures
and policies adequately, and to make accurate calculations consistently. The report identified that there were several absences of behavior: little communication concerning observations, not enough education and training about the importance and interpretation of observations among staff, and scant leadership. In addition to naming of organizational issues, Cullinane, Findlay, Hargreaves, and Lucas (2005) determined that there were specific patient populations more vulnerable to deterioration - those from emergency admission, after surgery, and during the recovery from a critical illness.

As a response to these concerns, research began focusing on the criteria identification for the deteriorating patient. Temperature, pulse, systolic blood pressure, respiratory rate, and oxygen saturation emerged as the most often used vital signs that would indicate deterioration. Elliott and Coventry (2012) believed that due to inpatients becoming older and sicker compared to previous years, additional parameters should be utilized including level of pain, level of consciousness, and urine output. One research study examined 3160 patient charts and found that over half of them had at least one parameter that had deteriorated, indicating that these parameters could be monitored (Harrison, Jacques, Kilborn, & McLaws, 2005). Current research includes the examination of if mortality can be linked with specific variables (Rothman, Rothman, & Solinger, 2013). In their review of 42,302 electronic medical records, key assessment variables were heart rate, creatinine and twelve physical assessment markers including cardiac status; the ability to eat; gastrointestinal functioning; genitouninary functioning; the ability to move independently; being without pain; alert and orientated; peripheral/vascular status; psychosocial ability; respiratory status; no safety or fall risk factors being present; and a Braden score of greater than 15. The chart examination demonstrated that
heart rate and creatinine values either low and high values were linked with mortality. Although patient age was explored as a potential variable in this study, no correlation was demonstrated.

In response to the search for parameters signifying patient deterioration, National Institute for Health and Clinical Excellence (NICE) published a guideline, NICE Clinical Guideline 50, on making routine observations (NICE, 2007). Based on the research, this guideline indicated that the following parameters should be part of the initial assessment and routine monitoring: heart rate; respiratory rate; systolic blood pressure; level of consciousness; oxygen saturation; and temperature. NICE made the recommendation to make these parameters part of a “track and trigger” system that included hourly urine output; biochemical analysis – lactate, blood glucose, base deficit, arterial pH; and pain assessment. It further recommended that in the acute hospital setting that these criteria should be monitored at least every 12 hours and observation intervals should increase if abnormal parameters are noted. Within the literature, these recommendations have been referenced numerous times as the standard of observation in the critical care setting (Frost & Wise, 2012, Green & Williams, 2006, Ftouh & Thomas, 2013).

In the last few years, greater emphasis has appeared in the literature to more systematically create tools that could help identify the deteriorating patient by identification of variation in the parameters. Garcea et al. (2010), for instance, described the original tool used, the Early Warning Score (EWS). This tool contained six parameters which are heart rate, respiratory rate, temperature, conscious level, urine output, and systolic blood pressure. Each parameter is assigned a number between 0-3, with 0 being normal. As the criterion varies off the normal either high or low a number of 1-3 gets applied. If the patient scores a three or greater, the patient is labeled as being in the early stages of deterioration.
Once the Early Warning Score was developed, research began to develop a more effective score to signal patient deterioration. As a result of those efforts, the Modified Early Warning Score (MEWS) emerged as the most widely used scoring tool for deteriorating patient identification. This tool was based on patients with low mortality rates, but with an increased risk for infection (Shapiro et al., 2003). Though this score uses the same parameters as the EWS, the criteria for each assigned number was more clearly defined. There was a recommendation that if the score is four or greater, the physician and/or rapid response team should be notified immediately (IHI, 2011). Another area that has been researched is the verification of the accuracy of the score to identify deteriorating patients. Ludikhuize, Smorenborg, de Rooij and de Jonge (2012) examined 204 charts and found that when deterioration occurred, the MEWS criteria were met 81% of the time in the 48 hours before the deteriorating event.

Within the literature, additional parameters suggesting patient deterioration have been investigated. Smith et al. (2008), for example, examined the relationship between vital signs, age, and in-hospital mortality. The data demonstrated that as the vital signs worsened, mortality increased for all age groups with a positive correlation between age and mortality. Parameters contained within the MEWS were further examined in how each correlated with mortality. Mortality escalated with respiratory rate greater than 36 per minute, systolic blood pressure less than 90mmHg, and a decreased conscious level. The study concluded with the recommendation that age be included as a considering factor when assessing for patient deterioration.

Another area of research is the concept of ideal scoring tools for each patient population. Kellett and Deane (2006) wanted to identify patients at low risk for death and very high risk for death and since the MEWS score lacked sensitivity when the score was two or less, they felt that there was a need for the tool that could better identify the deteriorating patient before several
parameters were affected. As a result, the simple clinical score (SCS) was developed. This tool contained the parameters of abnormal ECG; temperature of less than 35°C or greater than 39°C; breathlessness; systolic blood pressure of less than 100; coma not due to intoxication or overdose; oxygen saturation less than 95%; history of prior illness; inability to stand unaided; and greater than fifty years of age. The emergency room patient population has been researched frequently in the literature with the rapid emergency medicine score (REMS) emerging as the standard for this population (Olsson, Terent, & Lind, 2004). The goal was to determine a predictive score for non-surgical patients in the emergency room using the evaluation points of in-hospital mortality and length of stay in the hospital. The criteria contained within this score are systolic blood pressure; respiratory rate; pulse rate; Glasgow coma scale, oxygen saturation; and age. Another score for the emergency room patients is the MEWS max which didn’t include age, Glasgow coma scale, or oxygen saturation, but added temperature (Heitz et al., 2010). McGillicuddy et al. (2011) also developed an emergency warning score which is one of the few tools that included marked nursing concern as a parameter in addition to heart rate, respiratory, systolic blood pressure, and oxygen saturation.

Three other patient populations at risk for deterioration were found in the literature. Ghanem-Zoubi, Vardi, Laor, Weber, and Bitterman (2011) conducted research to determine if a specific warning tool for sepsis could be created since the MEWS and other similar scores were developed using patients with low mortality rates. The research concluded that the SCS and REMS were effective with the septic population and identifying deteriorating conditions. Van Voorhis and Willis (2009) wanted to develop a score to address the pediatric patients. The parameters that emerged as identifying the pediatric deteriorating patient were acute changes in heart rate; systolic blood pressure; respiratory rate; oxygen saturation; acute changes in mental
status; pain or agitation that is difficult to control; new or prolonged seizure; and concern of a staff member about the patient. The last patient population found in the literature was the post colorectal surgery patient (Li, Mills, Gutierrez, Herman, Berger, & Naik, 2013) in which physicians created a list of symptoms that patients should notify their doctor if they occur after discharge.

Since the release of the numerous scoring tools, there have been many studies in the literature examining the effectiveness of them. Ludikhuize et al. (2012) examined the MEWS’s effectiveness and Fullerton, Price, Silvey, Brace, and Perkins (2012) found that the MEWS provided an objective valid and reliable predictor of outcomes and when it was combined with staff judgment, it increased specificity to 84.8%. They found that clinical judgment alone without a warning scoring tool did not predict adverse outcomes, addressing the question if staff could identify a deteriorating patient without the utilization of a patient parameter indicator tool. McGaughey et al. (2009) performed a systematic review for The Cochrane Collaboration to determine the effectiveness of the EWS on reducing hospital mortality, unplanned ICU admissions and readmissions, length of hospital stay, and adverse events. The review was inconclusive due to only two studies were considered good quality.

The electronic medical record (EMR) was also examined to determine if it could contribute to the detection of the deteriorating patient. NICE Clinical Guideline 50 (NICE, 2007) stated that the EMR could assist in the identification of the deteriorating patient and Alvarez et al. (2013) found that the EMR was better at identifying the signs of the deteriorating patient compared to human judgment and “hand” charting.

Another significant advancement that has emerged to assist in the treatment of the deteriorating patient is the development of rapid response teams. They have become a standard
in the hospital setting since the recommendation for them first appeared in the Institute for Healthcare Improvement's 100,000 Lives Campaign" in 2005 (AHRQ, 2012). These teams have three components: specific identifying criteria and a system for notifying and activating the response team; the response team comprised of ICU-trained personnel and equipment; and an administrative and quality improvement contribution is present (Winters et al., 2013). The effectiveness of these teams has been examined, including a study that looked at why they were called, with the most frequent reason identified as being a staff member worried about a patient condition (Santiano et al., 2009).

Following an extensive review of the literature, this researcher concluded what parameters should be included in the survey tool for this study pertaining to key factors signaling patient deterioration. The criteria for the critical care educator to indicate usage will include: heart rate; respiratory rate; creatinine; abnormal ECG; alteration in the level of consciousness; decreased urine output; temperature of less than 35C or greater than 39C; systolic blood pressure of less than 100; lactate; blood glucose; base deficit; arterial pH; oxygen saturation less than 95%; greater than fifty years of age; Braden score greater than 15; pain or agitation that is difficult to control; new or prolonged seizure; and concern of a staff member about the patient. Within the literature, it is apparent that the individual critical care nurse may use other criteria as required by the setting organization. Because of this, the critical care educator will also be able to add any additional criteria that are used by their critical care nurses to identify the deteriorating patient.

4. **Methods Used for the Evaluation of a Nurse’s Ability to Detect a Deteriorating Patient**

The literature revealed numerous ways that nurse educators employ to currently assess competency in their nursing staff. The search was broad, in that it did not include the subject
deteriorating patient, in order not to limit the results. However, there were many articles that did address the deteriorating patient. These articles focused on the performance during advanced cardiac life support (ACLS). The most popular method of evaluation within the literature was simulation. One study examined simulation and confidence in performance. Gordon and Buckley (2009) assessed nurses in their confidence in performing ACLS utilizing simulation. They found that confidence in skills increased after simulation scenarios, with debriefing considered the most valuable part of the experience. In another study, Napier et al. (2009) investigated ACLS performance from the perspective that current methods of evaluation didn’t have validity due to the subjectivity by the instructor. A scoring tool that was developed for evaluation of simulation performance was shown that it assessed performance better than the current pass/fail method.

Another popular study population to evaluate the capability of determining patient deterioration was focused on nursing students. An integrative review performed by Fisher and King (2013) examined whether simulation prepared nursing students to recognize and effectively responded to the deteriorating patient. Their review demonstrated that while simulation increased confidence, clinical judgment, knowledge, and competence in the simulated environment; there is little evidence in the literature to support that simulation increases performance in recognizing and responding specifically to the deteriorating patient, in a simulated environment or in actual practice. In an additional effort to evaluate nursing assessment skills, Liaw, Scherpbier, Klainin-Yobas, and Rethans (2011) developed a reliable and valid tool, based on psychometrics, to evaluate performance in simulation with a deteriorating patient scenario. The tool incorporated assessment and management of clinical deterioration which included airway, breathing, circulation, disability, and examination of patient combined
with the performance of SBAR (situation, background, assessment, recommendation) reporting. Meanwhile, Cherry and Ali (2008) addressed the usage of simulation in trauma education with the conclusion that the more “real life” the scenario is, the better the learning environment. Other efforts included Jacobson et al. (2010) who studied simulation and utilized scenarios based on actual patient situations that staff had encountered. Both groups of authors found that simulation increased performance and confidence in the simulation environment.

Adding to the research already described, other studies combined other educational methods along with simulation to evaluate performance. Rodgers, Bhanji, and McKee (2010), for example, examined nursing students’ performance to see if written test scores correlated with performance in a simulated environment. The conclusion of the study was that written test scores was not a predictor of performance. A secondary conclusion was while simulation focused on one topic, a written test can cover a broader area of content and as a result, both of these should be used in conjunction to evaluate performance. Also utilizing simulation as the environment, Smith, Gilcreast, and Pierce (2008) examined written tests and simulation with ACLS, specifically if knowledge declined over time post instruction with nurses that performed ACLS. Their study demonstrated that written test scores didn’t decline over time; however skill performance deteriorated quickly post instruction with only 30% successfully demonstrating skills at three months and 14% that could perform the skills at twelve months. This finding contradicted the current recommendation from American Heart Association of skill performance is to be demonstrated every two years.

In another investigation, Cooper et al. (2011) utilized multiple methods of written test and video simulations to evaluate nurses’ care of the myocardial infarction and chronic obstructive pulmonary disease patients that are deteriorating. The nurses in this study recognized
deterioration of the patient, but performance declined as the patient deteriorated, based on observations by the evaluator and actions by the nurse. Their conclusion was that high-fidelity simulations with participation and feedback would have a more positive impact on performance. In general, simulation was the popular method of evaluation of a nurse’s performance. Whereas some used repeated simulation (Abe, Kawahara, Yamashina, & Tsuboi, 2013), typically simulations were conducted as a stand alone event (Brown & Beckman, 2008; Cross & Wilson, 2009; Stennett, Shuttlesworth, Davis & Decker, 2012).

Several types of simulation were used for testing purposes. These types include the standardized patient, role playing, and high and low fidelity simulation. There is little research to support one method of simulation versus another (Mancini et al., 2010). In addition, it is time consuming and costly for organizations to perform employee competency evaluations as two to ten hours are spent employee for performance validation and evaluation (Goran, 2011).

Some organizations used multiple methods to evaluate nurses’ performance. In addition to simulation, one organization had registered nurses document patient assignments throughout the year (Brown & Beckman, 2008) in order to ensure specific patient populations were cared for. Goran (2011) discussed an organization utilizing return demonstration, practicing in the skills lab, and requiring the attendance of mandatory continuing education pertaining to clinical topics for the nurse to demonstrate competence. Preston, Currey, and Eastwood (2009) studied assessment methods in England; finding that all of the educators sampled (20) used simulation with twelve of them also using written tests occurring every one to two years. In another study, Walsh and Wagemester (2007) discussed how one hospital performs in-services, simulation with debriefing, and return demonstration to determine competence. Unfortunately, there was not a consistent standard in the literature in the method of development, implementation, or evaluation.
of a simulation experience. While many of the articles discussed the quality of performance within the simulation environment, this doesn’t necessarily translate to performance in the workplace.

It isn’t unusual for organizations to determine a minimum number of successful procedures that a person must perform, however this belief doesn’t have scientific merit (King, 2002). A majority of articles applied to the practice of Basic Life Support (BLS) or Advanced Cardiac Life Support (ACLS). With ACLS, it isn’t uncommon for organizations to conduct annual or biannual written tests to determine competence, even though literature indicates that written tests should occur within six months of instruction (Mancini et al., 2010). This questions the value of annual written testing for experienced nurses. Generally, the primary reason organizations utilize annual written testing is to comply with governmental requirements, which are not based on evidence (Allen, Currey, & Considine, 2013). There is no indication that written tests are able to indicate competence. In regards to identification of patient deterioration, research has demonstration that written exam scores correlate poorly with performance (Rodgers, Bhanji & McKee, 2010; Napier et al., 2009).

In an evaluation of the performance of American Heart Association (AHA) BLS skills at pre-determined intervals post education, it was determined that demonstration of skills needed to occur every three months (Smith, Gilcrest and Pierce, 2008) to perform at the same level immediate post education. Mancini et al. (2010) determined that there was no research identifying the acceptable level of deterioration of skills before retraining needs to occur. The evaluation of skills performance was questioned in the literature as a majority of current tools are either unreliable, subject to assessor bias, or are prone to assessor error (Chamberlain & Hazinski, 2003)
To view methods from another perspective, the literature was reviewed to gather what methods were used to evaluate competency. Multiple methods were presented by Whelan (2006) to measure nursing competency. These methods are performance based development system (PBDS), which is an online simulation tool; competency days; and self study materials. A literature review was performed by EdCaN (National Education Framework Cancer Nursing) (2008) which demonstrated agreement that there should be more than one indicator. The indicators discussed in the literature review were objective structured clinical examination (OSCE), peer assessments, direct observation, and self-assessment. These methods were mentioned often in the literature as ways to evaluated staff. Cooper et al. (2013) used video OSCE to evaluate nurses’ performance, while Wilkinson (2013) examined a self assessment tool for nurses to evaluate their level of competency.

In addition to the above methods, documentation and annual assessments were examined. Jonsson, Jonsdottir, Moller, and Baldursdottir (2011) investigated the accuracy of nursing documentation of the MEWS parameters prior to emergency admission to the ICU. They found that nursing documentation was lacking primarily in the area of respiratory rate documentation, even though respiratory failure was the most common reason for admission into the ICU. Allen, Currey, and Considine (2013) examined the literature for why annual testing is performed in organizations, with the conclusion that annual testing is not supported by research.

Based on the reviewed literature, this researcher will have the following methods for evaluation listed for selection by the educator: Written test; Skills lab; Patient assessments; Classroom education; Direct observation of performance; Documentation of patient deterioration; Return demonstration of skills; Simulation – live - one time; Simulation – live - multiple times with different scenarios; Simulation –live - multiple times same scenario;
Simulation – video. The educator will be able to indicate as many methods as they utilize as well as indicate any other methods they use that are not listed. The literature also suggests that the frequencies of methods and length of time for each method to be conducted is important to evaluate in relation to assessment and therefore will included in this study.

5. **Perceived Effectiveness of Assessment Methods**

The literature was also reviewed to determine the perceived effectiveness of the current assessment methods utilized by critical care nurse educators to determine the nurse’s ability to detect the deteriorating patient. Though not all methods identified in the previous section have been evaluated for effectiveness, the popular methods of simulation and written testing have been evaluated numerous times.

The literature pertaining to simulation research included performance of skills and the tools used to evaluate performance. In their study involving medical residents, Ander, Heilpern, Goertz, Click, and Kahn (2009) examined skill retention one year after a simulation experience. After one year there was a decline in the recognition of ventricular fibrillation, performing defibrillation, performing airway management and management of a choking child. As a result, the researchers recommended instruction and skills practice occur every three months to maintain optimum performance. Adler et al. (2011) compared checklists and a performance assessment tool used to assess simulation performance to determine if they were able to accurately evaluate performance. Their research demonstrated that both were effective in the evaluation of simulation performance. Adamson and Kardong-Edgren (2012) established that there was a lack of simulation evaluation instruments that are valid and reliable. Their research tested three instruments that instructors frequently used to evaluate nursing students through video simulations, with the results demonstrating that the three instruments could be used for
evaluation purposes. Tannenbaum and Cerasoli (2013), on the other hand, performed a meta-analysis examining if debriefing enhances performance in the military setting. Though the focus was not healthcare related, critical discussion of the simulation and what could have been done differently to be more effective was examined in could that discussion improve future performance in the work setting, the goal in medical scenarios. The meta-analysis demonstrated that debriefing as a educational tool improves performance by 25%, working equally for teams and individuals. Computerized learning combined with simulation was examined by McKay et al. (2013) looked at the effect of computerized learning and low fidelity simulation on documentation on the deteriorating patient. Research demonstrated that after the education there was a significant increase in documentation of respiratory effort, capillary refill, blood pressure, and level of consciousness.

Rapid response team (RRT) effectiveness was also a frequent subject in the literature. Though the team response doesn’t affect the individual nurse’s performance; how the team responds could reflect how the nurse recognized and reacted to the deteriorating situation. Shearer et al. (2012) examined the care of 570 deteriorating patients and identified that over half didn’t receive appropriate medical care, even though the nurse recognized that the patient met the established criteria to activate the RRT. The primary reason identified of why the nurses didn’t activate the RRT is because they felt they could handle the situation, with the secondary reason that they didn’t feel they were the most appropriate person to activate the team. The conclusion was that unit culture needed to be addressed to significantly increase activation of RRT. The type of RRT calls were examined by Santiano et al. (2009) who looked at 3189 calls made to the RRT in six hospitals to gather data on what criteria the calls were based on, subjective and objective, and the outcomes of the patients. The analysis revealed that 924 calls
were made because the nurse was “worried”, however 695 were left on the ward after evaluation of the RRT, primarily because the patient was determine not to be in a deteriorating condition. The study concluded that nursing staff should gather objective data to support their concerns.

Intuition was the subject of systemic literature review performed by Odell, Victor, and Oliver (2009). They examined the literature to identify research with the focus of the nurses’ role in detection of deterioration in patients, resulting in fourteen studies. The review demonstrated that intuition plays an important part in a nurses’ detection of deterioration, using vital signs to validate their “gut” feeling that something was not right with the patient. The review also found that nurses typically underestimated the importance of the information they were gathering with the decision for timely intervention delayed. In summary, the critical care nurse should be indentifying the signs of deterioration and notifying the RRT as quickly as possible. The critical care educator can utilize this evaluation of performance as a method of identifying the deteriorating patient.

RRT and the use of the tools to notify them were proven to be effective, however not utilized to their full potential. McNeill and Bryden (2013) performed a systematic review to examine if early warning systems or RRT improve hospital patient survival. The review demonstrated that warning scores are more effective when implemented throughout the organization compared to only used in one or two units. Another result was that tools with multiple parameters were more effective compared to the use of a single parameter. Furthermore, Ludikhuize, de Jonge, and Goossens (2011) found that while nurses that were trained on the signs of the deteriorating patient identified the deteriorating patient and documented on them more frequently, the use of the MEWS tool or SBAR communication guide was low, which affects communication and potentially patient outcomes. Niegisch, Fabritius, and
Anhej (2013) found that even though documentation of the MEWS criteria occurred 90% of the time, only 38% of patients that met the MEWS criteria were correctly identified and treated. The electronic medical record (EMR) was examined in the use of the warning scores and the contribution to the care of the patient. Jones et al. (2011) found that the use of an EMR to calculate patient risk and issue alerts can improve clinical treatment to the deteriorating patient.

The reviewed literature has not shown any single method effective in maintaining skill over a period of time. To address this question in the study tool, the educator will be asked how effective are the methods they use to assess the critical care nurses' ability to detect the early signs of patient deterioration.

**Summary and Application to the Study**

The reviewed literature has guided this researcher by providing an understanding and awareness into the current proposed research inquiry. The employer is the direct evaluator for identifying competence in clinical practice. For many years the education, verification, and confirmation of competency has been a focus of organizations. This is reinforced through the standards per JACHO and NSCBN. Ultimately, competency links knowledge, skills, and abilities in a multidimensional construct, in this case the deteriorating patient. Currently, there are identified criteria and tools found in the literature that can be utilized to identify the deteriorating patient. What isn’t known is what criteria is currently being used by critical care nurses to recognize a deteriorating patient; and more importantly, how is the critical care nurse educator evaluating the critical care nurse’s ability to recognize this patient. Though simulation is used frequently, as demonstrated in the literature, the performance is in an artificial environment. Whether this tool translates into effective bedside performance will be revealed by the data received by the critical care educators providing their perception regarding the
effectiveness of the methods used. The demographic makeup of the participating critical care educators will supply this researcher specific detail of what skills and education the critical care educator possesses and how it correlates to the methods they utilize and their view of effectiveness of the method. The purposes for this study are supported by the literature with the goal of this descriptive correlational study to address these unanswered questions created by the literature review of what criteria and measurement methods do critical care nurse educators use to assess the critical care nurses' ability to detect the early signs of patient deterioration and the perceived effectiveness of these measurement methods.
Chapter 3

Proposed Study
Introduction

This chapter provides an overview of the study design, setting and sample, and protection of human subjects. In additions, the instruments for use in the study are presented followed by the study procedures. The chapter closes with a description of the data collection process, data management, and data analysis.

Design

This study has a descriptive correlational design to address the primary purpose which is to (a) identify the criteria and measurement methods critical care nurse educators use to detect the critical care nurses' ability to detect the early signs of patient deterioration and (b) describe the perceived effectiveness of the identified measurement methods. The secondary purpose of this study is to explore the associations of critical care nurse educators' characteristics, hospital characteristics, geographic regions to the type of methods and perceived effectiveness to evaluate the critical care nurses' ability to detect signs of patient deterioration.

Sample Population

A convenience sample will be used to obtain the desired data due to the limitations of access to potential participants. The desired minimum of participants for this study is 200 (please refer to page 10 in this chapter for the power analysis and rationale for the sample size). This population will be accessed through the members of the American Association of Critical Care Nurses (AACN), 2,000 of which are critical care educators as indicated by their demographic profile. This organization was selected to obtain the sample due to it being the largest specialty nursing organization in the world and has within it a great number of critical care nurse educators who educate critical care nurses. AACN also supports nursing research and shares information and links for those conducting research. With this organization's membership
of over 100,000 throughout the U.S. including all fifty states, the hope is that all states will be represented by the participants which will provide insight to assessment methods in different geographical locations adding depth to the knowledge gained through to the survey.

An invitation and survey link will be provided in the AACN’s weekly member email newsletter for interested persons to go to and subsequently participate if eligibility criteria are met. Final approval is presently being obtained from AACN for this survey listing. The invitation to the survey will be brief and include the purpose of the study and intended use of the data. Though many critical care educators that do not belong to this organization, membership will be part of the inclusion criteria to help keep the sample as homogenous as possible. There is minimum concern that the population sample has been overused in the past due to the self determination to participate and the large population from which to obtain the sample.

**Inclusion/Exclusion Criteria**

The inclusion criteria for the critical care educator is as follows: having a valid license as a registered nurse, employed in the United States, a current member of the American Association of Critical Care Nurses, currently serving in a designated unit based critical care educator role, and formally evaluates critical care nurses’ ability to detect early signs of patient deterioration on a consistent basis, defined as more often than two times a year. A minimum level of education or certifications will not be required for the critical care educator to participate in the study; however this will be part of the demographic information gathered. Exclusion criteria are if in their role, evaluation of nurses’ ability to detect deteriorating patients only occurs one time a year.
Protection of Human Subjects

Institutional Review Board (IRB) approval will be obtained from the University of Cincinnati before data is obtained. All collected data will be kept on a secured computer with all participants’ data being used for research purpose in this study only. Personal information such as participant’s name and the name of affiliated institution will not be asked in the survey. Participation and the completion of the survey will provide implied consent (Fink, 2003). In addition to the informed consent, the introduction will include how long it should take to complete the survey as well as how many items within the survey. As no individual or organizational names will be asked, all findings will be reported as aggregate data. There are no identified risks for participating in the survey as the imposed stress of completing the instrument is minimal with exception of the time involvement. Due to the large sample size required incentives to participants are cost prohibitive. The benefit to participation is to provide information about what is currently being performed in the critical care educator role to evaluate a critical care nurse’s ability to identify a deteriorating patient. This currently is unknown and based on this researcher’s experience; critical care educators are very willing to help expand knowledge.

Survey Instrument Development

This study will be structured utilizing The Survey Handbook by Fink (2003) as a guide and reference. The survey variables for this study will be evaluation methods and perceived effectiveness with the demographic information and specific criteria sections included to allow comparison within the data and provide information regarding the participants. Data gathered from these questions will be complied and communicated in aggregate format (Fink, 2003). This survey will be cross sectional as it will only be completed one time by the respondent. Survey
Monkey will be used for the study administration and was selected in order to reach participants regardless of geographic location, ease of use by the user and researcher, and the ease of ability to tabulate responses.

The questions and items, developed from the literature, will be structured in categories to provide a sense of flow for the participant. The first category of questions will be the collection of demographic material, individual and organization in which the educator will fill in the information except for when indicated. The following demographic information will be sought: age, gender, race, years of experience in clinical practice; years serving as an educator in the current role; years in the role of assessing critical care nurses, number of employees responsible for; how many units responsible for; type of unit (ICU, telemetry, progressive care, emergency room, other-fill in blank); educational background; and types of certification possessed. Employer data to be collected are state of employment, size of institution (as determined by number of licensed beds), nonprofit vs. profit, urban vs. suburban, teaching vs. community, and magnet vs. non magnet certification. The answers will be provided in numerical format instead of ranges in order to obtain the purest data possible. This approach will also allow this researcher to manipulate the data in order to fully answer the primary and secondary purposes of the study.

The second category of questions will focus on the criteria that are used to identify the deteriorating patient. These questions will be structured in a list format with the participant indicating all that is utilized by checking all that apply. The content within this category and identified with the literature include: heart rate; respiratory rate; creatinine; abnormal ECG; alteration in the level of consciousness; decreased urine output; temperature of less than 35C or greater than 39C; systolic blood pressure of less than 100; lactate; blood glucose; base deficit;
arterial pH; oxygen saturation less than 95%; greater than fifty years of age; Braden score greater than 15; pain or agitation that is difficult to control; new or prolonged seizure; and concern of a staff member about the patient. The critical care nurse educator will not be restricted in the number of criteria that is utilized. In addition to the listed items, an open ended response will be provided to allow the participant to state any other utilized methods not listed.

The third category is methods critical care nurse educators currently utilize to evaluate the critical care nurse’s ability to identify the deteriorating patient. Survey questions focusing on the methods that assess critical care nurses’ ability to detect a deteriorating patient will consist of a list asking participants to mark all that apply. The choices will be: written test; skills lab; patient assessments; classroom education; direct observation of performance; documentation of patient deterioration; return demonstration of skills; simulation – live - one time; simulation – live - multiple times with different scenarios; simulation – live - multiple times same scenario; simulation – video. The critical care nurse educator will not be restricted in the number of methods they utilize and will be able to indicate any other methods they use that are not listed in an open ended question. The frequencies of method evaluation and length of time spent for each method will also be asked to provide insight into the usage of individual methods. To gather a sense of which methods are most utilized, the participant will be asked to indicate the two methods most frequently used.

The last category is the perceived effectiveness of the methods that are utilized by the critical care nurse educator to evaluate the individual nurse. The participants will be asked to respond using a Likert scale to convey the perceived effectiveness of the methods used to evaluate assess critical care nurses’ ability to detect a deteriorating patient. To address this question in the study tool, the educator will be asked to rate each indicated method regarding
how effective each is in the accuracy of indicating the critical care nurse’s ability to identify a deteriorating patient. The critical care educator will indicate the effectiveness for each method on a Likert type five point scale ranging from not effective to extremely effective. To gather a sense of which methods are most effective, the participant will be asked to indicate the top two effective methods.

It is anticipated that the survey will have a minimum of eleven screens. These screens will include: three for description of survey, consent, and instructions; two for individual educator characteristics, one for employee characteristics, one for criteria, two for methods, and a minimum of two for effectiveness of methods. The planned study will be structured so that if a method is chosen, then a question regarding effectiveness will be generated.

**Data Collection**

The potential participants will click on the link with the participation inclusion criteria appearing first. If the participant meets these criteria, they will then continue to the description of the survey and the discussion of informed consent, which will be implied by their participation and completion of the survey. The questions for the survey will be divided into sections in order to provide continuity. A completion status bar will be present to provide the participants the progress of completion which will hopefully minimize non-completion rates. The survey will be set up to allow the participant to skip a question if they prefer not to answer. If this occurs, missing data will be addressed in the analysis phase. The minimum time frame for the survey to be “live” will be eight weeks to allow for maximum participation, with time extended if needed to gather the minimum number of responses.

When performing survey research, there is always the concern of poor response rate, response bias and error issues occurring. To address a potential low response rate, it is
anticipated that follow up requests to participate in the survey will occur. The survey invitation and link will be provided to the AACN membership weekly for the length of the survey being available in order to capture as many participants as possible. Due to the anonymous response, it will be unable to know if an individual participant completed the survey more than once. In the instructions, there will be a statement requesting the participant to only complete the survey once and will be asked to indicate if this is the first time completing the survey.

To minimize response bias and reduce error, several items have been considered. First, a population was sought out to maximize the number of eligible respondents. Second, based on personal experience, it is felt that this topic will be of interest to the respondents which should increase participation. Third, the survey responses will be anonymous and the eligibility criteria are specific to the role but broad enough to not exclude large numbers of potential respondents. Lastly, the reading level of the survey will be checked to ensure that it is at high school graduate level. This is to prevent any assumptions of the individual respondent's reading and comprehension capabilities.

Before this survey is administered to the study sample, two things will occur. First, content validity of the survey will be evaluated by a small group of experts. This group will be represented by the following expertise: critical care nursing, survey construction within survey monkey, and survey development. This researcher will also include the dissertation committee members to ensure that the survey matches the purpose of the study as outlined in Chapters 1, 2, and 3.

After determination of content validity has been performed, a small pilot study involving four critical care nurse educators will evaluate the survey to assess the functionality of the survey, comment on the value and relevance of the data being collected, and evaluate
comprehensibility and overall validity of the study. This number was selected arbitrarily by the researcher, with the goal for the survey to be seen by many different people, but the number small enough to manage the responses in an efficient manner. The specific goals for the pilot study is to see if potential respondents understand the directions for completing the survey as well for each of the questions; identify if the wording for each of the questions clear; and are the places to mark the responses clear. These pilot testers will represent the target population for the survey and meet all eligibility criteria, with exception of current membership of AACN, as that item will not affect their ability to answer the questions posed to them. It is hopeful that all four will submit their evaluation; however the researcher would like a minimum of three pilot testers, again an arbitrary number, to complete the pilot tester responsibilities. Each pilot tester will be asked to respond to questions regarding the survey and submit their evaluations within two weeks of receiving the survey. These questions will include how long it takes to complete the survey in order to convey the time expectation to the survey respondents, are the response choices mutually exclusive and exhaustive, can they follow the computer commands and instructions of how to change answers, any suggestions regarding addition or deletion of questions, clarification of instructions, and any suggested improvement to the question format. These questions will be provided in an electronic format with the survey; listed in the beginning of the survey for the educators to be aware of what information they will need to provide, and then at the end the survey they will be listed again this time allowing the pilot testers to write in their comments. After the feedback is received, any changes would be conducted by this researcher. If any changes of the survey occur as a result of the feedback, two pilot testers will be asked to retake the survey specifically looking at the changed items. The time frame for the survey administration, including pilot testing, is four months.
**Data Analysis**

The goals of the data and statistical analysis are to describe the background of the respondents, describe the responses to each of the questions, and fulfilling the primary and secondary purposes for this study. For the primary purpose of this study, which is to identify the criteria and measurement methods critical care nurse educators use to detect the critical care nurses' ability to detect the early signs of patient deterioration and describe the perceived effectiveness of the identified measurement methods, descriptive statistics will be used to summarize the data. The general statistical plan is to use mean ± standard deviation or median (range) to summarize all numerical variables and frequency (in %) or odds to summarize all categorical or binary variables. The numerical variables will also be inspected of their empirical distributions to determine if they fit the conditions for parametric statistical models. Transformed variables will be used otherwise.

The secondary purpose of this study is to explore the associations of critical care nurse educators' characteristics, hospital characteristics, geographic regions to the type of methods and perceived effectiveness in evaluating the critical care nurses' ability to detect signs of patient deterioration. The specific statistical plan to answer this is:

To explore the association between the critical care nurse educators' characteristics and the methods they utilize and perceived effectiveness of those methods

A. For numerical outcome measures or dependent variables, their associations to nurse educators’ characteristics will be assessed using fixed effect models. Post hoc means will be compared between the characteristic groups under the fixed effect model framework. Multiple comparisons will be adjusted for overall Type-1 error using a Bonferroni’s method.
B. For categorical or binary outcome measures or dependent variables, their associations to nurse educators’ characteristics will be assessed using logistical regression models. Comparisons between characteristic groups will be performed thru the odds ratio (OR) within the logistical regression model framework.

Both unadjusted and adjusted methods will be used in the proposed fixed effect models and logistical regression models. In the unadjusted models, each of the characteristics will be used as the only independent variable in the models, while in the adjusted models, the targeted characteristic will be adjusted by other covariate or independent variables in the same models. Other statistical methods include using Cronbach’s alpha to assess internal consistency of items, and Pearson’s correlation coefficient to assess relationship between numerical outcome measures, etc.

To explore the association between the hospital characteristics and the methods and perceived effectiveness of those methods: the statistical methods will be the same as described in Aim1 except all the independent variables will be replaced by hospital related characteristics.

To explore the association between geographic regions in the type of methods that are utilized: the statistical methods will be the same as described in Aim1 except the only dependent variable will be the methods and the independent variable will be the geographic region (defined as Northeast, Midwest, South and West). The time frame anticipated for data analysis is two months.
Sample Size and Power Analysis

The desired minimum sample size for this study is 200. In the fixed effect model, an effect size (or the difference of two post hoc means / standard deviation of the difference) of 0.7 can be detected with over 90% power assuming the smaller group defined by a categorical independent variable has only N=50. The similar power can be reached to detect an odds ratio of 4 when the logistical regression model is used.

Assumptions

The assumptions that are made for this study are that the critical care nurse educators will have the experience to provide insightful information in how they assess their staff’s ability to detect deteriorating conditions. An additional assumption is that the educators participating in the study will be willing to share the methods and organizational standards they currently use to assess the staff’s ability to detect the deteriorating patient. Along with this assumption, it is assumed that all of the survey participants will answer based on the concept definitions and not based on their perception of what they think the word means.

Limitations

The limitations are several. The descriptive study will utilize a convenience sample, with participants making the self-determination if they want to participate. Another limitation is that the participating educators’ practice may not reflect the practice of all critical care educators. This limitation will be reduced by soliciting a national organization’s membership to participate in the study. This organization, American Association of Critical Care Nurses, has a membership currently over 100,000 throughout the US and other countries. As of March 2012, nurse educators comprise 2% of their membership, which is 2,000 nurses, however not all members choose to share their demographic information, including their job role.
Summary

This chapter has outlined the methods that will be utilized to answer the primary purpose of (a) identify the criteria and measurement methods critical nurse educators use to assess the critical care nurses' ability to detect the early signs of patient deterioration and (b) describe the perceived effectiveness of the identified measurement methods. These methods will be used to answer the secondary purpose of does the method & effectiveness varies by characteristics of educator, hospital characteristics, and geographic region. This descriptive correlational study and data analysis will provide insight and a base for future research in the critical care educators practice.
Article 1

A Review of the Literature on Methods to Assess Critical Care Nurses’ Competency

Evaluating Deteriorating Patients

Julia K. Eberwine PhD, RN, CCRN, PCCN-CMC
The University of Cincinnati

Elaine Miller, PhD, RN, CRRN, FAAN, FAHA
The University of Cincinnati

Kim Johnson PhD, RN, CEN
The University of Cincinnati
Abstract

Recognizing a deteriorating patient is an essential skill of the critical care nurse. The responsibility of ensuring that the critical care nurse is performing correctly historically falls on the critical care educator. An appraisal of the literature was conducted to determine the current knowledge and methods used to evaluate registered nurses’ competencies. Within the literature, four areas emerged affecting the evaluation of the critical care nurse’s ability to recognize the deteriorating patient and the perceived effectiveness of these methods: a) qualifications for the critical care nurse educator role, b) specific criteria used to determine patient deterioration, c) current methods used in the evaluation of a critical care nurse’s ability to detect a deteriorating patient, and d) the perceived effectiveness of assessment methods used to evaluate the critical care nurse’s ability to recognize the deteriorating patient. The literature further revealed patient deterioration is highly associated with failure to quickly recognize signs/symptoms of declining patient status.

Within all of the articles, however, there wasn’t consensus regarding evaluation of nurse’s performance. There is not a single standard or popular tool that is used within organizations for evaluation and it is inappropriate to assume that the evaluation tools used with nursing students or physicians could be applied to the registered nurse in their practice environment. Moreover, identifying the deteriorating patient is a multidimensional concept linking knowledge and performance. What is even more important is the criteria critical care nurse educators employ to determine the critical care nurses’ ability to recognize in a timely manner patient deterioration in order to be objective and consistent in their methods.
Introduction

Recognizing a deteriorating patient is an essential skill of critical care nurses. Sixty percent of hospital deaths, cardiac arrests, and unplanned ICU admissions are preceded by documented abnormal physiology, including decreasing blood pressure, alteration in level of conscious, and significant changes in heart rate (Bell, Konrad, Granath, Ekbom, & Martling, 2006; Kause et al., 2004). Every year in the United States 370,000 -750,000 in-hospital resuscitation attempts are made with the incidence of cardiac arrest ranging from 1-5 events per 1000 hospital admissions (Sandroni, Nolan, Carallaro, & Antonelli, 2007) and mortality rates continue at 2% of every 100 admissions (CDC/NCHS, National Hospital Discharge Survey, 2000-2010). If these events can be prevented by recognizing and treating the deteriorating patient, significant positive patient outcomes, including survival, would result. Recognition within the hospital setting is the responsibility of the critical care nurse. The hospital critical care educator is typically tasked with assessing the critical care nurses’ ability to recognize the deteriorating patient.

To clarify the educator role, The Institute of Medicine (IOM) first released in 2003, and emphasized in 2010, that educators and organizations are responsible for ensuring that current employees develop and maintain competency in delivering patient centered care, working as part of interdisciplinary teams, practicing evidenced based care, focusing on quality improvement, and using information technology (IOM, 2010). An examination of the literature was performed to examine how the critical care nurse’s ability to recognize the deteriorating patient looking at current knowledge, applied knowledge, and ability to evaluate knowledge.
Literature Search

An appraisal of the literature was conducted to determine the current knowledge and methods used to evaluate registered nurses’ competencies. See Figure 1 for the process of the literature appraisal. Whittemore and Knafl’s framework (2005) was applied in the areas of method design, validity and reliability of instrument and competency areas assessed to the remaining 12 articles (see Table 1 for Whittemore and Knafl’s stages of integrative review and Table 2 for the integrative review). Applying Whittemore and Knafl’s framework to these studies did not result in a valid tool that could be applied to this study population. Even though all of the reviewed studies were examining the concept of “competency”, the conceptual and operational definitions differed making it impossible to compare the tools.

An additional appraisal of the literature was conducted focusing on nursing determination of deterioration of patients (See Figure 2). Eight tools were discovered in the literature that are currently be used to evaluate the nurses’ ability to detect or care for the deteriorating patient. These tools will be discussed later in this article.

Within the literature reviewed, four subject areas emerged. These four areas include: qualifications to meet the critical care nurse educator role expectations, specific criteria used to determine patient deterioration, current methods used in the evaluation of a critical care nurse’s ability to detect a deteriorating patient, and the perceived effectiveness of assessment methods used to evaluate the critical care nurse’s ability to recognize the deteriorating patient.

1. General Definitions of Nursing Competency

Historically, the word “competency” has not been well defined conceptually or operationally, even though it is identified as being fundamental to quality and safe nursing practice. The evolution of competence in nursing began in 1978 through the work of del Bueno
Del Bueno and colleagues (1980) defined competency in several ways as her work developed with her “base” definition always involving three main areas; interpersonal skills, technical skills, and critical thinking. This definition further evolved through the efforts of Johnson, Opfer, VanCura, and Williams (2000) that defined competency as actual performance in the real work situation and can only be assessed by observing job performance. They argued that current programs focus on task performance and pay little attention to critical thinking or resource utilization. Moreover, Jordan, Thomas, Evans, and Green (2008) contend that the ability to critically think and communicate is as important as clinical skills. For the purpose of this study, competence is the ability to recognize the deteriorating patient.

2. Qualifications to meet the Nurse Educator Role Expectations

Understanding the role and responsibilities of the critical care nurse educators is fundamental to comprehend how they evaluate a nurse’s performance. There are many articles regarding the expectations of the academic educator, but not the clinical educator. The National League of Nursing (NLN), an organization focusing on nursing faculty and nursing education programs, established a nurse educator certification in 2009 for the academic educator (NLN, 2011). American Association of Colleges of Nursing (AACN) also launched criteria and expectations for academic faculty. In 2008, AACN investigated the essential skills needed by new academic faculty as identified by deans of nursing programs. The five most important qualities identified were teaching skills; knowledge, experience, and preparation for the faculty role; curriculum/course development skills; evaluation and testing skills, and personal attributes that were strong in interpersonal and communication skills (Penn, Wilson, & Rosseter, 2008).

Davis, Stullenbarger, Dearman, and Kelley (2005) further investigated the expected competencies of a nurse educator in the academic setting. Their findings included the essential
The competencies of the educator were to provide clinical supervision for learners; plan appropriate learning experiences based on the class objectives; use evaluation instruments that will accurately assess learning and achievement of goals; communicate effectively; and assess personal knowledge and skills and implement plans for ongoing professional development. Although these competencies were validated in the academic setting, Davis et al (2005) found these same competencies and categories are applicable to the nurse educator outside the academic work setting.

A majority of the literature discussing the roles of the hospital based/clinical nurse educator are non-research based articles in non-peer reviewed journals. Dorin (2010), for instance, stated that the role of the clinical nurse educator was to instruct staff on whatever is needed for the unit to run properly. She emphasized that the educator had the responsibility of ensuring nursing staff was providing safe and effective patient care, along with staff development sessions, orientation for new nurses, and meeting competency standards established by The Joint Commission. Given the multiple roles nurse educators perform, Dorin coined the term “unit stabilizers.”

The literature emphasizes the nurse educator role entails documentation of progress, evaluating training programs, preparing orientation, developing training courses, grant proposal writing, writing reports, researching subjects, participating in professional associations, developing new procedures, and ensuring quality control. Further major attributes identified are being an effective communicator, understanding clinical practice, assessing staff, developing programs, evaluating efficiency, integrating practice into new course and demonstrating leadership qualities.
Not all organizations define the role of nurse educator, even though they refer to them. For instance, American Association of Critical Care Nurses (AACN) did not define the role of the critical care nurse educator; however they did define the standards of care and professional performance for the critical care nurse (AACN, 2008). Although AACN does not define what is required of a critical care nurse educator directly, it is assumed by the reader that the critical care educator needs to be able to assist and evaluate the individual critical care nurse in the standards of care and professional performance.

3. Criteria Used to Determine Patient Deterioration

Patient deterioration can occur for several reasons and can be classified into three categories 1) failures, 2) absent behavior, and 3) organizational. The main reasons for conditions deteriorating are failure to 1) take observations, 2) recognize early signs of deterioration, 3) prioritize specific treatments, 4) implement procedures and policies adequately and 5) make accurate calculations consistently (NICE, 2007). Additionally, causes were identified as little communication concerning observations, not enough education and training about the importance and interpretation of observations among staff, and scant leadership. In additional to organizational issues, Cullinane, Findlay, Hargreaves, and Lucas (2005) determined that there were specific patient populations more vulnerable to deterioration - those from emergency admission, after surgery, and during the recovery from a critical illness.

As a response to these concerns, it became clear that identifying the criteria that defines the deteriorating patient was necessary. Although temperature, pulse, systolic blood pressure, respiratory rate, and oxygen saturation are the most often used vital signs, Elliott and Coventry (2012) reasoned that due to inpatients becoming older and sicker, additional parameters of level of pain, level of consciousness, and urine output should also be used. Rothman, Rothman, &
Solinger (2013) examining if mortality can be linked with specific variables () also occurred. In their review of 42,302 electronic medical records, to determine links between mortality and heart rate; creatinine; cardiac status; the ability to eat; gastrointestinal functioning; genitouninary functioning; the ability to move independently; being without pain; alert and orientated; peripheral/vascular status; psychosocial ability; respiratory status; no safety or fall risk factors; and a Braden score of greater than 15 (Rothman et al., 2013). The results demonstrated that heart rate and creatinine of both low and high values were linked with mortality. To distinguish what is contained in each tool, Table 3 contains the tools discussed in this article with each of their components.

**Nice Criteria**

As a result of research and clinical practice guidelines, NICE distinguished major assessment and routine patient monitoring parameters (NICE, 2007). In the acute hospital setting these criteria (see Table 3) should be monitored at least every 12 hours and observation intervals should increase if abnormal parameters are noted. Within the literature, these recommendations have been referenced numerous times as the standard of observation in the critical care setting (Frost & Wise, 2012; Green & Williams, 2006; Ftouh & Thomas, 2013) and have been used to develop several measures.

**Early Warning Score (EWS)**

One of those measures is the Early Warning Score (EWS), which was used by Garcea et al. (2010) and compared with other scoring tools. Garcea et al. looked at measures including the ASA grade and Physiological and Operative Severity Score for the enUmeration of Mortality and Morbidity (POSSUM) scores and found they were the best predictors of mortality (AUC values of 0.81), however the EWS, APACHE II, and age were the next best predictors (AUC
values of 0.70). EWS on day 2 postoperatively was the best overall predictor of mortality of all the variables studied (AUC value of 0.83). Survival between patients with "improving or stable" EWS and those with "deteriorating or failing to improve" EWS was also found to be significantly different (P < 0.001). (Garcea et al., 2010).

**Modified Early Warning Score (MEWS)**

Whereas the Early Warning Score was effective, the criteria guidelines were not defined enough, so research to develop a more effective score to signal patient deterioration occurred. The Modified Early Warning Score (MEWS) emerged as the most widely used scoring tool for deteriorating patient identification. While it uses the same parameters as the EWS, the criteria for each were more clearly defined which allowed the score to better represent the patient condition. A recommendation was that if the score is high, the physician and/or rapid response team should be notified immediately (IHI, 2011). Ludikhuize, Smorenburg, de Rooij and de Jonge (2012) further examined 204 charts in a retrospective observational study and found that when deterioration occurred, the MEWS criteria were met 81% of the time in the 48 hours before the deteriorating event. Smith et al. (2008) examined for additional parameters indicating patient deterioration by using a database to look the relationship between vital signs, age, and in-hospital mortality. The data demonstrated that as the vital signs worsened, mortality increased for all age groups with a positive correlation between age and mortality. Mortality also escalated with respiratory rate greater than 36 per minute, systolic blood pressure less than 90mmHg, and a decreased conscious level. The study concluded with the recommendation that age be included as a considering factor when assessing for patient deterioration.

In the literature, there are many scoring tools for each patient population being researched. These include patients at low risk for death and very high risk for death that resulted
in the simple clinical score (SCS) (Kellett and Deane, 2006); emergency patient population resulting in the rapid emergency medicine score (REMS) (Olsson, Terent, & Lind, 2004) and MEWS max (Heitz et al., 2010); sepsis warning tools (Ghanem-Zoubi, Vardi, Laor, Weber, and Bitterman, 2011) and deteriorating pediatric patients (Van Voorhis and Willis, 2009). While these scoring tools are important, they have very specific patient populations that do not apply to the focus of this literature review. The SCS does apply to the adult deteriorating patient but with all of the measuring criteria; it never advanced to becoming a standardized tool (See Table 3 for SCS criteria).

There were studies in the literature examining the effectiveness of the scoring tools. Ludikhuize et al. (2012) examined the MEWS’s effectiveness and Fullerton, Price, Silvey, Brace, and Perkins (2012) found that the MEWS provided an objective, valid, and reliable predictor of outcomes and when it was combined with staff judgment, specificity increased to 84.8%. It found that clinical judgment alone without a warning scoring tool did not predict adverse outcomes, addressing the question if staff could identify a deteriorating patient without the use of a patient parameter indicator tool. McGaughey et al. (2009) performed a systematic review for The Cochrane Collaboration to determine effectiveness of the EWS on reducing hospital mortality, unplanned ICU admissions and readmissions, length of hospital stay, and adverse events. The review was deemed inconclusive due to only two studies were considered rigorous.

Assessment of effectiveness included the use of the electronic medical record (EMR) to determine if it could contribute to the detection of the deteriorating patient when triggering parameters were met was also examined. NICE Clinical Guideline 50 (NICE, 2007) stated that the EMR could assist in the identification of the deteriorating patient and Alvarez et al. (2013)
found that the EMR was better at identifying the signs of the deteriorating patient compared to human judgment and “hand” charting.

A significant development that has emerged in the treatment of the deteriorating patient is the rapid response teams. They are a standard in the hospital setting since the recommendation appeared in the Institute for Healthcare Improvement's 100,000 Lives Campaign in 2005 as a way to address early patient deterioration and prevention of further deterioration (AHRQ, 2012). These teams have three components: specific identifying criteria and a system for notifying the response team; the response team comprised of ICU-trained personnel and equipment; and an administrative and quality improvement contribution being present (Winters et al., 2013). The effectiveness of these teams has been examined with them making a significant positive impact on the immediate determination and management of the deteriorating patient (Santiano et al., 2009).

4. Methods Used for the Evaluation of a Nurse’s Ability to Detect a Deteriorating Patient

There are numerous ways that nurse educators employ to assess competency in their nursing staff, including the deteriorating patient. These methods involve written, simulation, and both. Simulation will be discussed as it by far is the most popular method.

Simulation

A majority of the literature was simulation focusing on the performance during advanced cardiac life support (ACLS). One study examined simulation and confidence in performance of ACLS (Gordon and Buckley, 2009). They found that confidence in skills increased after simulation scenarios, with debriefing considered the most valuable part of the experience. In another study, Napier et al. (2009) investigated ACLS performance from the perspective that current methods of evaluation didn’t have validity due to the instructor’s subjectivity. A scoring
tool was developed for evaluation of simulation performance and demonstrated that it assessed performance better than the current pass/fail method (median 77 vs 62.5, \( P < 0.0001 \)).

Meanwhile, an integrative review performed by Fisher and King (2013) examined whether simulation prepared nursing students to recognize and effectively respond to the deteriorating patient. Results of their review revealed that simulation increased confidence, clinical judgment, knowledge, and competence in the simulated environment.

Liaw, Scherpber, Klainin-Yobas, and Rethans (2011) developed a reliable and valid tool, Rescuing a Patient in Deteriorating Situations (RAPIDS)-Tool, to evaluate performance in simulation to address the lack of evaluation tools to objectively evaluate nurses’ simulation performance on clinical deterioration. This tool incorporated assessment and management of clinical deterioration including airway, breathing, circulation, disability, and examination of patient with the performance of SBAR (situation, background, assessment, recommendation) reporting. Data revealed significant differences (\( t =15.48, \ p <0.001 \)) in performance scores among participants with different levels of training supporting the construct validity. Plus, the RAPIDS-Tool also demonstrated a high inter-rater reliability (ICC=0.99) among the three raters and a high correlation between the global rating and checklist scores (\( r =0.94, \ p <0.001 \)).

Cherry and Ali (2008) addressed the usage of simulation in trauma education using team communication and developing scenarios with the conclusion that the more “real life” the scenario is, the better the learning environment. Jacobson et al. (2010) studied simulation and developed scenarios based on actual patient situations that staff had encountered. The purpose of this was to increase their confidence and skill in dealing with patient emergencies. Afterwards, nurses reported increased confidence in early recognition of the deteriorating patient and
management of that patient determined by a 3.0 on the pre simulation survey and a 4.0 on the post simulation survey (scale was 1-5 with 5 extremely confident).

Other studies combined additional educational methods along with simulation to evaluate performance. Rodgers, Bhanji, and McKee (2010), examined nursing students’ performance to see if written test scores correlated with performance in a simulated environment. The conclusion of the study was that written test scores was not a predictor of performance demonstrated by Spearman's rho correlation coefficient between the written test scores and skills performance being 0.194 (2-tailed significance=0.272). A secondary conclusion was while simulation focused on one topic, a written test can cover a broader area of content and as a result, both of these should be used in conjunction to evaluate performance. Smith, Gilcreast, and Pierce (2008) examined written tests and simulation with ACLS, specifically if knowledge declined over time post instruction. Their study demonstrated that while written test scores didn’t decline over time; skill performance deteriorated quickly post instruction with only 30% demonstrating skills at three months and 14% at twelve months. These studies demonstrate that while the written test is useful to examine knowledge, skills performance needs to be also examined and often. This is interesting as this finding contradicts current recommendations from American Heart Association that skill performance is to be demonstrated every two years.

Another study by Cooper et al. (2011) used multiple methods of written test and video simulations to evaluate care of the deteriorating myocardial infarction and chronic obstructive pulmonary disease patients. The thirty-five nurses in this study recognized deterioration of the patient, but performance declined in all nurses as the patient deteriorated, based on observations by the evaluators. Their conclusion was that high-fidelity simulations with participation and feedback would have a more positive impact on performance. Some used repeated simulation
for education and testing (Abe, Kawahara, Yamashina, & Tsuboi, 2013), however, typically simulations were conducted as a stand-alone event (Brown & Beckman, 2008; Cross & Wilson, 2009; Stennett, Shuttlesworth, Davis & Decker, 2012). In summary, several types of simulation are used for testing purposes, which include the standardized patient, role playing, and high and low fidelity simulation. There is little research to support one method of simulation versus another (Mancini et al., 2010).

The literature also indicates that organizations vary in how they evaluate nurses’ performance. This may be related to facing high cost spent for performance validation and evaluation (Goran, 2011). For instance, one organization had registered nurses document patient assignments throughout the year (Brown & Beckman, 2008) in order to ensure specific patient populations were cared for and maintain skills. Goran (2011) discussed an organization using return demonstration, practicing in the skills lab, and requiring the attendance of mandatory continuing education pertaining to clinical topics for the nurse to demonstrate competence. Preston, Currer, and Eastwood (2009), on the other hand, studied assessment methods in England; finding that all of the educators sampled (20) used simulation with twelve of them also using written tests occurring every one to two years. The educator performed assessments during a designated month (10), numerous times throughout the year (8), or on nurses' employment anniversaries (2). Walsh and Wagemester (2007) discussed how one hospital performs in-services, simulation with debriefing, and return demonstration to determine competence. Unfortunately, there was not a consistent standard in the literature in the method of development, implementation, or evaluation of a simulation experience. While many of the articles discussed the quality of performance within the simulation environment, this doesn’t necessarily translate to performance in the workplace. It isn’t uncommon for organizations to
conducted annual or biannual written tests to determine competence, even though literature indicates that written tests should occur within six months of instruction (Mancini et al., 2010). This questions the value of annual written testing for experienced nurses. In addition to this, Allen, Currey, & Considine (2013) found little evidence to support the current practice of annual resuscitation competency assessments.

There is no indication that written tests are able to indicate competence. In regards to identification of patient deterioration, research has demonstrated that written exam scores correlate poorly with performance as discussed earlier. This indicates that written exams should not be used as an indicator of performance, including recognition of a deteriorating patient.

Multiple methods were presented by Whelan (2006) to measure nursing competency. These methods are performance-based development system (PBDS), which is an online simulation tool; competency days; and self-study materials. The primary indicators identified by the EdCaN (National Education Framework Cancer Nursing) (2008) in their literature review were objective structured clinical examination (OSCE), peer assessments, direct observation, and self-assessment. Cooper et al. (2013) further argued that video OSCE is an important tool to assess performance while Wilkinson (2013) emphasized self-assessment as another means to evaluate competency. These methods, while popular, do have issues. PBDS, is quite expensive, which makes it cost prohibitive to organizations. Self-assessments are not an objective way of evaluation. OSCE has been used to evaluate medical students, however it is not appropriate for this topic as you are unable to create a deteriorating patient environment including deteriorating vital signs.

Other research by Jonsson, Jonsdottir, Moller, and Baldursdottir (2011) investigated the accuracy of nursing documentation of the MEWS parameters prior to emergency admission to
the ICU. They found that nursing documentation was lacking in the area of respiratory rate documentation in 14% of the patients prior to ICU admission, making it the least documented observation, even though respiratory failure was the most common reason for admission into the ICU. Allen, Currey, and Considine (2013) examined the literature for why annual testing is performed in organizations, with the conclusion that annual testing is not supported by research.

In summary, there are many articles that discuss evaluation of nurse’s performance with little consensus among them. There is not one standard or popular tool that is used within organizations. It is inappropriate to assume that the evaluation tools used with nursing students or physicians could be applied to the practicing registered nurse in their practicing environment as no research has been performed to demonstrate their reliability with practicing nurses. It is also inappropriate to assume that these tools are valid and reliable as a vast majority did not provide statistical data to support the tool used. Any statistical data that was available was provided within this article.

2. Perceived Effectiveness of Assessment Methods

Simulation and written tests appear to be the most popular methods to determine nurses’ competency. In their study involving medical residents, Ander, Heilpern, Goertz, Click, and Kahn (2009) examined skill retention one year after a simulation experience in which all achieved 100% in performance. After one year a decline occurred in the recognition of ventricular fibrillation (61.8%), performing defibrillation (61.8%), performing airway management (88.2%) and management of a choking child (47.1%). As a result, the researchers recommended instruction and skills practice occur every three months to maintain optimum performance. Adler et al. (2011) compared checklists and a performance assessment tool used to assess simulation performance to determine if they were able to accurately evaluate performance.
Their research demonstrated an inter-rater reliability coefficient was >0.9 for both instruments, demonstrating that the checklist and performance assessment tool performed both high reliability.

Adamson and Kardong-Edgren (2012) were concerned that there was a lack of simulation evaluation instruments that are valid and reliable. Their research tested 29 nurse educators using three instruments (Lasater Clinical Judgment Rubric, the Seattle University Evaluation Tool, and the Creighton-Simulation Evaluation Instrument) that instructors frequently used to evaluate nursing students. Results demonstrated that the three instruments could be used for evaluation purposes with the inter-instrument reliabilities for the instruments in this study ranged from $r = 0.367$ to $0.811$ and rho = 0.376 to 0.781 and all correlations significant to the $p \leq 0.05$ level.

Up to this point, all of the literature was looking at how simulation changed behavior in a simulated environment. Tannenbaum and Cerasoli (2013) performed a meta-analysis examining if debriefing enhances performance in the military setting. Though the focus was not healthcare related, critical discussion of simulation and what could have been done differently to be more effective was examined. The meta-analysis demonstrated that debriefing as an educational tool improves performance by 25%, working equally for teams and individuals. Computerized learning combined with simulation was examined by McKay et al. (2013) looked at the effect of computerized learning and low fidelity simulation on documentation on the deteriorating patient. Research demonstrated that after the education there was a significant increase in documentation of respiratory effort, capillary refill, blood pressure, and level of consciousness.

The effectiveness of the Rapid response team (RRT) was also a frequent subject in the literature. Rapid response teams originated in December 2006 when the Institute for Healthcare Improvement encouraged American hospital to develop them. The RRT is being examined in
this literature review based on the thought that though the team response doesn’t affect the individual nurse’s performance; how the team responds could reflect how the nurse recognized and reacted to the deteriorating situation. Shearer et al. (2012) examined the care of 570 deteriorating patients and identified that over half didn’t receive appropriate medical care, even though the nurse recognized that the patient met the established criteria to activate the RRT. The primary reason identified for nurses not activating the RRT is because they felt they could handle the situation, with the secondary reason that they didn’t feel they were the most appropriate person to activate the team. Santiano et al. (2009) looked at 3189 calls made to the RRT in six hospitals to gather data on what criteria the calls were based on, subjective and objective, and the outcomes of the patients. The analysis revealed that 924 calls were made because the nurse was “worried”, however 695 were not transferred after evaluation of the RRT, primarily because the patient was determined not to be in a deteriorating condition. The study concluded that nursing staff should gather objective data to support their concerns before notifying the RRT. However, intuition was the subject of systemic literature review performed by Odell, Victor, and Oliver (2009). They examined the literature 1990-2007 to identify research with the focus of the nurses’ role in detection of deterioration in patients, resulting in fourteen studies that met criteria. The review found seven studies that demonstrated that intuition plays an important part in a nurses’ detection of deterioration, with using vital signs to validate their “gut” feeling that something was not right with the patient.

RRT and the use of the tools notifying them were proven to be effective, however not used to their full potential. McNeill and Bryden (2013) performed a systematic review to examine if early warning systems or RRT improve hospital patient survival. The review demonstrated that warning scores are more effective when implemented throughout the

74
organization, instead of focusing on one department. Having an established early warning system is a step in alerting the patient that the patient is deteriorating. Ludikhuize, de Jonge, and Goossens (2011) found that while ninety-five nurses that were trained on the signs of the deteriorating patient identified the deteriorating patient and documented on them more frequently, the use of the MEWS tool or SBAR communication guide was low (N=4.11% and N=1.4%), which affects communication and potentially patient outcomes. Niegsch, Fabritius, and Anhej (2013) found that even though documentation of the MEWS criteria occurred 90% of the time, only 38% of patients that met the MEWS criteria were correctly identified and treated. The literature demonstrates that technology is capable to recognize the deteriorating patient; however the human component needs to also recognize the deteriorating patient in practice and not in just a simulated environment.

**Summary**

The reviewed literature has guided this researcher by providing an understanding and awareness into the current practicing environment of educators. In the critical care units within hospitals, the critical care educator is the direct evaluator for identifying competence in clinical practice, including the education, verification, and confirmation of competency. Ultimately, competency links knowledge, skills, and abilities in a multidimensional construct, in this case the deteriorating patient. Currently, there are identified criteria and tools found in the literature that can be used to identify the deteriorating patient. What isn’t known is what criteria is currently being used by critical care nurses to recognize a deteriorating patient; and how is the critical care nurse educator evaluating the critical care nurse’s ability to recognize this patient. The goal of this researcher is to further explore the topic of evaluating nurse’s performance by surveying critical care nurse educators to gather data on demographics of themselves and their
organizations, types of critical and methods used, and the perceived effectiveness of those methods. The demographic makeup of the participating critical care educators will supply this researcher specific detail of what skills and education the critical care educator possesses and how it correlates to the methods they use and their view of effectiveness of the method.
Figure 1 - Search of the Literature

Identification

CINAHL Plus with full text
January 2000 to October 2015
English Language, peer reviewed
Major Subject headings: competency evaluation; OR slater nursing competencies rating scale; OR competency assessment-evaluation; OR professional competence-evaluation
Medline with Full Text
Major headings: professional competence; OR clinical competence; keywords competency assessment; OR slater nursing competencies rating scale; OR competence evaluation
(N=763)

Screening

Combined with term AND Nurses
(n=189)

Limited to publication types of research instrument, utilization, validation, questionnaire/scale, practice guidelines, standards, journal article, clinical innovation
(n=120)

Included

Was the following criteria met: competency instruments that assessed registered nursing performance that did not involve self-assessment or self-skill check list; did not assess a specific topic and were considered by authors to be valid and reliable
(n=12)

NOT students
(n=68)
Second Search of the Literature Focusing on Nursing Competency

Included

Identification

CINAHL Plus with full text, Proquest Nursing & Allied Health, MEDLINE January 2000 to October 2015 English Language, peer reviewed Major key words: self-assessment; OR competency assessment; AND critical care nursing; OR critical care (N=95)

Included

Articles containing tools to evaluate a nurses’ ability to detect or care for the deteriorating patient (n=8)

Figure 2 - Additional Search of the Literature
<table>
<thead>
<tr>
<th>Stage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage 1</td>
<td>Problem Identification</td>
</tr>
<tr>
<td>Stage 2</td>
<td>Literature search</td>
</tr>
<tr>
<td>Stage 3</td>
<td>Data Evaluation – evaluation of the quality of primary sources</td>
</tr>
<tr>
<td>Stage 4</td>
<td>Data analysis – methods, processes. Consists of data reduction, data display, data comparison, conclusion drawing, and verification</td>
</tr>
<tr>
<td>Stage 5</td>
<td>Presentation – the results capture the depth and breadth of the topic and contribute to a new understanding of the phenomenon of concern; and implications for practice are emphasized in addition to implications for research and policy initiatives. Lastly, all methodological limitations of the review are explicitly stated. Quality criteria for review methods have been proposed</td>
</tr>
</tbody>
</table>

(Whittemore and Knafl, 2005)
Table 2 - Article Analysis Using Whittemore and Knafl

<table>
<thead>
<tr>
<th>Topic</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>competency based tools frequently used compared to newly developed ones</td>
<td>Meretoja, Isoaho, &amp; Leino-Kilpi, 2004</td>
</tr>
<tr>
<td></td>
<td>Clinton, Murrells, &amp; Robinson, 2005</td>
</tr>
<tr>
<td></td>
<td>Klein &amp; Fowles, 2009</td>
</tr>
<tr>
<td>Correlational studies using competency</td>
<td>Meretoja, Isoaho, &amp; Leino-Kilpi, 2004</td>
</tr>
<tr>
<td></td>
<td>Dellai, Mortari, &amp; Meretoja, 2009</td>
</tr>
<tr>
<td></td>
<td>Klein &amp; Fowles, 2009</td>
</tr>
<tr>
<td></td>
<td>Clinton, Murrells, &amp; Robinson, 2005</td>
</tr>
<tr>
<td></td>
<td>Cheraghi, Hassani, Yaghmaei, &amp; Alavi-Majed, 2009</td>
</tr>
<tr>
<td>Instruments that evaluated senior nursing students’ competencies</td>
<td>Cheraghi, Hassani, Yaghmaei, &amp; Alavi-Majed, 2009</td>
</tr>
<tr>
<td></td>
<td>Klein &amp; Fowles, 2009</td>
</tr>
<tr>
<td></td>
<td>Walsh, Bailey, Mossey &amp; Koren, 2010</td>
</tr>
<tr>
<td></td>
<td>McWilliam &amp; Botwinski, 2012</td>
</tr>
<tr>
<td>NICE Guidelines</td>
<td>EWS</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----</td>
</tr>
<tr>
<td>heart rate</td>
<td>heart rate</td>
</tr>
<tr>
<td>respiratory rate</td>
<td>respiratory rate</td>
</tr>
<tr>
<td>Systolic BP</td>
<td>temperature</td>
</tr>
<tr>
<td>level of consciousnes s</td>
<td>conscious level</td>
</tr>
<tr>
<td>oxygen saturation</td>
<td>urine output</td>
</tr>
<tr>
<td>temperature</td>
<td>systolic blood pressure</td>
</tr>
<tr>
<td>Labs- lactate, blood glucose, base deficit, arterial pH</td>
<td>Labs: Hgb, WBC, Urea, serum sodium, potassium</td>
</tr>
<tr>
<td>hourly urine output</td>
<td></td>
</tr>
<tr>
<td>pain assessment</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Article 2

Methods Used to Assess Critical Care Nurses’ Ability to Detect the Deteriorating Patient and the Perceived Effectiveness of Those Methods

Julia K. Eberwine PhD, RN, CCRN, PCCN-CMC
The University of Cincinnati

Elaine T. Miller PhD, RN, CRRN, FAAN, FAHA
The University of Cincinnati

Jun Ying, PhD
The University of Cincinnati

Kimberly Johnson PhD, RN, CEN
The University of Cincinnati
Abstract

**Problem:** Detection of critically-ill patient deterioration is an essential nursing skill that impacts healthcare costs and the mortality and morbidity of 128 deaths out of every 1,000 patients nationally. The ability to effectively assess skills in critical care nurses is often given to the critical care educator who has not been provided standardized tools that can accurately measure competence.

**Purpose:** The primary purpose of this descriptive correlational study was to identify the criteria and measurement methods critical care nurse educators use to assess nurses' ability to detect the early signs of patient deterioration and describe the perceived effectiveness of the measurement methods used. The secondary purpose was to explore the association of critical care nurse educators' characteristics, hospital characteristics, and geographic regions with the type of methods and perceived effectiveness in the evaluation.

**Design:** The critical care nurse educator population was accessed through the American Association of Critical Care Nurses (AACN). An invitation with a Survey Monkey link was provided in AACN’s weekly eNewsletter for persons to access and participate for a total of 4 weeks.

**Results:** The study received a total of 245 responses from the Survey Monkey. However, only 72 responses were considered valid based upon the criteria of answering all questions related to the key measurements of interest (specifically in Q’s 23-25). The reasons for this are unknown, but the survey did allow participants to skip questions. Sixty eight percent of participants showed education level at Masters prepared and above, higher than national level of 12% in similar studies. Both Classroom Education and Direct Observation were considered most frequently used methods among nursing educators. Most (72%) of the nursing educator also
considered the Direct Observation as the most effective method in education, higher than the second most effective method (28%) in Simulation (Live). Perceived effectiveness of all methods was examined found not affected by demographics, education and years of experience of nursing educators. Perceived effectiveness of most of the methods were also find not associated to nursing units, except that the perceived effectiveness of simulation methods were positively associated to the number of criteria used to detect deteriorating patients.

**Conclusions:** The lack of responses did not allow attaining rich data from all survey questions; but the 72 responses on the critical questions provided information for future research. While the education for the educators is Masters prepared and above, it may not be appropriate to compare as national studies are looking at all nurses. Despite the popularity of simulation as an effective teaching method, direct observation remains a favored method and viewed as the most effective method. Simulation is also the method least used by the participants. There is literature supporting the use of simulation and how it facilitates learning; however these educators are not using it. This lack of use will be explored in future research designed to support the critical care educator in their role of assessment of nurses’ practice.

Keywords: Competency, Competence, Critical Care, Evaluation, Nursing
Background

Despite the increasing emphasis on healthcare organizations to evaluate the competence level of registered nurses, educators struggle with how to most effectively assess it. An even more frustrating issue is that educators are left with the task of measuring the competency at hand, without having tools that can accurately measure competence. When applied to critical care, detection of patient deterioration is a pivotal skill fueled by governing body’s standards along with the financial costs and mortality and morbidity. With many organizations, including The Joint Commission and National Council of State Boards of Nursing (NCSBN), stating the need for competency measurement while not providing guidance in how to do that, difficulties are created for the critical care educator to determine what standards are required by each individual nurse, including the capability to identify and properly care for the deteriorating patient.

There are patient assessment scales that have been established to detect early deterioration of a critically ill patient. As part of the Institute for Health Improvement’s (IHI) 100,000 Lives Campaign, The Modified Early Warning Score (MEWS) was created to identify an adult deteriorating patient in an effective manner (IHI, 2013). It is based on five factors which are systolic blood pressure, heart rate, respiratory rate, body temperature, and level of consciousness. Scoring is based on where on the continuum the patient’s signs fall, ranging from 0-3 for each parameter. A score of five or more is statistically linked to increased likelihood of death or admission to an intensive care unit (Hammond et. al., 2013). Since implementation of this tool; cardiac arrest rates, mortality rates, and lengths of stay in the intensive care unit (ICU) have decreased due to earlier identification of the adult deteriorating patient (NICE, 2007). Though this scale is known and frequently appearing in the literature, what is missing from the
literature is how the critical care educator assesses the nurse’s ability to detect the early signs of deterioration as well as how effective these methods are in accurately assessing the nurse’s ability.

**Significance**

The primary purpose of this correlational study was to (a) identify the criteria and measurement methods critical care nurse educators use to detect the critical care nurses' ability to detect the early signs of patient deterioration and (b) describe the perceived effectiveness of the identified measurement methods. The secondary purpose of this study is to explore the associations of critical care nurse educators' characteristics, hospital characteristics, and geographic regions with the type of methods and perceived effectiveness in evaluating the critical care nurses' ability to detect signs of patient deterioration.

This study focus was based on the literature. Deterioration of a patient is costly, not only in the amount of monies that organizations have to pay, over $80 billion per year, but in terms of lost lives (Gooch & Kahn, 2014). The ability to detect the deteriorating patient quickly and accurately allows the provision of care to address the underlying issues creating the deterioration. As many as eighty percent of hospitalized patients have physiological parameters outside normal ranges in the twenty-four hours prior to intensive care unit admission with up to three-fourths of such patients have at least one potentially life-threatening factor in the eight hours before ICU admission (Tarassenko, Hann & Young, 2006) with some signs occurring up to twenty-four hours prior to recognition of deterioration (Felton, 2012). When warning signs are not recognized, the resulting delay in treatment leads to increased mortality and morbidity (Chalfin, Trzeciak, Likourezos, Baumann, & Dellinger, 2007). Between 2004 and 2006, Healthgrades (2008) reported that "failure to rescue" accounted for 128 deaths out of every 1,000 patients nationally;
with failure to rescue defined as a failure to react promptly or escalate care (Jones, DeVita, & Bellomo, 2011). Additionally, the Agency for Healthcare Research and Quality (AHRQ) has focused on improving the quality, safety, efficiency, and effectiveness of health care. One organization’s success included reducing its code rate in half, going from eight codes to four per 1,000 discharges by implementing the MEWS tool and appropriately caring for the patient (AHRQ, 2012). This success was attributed to the staff implementing the tool appropriately when recognizing deteriorating vital signs. In summary, there is not one current evaluation standard for use by the educator to assess the critical care nurses’ competency to recognize early signs of patient deterioration, though simulation is frequently used to expose the critical care nurse to patient care scenarios in a safe environment.

**Content Validity and Pilot Study**

Content validity of measurements of perceived effectiveness was evaluated by three experts representing critical care nursing instrument development and delivery per survey monkey. Afterwards, a small pilot study involving four critical care nurse educators was conducted to assess the functionality of the survey, comment on the value and relevance of the data being collected, and evaluate comprehensibility and overall face validity of the study. This number was selected by the researcher so that enough experts can provide feedback on the survey while keeping the number small enough to efficiently manage the responses. The goals for the pilot study were to determine if potential respondents understood the directions for completing the survey questions; assess each question for clear wording; and to determine the time commitment required by participants to complete the survey. The inclusion criteria for the study were: having a valid Registered Nurse license, employment in the United States, current membership in the American Association of Critical Care Nurses (AACN), an active unit based
critical care educator role where formal evaluation of critical care nurses’ ability to detect early signs of patient deterioration occurs semi-annually at a minimum. These clinical educators represented the target population for the survey and met all eligibility criteria, with exception of current membership of AACN, as it was felt that current membership will not affect their ability to provide feedback about the survey. These pilot study participants were all women with over 5 years of educator experience and represented different critical care units. Their recommendations focused on spelling corrections and clarification of the functionality of how Survey Monkey operated. All pilot participants supported the relevance and value of the data and were very interested to see the results of the study.

**Study Design**

Institutional Review Board (IRB) approval was obtained from the University of Cincinnati before data was obtained. Participation and the completion of the survey provided implied consent (Fink, 2003). In addition to the informed consent, the introduction included expected time commitment to complete the survey as well as a brief description of the survey. Participants were allowed four weeks to complete the survey. Recruitment occurred by accessing the members of AACN because this organization is the largest specialty nursing organization in the world and has over 2,000 critical care nurse educators in their membership. An invitation and survey link was provided in the AACN’s weekly member email newsletter for four weeks between January and February 2015 for interested persons to access and subsequently participate if eligibility criteria are met.

Given the limitations in accessing potential participants in a randomized method, a convenience sample was used to obtain the desired data. For this study, a minimum sample was 200 based on a power analysis in the fixed effect model to determine the difference of the two
means and be detected with over 90% power assuming the smaller group defined by a
categorical independent variable has only N=50. The similar power can be reached when a
logistic regression model is used.

The study survey was developed with a completion status bar to minimize non-
completion rates; however the survey allowed the participant to skip as many questions as they
like if they preferred not to answer. The study’s questions and items were developed from the
literature and were structured in categories to provide a sense of flow for the participant.
Potential participants clicked on the survey link with the participation inclusion criteria
appearing, the same inclusion criteria as the pilot study. As no individual or organizational
names were asked, all findings would be reported as aggregate data.

The first category of questions was demographic questions, with the second category of
questions focused on the criteria that were used to identify the deteriorating patient, all gather
from the literature as commonly accepted parameters. These questions were structured in a list
format allowing the participant to indicate indicating all that they used. The third category was
methods critical care nurse educators currently use to evaluate the critical care nurse’s ability to
identify the deteriorating patient. Along with the method, the survey also asked the participants
to state the frequencies with which that evaluation method was used. To understand which
methods are used most frequently, the participant was asked to indicate the top two methods that
were used.

The last survey category was the perceived effectiveness of the methods that are used by
the critical care nurse educator to evaluate the individual nurse. The participants responded
using a Likert type five point scale ranging from 0 (not effective) to 5 (extremely effective) to
convey the perceived effectiveness of each the methods used to assess a critical care nurse’s
ability to detect a deteriorating patient. They also indicated the top two methods they feel are most effective. This section contained the three critical questions out of the 25 question survey. These questions are: 1) Which two evaluation methods have you used the most frequently in your life time as a nursing educator, the question described before – 2) please indicate your perceived effectiveness of the methods used to evaluate the critical care nurses’ ability to detect the deteriorating patient, and 3) which two evaluation methods you feel are the most effective in assessing the critical care nurse’s ability to detect the deteriorating patient.

**Data Analysis**

For the primary purpose of this study, which is to identify the criteria and measurement methods critical care nurse educators use to detect the critical care nurses' ability to detect the early signs of patient deterioration and describe the perceived effectiveness of the identified measurement methods, Mean± standard deviation was used to summarize all numerical variables and frequency (in %) was used to summarize all categorical or binary variables.

The specific statistical plan to address the secondary purpose was: For numerical outcome measures or dependent variables, their association to nurse educators’ characteristics was assessed using fixed effect models. Post hoc means were compared between the characteristic groups under the fixed effect model. Multiple comparisons were adjusted for overall Type-I error using a Bonferroni’s method. For categorical or binary outcome measures or dependent variables, their associations to nurse educators’ characteristics were assessed using logistical regression models. Comparisons between characteristic groups were performed thru the odds ratio (OR) within the logistical regression model framework. Both unadjusted and adjusted methods were used in the proposed fixed effect models and logistical regression models. In the unadjusted models, each of the characteristics were manipulated as the only independent
variable in the models, while in the adjusted models, the targeted characteristic was adjusted by other covariate or independent variables in the same models. Other statistical methods used include Cronbach’s alpha to assess internal consistency of items and Pearson’s correlation coefficient to assess relationship between numerical outcome measures. When missing data were detected, it was identified and separated within the statistical analysis.

Results

At the conclusion of the study, 245 responses were collected for some of the questions. For the majority of the questions including the critical questions of the survey, only 72 answered. The results are expressed in several tables. Table 1 - Summary of Demographics of Critical Care Nurse Educators presents the data on age, gender and race of the critical care nurse educator. The typical participant was greater 45 years, female, and white/Caucasian. Table 2 - Summary of Nursing Characteristics provides data on the nurse educator characteristics – years of experience, years as an educator, years assessing performance, number of certifications possessed, if CCRN certification is possessed, and highest level of education. The majority of the educators were Masters prepared or above (68%) and have their CCRN. The critical care nurse educator has been a nurse for many years as well as an educator; however, they have not spent that many years assessing performance. Table 3 - Summary of Characteristics of Nursing Unit – contains data of the number of units critical care educator responsible for, number of employees responsible for, size of organization, number of criteria used to determine a deteriorating patient, was the unit an ICU, and the region of the country. The regions were evenly distributed, 86% were from ICUs, and most had over 50 employees that they were responsible for assessing their performance.
Perceived effectiveness of each method was compared with each demographic item (See Appendix A). The results of these comparisons are that perceived effectiveness of any method is not associated to demographics, nursing characteristics, or nurse unit except perceived effectiveness of simulation associated to number of criteria (see Table 4). If the organization uses 11 or more criteria to detect a deteriorating patient, there is a positive correlation to the perceived effectiveness to demonstration of skills and live simulations.

In numbers, the most effective methods to assess a nurse’s performance are direct observation of performance (54) and simulation – multiple times, different scenarios (21) and all forms of simulation (33). This varies from the methods most used, which is classroom education (36) and direct observation of performance (35).

Discussion

The percentages of clinical educators with advanced degrees are significantly different compared to the National Workforce Survey (National Board of Nursing study) in which the highest level of education obtained was as follows: Master’s degree in Nursing 12%, Baccalaureate degree in nursing 34%, Associate degree in nursing 28%, Doctoral degree in nursing 1%, and Diploma in nursing 11% (Budden, Zhong, Moulton, & Cimiotti, 2013). This difference may be due to job requirements or possibly due to the trend of organizations seeking Magnet status. However, it may not be appropriate to compare the two groups for this study. The national survey is looking at all practicing nurses, where this survey’s focus is critical care nurse educators, typically requiring more education.

There was nothing unanticipated from the data; all of the categories supported this researcher’s expectations, including the participants being relatively evenly distributed among
the 4 geographical regions which was a desired goal to examine how the methods were distributed throughout the country.

In the examination of the critical care educator demographics, the age of the educator is at a mean of 46 years of age. When combined with the educators at a mean of 6 years of experience in the role combined with a mean of 20 years of clinical experience indicates that the participants in this study have many years of experience. This know-how allows them to draw from more evaluation methods that they can utilize. It also leads to a conclusion that they have been exposed to a written test frequently in their career and are more familiar and comfortable with a written test format and patient assessment as method resources. These conclusions are also linked with the number of employees; it makes sense that the more employees that need to be assessed, the more number of units responsible for, that more methods are utilized to assess the nurses and those methods may be chosen based on time involvement of the educator.

Unfortunately, within the organizational demographic data, magnet/non magnet comparison was unable to be performed due to over 50% of the organizational descriptive information was missing in the survey responses. This is unfortunate as that data analysis would be meaningful to organizations to support methods of assessment methods of performance and competency.

Looking at the critical questions of this study, in the methods most used, simulation is used very little (see Table 5). However, simulation is seen as one of the most effective methods. Why isn’t simulation used more if it is seen as effective? In Table 4, Question 24 provides a table of how the educators responded to how effective each method was. That is why Question 25 was important – of all of those methods, which are the most effective.
In this study, an assumption was made that critical care nurse educators with more experience with assessing nursing staff’s ability to recognizing the deteriorating patient will be able to provide insightful information in how they assess their staff’s ability to detect deteriorating conditions. An additional assumption is that these same educators will share their methods and organizational standards they currently use to assess the staff’s ability to detect the deteriorating patient.

This study has several limitations. This descriptive study utilized a convenience sample, with participants making the self-determination if they want to participate. This self-determination was evident in the number of questions that were not answered by the participants. Another limitation was that the participating educators’ practice may not reflect the practice of all critical care educators. This limitation was reduced by soliciting a national organization’s membership to participate in the study. In addition, the data obtained is subjective due to the self-reporting mechanism of the survey. Due to the anonymous response, it will be unable to know if an individual participant completed the survey more than once. In the instructions, there was a statement requesting the participant to only complete the survey once to lessen this limitation.

To minimize response bias and reduce error, several items have been considered. First, a population was sought out to maximize the number of eligible respondents. Second, based on this researcher’s personal experience, it was felt that this topic will be of interest to the respondents which should increase participation. Last, the survey responses were anonymous and the eligibility criteria are specific to the role but broad enough to not exclude large numbers of potential respondents.
Summary

This study has provided the nursing community with a beginning examination into what methods are used to evaluate the registered nurses’ ability to recognize the deteriorating patient. This knowledge will support future examination into what methods are used for all evaluation standards to have an understanding of educators practice. The knowledge that has been created from this study will guide future actions in the development of standards for determining critical care nurses ability to detect patient deterioration in a timely manner. The study results suggest further exploration of how evaluation occurs with the critical care educator. Due to there being no current knowledge to build off of, this researcher will continue to investigate the use of the methods to assess the registered nurses’ ability to assess the deteriorating patient and develop an objective method that can be utilized in many settings.
Table 1 - Summary of Demographics of Critical Care Nurse Educators

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Group</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>45.8±11.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;45</td>
<td>27 (38%)</td>
</tr>
<tr>
<td></td>
<td>≥45</td>
<td>44 (62%)</td>
</tr>
<tr>
<td>Gender</td>
<td>M</td>
<td>8 (11%)</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>63 (89%)</td>
</tr>
<tr>
<td>Race</td>
<td>Hispanic/Asian/Alaskan/ American Indian</td>
<td>3 (4.17%)</td>
</tr>
<tr>
<td></td>
<td>Black/African American</td>
<td>4 (5.56%)</td>
</tr>
<tr>
<td></td>
<td>White/Caucasian</td>
<td>63 (87.5%)</td>
</tr>
<tr>
<td></td>
<td>Other</td>
<td>2 (2.78%)</td>
</tr>
</tbody>
</table>
Table 2 - Summary of Nursing Characteristics

<table>
<thead>
<tr>
<th>Nursing Characteristics</th>
<th>Group</th>
<th>Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Years of Experience</td>
<td></td>
<td>20.5+12.1</td>
</tr>
<tr>
<td>&lt;20</td>
<td></td>
<td>30 (42%)</td>
</tr>
<tr>
<td>&gt;20</td>
<td></td>
<td>42 (58%)</td>
</tr>
<tr>
<td>Years as Educator</td>
<td></td>
<td>6.4+7.3</td>
</tr>
<tr>
<td>&lt;20</td>
<td></td>
<td>33 (47%)</td>
</tr>
<tr>
<td>&gt;20</td>
<td></td>
<td>37 (53%)</td>
</tr>
<tr>
<td>Years Assessing Performance</td>
<td></td>
<td>9.8+10.0</td>
</tr>
<tr>
<td>&lt;10</td>
<td></td>
<td>45 (62.5%)</td>
</tr>
<tr>
<td>&gt;10</td>
<td></td>
<td>27 (37.5%)</td>
</tr>
<tr>
<td>Number of Certifications</td>
<td></td>
<td>1.0+1.0</td>
</tr>
<tr>
<td>0</td>
<td></td>
<td>14 (19%)</td>
</tr>
<tr>
<td>&gt;0</td>
<td></td>
<td>58 (81%)</td>
</tr>
<tr>
<td>Possessing CCRN Certification</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>49 (68%)</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>23 (32%)</td>
</tr>
<tr>
<td>Highest level of Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AD/Diploma</td>
<td></td>
<td>5 (7%)</td>
</tr>
<tr>
<td>BSN</td>
<td></td>
<td>18 (25%)</td>
</tr>
<tr>
<td>MSN and above</td>
<td></td>
<td>49 (68%)</td>
</tr>
<tr>
<td>Characteristics of Nursing Unit</td>
<td>Group</td>
<td>Statistics</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------</td>
<td>------------</td>
</tr>
<tr>
<td>Number of Employees</td>
<td></td>
<td>62.6±72.0</td>
</tr>
<tr>
<td>&lt;50</td>
<td></td>
<td>29 (40%)</td>
</tr>
<tr>
<td>&gt;50</td>
<td></td>
<td>43 (60%)</td>
</tr>
<tr>
<td>Units Responsible for</td>
<td></td>
<td>1.8±1.7</td>
</tr>
<tr>
<td>&lt;2</td>
<td></td>
<td>49 (68%)</td>
</tr>
<tr>
<td>&gt;2</td>
<td></td>
<td>23 (32%)</td>
</tr>
<tr>
<td>Size of Organization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;500</td>
<td></td>
<td>57 (79%)</td>
</tr>
<tr>
<td>&gt;500</td>
<td></td>
<td>15 (21%)</td>
</tr>
<tr>
<td>Number of Criteria</td>
<td></td>
<td>11.3±5.4</td>
</tr>
<tr>
<td>&lt;10</td>
<td></td>
<td>57 (79%)</td>
</tr>
<tr>
<td>&gt;10</td>
<td></td>
<td>15 (21%)</td>
</tr>
<tr>
<td>ICU Unit?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td>65 (90%)</td>
</tr>
<tr>
<td>No</td>
<td></td>
<td>7 (10%)</td>
</tr>
<tr>
<td>Region</td>
<td></td>
<td></td>
</tr>
<tr>
<td>West</td>
<td></td>
<td>16 (23%)</td>
</tr>
<tr>
<td>Midwest</td>
<td></td>
<td>24 (34%)</td>
</tr>
<tr>
<td>South</td>
<td></td>
<td>20 (29%)</td>
</tr>
<tr>
<td>North</td>
<td></td>
<td>10 (14%)</td>
</tr>
<tr>
<td>Method</td>
<td>no of criteria &lt;10</td>
<td>11&lt;</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------------------</td>
<td>-----</td>
</tr>
<tr>
<td>Written Test</td>
<td>1.56±1.09</td>
<td>1.64±0.75</td>
</tr>
<tr>
<td>Skills Lab</td>
<td>2.63±1.03</td>
<td>2.45±0.91</td>
</tr>
<tr>
<td>Patient Assessment</td>
<td>3.00±0.82</td>
<td>2.96±0.79</td>
</tr>
<tr>
<td>Classroom Education</td>
<td>2.00±0.97</td>
<td>1.91±0.77</td>
</tr>
<tr>
<td>Direct Observation of Performance</td>
<td>3.13±0.72</td>
<td>3.23±0.74</td>
</tr>
<tr>
<td>Documentation of Patient Deterioration</td>
<td>2.19±0.98</td>
<td>2.34±0.98</td>
</tr>
<tr>
<td>Return Demonstration of Skills</td>
<td>2.33±1.29</td>
<td>2.82±0.88</td>
</tr>
<tr>
<td>Simulation - live - one time</td>
<td>1.71±0.83</td>
<td>2.33±0.87</td>
</tr>
<tr>
<td>Simulation - live - multiple times same scenario</td>
<td>1.93±1.10</td>
<td>2.65±0.87</td>
</tr>
<tr>
<td>Simulation - live - multiple times different scenarios</td>
<td>2.50±1.16</td>
<td>2.95±0.83</td>
</tr>
<tr>
<td>Simulation - Video</td>
<td>1.54±1.05</td>
<td>1.84±0.83</td>
</tr>
</tbody>
</table>
Table 5 – Responses to Critical Questions

Q23 Which two methods have you used the most frequently in your lifetime as a nursing educator?

Answered: 75  Skipped: 179

<table>
<thead>
<tr>
<th>Answer Choices</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Test</td>
<td>32.00%</td>
</tr>
<tr>
<td>Skills Lab</td>
<td>30.67%</td>
</tr>
<tr>
<td>Patient Assessment</td>
<td>24.00%</td>
</tr>
<tr>
<td>Classroom Education</td>
<td></td>
</tr>
<tr>
<td>Direct Observation of Performance</td>
<td>46.67%</td>
</tr>
<tr>
<td>Documentation of Patient Deterioration</td>
<td>18.07%</td>
</tr>
<tr>
<td>Return Demonstration of Skills</td>
<td>33.33%</td>
</tr>
<tr>
<td>Simulation - live - one time</td>
<td>1.33%</td>
</tr>
<tr>
<td>Simulation - live - multiple times same scenario</td>
<td>9.33%</td>
</tr>
<tr>
<td>Simulation - live - multiple times different scenarios</td>
<td>8.00%</td>
</tr>
<tr>
<td>Simulation - Video</td>
<td>4.00%</td>
</tr>
</tbody>
</table>

Total Respondents: 75
Q24 Please indicate your perceived effectiveness of the methods used to evaluate the critical care nurse's ability to detect the deteriorating patient.

<table>
<thead>
<tr>
<th>Method</th>
<th>Not Effective</th>
<th>Somewhat Effective</th>
<th>Effective</th>
<th>Very Effective</th>
<th>Extremely Effective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Test</td>
<td>4.17%</td>
<td>44.44%</td>
<td>38.89%</td>
<td>9.72%</td>
<td>2.78%</td>
</tr>
<tr>
<td>Skills Lab</td>
<td>0.00%</td>
<td>15.28%</td>
<td>36.11%</td>
<td>33.33%</td>
<td>15.28%</td>
</tr>
<tr>
<td>Patient Assessment</td>
<td>0.00%</td>
<td>2.62%</td>
<td>23.94%</td>
<td>46.48%</td>
<td>26.76%</td>
</tr>
<tr>
<td>Classroom Education</td>
<td>1.30%</td>
<td>23.17%</td>
<td>47.22%</td>
<td>19.44%</td>
<td>2.78%</td>
</tr>
<tr>
<td>Direct Observation of Performance</td>
<td>0.00%</td>
<td>1.39%</td>
<td>13.89%</td>
<td>47.22%</td>
<td>37.56%</td>
</tr>
<tr>
<td>Documentation of Patient Deterioration</td>
<td>0.00%</td>
<td>23.61%</td>
<td>34.72%</td>
<td>29.17%</td>
<td>12.56%</td>
</tr>
<tr>
<td>Return Demonstration of Skills</td>
<td>1.41%</td>
<td>9.86%</td>
<td>28.17%</td>
<td>36.62%</td>
<td>23.54%</td>
</tr>
<tr>
<td>Simulation - live - one time</td>
<td>2.94%</td>
<td>17.65%</td>
<td>41.18%</td>
<td>33.82%</td>
<td>4.41%</td>
</tr>
<tr>
<td>Simulation - live - multiple times same scenario</td>
<td>4.29%</td>
<td>7.14%</td>
<td>35.71%</td>
<td>40.00%</td>
<td>12.56%</td>
</tr>
<tr>
<td>Simulation - live - multiple times different scenarios</td>
<td>1.41%</td>
<td>4.23%</td>
<td>29.58%</td>
<td>38.83%</td>
<td>26.76%</td>
</tr>
<tr>
<td>Simulation - Video</td>
<td>5.08%</td>
<td>32.35%</td>
<td>41.16%</td>
<td>19.12%</td>
<td>1.47%</td>
</tr>
</tbody>
</table>
Article 3

Translating Methods to Assess Critical Care Nurse Performance into Practice Using the Stevens Star Model of Knowledge Transformation

Julia K. Eberwine PhD, RN, CCRN, PCCN-CMC

The University of Cincinnati

Elaine T. Miller PhD, RN, CRRN, FAAN, FAHA

The University of Cincinnati
Abstract

Recognizing a deteriorating patient is an essential skill of critical care nurses. For critical care nurse educators, a fundamental activity is evaluating the critical care nurse’s ability to recognize the deteriorating patient. A recent study of critical care nurse educators determined that the top two effective methods used for evaluation are direct observation of performance and simulation, conducted at several times using different scenario. The purpose of this article is to describe how the findings from this study can be translated into practice by the critical care nurse educators. The Stevens Star Model of Knowledge Transformation will serve as the framework to translate these findings into practice. Each stage of the model will be applied to the research findings demonstrating how research can guide evidence based practice.
Introduction

Determination of nursing competency is considered necessary in all settings, especially in critical care. The Joint Commission, one of the governing bodies, evaluates and accredits more than 18,000 healthcare organizations and programs in the United States and is the nation's oldest and largest standards-setting and accrediting body in healthcare (The Joint Commission, 2010). Their 2010 accreditation manual state that one of the established standards for organizations is to ensure that staff is competent to perform their responsibilities. Another governing body is the National Council of State Boards of Nursing (NCSBN, 2005), which acknowledged that competency was difficult to measure with the volume of practicing registered nurses. NCSBN identified that there is an evolution of practice from the new graduate nurse to the experienced nurse. Due to this evolution in practice, the evaluation of competency isn't a constant attribute of practicing nurses, but instead is on an evolving continuum. All of these organizations' recommendations create difficulties for the critical care educator to determine what standards are required by each individual nurse, including the capability to identify and properly care for the deteriorating patient.

The employer is the direct evaluator for identifying competence in clinical practice. Per earlier definitions, competency incorporates more than having the requisite current knowledge; it also includes how well one can communicate with peers, superiors, and patients. The individual needs to demonstrate technical skills, clinical reasoning, problem-solving skills, and the ability to have the psychological and social temperament to adapt to changing environments and conditions. Ultimately, competency links knowledge, skills, and abilities in a multidimensional construct. Despite the increasing emphasis on healthcare organizations to evaluate the competency level of registered nurses, educators struggle with how to most effectively assess it.
An even more frustrating issue is that educators are left with the task of measuring the competency at hand, without having tools that can effectively measure competency outcomes.

**Background and Significance**

Deterioration of a patient is costly, not only in the amount of monies that organizations have to pay, but in terms of lost lives. The ability to detect the deteriorating patient quickly and accurately allows the provision of care to appropriately address the underlying issues creating the deterioration. As many as eighty percent of hospitalized patients have physiological parameters outside normal ranges in the twenty-four hours prior to intensive care unit admission with up to three-fourths of such patients have at least one potentially life-threatening factor in the eight hours before ICU admission (Tarassenko, Hann & Young, 2006) with some signs occurring up to twenty-four hours prior to recognition of deterioration (Felton, 2012). When warning signs are not recognized, the resulting delay in treatment leads to increased mortality and morbidity (Chalfin, Trzeciak, Likourezos, Baumann, & Dellinger, 2007). Though there are scales to evaluate the patients, there is not one current evaluation standard for use by the educator to assess the critical care nurses’ competency to recognize early signs of patient deterioration, though simulation is frequently used to expose and evaluate the critical care nurse to patient care scenarios in a safe environment.

The purpose of this article is to describe the translation of the results from a descriptive correlational research study into practice focusing on development of the educator and utilizing the Stevens Star Model of Knowledge Transformation. The Stevens Star Model of Knowledge Transformation takes research or evidenced based knowledge and moves it into practice through the five phases (Stephens, 2015). This model contains 5 stages of knowledge transformation: discovery research, evidence summary, translation to guidelines, practice integration, and
process, outcome evaluation which will be used to translate the study results. (see Diagram 1 - Stevens Star Model of Knowledge Transformation Diagram)

**Stevens Star Model of Knowledge Transformation**

*Stage 1: discovery*

In this stage, new knowledge is discovered through the traditional research methodologies and scientific inquiry (Stevens, 2015). The literature providing guidance on how to best assess critical nurses’ performance is limited or nonexistent. A descriptive correlational study was conducted nationally through the members of the American Association of Critical Care Nurses (AACN) (Eberwine, Miller, Ying, & Johnson, 2016) that provides some needed direction. Given the limitations in accessing potential participants, a convenience sample was used to obtain the desired data. The survey contained demographic questions, individual and organizational; criteria that were used to identify the deteriorating patient; methods critical care nurse educators currently utilize to evaluate the critical care nurse’s ability to identify the deteriorating patient, and the perceived effectiveness of the methods that are utilized by the critical care nurse educator to evaluate the individual nurse. To gather a sense of which methods are most effective, the participant was asked to indicate the top two effective methods as well as the top two methods used to evaluate the individual nurse.

The study received a total of 245 responses from the Survey Monkey. However, only 72 responses were considered valid based upon the criteria of answering all questions related to the key measurements of interest. Sixty eight percent of participants showed education level at Masters prepared and above, higher than national level of 12% in similar studies. Both Classroom Education and Direct Observation were considered most frequently used methods among nursing educators. Most (72%) of the nursing educator also considered the Direct
Observation as the most effective method in education, higher than the second most effective method (28%) in Simulation (Live). Perceived effectiveness of all methods was examined found not affected by demographics, education and years of experience of nursing educators. Perceived effectiveness of most of the methods were also find not associated to nursing units, except that the perceived effectiveness of simulation methods were positively associated to the number of criteria used to detect deteriorating patients.

*Stage 2: evidence summary*

The purpose of this stage is to synthesize the corpus of research knowledge into a single, meaningful statement of the state of the science (Stephens, 2015). There are many conclusions that could be derived from these survey results (Eberwine et al., 2016). The first is that the higher education you have the more methods educators incorporate in their assessment methods due to being exposed to a variety of methods. Also, with the age of the educator at a mean of 46 years of age, the expertise gained allows them to draw from more evaluation methods that they can utilize. These conclusions makes sense that the more employees that need to be assessed, the number of units responsible for, that more methods are utilized to assess the nurses are associated with age of the educator.

However, the data also raises questions. So how does the educator with only a couple of years’ experience and in their 20s determine the evaluation methods to use? Are we as a profession preparing the younger educator appropriately? Are the educators using a method that they are comfortable with – use of classroom education – versus a method that objectively examines performance?
Stage 3: translation

Stage 3 requires two stages: translation of evidence into practice recommendations and integration into practice (Stephens, 2015). For this topic it will be the development of practice guidelines and recommendations. While practice guidelines cannot affect who is hired for an educator position, they can provide the structure for the educator to follow for evaluation methods. The recommendation from this study is to use a specific structure in all areas for evaluation of competency. Based on the data from this study, the educator must implement explicit guidelines to evaluate the critical care nurse. The methods that will be given to the educator for use are direct observation of performance and simulation – multiple times performed, different scenarios, the two methods indicated most often as the most effective in evaluating a nurse’s performance. Since definitions of the methods were not provided within the survey, so it is unknown what the participant thought when marking the method. So the researcher has defined the methods and how they can be performed in the most effective and objective way possible.

These implemented guidelines will provide direction to educators and organizations to assess registered nurses’ competency with definitions and behavioral expectations of critical care educators and critical care nurses. While this study was examining critical care educators, these educators could not be reflective of the critical care educators as a whole since the group size was only 72 for most of the survey questions. Also, this study demonstrated that there was statistical significance with educators with over 6 years’ experience. This proposes a problem if the educators are in their role less than this amount of time. The guidelines will then not only have to provide a structure of how to evaluate but also mentor them in their role as an educator.
Stage 4: Integration

Integration involves changing both individual and organizational practices through formal and informal channels (Stephens, 2015). Integration of the guidelines and recommendations fortunately doesn’t require equipment or upfront costs to develop the evaluation tools. The costs, though, will include being able to evaluate the staff nurse in the simulated environment, which will require taking the nurse off the floor while still paying for their time. For many organizations, this effect on productivity could be unacceptable, so it will require the educator to be creative in how to accomplish this evaluation (Nagle, McHale, Alexander, & French, 2009). These costs, whether it is equipment, staff pay, or other operational expenses, can be anticipated and not create prohibitive increases. Research demonstrates that simulation positively impacts patient safety and outcomes. Integration also requires the organization to be consistent in the implementation of the guidelines, provide educators support, and hold educators accountable to implement the guidelines.

To implement this in one organization, it is recommended that the guidelines are reviewed with all educators as well as the simulation department to understand the scenarios that will be used so everyone will has the same understanding of what they are examining in the simulation environment. Using the Stevens Star Model of Knowledge Transformation, gaining organizational support, including administration, will be better accomplished if the evidence summary is shared with them, including the cost benefits. The scenarios, involving the deteriorating patient, will include the first five minutes of a code; a patient with pneumonia that deteriorates into acute respiratory failure and a deteriorating condition that is occurring in that organization that needs to be addressed. These three scenarios were selected by the researcher based on the literature and current practice as there was nothing in the literature regarding the
length, type, or structure of these scenarios. For the method of direct performance, the educators and managers should meet to discuss the guidelines and tools so that everyone has the same understanding of what is being measured. This process will involve developing rubics and determining interrater reliability with the educators using the rubic containing specific criteria/behaviors that can be checked off. At the end of the year, there should be a debriefing meeting with all involved to review what went well, and what didn’t. Those involved would include the educators, the researcher, and administration of the hospital. The discussion would then occur of what modifications or refinements need to occur, as well as feasibility of using the methods for evaluation. There will be a statistical analysis of the methods as done with this study such as descriptive statistics to determine if perceived effectiveness increased and if the same methods should be used in the future.

**Stage 5: Evaluation**

To successfully complete the fifth stage, evaluation, a broad array of endpoints and outcomes are evaluated (Stephens, 2015). In order to evaluate this translation into practice, a number of hospitals will need to implement the practice guidelines and participate in the “debriefing” to determine the effectiveness of the guidelines. Initially, these organizations will be selected using a convenience sample as the researcher would like to lead the evaluation meetings, the number determined by a power analysis. After the above post processes have been performed, then the outcomes will be established from the educator point of view – did the guidelines and tools provide a method to evaluate the staff nurse in an effective and an objective manner? Was the purpose and objectives clear? Were these the best methods in how to evaluate a staff nurse’s competency? Can these methods evaluate other competencies in addition to the deteriorating patient? These questions are in addition to the post processes already described.
Each of the organizations will answer these questions to determine any revisions with the guideline and tools with the ultimate goal of having a valid and reliable tool to be used by educators. This is timely as there is an increased emphasis on competency from accrediting organizations and this topic is becoming more of a focus in how is it being performed.

**Summary**

The advantage of using the Stevens Star Model of Knowledge Transformation is many for translating this study into practice. Of the five stages, three of them significantly contributed to the process. Stage 2 – evidence summary - assisted in integrating and condensing all of the evidence. This allowed this researcher to format the evidence into a product that allowed assessment of sameness and explain variation. When performed systematically, which is the goal of this translation, Stage 3 assists in constructing guidelines and tools that can be articulated and reproducible. The evaluation that occurs in Stage 5 allows the knowledge gained to become Evidenced Based Practice. The eventual goal is that the developed guidelines and tools become a standard in organizations. In summary, the Stevens Star Model of Knowledge Transformation serves as an acceptable and appropriate framework to translate the types of methods used and the effectiveness of those methods into a structured way for educator to perform their role in evaluating competency.
Article 3 Diagram 1 – Stevens Star Model of Knowledge Transformation
Bibliography

Agency for Healthcare Research and Quality. (2012). Retrieved from


doi:10.1097/SIH.0b013e3181a9dd84


National Council of State Boards in Nursing. (March, 2007). *PR&E Committee Faculty Shortage Survey*. Retrieved from https://www.ncsbn.org/07_Final_Faculty_Qualifications.pdf#page=1&zoom=auto,0,792


doi:10.1016/j.aucc.2009.05.002


