

FACTORS THAT INFLUENCE NURSES' CLINICAL JUDGMENT DURING EPISODES
OF ACUTE PHYSIOLOGIC PATIENT DETERIORATION

By
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Susan Christianson Dresser
M.S.N., Duke University, 1989
B.S.N. University of North Carolina 1977

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Co-Chair: Cynthia Teel PhD, RN, FAAN

Co-Chair: Jill Peltzer, PhD, RN, APRN-CNS

Member: Heather Nelson-Brantley, PhD, RN, CCRN-K

Member: Danielle Olds, PhD, MPH, RN, CIC

Member: Jessica Williams, PhD

Date Defended: April 30, 2019

The Dissertation Committee for Susan Christianson Dresser
certifies that this is the approved version of the following dissertation:

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Co-Chair: Cynthia Teel PhD, RN, FAAN

Co-Chair: Jill Peltzer PhD, RN, APRN- CNS

Date approved: May 17, 2019

Abstract

Each day in hospitals across the United States patients experience serious adverse events such as a cardiopulmonary arrest, unexpected admission to the intensive care unit, or unanticipated death. Many of these events occur on medical and surgical units and are preceded by a period of demonstrated warning signs of physiologic deterioration. Acute physiologic deterioration is characterized by abnormalities in one or more physiological measures such as blood pressure, heart rate, respiratory rate or level of consciousness. Unfortunately, the clinical warning signs indicating deterioration are sometimes missed, unrecognized, or mismanaged. Despite widespread efforts to improve early detection and management of acute physiological deterioration, substantial problems persist in hospitals across the United States. Noticing that a patient problem exists is the basis on which nurses' clinical reasoning, clinical judgment and decision-making rest according to the Clinical Judgment Model by Christine Tanner. Failing to notice, interpret, or respond appropriately to deterioration can have serious consequences for patients. Little is known, however, about the factors that influence the registered nurse's ability to notice, interpret, and respond to the clinical signs of deterioration. The purpose of this qualitative descriptive study was to identify nurses' descriptions of factors that influence their ability to notice, interpret, respond and reflect on situations of acute physiologic patient deterioration. Twenty medical-surgical RNs from an academic medical center in the South Central region of the United States volunteered to participate in semi-structured telephone interviews about their experiences with acute patient deterioration.

Eight themes and 18 subthemes emerged during data analysis as being important to nurses' clinical judgments. An overarching theme that cut across all components of clinical

judgment (i.e., noticing, interpreting, responding and reflecting) also was revealed: Nurses' Keen Sense of Responsibility.

Within the component of noticing three themes were identified: knowing the patient, experience matters, and lots of small points where the system can fail. Two themes were identified in the clinical judgment component of interpreting: making sense of the data and, something doesn't go together. Within the component of responding three themes were identified: caught in the middle, culture of teamwork, and increased nursing workload.

Two themes were identified that showed participants' reflections on situations of acute deterioration: *I always remember*, and *lessons learned*. Participant recommendations for improving the response to a deteriorating patient were grouped into three themes: *know your patient, be prepared, and trust your gut*.

Findings of this study revealed mixed support for Tanner's Clinical Judgment model during situations of acute physiologic patient deterioration. An underlying premise of the model is that clinical judgments are influenced by individual characteristics and pre-established perspectives of the nurse. These perspectives are informed by various types of knowledge, including the nurse-patient relationship. These perspectives influence nurses' "initial grasp" of a situation, or what is noticed. The results of the present study support the influence of the nurse's background knowledge on clinical judgments. The results of this study also support the model's proposal that nurses who have a stronger nurse-patient relationship are likely to notice changes of deterioration earlier. The second underlying premise of the model is that clinical judgments are influenced by the context in which the situation occurs, and the culture of the nursing unit. This premise was also supported by the findings of the present study. According to the model, clinical judgment situations trigger nurses to use one or more reasoning strategies to interpret the meaning

of data. The findings of this study revealed that nurses used different reasoning strategies such as intuition, recognizing similar situations, and hypothesis testing in order to understand the situation. A finding that did not support the clinical judgment model was in the area of reflection. Nurses in the present study did not demonstrate reflection-in-action. Reflection-on-action was observed through the stories that demonstrated looking back on the experience and gaining knowledge for future situations.

The findings of the current study indicate that nurses' clinical judgments (noticing, interpreting, responding, and reflecting) are much more iterative than is depicted by the description of the model. This finding suggests the need for refinement in the model. A significant new finding from this study was the role that nurses' sense of responsibility played in influencing clinical judgment. This theme demonstrates how participants' professional and personal values regarding caring and patient responsibility affected how they performed during their experience of caring for a patient who was deteriorating. Nursing hand-off report at transitions of care also was identified as a key opportunity for improving nurses' ability to notice early signs of deterioration. Findings from this study revealed important considerations for future research in the areas of transitions of care and patient hand-off, nurses' perspectives on and practice of conducting patient assessments, nurse' autonomy and relationship with physicians, and the practice of taking vital signs.

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CHAPTER 1: INTRODUCTION

Each day in hospitals across the United States patients experience serious adverse events (SAE) such as a cardiopulmonary arrest (CPA), unexpected admission to the intensive care unit (ICU), and unanticipated death (Chen et al., 2015; Mozaffarian et al., 2014). Most (60%-80%) of these events are not sudden, isolated occurrences but rather are preceded by warning signs in the form of physiologic abnormalities indicating deterioration (Andersen et al., 2016; Ludikhuizen, Smorenburg, de Rooij, & de Jonge, 2012). These warning signs represent acute physiologic deterioration (APD), which can be identified by abnormalities in levels of consciousness and in physiologic measures such as blood pressure (BP), heart rate (HR), respiratory rate (RR), and oxygen saturation (SO₂) (Lavoie, Pepin, & Alderson, 2014; Ludikhuizen et al., 2012; Odell, 2014). Although data suggest that physiologic abnormalities commonly precede these serious adverse events, indicators of deterioration are often missed, unrecognized, or ineffectively managed (Boniatti et al., 2014; Ludikhuizen et al., 2012; Odell, 2014). When deterioration occurs, nurses are sometimes unaware, or have delayed recognition or response (Adelstein et al., 2011; Sankey, McAvay, Siner, Barsky, & Chaudhry, 2016). Factors that influence nurses in noticing physiologic abnormalities are not well understood.

According to Tanner (2006), noticing a change in a patient's condition is a foundational component of nurses' clinical judgments or conclusions regarding a patient's problems. Identifying factors that influence nurses' ability to notice in emergent situations of acute physiologic patient deterioration is needed. Knowledge of these factors may contribute to changes in nursing practice, which could potentially improve patient outcomes. To date little is known about the factors that influence nurses' noticing, interpreting, and responding, or the

clinical judgment surrounding acute physiologic deterioration. This study sought to describe factors that influence clinical judgment.

Background and Significance of Physiologic Deterioration

Approximately 200,000 adults are treated for a cardiopulmonary arrest each year in hospitals across the United States (Go et al., 2014; Merchant et al., 2011) and as many as 75% of them do not survive (Morrison et al., 2013). Physiologic abnormalities have been documented prior to approximately 60%-80% of events such as a cardiopulmonary arrest, sudden death, or unexpected admission to the ICU (Andersen et al., 2016; Ludikhuize et al., 2012). Early detection of signs of deterioration and appropriate response is important for patient outcomes (Churpek, et al., 2016). Given the poor survival outcomes for in-hospital cardiopulmonary arrest (Girotra et al., 2012; Tran et al., 2016), the need to respond early to patients with warning signs of physiologic abnormality is compelling.

In patients with demonstrated physiologic abnormalities, a failure to respond at the first sign of physiologic change constitutes a failure to rescue and may result in a serious adverse event (Churpek et al., 2016; Devita et al., 2006). Failure to rescue refers to a clinician's inability to save a patient's life after the development of a complication (Clarke & Aiken, 2003; Silber, Williams, Krakauer, & Schwartz, 1992). Failure to notice and respond to these physiologic abnormalities in a timely manner can lead to extended lengths of hospitalization, disability, or death (Chen et al., 2015; Meester, Bogaert, Clarke, & Bossaert, 2012). Delays in response also have been shown to be independently associated with an increase in unplanned admission to the ICU (Chen et al., 2015) and death (Boniatti et al., 2014; Chen et al., 2015). This period of unrecognized physiological deterioration is an opportunity for intervention that could improve the safety of hospitalized patients. If episodes of acute deterioration are identified and corrected

early, patient safety and outcomes may improve. While not all severe adverse events are preventable, the timely recognition of patients at risk for severe adverse events, as well as the escalated nursing response in these situations clearly needs to improve.

As the first line care providers in hospitals, the nursing response to indicators of deterioration is a substantial patient safety opportunity (Chen et al., 2015). Appropriate nursing response has been found to occur anywhere from 1 to 48 hours after physiologic abnormalities are first documented (Boniatti et al., 2014; Sankey, McAvay, Siner, Barsky, & Chaudhry, 2016; Trinkle & Flabouris, 2011). Delays in response are particularly problematic on medical and surgical units (Adelstein et al., 2011; DeVita et al., 2010; Ludikhuizen et al., 2012). Delays are attributed to factors such as increased nursing workload, patient acuity, and use of unlicensed assistive care providers (Guinane, Bucknall, Currey, & Jones, 2013; Sankey et al., 2016). Rescuing a patient from further deterioration requires the early recognition of the indicators of deterioration (eg. vital sign changes) appropriate intervention, and mobilization of resources to prevent a patient's death (Clarke & Aiken, 2003). Embedded within the actions of intervening and mobilizing resources is nursing clinical judgment.

Calculating the incidence of vital sign abnormalities that progress to a severe adverse event is difficult because not all patients who demonstrate abnormal vital signs deteriorate to that degree, nor are all abnormalities documented and reported (DeVita et al., 2010; Fagan, Sabel, Mehler, & MacKenzie, 2012). Some patients exhibit physiologic abnormalities and do not deteriorate further. In a prospective study of 6300 hospitalized adults by Buist and colleagues (2004) approximately 9% of patients admitted to general hospital wards developed serious clinical abnormalities such as bradycardia, tachypnea, hypotension, or decreased level of consciousness during their hospitalization. Although most (67%) patients improved

spontaneously or with treatment on the nursing unit (22%), 26% of the patients with abnormal vital signs subsequently died (Buist et al., 2004). The mortality rate included patients who had a pre-existing 'do not resuscitate' order at the time vital signs were obtained.

Fuhrmann and colleagues (2008) conducted a prospective observational study on patients in general wards at a Denmark hospital to determine staff awareness of patients at risk for an adverse outcome. During the two-month study period 877 patients were included in the study and 155 (18%) of these patients were observed to have abnormal vital signs. In-hospital mortality was significantly higher ($p = 0.003$) in patients with abnormal vital signs compared to patients in the study who had normal vital signs. Similarly, 30-day, and 180-day mortality was significantly higher ($p < 0.001$) in the patients with abnormal vital signs.

Similarly a prospective multi-center observational study of 1,688 patients (adult and children) admitted to non-ICU units revealed that 1 in 30 patients demonstrated physiologic abnormalities warranting an escalated response in a single set of vital sign measurements (Bucknall, Jones, Bellomo, & Staples, 2013). Similar to the previous studies patients that demonstrated physiologic abnormalities had a significantly increased risk of death ($p=0.005$).

Organizational Initiatives and Patient Deterioration

In response to the evidence of a failure to rescue acutely deteriorating patients, the Institute of Medicine (IOM) challenged hospitals to reduce the number of avoidable deaths and adverse events (Kohn, Corrigan, & Donaldson, 1999). This charge, combined with recommendations put forth by the Institute for Health Care Improvement (IHI) (Berwick, Calkins, McCannon, & Hackbarth, 2006) and The Joint Commission (TJC), provided incentive for the implementation of several patient safety initiatives in hospitals across the country. In 2004 the IHI launched the 100,000 Lives Campaign to reduce mortality and morbidity in

hospitals across the United States through the implementation of six interventions. One key campaign recommendation was for hospitals to develop and implement rapid response teams (RRT). In 2008 the Joint Commission on Accreditation of Healthcare Organizations released a National Patient Safety Goal calling for improved methods for the recognition and response to changes in a patient's condition (The Joint Commission, 2009). Hospitals were asked to provide a suitable method to help nurses and other staff members directly request additional assistance from specially trained individuals when a patient's condition appeared to be worsening.

The concept of a Rapid Response System (RRS), the more global term, was proposed as a method to detect and treat hospitalized patients demonstrating acute clinical deterioration and reduce the occurrence of adverse events (Berwick et al., 2006; D. Jones, DeVita, & Bellomo, 2011). Standard cardiac arrest or "code blue" teams are called in situations of a cardiopulmonary arrest. In contrast, the RRS combines a method for early recognition of patients at risk for deterioration, a mechanism for early notification of an identified set of emergency health care responders, and rapid response intervention by a team of critical care specialists before an arrest occurs (Jones et al., 2011).

The RRS refers to a system of care that typically includes four components (Jones et al., 2011). The first component of the RRS is designed to help nurses identify clinical deterioration in patients and trigger a response. The second component is the response, which includes the trained personnel and equipment that respond to the patient's bedside to prevent further deterioration. The third component is the monitoring and analyzing data from events for the purposes of improving patient safety and quality. The fourth component is the administrative oversight that coordinates resources (Devita et al., 2006; Jones et al., 2011).

Within the RRS, hospitals have developed several variations of response teams to bring critical care expertise to the bedside of a deteriorating patient. The most commonly known teams are the Medical Emergency Team (MET), Rapid Response Team (RRT), and the Critical Care Outreach Team (CCO)(Devita et al., 2006). Regardless of team member composition, competencies, or structure, criteria for team activation are similar. Generally any member of the health care team can activate the system according to preset criteria. Typical activation criteria are: acute changes in heart rate (<40 or >140 beats/minute), systolic blood pressure (<90mmHg), respiratory rate (<5 or >36 breaths/minute), level of consciousness, oxygen saturation (<90%) and generalized nursing concerns about the patient's condition (Boniatti et al., 2014; Jones et al., 2011). Bedside nursing staff are directed to activate the RRS when a patient meets any of these predetermined criteria (Jones et al., 2011).

Evaluation of the impact of RRSs on patient outcomes are inconsistent, and meta-analyses are inconclusive (Chan, Jain, Nallmothu, Berg, & Sasson, 2010; Karpman et al., 2013). Robust evidence to support the effectiveness of RRSs in reducing patient mortality is lacking (Chan et al., 2010; Chen et al., 2015). Because randomized controlled trials may be difficult or inappropriate to study the impact of an RRS on patient mortality, many of the studies have used a before and after implementation design, which is prone to bias due to possible variations in the patient population and in the provision of care over time. The literature indicates that nurses value the RRS and generally believe it to be beneficial in managing unstable deteriorating patients (Bagshaw et al., 2010). However, sometimes nurses do not activate the RRS when their patients demonstrate clear signs of physiologic deterioration (Braaten, 2015; Pantazopoulos et al., 2012). Inconclusive findings to support the benefit of the RRS may thus be due to study designs or to continued widespread delays that occur in activating the RRS in situations of

patient deterioration (Adelstein et al., 2011; Chen et al., 2015; Shearer et al., 2012). These findings suggest that factors associated with underutilization of the RRS are not clearly understood.

Track-and-trigger tools, commonly known as early warning systems (EWS) are another widely implemented hospital patient safety initiative that can help identify patients at risk for a serious adverse event (Morgan, Williams, & Wright, 1997). Early warning system scores were designed to assist hospital staff to recognize early signs of clinical deterioration and trigger a higher level of care such as increased nursing surveillance, notification of the physician, or activating the RRS (De Meester et al., 2013; Smith et al., 2014).

Track and trigger tools help nurses track physiologic parameters such as BP, HR, RR, SO₂, and level of consciousness, assign a weighted score to each measured value, and, finally, trigger a nursing response depending upon the score (Gao, Harrison, & Adam, 2006; Smith, Prytherch, Meredith, & Schmidt, 2015). Points assigned to each parameter are based on the degree of abnormality from normal ranges observed in each of these variables with higher points and higher total sums of the points being associated with an increased risk of an adverse event such as a CPA, death, or an unanticipated transfer to the ICU (Alam et al., 2014; Smith et al., 2014). The total summed score is used to direct and escalate nursing care, which might include increasing the frequency of vital sign monitoring, consulting with more experienced staff, or activating the rapid response system (Odell, 2014; Stewart, Carman, Spegman, & Sabol, 2014; Watson, Skipper, Steury, Walsh, & Levin, 2014).

The impact of EWS scores on patient outcomes, such as in-hospital mortality, patterns of ICU admission and use, cardiac arrest and other adverse events is mixed (Alam et al., 2014). The EWS performs reasonably well in predicting cardiac arrest and death within 48 hours of

measurement (Smith et al., 2014), however, the impact of a EWS on patient mortality is less clear (Bokhari et al., 2010; Moon, Cosgrove, Lea, Fairs, & Cressey, 2011; Peris, Zagli, & Maccarrone, 2012)

The EWS is reportedly simple and easy to use at the bedside, however, investigators report inaccuracy and compliance in scoring (Jonsson, Honsdottir, Moller, & Baldursdottir, 2011; Odell, 2014; Tirkkonen et al., 2013). Sometimes scores are miscalculated because vital sign parameters such as respiratory rate or level of consciousness are missing and sometimes the total score is totaled incorrectly (Cherry & Jones, 2015; Watson et al., 2014). In each of these scenarios, the total score is lower than it should be, reflecting an inaccurate physiologic picture of a patient's condition. Having lower scores might influence nurses' recognition and timely response.

In summary, patient safety initiatives such as systems of rapid response and early warning are part of most hospitals' approach to early identification and management of deteriorating patients. Unfortunately, evidence to determine the effectiveness of these systems in reducing hospital mortality, unplanned ICU admission, length of hospital stay, and adverse events remains inconclusive (Alam et al., 2014; McGaughey et al., 2007; Smith et al., 2014). Experts suggest that these ambiguous findings may be due in part to inconsistencies in activating the team or underutilizing the systems (Chan et al., 2010; DeVita et al., 2010). The effectiveness of these initiatives is complex and depends largely on nurses' ability to notice physiologic changes in a patient, make sound clinical judgments, and respond with appropriate calls for assistance. Despite implementation of these measures, delays from the onset of clinical deterioration to an appropriate response continue to occur (Boniatti et al., 2014; Sankey et al., 2016).

Response to patient deterioration has been investigated from various perspectives in an attempt to reduce delays and prevent serious adverse events (Boniatti et al., 2014; Braaten, 2015; Calzavacca et al., 2010). Studies to date have focused primarily on the impact of systems of rapid response and early warning on patient outcomes (Alam et al., 2014; McNeill & Bryden, 2013), response times (Adelstein et al., 2011; Chen et al., 2015), and problems surrounding escalation of care (Braaten, 2015; Johnston, Arora, King, Stroman, & Darzi, 2014; Tirkkonen et al., 2013). The outcomes of systems of rapid response and early warning on patient outcomes such as unexpected cardiac arrest, unscheduled ICU admission, and hospital survival, are mixed (Alam et al., 2014; McNeill & Bryden, 2013). Delays in response to patient deterioration are common, with medical intervention occurring anywhere from one to 48 hours after deterioration is first observed (Adelstein et al., 2011; Chen et al., 2015). Failure to identify early indicators of deterioration has serious consequences for patients with adverse events such as cardiac arrest, admission to an ICU, or death (Alam et al., 2014; Tirkkonen et al., 2013).

Understanding factors contributing to delayed response is incomplete, with numerous and complex reasons being given including incorrect or infrequent patient assessments and documentation of vital signs, lack of awareness of the deterioration, organizational culture, and hesitation to activate the RRS (Adelstein et al., 2011; Braaten, 2015; Johnston et al., 2014; Tirkkonen et al., 2013). While some explanations for delays have been identified, a gap in the research includes identifying factors within the context of acute physiological deterioration that influence nurses' recognition and response to deterioration. No study has identified nurses' perspectives of the factors that negatively influence their ability to notice patient deterioration. While multiple problems have been revealed, the understanding of factors that influence nurses'

ability to notice and respond to deterioration is incomplete and therefore further research is needed.

Nurses' Role in Patient Deterioration

In the acute care hospital setting, registered nurses provide an around-the-clock presence to monitor, recognize risks, evaluate, and respond to early signs of a complication or changes in a patient's condition. This nursing surveillance is characterized by ongoing patient observations combined with the collection of data from multiple sources over time (Kelly & Vincent, 2011; Kutney-Lee, Lake, & Aiken, 2009). Surveillance includes the application of cognitive processes such as clinical reasoning and clinical judgment, and behavioral activities to monitor a patient's status (Clarke & Aiken, 2003; Kutney-Lee et al., 2009).

These cognitive and behavioral processes occur in highly complex clinical environments characterized by complicated illnesses, frequent task switching, unpredictability, interruptions, uncertainty, risk, and time pressure (Burger et al., 2010; Cornell, Riordan, Townsend-Gervis, & Mobley, 2011; Sorensen & Brahe, 2014; Tower & Chaboyer, 2014). The nurse's skill in managing complex care environments affects the outcomes and safety of patients (Blackman et al., 2014; Ebright, 2014; Kalisch, Landstrom, & Hinshaw, 2009). A nurse's ability to recognize changes in a patient's condition can be challenged by environmental complexity in part due to the substantial increase in cognitive load which can impair clinical reasoning processes, clinical judgment and decision-making performance (Choi, van Merriënboer, & Paas, 2014; Cornell et al., 2011; Ebright, Kookan, Moody, & Latif Hassan AL-Ishaq, 2006).

For nurses working on medical and surgical units the challenge is even greater. Routine patient assessments occur less often (compared to areas such as the ICU, emergency department, or operating room), patients may be unmonitored for long periods of time, nurse to patient ratios

are higher, and typical patients are burdened by age, multiple comorbidities, and complex medical conditions (Jaderling et al., 2013; Odell, 2014). Although the link between hospital environment complexity and the cognitive work of nurses has not been investigated extensively, findings suggest that contextual factors might impact nurses' overall clinical judgment (Burger et al., 2010; Grundgeiger, Sanderson, MacDougall, & Venkatesh, 2010; Kalisch et al., 2009).

A number of studies have been conducted to gain an understanding of the nursing response to patients who are experiencing acute deterioration (Astroth, Woith, Stapleton, Degitz, & Jenkins, 2013; Bagshaw et al., 2010; Braaten, 2013). Most of this research is qualitative, descriptive, and retrospective in design and can largely be divided into four main categories. Categories include studies that focus on nurses' experiences in caring for a deteriorating patient (Chua, Mackey, S., & Liaw, 2013; Cioffi, 2000a; Cox, James, & Hunt, 2006), studies that assess compliance with EWS scoring protocols and vital sign monitoring (Mok, Wang, & Liaw, 2015; Odell, 2014), studies that identify barriers and facilitators to using the RRS (Astroth et al., 2013; Braaten, 2015), and studies that identify the clinical indicators nurses use to identify deterioration (Cioffi, 2000b; Cioffi, Conway, Everist, Scott, & Senior, 2009).

Barriers to using the RRS appropriately include nurses' beliefs and attitudes towards the team, unit culture, social rules, and the need to justify the call (Astroth et al., 2013; Bagshaw et al., 2010; Shearer et al., 2012; Stewart et al., 2014). Knowing the patient over time and within the context of their illness has been demonstrated as an important factor in helping nurses recognize changes (Chua et al., 2013; Gazarian, Henneman, & Chandler, 2010; Minick & Harvey, 2003). Several studies report the influence of nurses' experience on decisions to activate the RRT. While some support the positive influence of years of experience on willingness to activate (Gazarian et al., 2010; Wynn, Engelke, & Swanson, 2009) others have

found that experienced nurses were less likely to escalate a call for assistance (Astroth et al., 2013; Pantazopoulos et al., 2012).

Patient characteristics that nurses use in determining patient acuity have also been identified (Douw et al., 2015; Rattray et al., 2011). Nurses recognize signs indicating patient deterioration using a combination of visual, tactile, and auditory indicators (Gazarian et al., 2010; Rattray et al., 2011). Nurse also rely on an intuitive sense that a patient is not doing well (Douw et al., 2015) and may use vital sign measurements to confirm that a patient is deteriorating (Odell, Victor, & Oliver, 2009). Many indicators of deterioration are obtained through patient observation and monitoring of vital signs. However, as previously mentioned important gaps in the measurement and documentation of vital signs and the communication of abnormal observations have been found (Considine, Trotter, & Currey, 2015; Ludikhuizen et al., 2012).

Few investigators have examined situations of acute patient deterioration from the perspective of nurses' clinical judgment (Cioffi, 2001; Parker, 2014; Rattray et al., 2011). Because assessing nurses' clinical judgments in real world situations is problematic, most investigators used simulation (Thompson et al., 2009; Thompson, Yang, & Crouch, 2012; Yang & Thompson, 2011) or focused on nursing students (Cooper, Cant, Bogossian, Bucknall, & Hopmans, 2015; Lavoie, Cossette, & Pepin, 2016; Lindsey & Jenkins, 2013) instead of clinical deterioration as it is occurring with nurses in practice and real patients. Other investigators examined *decision making* with clinical deterioration (Cioffi, 2000a, 2000b, 2001; Gazarian et al., 2010; Minick & Harvey, 2003; Parker, 2014). However, few studies were found that identified factors that influence recognizing or *noticing* clinical deterioration and none were found that identified factors that negatively influenced *noticing*. Since noticing is an integral

precursor for clinical judgement, exploring factors that influence nurses' ability to actually notice a patient's changes is critical.

Theoretical Perspectives

The thinking processes used by nurses during decision making and when identifying and responding to patient problems has captured the interest of nurse scholars for over fifty years. Beginning with early studies by Hammond (1964, 1966) and colleagues (Hammond, Kelly, Schneider, & Vancini, 1966; Kelly, 1964), followed by the work of Patricia Benner (1984, 2004b) and colleagues (Benner & Tanner, 1987; Benner, Tanner, & Chesla, 1997), and more recently with studies by Thompson (1999) and colleagues (Thompson et al., 2004; Thompson et al., 2008; Thompson, Doran, & Dowding, 2013; Thompson & Dowding, 2002; Thompson & Yang, 2009), a significant body of knowledge has been built.

Research attempting to understand the nature of clinical judgment and decision-making is vast, spanning multiple disciplines and embracing a number of theoretical perspectives, research traditions and methodologies. Authors have sought to describe clinical judgment and clinical decision making using a number of different concepts to describe the same phenomena. Terms such as nursing diagnosis (Carpenito-Moyet, 2006; Gordon, 1976), clinical inference (Hammond, 1966; Hammond et al., 1966), clinical judgment (Itano, 1989; Tanner, 1998, 2006), clinical reasoning (Murphy, 2004; Simmons, 2010b), diagnostic reasoning (Su, Osisek, & Starnes, 2005) and decision-making (Banning, 2008b; Thompson, 1999; Thompson et al., 2013; Thompson & Dowding, 2002) have all been used interchangeably to describe the same general phenomena. Adding to this confusion is the fact that clinical judgment has been viewed as both a process and an outcome of critical thinking and the clinical reasoning process as well as a

decision. Because of these inconsistencies the literature on clinical decision making and clinical judgment is difficult to interpret.

There is a substantial body of literature and theoretical perspectives related to decision making and clinical judgment. The model of clinical judgment was selected as the theoretical model in the present study because it is proposed to account for the complexity of clinical judgment in nursing and the factors that influence it (Tanner, 2006). This model was developed based on an extensive critique of nursing literature over several decades. The model is believed to reflect the processes and practice of clinical judgment in nursing practice where situations are complex, constantly changing and typically associated with ambiguity. Tanner's (2006) model of clinical judgment (CJM) provides the conceptual framework that guided this study because of its applicability for nurses during situations of patient deterioration (Figure 1).

The Clinical Judgment Model

Clinical judgment is defined as an “interpretation or conclusion regarding a patient’s needs, condition, or problems and /or the decision to take action (or not), to use or modify standard approaches, or improvise new ones as deemed appropriate by the patient’s response” (Tanner, 2006, p. 204). Clinical reasoning refers to the cognitive processes used by nurses to arrive at a clinical judgment (Tanner, 2006). Based on three decades of work and an analysis of almost 200 studies Tanner (2006) conceptualized clinical judgment as the flexible and ongoing processes of noticing, interpreting, responding, and reflecting. The CJM describes the processes used by nurses when faced with complex, ambiguous, and conflicting clinical situations commonly seen in acute care nursing environments. Although the CJM wasn’t developed specifically for this purpose it is useful in describing the clinical judgments of nurses when recognizing and responding to situations of patient deterioration.

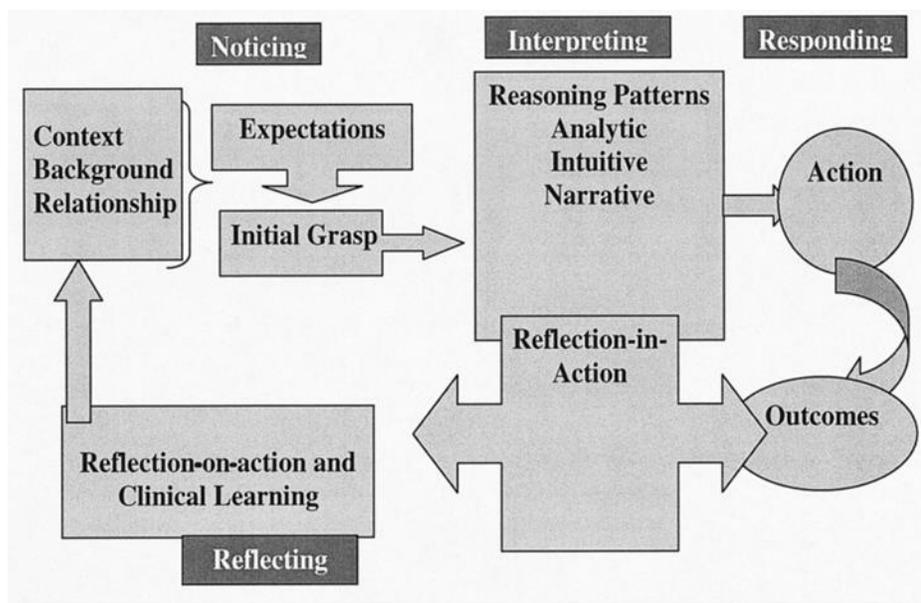


Figure 1. Clinical Judgment Model (Tanner, 2006, p. 208).

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Conclusions that Contributed to the Clinical Judgment Model

Tanner's review of the literature led to five conclusions about clinical judgment in nursing that were foundational to the development of a model that describes the ongoing processes nurses use to reach a clinical judgment and the variables influencing those processes.

These conclusions are (1) clinical judgments are influenced more by what a nurse brings to a situation than objective information available; (2) clinical judgment comes from knowing the patient and his or her typical responses and his or her concerns; (3) clinical judgment is influenced by the context of the culture or environment in which nursing care is provided; (4) clinical judgment results from a variety of reasoning patterns rather than a singular reasoning method; and (5) reflection on practice is often triggered by a breakdown in clinical judgment and is critical for developing clinical judgment to be used in future situations (Tanner, 2006).

Aspects of the Clinical Judgment Model

The circular processes in Tanner's (2006) model begin with *noticing*. Context, background knowledge, and relationship establish *noticing*, which is described as a nurse's awareness of salient elements within a clinical situation (Tanner, 2006). Noticing is the ability to recognize deviations from patient baseline conditions and is an essential component of nursing surveillance (Kutney-Lee, Lake, & Aiken, 2009). A nurse's clinical judgments are strongly influenced by the background of different types of knowledge a nurse has; knowledge that is obtained through formal education, science, and theory, clinical knowledge that develops over time with experience, and knowledge gained through knowing an individual patient (Tanner, 2006). Knowledge gained through experience with similar situations will facilitate an experienced nurse to quickly recognize critical aspects of a situation and respond based on having an immediate grasp of the situation (Benner, Hughes, Sutphen, 2008; Cioffi, 2000, Dreyfus & Dreyfus, 1986; Tanner, 2006). The influence of experience in determining what a nurse notices and perceives as relevant in clinical situations has also been described by Patricia Benner (2009) and colleagues (Benner & Tanner, 1987).

The four primary, interrelated aspects of clinical judgment are noticing, interpreting, responding and reflecting. All four aspects are situated within the context, background, and relationships of a situation, demonstrating the social embeddedness of the process. According to Tanner (2006) nurses' clinical judgments rely on theoretical and experiential knowledge and the ability to recall and apply this knowledge while progressing through the four interrelated aspects of clinical judgment. Contextual factors surrounding the situation, the nurse's background knowledge, and relationship with the patient are presented as foundational to reaching accurate clinical judgments (Tanner, 2006).

Tanner (2006) suggested that a nurse's relationship with and knowledge of the patient as a person and the patient's typical patterns of response is essential to skilled clinical judgment. Knowing the patient refers to how nurses understand a patient, grasp the meaning of a situation for the patient, and recognize the need for a specific responsive nursing action to changes (Tanner, 2006; Tanner, Benner, Chesla, & Gordon, 1993). Nurses describe clinical judgments that require individualizing courses of action based on a thorough understanding of how a particular patient responds under certain circumstances (Tanner, et al. 1993). This synthesis of nursing knowledge establishes the expectations a nurse brings to a patient situation, and influences a nurse's ability to recognize what stands out as salient (Tanner, 2006). When a patient response or situation differs from the expectation, nurses recognize that difference as important (Dillard et al, 2009).

Tanner (2006) also concluded that a nurse's clinical judgment is profoundly influenced by contextual factors in which a situation occurs. Factors such as power differentials between nurses and physicians, level of autonomy nurses have in making clinical decisions, culture of the nursing unit, and availability of information all contribute to what is noticed in a situation. Benner, Tanner, and Chesla (1997) note that nurses' clinical reasoning and clinical judgment is enhanced through their sharing of observations and experiences with other nurses. These exchanges create a shared common understanding and is the social embeddedness of nursing knowledge.

Developing clinical knowledge over time with a specific patient population helps establish a background set of expectations and understanding that then allows the nurse to detect even subtle differences from one patient to another. In addition to the various types of knowledge that a nurse brings to a situation, a nurse's values, vision of nursing, and the context

of a situation such as the culture of a nursing unit and the complexity of the work environment also influence what stands out as a salient issue in a situation (Tanner, 2006). These factors collectively shape nurses' noticing and contribute to the development of an initial grasp of a situation, which begins with perception of what is different and salient in a clinical situation and is determined by a theoretical and experiential knowledge base and a nurse's perceptual skills (Benner, Hughes, & Sutphen, 2008).

There are four aspects of clinical grasp: making qualitative distinctions, engaging in detective work, recognizing changing relevance, and developing clinical knowledge in specific patient populations (Benner et al., 2008). Qualitative distinctions refer to those differences that can be identified within a particular context or situation. Qualitative distinctions are made through touch, sound, or sight, such as the qualities of a wound, a patient's degree of fatigue, or capillary refill. Engaging in detective work refers to the ongoing, reasoning in transition that must occur in evolving clinical situations where all necessary information may be unavailable. In these situations the nurse must remain situated and engaged with the patient and the unfolding situation, making meaning of the patient's responses, what interventions have been tried with this patient and what has - or has not - been successful (Benner, Hughes, & Sutphen, 2009).

Recognizing changing clinical relevance refers to the understanding that clinical signs and symptoms can acquire new meaning with different implications and consequences as a patient's situation improves or worsens. An example of changing relevance and how symptoms take on new meanings would be the symptom of dyspnea in a patient transitioning from acute curative care to palliative care. Noticing salient changes in a patient is the foundation for making a sound clinical judgment and responding with an appropriate nursing action regarding a patient situation (Benner & Tanner, 1987; Tanner, 2006).

Interpreting what is noticed is the next component of the CJM. After recognizing deviations in a patient's condition a nurse uses various reasoning patterns to interpret the information within the context of the patient and the situation (Kutney-Lee, Lake, & Aitken, 2009; Tanner, 1998, 2006). The selection of any one or combination of reasoning patterns used depends on the demands of the situation, the nurse's knowledge, and initial grasp of the situation (Tanner, 2006). Analytic reasoning processes such as hypothetico-deductive reasoning, intuitive reasoning, and narrative thinking are all used individually or in combination during the process of arriving at a clinical judgment. Clinical reasoning is ongoing, and occurs as the situation unfolds, with the nurse gathering additional data, and combining information to refine the initial understanding of the situation (Tanner, 2006). The initial interpretation may require further patient assessment or review of patient information from the medical record. The resulting understanding or conclusion represents a clinical judgment and a response to the situation in the form of a decision to either collect more information, intervene, or not to intervene (Tanner, 2006). Within the interpreting stage of this model the nurse decides on an appropriate course of action for the particular situation.

Responding to a patient situation is the third component of the model. Based on the nurse's interpretation of what was noticed and how the stimulus was interpreted, the nurse responds with a course of action. The nursing response might be to modify the patient's plan of care, reassess the patient, communicate with other care providers, or collect additional data. The nurse implements the course of action while continuing to observe the patient response.

Reflection is seen at the end of the model and during the processes of *noticing*, *interpreting*, and *responding*. Reflection is a process of thinking about what is happening or has happened, why it happened, and what might have been done differently (O'Donnell, Reeve, &

Smith, 2012). Reflection is depicted as an ongoing process, occurring both during (reflection-in-action) and following a clinical event or situation (reflection-on-action). Reflection-in-action is usually not verbalized, but is a subconscious self-dialogue, where perspectives and underlying assumptions within context are examined in order to make sense of a situation (Benner, Hughes, & Sutphen, 2009; Forneris & Peden-McAlpine, 2006). The nurse reflects in-action during the situation as it unfolds, incorporating the patient's response to the situation and making adjustments accordingly. Reflection on-action completes the model, occurring after reaching a clinical judgment, as the nurse consciously reflects back on the events that occurred during the situation (Tanner, 2006). Reflection-on-action promotes refinement of knowledge and is essential to the development of clinical judgment (Tanner, 2006).

Summary

In summary, the model of clinical judgment by Tanner (2006) was selected as the theoretical model for the present study because it was based on an extensive body of research on clinical judgment in nursing and relates to the phenomenon of interest in the current study. The CJM provides a description of how nurses arrive at clinical judgments in the midst of complex patient situations involving uncertainty and changes in status. The model highlights the importance of nurses' background knowledge and experience, context of a situation, and nurses' relationship with their patients as key determinants of clinical judgment. The major components of clinical judgment include noticing, interpreting, responding, and reflecting. For Tanner, noticing is the initial step in clinical judgment and is the process of perceiving what is important or salient in a situation in order for an interpretation and response to occur. The model can be summarized as the thinking-in-action processes of noticing, interpreting, responding and

reflecting during a situation requiring clinical judgment, followed by the thinking-on-action skills of reflection at the conclusion of the experience (Tanner, 2006).

Problem Statement

Nurses notice and interpret multiple pieces of clinical information to make sound clinical judgments. Clinical judgment is the basis for nursing interventions. Noticing, interpreting, responding, and reflecting are fundamental aspects of the process of clinical judgment (Tanner, 2006). In situations of acute physiologic deterioration, a nurse's clinical judgment is critical to patient safety. Clinical judgment can be compromised by factors within the nurse, the patient, or the clinical environment (Tanner, 2006). Therefore, identifying factors that influence nurses' clinical judgment in situations of acute physiologic deterioration may lead to improved patient safety.

Despite the introduction of EWS tools and RRSs, the problem of early recognition and response to acute patient deterioration has not been solved (Braaten, 2015; Bucknall et al., 2013). To date, no studies have been located that identify the factors that influence nurses' ability to *notice* salient indicators of acute physiologic deterioration. Identifying these factors may improve clinical judgment so that patient safety is improved. This gap in knowledge limits insight into strategies for improvement at the hospital, nursing unit, and nursing levels. Greater understanding of the factors that influence nurses' clinical judgment in situations of acute physiologic patient deterioration is sought in this study.

Study Purpose

The purpose of this study was to identify factors that influence the clinical judgment of registered nurses during an episode of acute physiologic deterioration in the adult patient. By exploring the experiences of registered nurses, this study proposed to fill a significant gap in the

literature related to the failure to notice and respond appropriately to warning signs of acute physiologic deterioration.

Significance of the Study

Each year approximately 200,000 hospitalized patients experience a cardiopulmonary arrest following a period of acute physiological deterioration (Go et al., 2014). Approximately 80% of these patients will not survive to discharge (Girotra et al., 2012). In episodes of acute physiologic deterioration, noticing a patient problem is the basis on which clinical reasoning, clinical judgments and decision-making rest (Tanner, 2006). Failing to notice, interpret and respond appropriately can have serious consequences with adverse events such as cardiac arrest, admission to an ICU, increased hospital length of stay, or death (Alam et al., 2014). To improve response to acutely deteriorating patients more must be learned about the factors that influence nurses' ability to notice changes, interpret the situation, and take appropriate action. This knowledge may lead to the development of new solutions aimed at overcoming those barriers and enhancing facilitators so that patient outcomes are enhanced.

Aims and Research Questions

The primary aims of this study were to describe nurses':

- a. perceptions of factors that influence clinical judgment in situations of acute physiologic deterioration in the adult patient,
- b. use of reflection in situations of acute physiologic deterioration in the adult patient, and,
- c. strategies for enhancing clinical judgment in situations of acute physiologic deterioration in the adult patient.

The research questions for this study were:

RQ1: What factors influence nurses' ability to notice, interpret, respond and reflect on situations of acute physiologic deterioration in the adult patient?

RQ2: How do nurses describe the use of reflection during and after the process of noticing, interpreting, and responding during situations of acute physiologic deterioration in an adult patient?

RQ3: What strategies would help the nurse notice, interpret and respond to cues signaling clinical deterioration?

Conclusion

Patients on medical and surgical units of acute care hospitals commonly experience episodes of acute physiologic deterioration. Nurses sometimes have trouble noticing, interpreting, and responding to these situations in a timely and effective manner. Despite the implementation of multiple patient safety strategies such as rapid response and early warning systems, failure to rescue and preventable deaths still occur in hospitals across the United States. To potentially reduce severe adverse events that can occur during situations of patient deterioration more must be known about nurses' clinical judgment.

CHAPTER 2: LITERATURE REVIEW

The purpose of this study was to discover factors that influence nurses' clinical judgment in situations of acute physiologic deterioration (APD) in the adult patient, from the perspective of nurses who have cared for patients who have deteriorated. Specifically, the aim was to identify the factors that influence nurses' ability to notice, interpret, and respond to the clinical signs of acute physiologic deterioration. An integrative review of the literature was conducted to identify what is known about this topic. Emphasis was placed on identifying and reviewing studies that investigated medical and surgical nurses' experiences in the recognition, interpretation, and response to APD. The findings of the review were organized around the major concepts within the Clinical Judgment Model (Tanner, 2006), i.e., noticing, interpreting, responding, and reflecting. Findings in each of the reviewed studies that reflected aspects of the major concepts of the CJM were then highlighted to identify themes across studies. Organizing the review within the context of this framework helped illuminate gaps in the body of knowledge of nurses' clinical judgment in situations of an acutely deteriorating patient. Identifying gaps related to noticing, interpreting and responding helped explain and justify the need for this study and support the rationale for the selected research strategy.

Search Strategy Method for the Integrative Literature Review

A comprehensive integrative review of the literature was conducted following the process described by Whitemore and Knafl (2005). This process includes focusing the search on an identified problem, searching the literature, evaluating the data, analyzing the data, and then presenting the findings. A computerized database search of the Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed, and ProQuest Dissertations was performed due to their comprehensiveness and appropriateness for this topic. The literature search was

conducted using combinations of key terms and phrases: recognition, response, deterioration, nurses, vital signs, clinical deterioration, clinical judgment, and decision making with the application of the Boolean search term AND. From the identified articles, titles and abstracts were scanned for primary selection. Using the ancestry approach reference lists of selected studies were then hand searched to identify further relevant studies. The purpose of this combination of search strategies was to ensure that as much as possible all relevant research would be identified.

Inclusion and Exclusion Criteria

Only studies that sampled nurses working on medical or surgical units of a hospital and that had an explicit focus on the recognition and response to acute physiologic deterioration of the adult hospitalized patient were included in the review. Studies must have been English-language, peer-reviewed, and published between 2000 and 2017. The time-frame was chosen to capture the work that has been done following implementation of RRSs and EWSs. Studies were considered only if they focused on medical or surgical nurses' experiences and responses to patients in acutely deteriorating situations. Studies that focused on patients in specialized units such as emergency, ICU, surgery, pediatric or psychiatric units were excluded. Studies that included nursing students were excluded. Studies that evaluated the outcomes of RRSs, EWSs, and educational programs were not included since the purpose was to uncover studies related specifically to nurses' perspectives, experiences, and role in situations of APD. Consistent with the integrative review approach no restrictions were placed on research methodology included in the review.

Characteristics of Included Studies

The initial search for literature related to the study aims resulted in a large number of studies (n=711). After application of the above inclusion and exclusion criteria, and reviewing

abstracts, 34 studies remained in the final review (Figure 2). Studies included a wide variety of methods ranging from grounded theory, phenomenology, descriptive, cross-sectional, correlational, and factor analysis. All studies pertained to registered nurses in situations of acute physiological deterioration of adult patients on medical-surgical units. The majority (n=24) of the studies were retrospective in nature. There were 16 quantitative, 15 qualitative, and three mixed-methods designs in the final studies reviewed. Studies were conducted in Australia (n=11), the United States (n=11), the United Kingdom (n=6), and one each in Belgium, Denmark, Greece, Netherlands, Singapore, and Iceland. Of the 34 studies reviewed, most (n=27) were single site studies with the remaining seven studies being conducted at multiple sites (Cioffi, 2000a, 2000b, 2001; Cioffi et al., 2009; Hart et al., 2014; Hart, Spiva, Dolly, Lang-Coleman, & Prince-Williams, 2016; Parker, 2014). Purposive sampling was used to recruit participants in the majority (n=12) of the qualitative studies. All study reports, excluding one doctoral dissertation, were published in peer-reviewed journals. Studies in the review using quantitative methods were primarily descriptive, exploratory, or correlational except for one quasi-experimental design (Cooper et al., 2013). Three of the quantitative studies reported calculating a power analysis (Hart et al., 2014; Rattray et al., 2011), of which one study was underpowered (Pantazopoulos et al., 2012).

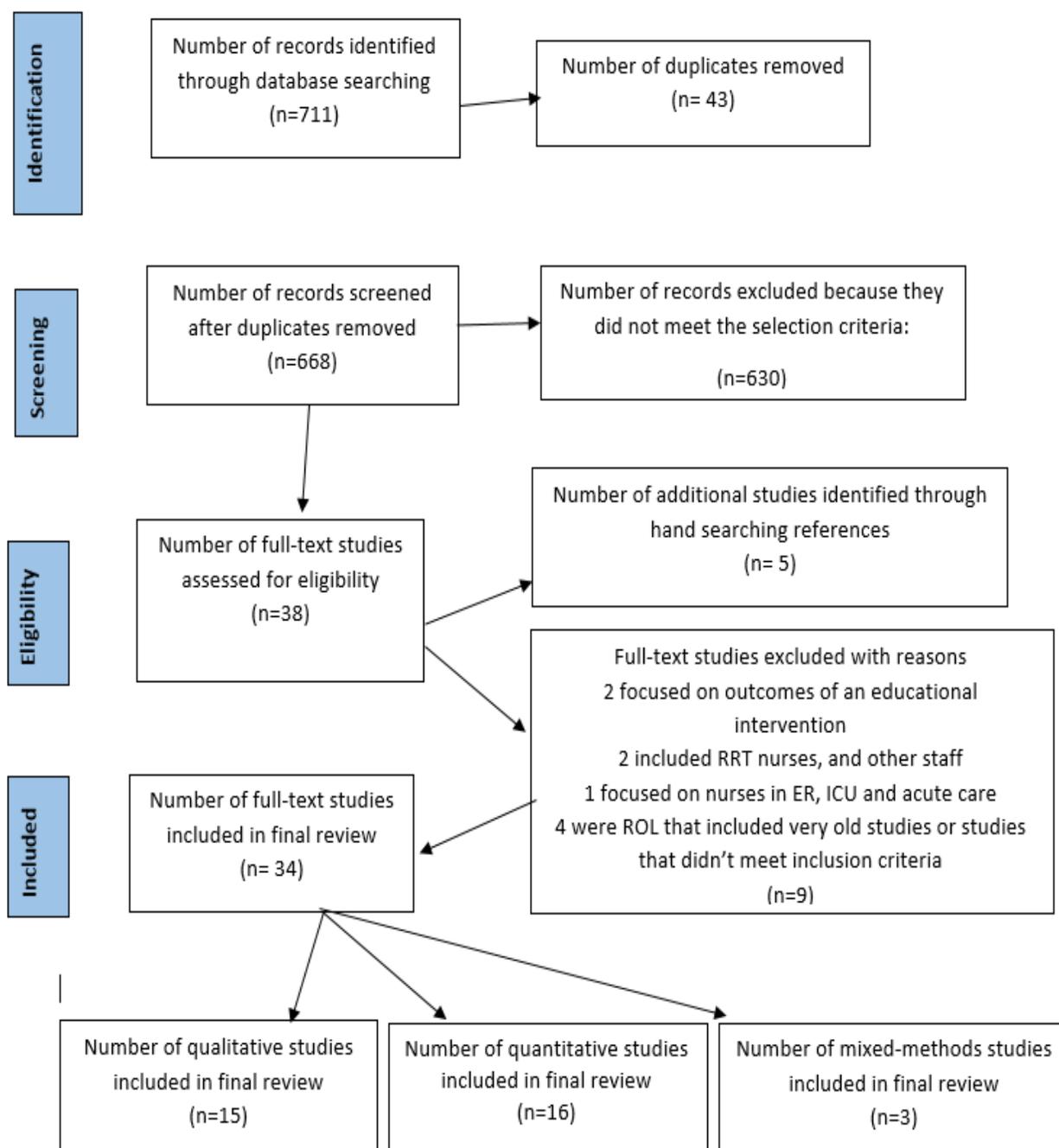


Figure 2. Flow Chart of Search Strategy

Quality Assessment

Due to the complexity in evaluating the quality of diverse primary studies in this integrative review, two methods for assessing quality were used (Whittemore & Knaf1, 2005).

Qualitative studies were evaluated for methodological rigor using a nine-item instrument developed by Hawker and colleagues (2002). This instrument includes an assessment of title and abstract, introduction and aims, method and data, sampling, data analysis, ethics and bias, results, transferability/generalizability, implications and usefulness. Each of these nine items are evaluated using a four-point scale designed to determine whether the methodological quality is good (4), fair (3), poor (2), or very poor (1) according to detailed criteria provided for each category (Hawker, 2002) (Appendix B). For example, the methods section of a study would be assessed as “good” if the method was appropriate and clearly described, and provided clear details of the data collection. The methods section of a study would be assessed as “very poor” if there was no discussion of the method, if an inappropriate method was used, or if details of the data were not presented.

Sub-scores for each of the nine items were then summed for an overall score between 9 and 36. Overall quality ratings were assigned as high quality (30-36 points); medium quality (24-29 points), and low quality (9-23 points) (Lorenc, et al., 2013). All of the qualitative studies in this review scored between medium quality (n= 4) to high quality (n=11) when scores were rounded up.

A modified version of Downs and Black (1998) revised checklist was used to assess methodological quality of the quantitative studies (Chudyk, Jutai, Petrella, & Speechley, 2009). This instrument is identified as a rigorous quality evaluation tool appropriate for all types of quantitative research and has established psychometric properties for determining quality. The checklist contains 27 questions that yield a summed score of 0 to 28, with higher scores reflecting a higher quality study. The profile of study quality is based on five subscales: reporting (10 items), external validity (3 items), internal validity-bias (7 items), confounding (6

items), and statistical power (1 item). Items within the reporting subscale evaluate whether sufficient information was provided in the paper to allow the reader to form an unbiased assessment of the study findings. Criteria within the external validity subscale attempt to address the representativeness of the findings and the degree to which the study findings can be generalized to the population from which the sample was drawn. The internal validity subscale focuses on identifying potential biases in the measurement of study interventions or analyses. Within the confounding subscale items address possible sample selection bias. The final subscale, power, attempts to determine whether the study had sufficient power to detect a difference when a difference really exists.

Each of the subscale items are scored 0 (no or unable to determine) or 1 (yes) except for one item in the reporting subscale which is scored 0 (no), 1 (partially), or 2 (yes). Studies with a summed score above 26 were considered excellent; scores of 20-25 were considered good; studies with scores between 15-19 were considered moderate or fair quality, and scores below 14 were considered poor methodological quality (Chudyk et al., 2009; Jutai, Strong, & Russell-Minda, 2009). Most of the studies in this review were of moderate or fair quality (n=9) while a considerable number were scored as poor quality (n=7).

After applying the quality assessment criteria all 34 studies were included in the literature review even though some were of lower quality. All studies were included in the final review and treated equally in the review of literature because the primary goal was to determine what was known about the topic being investigated. An assessment of quality was done to demonstrate information about the relevance of each study to the review and trustworthiness of the studies.

Patient Deterioration as a Concept

Before presenting the integrated review of literature a brief discussion of medical-surgical nurses' perspectives and understanding of the concept of patient deterioration will be provided. Lavoie and colleagues (2014) conducted a dimensional analysis of acute deterioration to explore differences in understanding between ICU and medical-surgical nurses based on findings from the nursing literature from 2002-2012. Although no explicit definition of patient deterioration was found in the literature, four characteristics of patient deterioration were identified in their final sample of studies ($n = 34$) (Lavoie et al., 2014). From these descriptions it was apparent that medical-surgical nurses perceived patient deterioration as an evolving, physiological, predictable, and symptomatic phenomenon (Lavoie et al., 2014).

For the current study, patient deterioration was defined as an evolving, physiological patient situation that leads to the activation of either the Rapid Response System or the cardiac arrest-code blue team. The integrated review of the literature conducted for the study is presented next. This review revealed several themes within each of the major components of the CJM. Themes identified for the aspects of noticing, interpreting, responding, and reflecting are discussed.

Themes for Noticing Patient Deterioration

Noticing is the initial component in the model of clinical judgment proposed by Tanner (2006). Others have also identified noticing as a foundational step in the processing of information for nurses' decision-making and clinical judgments (Burbach & Thompson, 2014; Hoffman, Aitken, & Duffield, 2009; Thomas & Fothergill-Bourbonnais, 2005). Three key interrelated themes relevant to the aspect of noticing patient deterioration were revealed: (1) knowing the patient, (2) assessing the patient, and (3) experience and intuition.

Knowing the Patient

The importance of knowing the patient, recognizing patterns that represent deviations from baseline, and an initial sense that something is wrong with a patient was a central theme in describing how nurses identify patient deterioration (Chua et al., 2013; Cioffi, 2000b; Cioffi et al., 2009; Gazarian et al., 2010; Hart et al., 2016; Minick & Harvey, 2003; Smith, 2013).

Knowing the patient facilitates an initial suspicion or detection of deterioration made through observation of a change in a patient's appearance or behavior compared to the patient's previous condition (Chua et al., 2013; Cioffi, 2000a, 2000b). Knowledge of the patient is enhanced through continuity in patient care assignments (Gazarian et al., 2010; Hart et al., 2016) and through the provision of direct patient care activities (Chua et al., 2013; Cioffi, 2000a, 2000b). Caring directly for a patient over time, interacting with family, and gathering information from the medical record are ways nurses come to know their patients. Knowledge related to the patient's current experience of their illness and knowledge of the pathophysiologic condition was also found to be particularly important in identifying subtle changes and in determining severity of illness (Gazarian et al., 2010; Hart et al., 2016; Minick & Harvey, 2003). Participants described how knowing a patient provides a baseline from which deviations can be determined (Gazarian et al., 2010).

Minick and Harvey (2003) examined the concept of early problem recognition among medical-surgical nurses using an interpretive phenomenological approach. Experienced nurses were asked to describe an experience in which they felt they had recognized a patient problem early and thus made a difference in the patient's clinical course. Analysis of interviews revealed three underlying ways of knowing that contributed to nurses' ability notice acute deterioration. Knowing the patient directly, knowing the patient through the family, and knowing something is

not as expected were identified through analysis of interviews with nurses (Minick & Harvey, 2003). The early recognition of patient problems was characterized as noticing a pattern of change as a result of knowing the patient. Nurses described changes that were so subtle and vague that they were difficult to quantify but served to alert nurses to potential deterioration. This study highlighted the importance of nurses spending time at the bedside and developing clinical assessment skills. It also raises questions about patient care activities being delegated to non-nursing personnel which could remove nurses from the provision of direct care.

One study provided insight into barriers to nurses' noticing patient deterioration. Gazarian, et al., (2010) described the cues nurses used to identify a patient at risk for deterioration and the factors that influenced the decision to interrupt an adverse event such as a cardiopulmonary arrest. Purposive sampling was used to recruit 13 experienced nurses who had previously demonstrated competence in the ability to respond appropriately to life-threatening situations. Using the critical decision method, cases of cardiopulmonary arrest, unplanned transfer to the ICU, or a RRS consult were identified. Nurses who had cared for a patient in one of these cases were invited to participate in a face-to-face interview. In addition to the types of cues nurses described using to identify risk of deterioration, nurses believed their knowledge of the patient and the patient's baseline were important in identifying changes indicating deterioration. Nurses most frequently described physiologic cues and knowing the patient as triggers for noticing that a patient was deteriorating. Nurses' reported that not knowing the patient well lead to more ambiguity and difficulty in identifying subtle changes (Gazarian et al., 2010). While this study included a few new graduates, participants had an average of 8.5 years of experience.

There were a number of limitations in the Gazarian (2010) study, including retrospective reports, a small sample from a single setting, and uniqueness of the setting. The hospital where the study was conducted had a national reputation for early adoption of patient safety initiatives to meet its organizational mission of the “safest care possible”. These factors may influence the transferability of the findings. The major limitation of this study was the lack of reported situations where the nurse failed to notice a patient was deteriorating. Failure to recognize deterioration may have occurred but nurses’ who were involved in those situations may have declined to participate in the study (Gazarian et al., 2010). Despite these limitations, this study suggested important implications for nursing practice by describing the cues nurses used to notice patient deterioration and the importance of nurses *knowing* their patients.

A qualitative descriptive study of medical-surgical nurses recruited from an integrated healthcare system located in the United States further demonstrates how knowing a patient facilitates identification of deterioration (Hart et al., 2016). The purpose of this study was to understand the experiences of nurses as first responders to situations of acute patient deterioration. Nurses reported being able to recognize a deteriorating patient and that caring for the same patient more than one shift provided a baseline for comparison. This baseline knowledge increased the likelihood that they would recognize the early warning signs of patient deterioration. The interview questions in Hart’s study focused on the nurses’ experience, how they knew what to do, their confidence level and role as team leader, and challenges during the situation. The interviews did not include questions related to factors that negatively influenced nurses’ ability to notice patient deterioration. Because the data represent only the nurse participants’ self-reported perspectives, the question of whether nurses actually notice the signs of deterioration they reported remains unanswered.

Endacott and colleagues (2012) further demonstrated the importance of knowing the patient in a mixed-methods study of 34 medical-surgical nurses from a rural hospital in Australia. Video recorded simulation scenarios of patient deterioration followed by participant interviews were used to examine how nurses identified patient deterioration. Several common omissions in the patient assessment process were revealed, sometimes resulting in an incorrect nursing action. Nurses often missed cues by not taking a patient history or talking to the patient, suggesting that they did not seek to know the patient. Because of the incomplete assessment important cues were missed, leading to a protocol-initiated response to a situation or to an incorrect response. Limitations include the use of a convenience sample, where self-selection into the study may not reflect the perceptions and actions of the general medical-surgical nurse population.

Assessing the Patient

The second theme surrounding identifying patient deterioration was the importance of nurses being able to do a visual and physical assessment (Braaten, 2015; Chua et al., 2013; Cioffi, 2000b; Cioffi et al., 2009; Cox et al., 2006; Donohue & Endacott, 2010; Endacott, Kidd, Chaboyer, & Edington, 2007; Massey, Chaboyer, & Aitken, 2014). Multiple studies discussed the presence of clinical signs occurring with patient deterioration that can be discovered through physical assessment, patient observation, and vital sign monitoring (Andrews & Waterman, 2005; Cioffi, 2000b; Donohue & Endacott, 2010; Massey et al., 2014). Nurses use theoretical, experiential, and patient-related knowledge to recognize visual tactile, auditory, and behavioral cues when noticing deterioration (Cioffi, 2000b; Cioffi et al., 2009; Cox et al., 2006; Endacott et al., 2007; Endacott et al., 2012; Gazarian et al., 2010). Research to describe the cues used to notice a deteriorating patient indicate that nurses rely on a combination of subtle and obvious

changes in a patient's behavior as well as more objective indicators such as alterations in blood pressure, heart rate, or oxygenation (Chua et al., 2013; Endacott et al., 2007; Gazarian et al., 2010).

Agitation, confusion, diaphoresis, altered skin color, labored respirations, and an intuitive sense that something isn't right are examples of subjective cues that contribute to a nurse's clinical judgment that a patient is deteriorating (Cioffi et al., 2009; Gazarian et al., 2010). Objective physiologic cues such as vital signs also are used by nurses to detect clinical deterioration (Andrews & Waterman, 2005; Hart, Spiva, Dolly, Lang-Coleman, & Prince-Williams, 2016). Objective measures include physiologic variable such as temperature, respiratory rate, heart rate, oxygen saturation, systolic blood pressure, and level of consciousness (Endacott et al., 2007; Massey, Chaboyer, & Aitken, 2014; Rattray et al., 2011). Vital signs also are used to validate intuitive feelings that a patient is at risk of decline (Cox et al., 2006). Collectively, these findings provide support for the noticing stage of the CJM (Tanner, 2006).

The importance of performing a patient assessment was highlighted by nurses in a qualitative descriptive study by Cox and colleagues (2006). For some nurses interviewed in this study there was a sense that over dependence on technology (e.g., pulse oximetry, or automatic BP monitoring) might interfere with the ability to get close to, touch, and perform a holistic patient assessment (Cox et al., 2006). Nurses felt that being unfamiliar with monitoring equipment sometimes interrupted communicating with and assessing a patient for signs of deterioration.

Visual assessment often reveals changes such as worsening color, fatigue with sitting up, altered level of consciousness or increased respiratory effort (Donohue & Endacott, 2010). Physical assessment is even more important when clinical changes are subtle or gradual because

often these changes are not distinctive enough to be generally recognizable as a sign of deterioration (Minick & Harvey, 2003). Nurses describe the process of gathering assessment information through touching, observing, listening, and assessing a patient and are all important components to nurses' gathering information that contribute to their ability to notice deterioration.

Similar to previous work, Donohue and Endacott's (2010) qualitative descriptive study revealed that nurses were very reliant on visual patient assessment for trends, and comparing a patient's condition across time. Similarly, Gazarian and colleagues (2010) revealed multiple assessment findings and cues that nurses reported using to identify a patient at risk for a CPA including changes in level of consciousness, trends in blood pressure, oxygenation level and knowledge of the patient. This was further supported by Braaten's (2015) findings that nurses believed the most important factor in recognizing and interpreting was not vital signs but "laying eyes on a patient" and bringing others over to "have more eyes on the patient" (p. 25).

Nurses' reliance on vital signs for initial awareness of a patient's condition was reinforced in a study by Endacott and colleagues (2007). To identify the cues medical and surgical nurses used to identify patient deterioration a mixed methods case study design was used with a sample of 17 patients who had an unanticipated transfer to the ICU. Eleven nurses participated in the interview portion of the study. All nurses reported that they relied heavily on vital signs when assessing for deterioration. Level of consciousness was identified as the first cue used to identify deterioration, however, this parameter was rarely documented. Medical record review of the 17 patients in the sample revealed that none of the patients' charts contained a complete documentation of vital signs and essential information such as urine output and Glasgow Coma Scores were missing from all charts (Endacott et al., 2007). The most frequent

reason given for incomplete assessments or documentation of assessments was lack of time. These findings raise the question of the importance of physical assessment parameters to nurses. It is not clear whether these assessments were done and not documented or whether the lack of documentation means a gap in assessment which could have interfered with noticing.

Despite their reported importance, the collection and documentation of vital signs have consistently been shown to be incomplete in the medical record of patients who have deteriorated (Fasolino & Verdin, 2015; Jonsson et al., 2011; Ludikhuizen et al., 2012; Meester et al., 2012; Odell, 2014; Pantazopoulos et al., 2012). Similarly gaps in patient assessments (Endacott et al., 2012) and miscalculations of MEW scores (Jonsson et al., 2011; Odell, 2014) have also been found to be common. The measurement and recording of patients' vital signs and other patient observations made during direct care is often delegated to less skilled staff, thus removing the nurse from directly interacting with and getting a first-hand assessment of the patient (Minick & Harvey, 2003), which may impact the timely noticing and response to clinical deterioration.

To estimate the incidence of abnormal vital signs, staff awareness, and mortality of patients at risk for deterioration on general medical-surgical wards a prospective observational study was conducted by Fuhrmann and colleagues (2008). Vital signs were measured over a 2-month period at random points during a nursing shift on 877 patients. Simplified MEW score calling criteria were used to define abnormal vital signs. Nursing staff were interviewed about patients with abnormal vital signs to determine their awareness. One out of five patients (18%) experienced at least one episode of documented seriously abnormal vital signs during the study period. These at risk patients were subsequently found to have significantly higher in-hospital mortality rates ($p=0.0003$), higher 30-day mortality rates ($p<0.0001$), and greater length of hospitalization ($p<0.001$) compared to patients who did not demonstrate vital sign abnormalities.

Nurses were unaware of patients' abnormal vital signs in 43% of the cases. This low level of staff awareness was speculated as being related to the lack of a systematic routine monitoring of vital signs within this hospital system.

A retrospective observational study of 204 medical and surgical patients who suffered a SAE was conducted to describe current practice in the measurement and documentation of vital signs in the 48 hours prior to the event (Ludikhuize et al., 2012). MEW scores were calculated retrospectively based on the documented vital parameter in the medical record. Respiratory rate was documented in only 23% of the cases, level of consciousness in only 6.5% and oxygen saturation in 43%. In one patient no vital signs were recorded in the 48 hours prior to the event. Overall, 81% of the patients who suffered a SAE could have been identified early by an abnormal MEW score of three or greater, a score indicating that a physician should be notified. Consistent with other studies (Leuvan & Mitchell, 2008; Trinkle & Flabouris, 2011), these results showed an important lack of documentation and possibly gaps in assessment and measurement of vital signs in the 48 hours prior to a severe life threatening event (Ludikhuize et al., 2012).

Other researchers also have reported incomplete documentation of vital signs and other clinical assessments in medical record review. To investigate the circumstances surrounding hospital deaths De Meester and colleagues (2013) conducted a mixed-methods study in a 600-bed tertiary hospital in Belgium. A retrospective medical record review was done on all patient deaths (n=63) following cardiac arrest team calls or unplanned admission to the ICU on patients from medical and surgical units during an 8.5 month period. Data collection included the presence of vital sign documentation in the eight hours prior to the event and a survey of staff nurses (n=44) regarding their experience with deteriorating patients. Despite most nurses (98%)

account that they took vital signs before the patient deteriorated, an average of only 2.3 vital signs were documented and none of the 63 patients had a respiratory rate documented within eight hours prior to the event. In nearly two out of three cases, nurses said that they were unaware that their patient was deteriorating before the actual clinical event occurred. There are several limitations to this study. One is the representativeness of the sample since a convenience sample was used. Second is the subjectivity of the data obtained due to the self-reporting nature of the survey.

The work of Odell (2014) further supports the findings that there are significant gaps in documentation of vital signs. Medical record review was done on all adult patients (n=120) who suffered a cardiopulmonary arrest during one year at a 700 bed general hospital in England. EWS scoring was completed on 84% of the cases but the scores were inaccurate in one out of four cases. In 36% of the cases the recording of EWS scores was either inaccurate or not calculated. Only 20% of the cases contained all elements of the required documentation which included recording vital signs, calculating the EWS score, and an appropriate referral when the EWS score trigger threshold was met. Additionally, in 39% of the cases of CPA nurses failed to follow protocol and activate the RRS. (Odell, 2014).

These findings resonate with earlier studies (Fasolino & Verdin, 2015; Jonsson et al., 2011; Pantazopoulos et al., 2012), and indicate that the documentation of assessment and key physiologic parameters is often inadequate for medical-surgical patients. In addition, gaps in assessment may be occurring and interfering with nurses' ability to notice patient deterioration. Further research needs to be conducted to fully understand the processes and factors that influence nurses' noticing patients with acute physiologic deterioration.

Nurses' Experience and Intuition

A second theme that emerged from the literature was that nurses' experience and intuition play a central role in noticing patient deterioration. The concept of intuition as a component of clinical judgment is most notably credited to Patricia Benner (1982b) and her work examining the clinical decision making of novice and expert nurses. Intuitive knowledge involves recognition of previously experienced patterns and the detection of subtle clinical changes (Benner & Tanner, 1987) and often is expressed as an uneasy, gut feeling that something isn't right with a patient. Merriam-Webster (Intuition, (n.d.) defines intuition as "immediate apprehension or cognition, the power or faculty of attaining to direct knowledge or cognition without evident rational thought and inference". Benner and Tanner (1987) defined intuition as "understanding without a rationale" (p.23) and proposed that intuitive judgment is what distinguishes experts from beginners. This intuitive sense develops as the nurse gains experience with similar patients and situations over time. Experience, knowing the patient, and being directly involved with the patient's care seem to be key elements that strengthen the nurses' intuitive knowledge.

Several investigators demonstrate how nurses use intuitive knowledge to notice changes in a patient's condition (Andrews & Waterman, 2005; Chua et al., 2013; Cioffi, 2000a, 2000b, 2001; Cioffi et al., 2009; Cox et al., 2006; Gazarian et al., 2010; Hart et al., 2016; Minick & Harvey, 2003; Smith, 2013). Each of these qualitative studies focused on the experience of nurses and early recognition of patient problems from the perspective of the nurse. Each study found that nurses' perceptions that something is wrong with a patient often alerts them to a deteriorating clinical situation. This ability may be linked to nursing experience and knowing the patients involved, which allows nurses to notice subtle changes that develop.

A number of studies report on the subjective, non-specific patient characteristics that nurses often refer to when deciding that a patient is at risk for deterioration (Cioffi, 2000a; Cioffi, 2000b; Cioffi et al., 2009). Patients who fall into this category usually do not meet established objective RRS activation criteria but typically cause nurses a general sense of concern or worry that something isn't right with a patient. Nurses often described feeling that something isn't right even before the patient demonstrates established, objective physiologic or physiologic cues (Cioffi, 2000a, 2001).

Cioffi (2000b) used a qualitative descriptive approach to explore Australian nurses' descriptions of patient characteristics and the process used to detect early changes in patients about whom they were seriously worried. Participants (n=32) were nurses with at least five years of experience (average of 14 years of experience) who had made calls to the MET since being employed in this hospital. Using unstructured interviews, nurses were asked to describe their experience when detecting and escalating care in response to a patient about whom they were seriously worried. In these situations participants reported a sense of knowing something wasn't right but were unable to quantify their feelings. Four characteristics were described that prompted serious worry or concern about a patient: feeling not right about a patient, a patient's color, agitation, and patient observations that were marginally changed in some way (Cioffi, 2000b).

More often nurses detected a difference in the patient's condition compared to the patient's previous condition, which also requires knowing the patient (Cioffi, 2000b). These characteristics often prompted the nurse to increase surveillance measures and to question the patient more closely. Nurses often referred to concerning changes in a patient's skin color as being pale or ashen along with observations that the patient might be cold or sweaty. The

presence of agitation heightened nurses' concern, particularly when it represented a change from the patient's baseline. Furthermore, these subjective findings often prompted nurses to activate the MET even before objective physiologic data were evident (Cioffi, 2000b). Knowledge of the patient and previous experience was credited with enabling nurses to recognize these changes.

To identify signs of early deterioration used by nurses when recognizing *patients of concern* who did not meet the objective criteria for activating the Medical Emergency Team (MET), a subsequent descriptive study was conducted (Cioffi et al., 2009). The goal was to characterize nurses' description of *patients of concern* because previous research indicated that a substantial number of calls were made based on this criteria (Andrews & Waterman, 2005; Hodgetts, Kenward, Vlachonikolis, Payne, & Castle, 2002). Interviews were conducted with a purposive sample of 17 experienced nurses who had been directly involved in recognizing deteriorating patients and activating the RRS. Nurses used 10 indicators to recognize patients with potential early deterioration: noisy breathing, inability to speak in full sentences, agitation, impaired mentation, altered perfusion, increasing requirements for oxygen, new or increasing levels of pain, new symptoms, changes in skin color, and an unexpected clinical course (Cioffi et al., 2009). These findings are consistent with other studies that demonstrate the importance of intuition and pattern recognition as an important factor in nurses' ability to detect changes in a patient's condition (Cioffi, 2000a, 2000b; Cox et al., 2006; Minick & Harvey, 2003).

To understand how nurses reach their decisions when caring for a deteriorating patient Smith (2013) used grounded theory comprised of fieldwork and semi-structured interviews with experienced nurses. Participants included a purposive sample of 22 nurses working in general medical and surgical units at a hospital in England. Participants described feeling anxious when confronted with little empirical evidence of deterioration after noticing a change in the condition

of a patient. Frequently they reported difficulty articulating these subtle changes to others. In an attempt to reduce their uncertainty they recounted efforts to obtain additional objective patient information in order to be perceived as credible and to verify their feelings that something was wrong. Nurses in this study had an average of 12 years of experience.

While knowledge and experience consistently play a valuable role in helping nurses notice changes in a patient, not all studies identified a positive relationship between knowledge and experience and the ability to identify deterioration. Some quantitative study findings indicate that experienced nurses were unable to recognize or were unaware of clinical deterioration (Cooper et al., 2011a; Meester et al., 2013). Cooper and colleagues (2011a) conducted an exploratory quantitative study in a simulated environment with a convenience sample of 35 nurses from a single medical-surgical unit to describe how experienced nurses from a rural hospital detected and managed deteriorating patients. Knowledge, situation awareness and skill performance were measured. Most of the nurses (75%) in the sample had at least three years of experience with an average of 13 years of experience. An 11-item multiple-choice questionnaire with four response options was used to identify participant knowledge of patient deterioration. Questions were based on an instrument designed to measure junior physician knowledge of acute care and from an adapted peer-reviewed question set. Previous face and content validity had been assessed (Cooper et al., 2010; Endacott, Jevon, & Cooper, 2009).

An observer recorded skill performance during two eight-minute video-recorded simulation exercises involving standardized patients with an acute myocardial infarction and chronic obstructive pulmonary disease scenarios. In both scenarios subtle cues of deterioration were present during the initial four minutes followed by the development of more obvious and significant signs of deterioration. The number of correct observations made or clinical actions

undertaken determined the skill performance score. Situation awareness was measured using an objective measure known as the Situation Awareness Global Assessment Technique (SAGAT) (Technologies, 2007). The SAGAT is considered a reliable and valid assessment tool that measures three levels of situation awareness: perception, comprehension, and projection (Endsley, 2000).

Nurses' knowledge of patient deterioration varied widely (27%-91%) with a mean score of only 67%, which was lower than third year student nurses who were assessed in a parallel study using the same measure (Cooper et al., 2010; Cooper et al., 2011a). Skill performance and situational awareness outcomes were even lower than knowledge scores across both scenarios. Nurses' skill in managing patients in situations was notably lower than knowledge scores, averaging only 50% (range 26%-74%). Additionally, nurses' skill performance worsened as the patient deteriorated, despite the presence of more obvious cues. Nurses missed important clinical observations and failed to complete many of the assessment skills that contributed to the declining patient situation. Increasing participant anxiety was likely a major contributor to the declining skill performance. Situation awareness scores were also low, demonstrating poor perception of the situation. Even though these were experienced nurses this was a small sample from a single unit at one rural hospital in Australia and the results may not be generalizable. This finding conflicts with that of Endacott *et al.* (2007) which suggested that the nurse's experience and expertise positively influenced the quality of patient assessments.

De Meester et al. (2013) used expert reviewers and determined that almost half (49.2%) of the sample of medical-surgical patient deaths were considered potentially preventable. Nurses may have had delayed recognition of deterioration and reported their concerns for abnormal vital signs relatively late in deteriorating situation. Even though these were experienced nurses they

may not have had the knowledge to correctly interpret abnormal vital signs. Many nurses felt that the degree of vital sign abnormality that should trigger an escalation of care was unclear and therefore they were less likely to call for help early on. Additionally, results of the surveys revealed that only 30% of the nurses were aware their patient was deteriorating before the situation became critical.

Summary of the Literature for Noticing

This section presented three interrelated themes that emerged from the review of the literature and are relevant to the concept of *noticing* in clinical judgment: (1) knowing the patient, (2) assessing the patient, and (3) experience and intuition. Knowing the patient was identified as a central theme in seven studies (Chua et al., 2013; Cioffi, 2000a, 2000b; Gazarian et al., 2010; Hart et al., 2016; Minick & Harvey, 2003; Smith, 2013). Knowledge of the patient through consistent patient care assignments, the provision of direct care activities, within the context of their illness, and through knowing the family all seemed to increase nurses' ability to notice subtle changes that indicate deterioration. Each of these studies used a qualitative methodology with purposive sampling and participant interviews.

Only two studies were conducted in the United States and are somewhat dated (Gazarian et al., 2010; Minick & Harvey, 2003). Minick and Harvey sought to describe the phenomenon of early problem recognition and to understand early recognition skills of medical-surgical nurses. The purpose of the study by Gazarian et al. was to describe cues nurses use to identify deterioration. Data from both studies depended on nurses' self-reported perceptions of the cues they used when noticing a patient who demonstrated signs of deterioration. However, sometimes nurses fail to notice these cues (Endacott et al., 2012; Fuhrmann et al., 2008; Meester et al.,

2012). Overall, the data from these studies fail to identify why nurses sometimes fail to notice changes signaling patient deterioration.

The second theme within *noticing* was the importance of being able to assess and visually lay eyes on a patient for nurses to identify deterioration. Within this theme nurses' reliance on vital signs, physiologic cues, and changes in behavior were demonstrated in eleven studies (Andrews & Waterman, 2005; Braaten, 2015; Chua et al., 2013; Cioffi, 2000b; Cioffi et al., 2009; Cox et al., 2006; Donohue & Endacott, 2010; Endacott et al., 2007; Gazarian et al., 2010; Massey et al., 2014; Minick & Harvey, 2003). The study findings reported a reliance on vital signs and physical assessment to notice signs of deterioration. The data from these studies also reveal numerous examples of gaps in patient assessments and vital sign documentation. These gaps may contribute to nurses' inability to notice changes that indicate a patient is deteriorating.

Intuitive knowing based on experience and knowing the patient was identified as a significant theme in being able to notice patient deterioration (Andrews & Waterman, 2005; Chua et al., 2013; Cioffi, 2000a, 2000b, 2001; Cioffi et al., 2009; Cox et al., 2006; Hart et al., 2016; Massey et al., 2014; Minick & Harvey, 2003; Smith, 2013). All of the studies suggested that experience and expertise are required components to developing intuition for clinical situations. Eleven studies provided descriptions of nurses being worried or concerned about patients who developed subtle cues that aroused their suspicion but was difficult to quantify. Descriptions included statements such as knowing something is happening (Cioffi et al., 2009), having a sixth sense (Cioffi, 2001), and just a feeling (Cioffi, 2000a). Perhaps the most important finding from these studies is that the signs and symptoms that characterize nurses' worry or concern about a patient have been identified and summarized in 10 indicators. Nurses' subjective feeling of worry or concern may be based on the recognition of patterns that suggest

deterioration. These subjective signs are among the most commonly used criteria in recognizing deterioration and often are detected before objective physiologic signs are present (Cioffi et al., 2009). The signs and symptoms that characterize nurses' worry or concern often alert nurses to impending deterioration and motivate them to take action to validate their intuitive feelings.

Themes for Interpreting Patient Deterioration

The second component of Tanner's (2006) model centers on the collection of relevant information and the use of various reasoning strategies to interpret a situation and arrive at a sound clinical judgment. The literature that has directly investigated medical-surgical nurses' interpretation of situations of acute deterioration is limited in scope. A few studies provide insights into medical-surgical nurses' interpretation during situations of deterioration (Andrews & Waterman, 2005; Astroth et al., 2013; Braaten, 2015; Cox et al., 2006; Donohue & Endacott, 2010; Gazarian et al., 2010; Rattray et al., 2011; Smith, 2013). All of these studies are qualitative except for one by Rattray and colleagues (2011) which is a correlational factorial survey design that used non-probability sampling. No study's purpose was to investigate nurses' interpretation of situations of patient deterioration however, some understanding can be gained from the findings reported. Three factors play a key role in medical-surgical nurses' ability to interpret patient deterioration: available resources, information gathering, and past experience.

Available resources. Several studies highlighted the importance of human and non-human resource availability as factors that influence nurses' interpretation of a situation (Astroth et al., 2013; Braaten, 2015; Gazarian et al., 2010). In order to interpret a change in a patient's condition nurses need objective information. While patient assessment is valued by nurses, much of this information is supplemented by the use of data obtained through specialized equipment and technology. Equipment resources may include pulse oximetry, telemetry, or

automated blood pressure machines. Having the necessary equipment at the bedside, such as a portable bedside monitor, was an essential component in supporting nurses' decision-making so that further deterioration was prevented (Gazarian et al., 2010). Technology may also include the information found in the electronic health record (EHR). Braaten's (2015) qualitative descriptive study describes situations where the availability of monitoring equipment may be limited, or unreliable, or the information in the EHR is unavailable or difficult to access in a timely manner. Each of these circumstances can place considerable constraints on the nurse's ability to effectively interpret a situation.

Human resources refer to having access to experienced nurses when trying to place patient changes in context and interpret a situation of deterioration (Astroth et al., 2013; Braaten, 2015; Gazarian et al., 2010). Staffing levels, patient assignments and the availability of other health care providers were cited as factors influencing the ability of nurses to interpret changes in a patient's condition. When the signs of deterioration were gradual or subtle nurses described the importance of not only conducting further physical assessment but the need for consultation with more experienced staff (Braaten, 2015). Having experienced nurses available to see a patient and provide additional information and collaborative support helped in interpreting a situation (Braaten, 2015). Additionally, the expertise of RRS members also was described by some participants as helping validate nurses' concerns about a patient's condition (Astroth et al., 2013).

Each of these studies used a qualitative descriptive design with purposive sampling. Limitations include small sample sizes and each of the three studies was conducted at a single institution. Further investigation is needed using a larger sample, additional settings, and a different methodology to verify the findings.

Information gathering. Nurses use a combination of cues and clinical information to interpret patient situations, rather than just one piece of information (Rattray et al., 2011). Several studies emphasized the importance of information gathering when nurses are trying to make sense of changes in a patient (Andrews & Waterman, 2005; Smith, 2013). Nurses in the Andrews and Waterman (2005) study intentionally incorporated the multiple signs, symptoms, test results and other related quantifiable data to present credible evidence of physiological deterioration to physicians.

Rattray and colleagues (2011) examined which patient, nurse, and situational characteristics predicted nurses' judgements of patient acuity, and the likelihood nurses would refer acutely deteriorating patients to physicians. Using a factorial survey design, randomly generated paper-based scenarios were used to determine whether nurses would refer a patient and this was correlated with the EWS scores from the scenarios. The strongest predictor of acuity was the early warning score however nurses used a combination of cues and clinical information in interpreting the patient situations (Rattray et al., 2011).

Smith (2013) conducted a grounded theory study to understand how nurses reach clinical decisions when caring for a deteriorating patient. Interviews with 22 nurses revealed that once a patient problem is noticed, considerable time is spent collecting additional information to reduce uncertainty and make sense of a situation. Nurses described an increase in the pace of care as they collected additional physiological data, test results, and assessment findings to direct their reasoning. Cioffi (2000b) showed that nurses used several processes to gather and combine additional information to help interpret a situation including observing, listening, and touching the patient.

In contrast, other authors reported conflicting evidence related to nurses' information seeking (Cooper et al., 2011a; Endacott et al., 2012). To examine how nurses identify and respond to deteriorating patients during an in-hospital simulation study, Endacott and colleagues (2012) found that nurses placed greater emphasis on patient's statements as to whether their condition was improving or worsening rather than seek additional evidence by listening to breath sounds or re-assessing respiratory rate- even in a respiratory simulation scenario. Analysis of participant interview data revealed that this was primarily due to perceived role boundaries and may be specific to the organization or the health care system and role of the nurse in Australia.

To examine rural nurses' ability to assess and manage patient deterioration Cooper and colleagues (2011a) conducted an exploratory quantitative study in a simulated training environment designed to mirror the hospital ward setting. Participants (n=34) completed two 8-minute simulation exercises that were video recorded. In each scenario subtle cues of deterioration were initially present before more obvious and significant signs of deterioration developed during the final 4 minutes. Participants failed to seek additional critical assessments such as respiratory rate despite worsening patient conditions and more obvious deterioration cues being provided. A limitation of this study is that it is based on a convenience sample from a single hospital setting and may not be generalizable to the wider population of medical-surgical nurses. These conflicting findings suggest that further research is needed in the area of information seeking and reasoning in situations of acute patient deterioration.

Experience. Nurses' knowledge from past experiences influence their reasoning and ability to interpret situations. Less experienced nurses typically sought the opinions of other more experienced nurses when unsure about a situation of acute deterioration and whether to activate the RRS (Cioffi, 2000a, 2001; Gazarian et al., 2010; Smith, 2013). Inexperienced nurses

were more likely to repeatedly seek additional information and consultation with experienced nurses when the level of uncertainty was high or the patient data ambiguous (Smith, 2013).

Experience allowed nurses to have a better understanding of the severity of changes in a patient assessment and the typical trajectory of an illness (Gazarian et al., 2010). Cioffi (2001) reported that 63% of the 32 nurses in her exploratory descriptive study described relying on past experience in interpreting patient situations. Nurses used past experience of normal progression of an illness or recovery and compared that to a particular patient's progress when interpreting a situation.

Themes for Responding to Patient Deterioration

Four themes were identified as important to the nursing response to patient deterioration: experience, characteristics of the RRT, unit culture and social rules, and nurses' self-confidence.

Experience. The role of nurses' experience in responding to situations of patient deterioration was described in several studies (Astroth et al., 2013; Cox et al., 2006; Hart et al., 2016; Salamonson, Heere, Everett, & Davidson, 2006; Wynn et al., 2009). Hart and colleagues (2016) used a qualitative descriptive approach to understand the experiences of medical-surgical nurses as first responders to situations of clinical deterioration. A purposive sample of 28 nurses from five hospitals in a large healthcare system in the United States were recruited for the study. Experience was credited for providing nurses with the cognitive, technical and behavioral skills needed to respond appropriately to situations of patient deterioration. Nurses described how previous experience helped them understand what was happening and what needed to be done and played a critical role in their ability to promptly respond to the situation. Experience also gave them the confidence needed to respond (Hart et al., 2016).

Experienced nurses view the RRS as an asset (Astroth et al., 2013) and are more likely to seek assistance and make referrals when patients deteriorate (Salamonson et al., 2006).

Experienced nurses may be more confident in their decision making and/or may be less intimidated by members of the response teams. Inexperienced nurses on the other hand tend to hesitate while seeking assistance from more experienced nurses to confirm their assessment findings, which can delay activating the RRT (Braaten, 2015; Cox et al., 2006). Wynn et al. (2009) used a descriptive, cross-sectional correlational design to examine relationships between nurses' years of experience, educational level, degree of engagement, and RRS activation status (independent vs dependent) (Wynn et al., 2009). Participants included staff nurses (n=75) from a medical center in the United States with an established RRS. In this study, nurses with a baccalaureate degree and at least three years of experience were more likely to make independent calls to activate the RRS.

Characteristics of the RRS. Characteristics of the RRS and nurses' attitudes and beliefs towards the RRS have been shown to play a critical role in a nurse's decision and willingness to activate the team (Astroth et al., 2013). Nurses experienced a negative emotional response when activating the RRS for patient deterioration (Andrews & Waterman, 2005; Astroth et al., 2013; Braaten, 2015; Cioffi, 2000a; Cooper et al., 2013; Cox et al., 2006; Massey et al., 2014). Fear of criticism, belittling comments, and condescending behavior from RRS members have been cited as barriers to RRS activation (Astroth et al., 2013). Negative experiences with the RRS caused new nurses in particular to question their ability and to delay reporting abnormal vital signs (Andrews & Waterman, 2005; Cioffi, Salter, Wilkes, Vonu-Boriceanu, & Scott, 2006).

In contrast to these findings, four studies showed that nurses held a positive attitude towards the RRS and believed it was helpful in managing seriously ill patient (Astroth et al.,

2013; Jackson, Penprase, & Grobbel, 2016; Jenkins, Astroth, & Woith, 2015; Jones, Baldwin, et al., 2006). A quantitative descriptive study of 351 ward nurses was conducted to determine whether nurses valued the RRS and whether there were barriers to calling the RRT (Jones, Baldwin, et al., 2006). Most (91%) of the nurses agreed that the RRS was beneficial in preventing a minor problem from becoming worse, and preventing cardiopulmonary arrest. Very few nurses (2%) feared criticism from the RRS when making a call for assistance.

Massey, Chaboyer and Aitken's (2014) qualitative study to explore nurses' experiences in calling the medical emergency team revealed that nurses often experienced anxiety and uncertainty and hesitated in calling the MET due to "not wanting to look like an idiot" or "not knowing if it is the right thing to do"(p. 135). Nurses were also fearful of reprisal if they failed to correctly recognize a patient who was deteriorating.

Astroth and colleagues (2013) qualitative study revealed that characteristics of the RRS and unit culture were the two primary determinants of whether nurses tended to activate the team when a patient was deteriorating. Expertise and a supportive RRS were identified as facilitators to activation, however, criticism by members of the RRS was identified as a barrier in this and multiple other studies, leading to potential delays in activation (Astroth et al., 2013; Massey, Aitken, & Chaboyer, 2008; Shearer et al., 2012). In other studies nurses appear to value the RRS as a mechanism for obtaining timely assistance when caring for acutely deteriorating patients (Cox et al., 2006; D. Jones, Bellomo, et al., 2006; Salamonson, van Heere, Everett, & Davidson, 2006). However, nurses' hesitation to activate the team remains an ongoing concern (Braaten, 2015; Jones, King, & Wilson, 2009).

Unit culture and social rules. Unit culture and social rules play an important role in how willing and able nurses are to escalate care for a deteriorating patient to the RRT. A supportive

team was identified as a critical component in responding to situations of patient deterioration (Cox et al., 2006; Gazarian et al., 2010). A culture characterized by mutual respect and trust between nurses seemed to enhance nurses willingness to consult with experienced nurses which expedited a response (Gazarian et al., 2010). A unit culture characterized by lack of support or encouragement from co-workers, the fear of appearing dumb or unable to handle a situation on their own seems to decrease nurses' confidence in calling for assistance (Astroth et al., 2013). Similarly, fear of criticism and a unit culture where the expectation was that nurses notify the physician first before activating the RRS have also been seen as barriers to a timely response (Andrews & Waterman, 2005; Astroth et al., 2013).

Hierarchical cultures have been identified as a barrier to effective use of an RRS. In these studies there is a culture and belief that physicians are notified first before the RRS, which delays activation (Astroth et al., 2013; Bagshaw et al., 2010).

Self-confidence A nurse's self-confidence can also impact the decision to call the RRT or to handle the situation (Andrews & Waterman, 2005; Astroth et al., 2013). A confident nurse may not call because of the belief that the situation can be managed with the available resources on the unit. In situations where patients demonstrated subtle changes experience, education, and confidence enabled nurses to communicate their findings more convincingly using medical terminology in a confident manner (Andrews & Waterman, 2005). Similarly, a nurse whose self-confidence is low may delay calling for assistance and instead seek further consultation and information (Braaten, 2015). Lack of self-confidence has important implications since one study of medical and surgical nurses perceived self-confidence in recognizing and responding to situations of APD showed that nurses were only moderately self-confident in their ability (Hart et al., 2014).

Themes for Reflecting and Patient Deterioration

Nurses who reflect on their daily experiences may have a better understanding of their actions, which contributes to improved clinical knowledge (Hansebo & Kihlgren, 2001). Tanner (2006) noted the paucity of empirical literature focusing on reflection during clinical judgment. Consistent with this observation, none of the studies in this current review of the literature focused on nurses' reflection during situations of acute patient deterioration.

Summary of the Literature on Patient Deterioration

The literature on acute physiologic patient deterioration was reviewed and presented within the conceptual framework of Tanner's (2006) CJM. Thirty-four studies met inclusion criteria for this review. Findings were analyzed using the major concepts of noticing, interpreting, responding and reflecting described by Tanner (2006). Findings of this integrative review generally provide support for the CJM, however, the role of nurses' background knowledge and experience in noticing and responding to patient deterioration is inconsistent (Cooper et al., 2011; De Meester et al., 2013). No studies were found that focused on nurses' use of reflection during or after situations of acute physiological deterioration. This review supports the need for research to study the relationship of reflection and clinical judgment since reflection is a large component of the CJM (Tanner, 2006).

The importance of intuition and pattern recognition, characteristics of more experienced nurses, was found to be an important factor in nurses' ability to notice and interpret changes in a patient's condition (Cioffi, 2000a, 2000b; Cox et al., 2006; Minick & Harvey, 2003). The importance of knowing the patient and the patient's typical response, and being able to conduct patient assessments were found to be important components of clinical judgment and provided strong support for the CJM (Chua et al., 2013; Cioffi, 2000a; Gazarian et al., 2010; Smith 2013). Similarly, contextual factors of the situation such as the culture of the nursing environment,

availability of information, and presence of supportive nursing expertise were also found to influence nurses' clinical judgments and provided additional support for the CJM (Braaten, 2015; Cox et al., 2006).

A number of studies used participant interviews. The retrospective nature of the interviews may have caused the data collected to be inaccurate, incomplete or distorted due to reliance on the participant's memory to recall a situation. However, this review has highlighted gaps in the current body of literature on this topic. It is likely that most participants would share experiences where they had performed well, exercised good clinical judgment and had good patient outcomes. Through this integrative review, limited information was found related to knowledge of factors that negatively influence the medical-surgical nurse's ability to notice the signs of acute patient deterioration. Most of the information focused on barriers and facilitators to activating the RRS (Jackson et al., 2016). Delays in identifying and escalating care for deteriorating patients continue to occur.

Overall, findings from this review suggest that clinical deterioration can be identified and managed early, before progressing to a SAE, such as cardiac arrest, urgent transfer to the ICU, or unexpected death. Although multiple investigators have explored the role of nurses in responding to patient deterioration and reasons for delays in responding, there has been no exploration of the experience of medical and surgical nurses working with deteriorating patients and the factors nurses believe influence their ability to notice or detect cues that indicate a patient is deteriorating. This literature review highlights the need for additional research to identify factors that influence nurses' ability to notice indicators of acute physiologic patient deterioration. In particular there is a need to examine situations that nurses believe did not go well, or where there was a delay in noticing and responding to deterioration.

The main contribution of this review is the identification of the current state of the research on acute patient deterioration. It also revealed the gaps in the existing literature, both in content and methodology. Many of the qualitative studies reviewed were methodologically sound and provided relevant information. Nine of the qualitative studies were scored as “high quality” and the remainder of studies were scored as “medium quality”. Unfortunately few of the qualitative studies have led to the development of quantitative studies or instruments to evaluate the influence of factors on clinical judgment quantitatively

The overall quality of the quantitative studies was fairly low with seven studies scored as “poor quality” and the remainder scored as “moderate quality.” Few of these studies provided sufficient information to allow the reader to make an unbiased assessment of the findings. Few studies addressed bias in the outcomes or in the selection of study subjects. Few studies justified sample size or addressed statistical power. Given the low quality scores readers should use caution in interpreting the findings of the quantitative studies. Additionally, none of the reviewed studies examined acute deterioration or nurses’ perspectives on deterioration using the conceptual framework of the CJM (Tanner, 2006). The reviewed evidence suggests that further investigation of the topic of clinical deterioration is warranted.

CHAPTER 3: METHODS

This chapter describes the methodology that was used to conduct the study. The primary purpose of this study was to describe the factors that influence nurses' clinical judgment in situations of acute physiologic patient deterioration. Interviews were used to obtain an in-depth understanding of the phenomenon within a specific context (Creswell, 2013). The following sections of this chapter describe the approach that was used to address the research questions of this study including 1) research design, 2) sample and sampling method, 3) protection of human subjects, 4) data analysis, and 5) the mechanisms used to ensure the trustworthiness of the data.

Research Design

Qualitative research, through its characteristics of naturalistic inquiry and emergent design, can facilitate a more thorough understanding of the phenomenon under investigation (Patton, 2015). Researchers use qualitative inquiry when the goal is to explore emotions, perspectives, beliefs, and values of participants in order to understand the meaning and response to an experience (Morse, 2012). A qualitative descriptive design was used to guide this study. A qualitative descriptive approach provides comprehensive summarization of a phenomenon in everyday terms presented in a way that closely reflects the participants' words, thoughts, perspectives, and experience (Sandelowski, 2000). When a comprehensive descriptive summary of an event is desired, with very little interpretation, then qualitative description is an appropriate method of choice (Sandelowski, 2000, 2010). Since the identification of factors that influence noticing in situations of acute patient deterioration are neither well known nor well described, a qualitative descriptive approach was suitable for the proposed study.

Aims and Research Questions

The primary aims of this study were to describe nurses':

- a. perceptions of factors that influence clinical judgment in situations of acute physiologic deterioration in the adult patient,
- b. use of reflection in situations of acute physiologic deterioration in the adult patient, and,
- c. strategies for enhancing clinical judgment in situations of acute physiologic deterioration in the adult patient.

The research questions for this study were:

RQ1: What factors influence nurses' ability to notice, interpret, respond and reflect on situations of acute physiologic deterioration in the adult patient?

RQ2: How do nurses describe the use of reflection during and after the process of noticing, interpreting, and responding during situations of acute physiologic deterioration in an adult patient?

RQ3: What strategies would help the nurse notice, interpret, respond, and reflect during situations of acute physiologic deterioration?

Assumptions

The investigator presented the following assumptions going into this study:

1. The study setting will provide a rich environment to capture the perceptions of nurses' experiences in caring for a patient who developed acute physiologic deterioration
2. Clinical judgment is complex and developmental and can be facilitated
3. The healthcare environment is extremely complex and influences nurses' clinical judgment

4. Registered nurses working on medical and surgical units will have perspectives and opinions on acute physiologic deterioration that will have been shaped by their experiences
5. The investigator's personal perspectives could potentially bias the findings of this research.
6. The investigator has extensive experience in caring for acutely ill patients and patients who unexpectedly develop acute physiologic deterioration. The perspectives and opinions of the investigator will be acknowledged and set aside at the beginning of the study
7. The investigator will gain insights about nurses' clinical judgment surrounding the care of an acutely deteriorating adult patient that may serve as a basis for developing strategies to improve patient outcomes and the clinical judgment of nurses

Setting and Sample

Setting. The sample for this study was obtained from RNs working on any of the 10 adult medical or surgical units within a 350-bed adult acute care level one-trauma center in a large metropolitan city in the South Central region of the United States. The hospital is located on the campus of an academic health sciences center that has seven professional colleges, a freestanding pediatric hospital, a diabetes center, a comprehensive ophthalmology institute, and a nationally recognized cancer center. The hospital provides comprehensive high-acuity care to a diverse population of adult patients, contains 10 medical-surgical units from which to sample nurse participants, and utilizes a RRT and EWS to help with identification and response to deteriorating patients. Because the aims of the study focused on in-patient, acute care in a medical-surgical environment, other areas such as outpatient areas, procedural areas, the

emergency department, ICUs, pediatric units, the bone marrow transplant unit, and labor and delivery units were not included.

Sample.

Sampling strategy. Purposeful, maximum variation sampling was used in the recruitment of study participants in an attempt to recruit a wide range of perspectives that could provide depth of insight and rich information related to the identification and management of a deteriorating patient (Patton, 2015). Maximum variation sampling is designed to maximize the diversity and heterogeneity of participants so that essential elements of a phenomenon are identified (Patton, 2015).

Potential participants were asked about years of experience as a registered nurse working with adult medical-surgical patients, with the goal of having at least three participants in each experience category, i.e., less than 2 years, 2-3 years, over 3-5 years, more than 5 years. Some evidence suggests that experience influences nurses' clinical reasoning, clinical judgment, and decision-making performance (Johansson, Pilhammar, & Willman, 2009; Ramezani-Badr, Nasrabadi, Yekta, & Taleghani, 2009). In contrast, other studies have shown that years of experience does not correlate positively with the quality of nurses' clinical judgments (Cooper et al., 2011a; Yang & Thompson, 2011). Recruitment goals were for three participants from each of the categories for years of experience, however, only two participants fell in the 2-3 years category.

Inclusion criteria. For the purposes of this study, participants must (a) be an Oklahoma licensed registered nurse whose primary role is in a staff nurse position, (b) have completed hospital and unit orientation, (c) work at least part-time, (d) work primarily on an adult medical or surgical unit at a medical center in Oklahoma and have had at least one experience of

providing direct care for a patient who experienced an episode of APD that resulted in the activation of the RRT or Code Blue Team within this facility during the last year. Registered nurses whose primary role is in administration, education, case management, and advanced practice roles were excluded from participation. Nurses in these positions are not practicing in a staff nurse role providing direct care at the point of care delivery and are not responsible for ongoing around the clock patient assessment and management. Pregnant women also were excluded from participating in this study because federal regulations require additional protection for this population from emotional or psychological distress (University of Oklahoma Office of Human Research Participant Protection, 2016). Licensed practical nurses (LPNs) were excluded from this study. LPNs work under the direction of a registered nurse and, while LPNs contribute to the assessment of a patient, their legal scope of practice does not include interpreting clinical data or conducting patient assessments (Oklahoma Board of Nursing, 2017).

Sample size. Sample size in qualitative research is influenced by a number of factors including purpose and scope of the study, nature of the topic, characteristics of the participants, quality and richness of the data, study design, analytic strategy, and sampling method (Morse, 2000, 2015a). Sample size should be estimated initially when planning a study, then assessed continuously during the research process, and finally evaluated for adequacy for analysis (Guest, Bunce, & Johnson, 2006; Malterud, Siersma, & Guassora). A guiding principle for determining sample size within qualitative research is the concept of saturation (Morse, 2015a). Bowen (2008) contends that adequacy of sampling refers to the demonstration that saturation has been accomplished. Because of the emergent nature of qualitative inquiry the size of a sample can be adjusted based on what is learned as data are collected (Patton, 2015). The sample must be large enough to ensure that all perceptions that might be important are uncovered and patterns

identified while simultaneously not so large that the data becomes repetitive (Mason, 2010; Morse, 2015a). While the idea of saturation is helpful from a conceptual perspective, it offers little useful guidelines for how the size of a sample might be initially determined (Guest et al., 2006).

To examine the issue of sample size within the context of doctoral studies from diverse disciplines, Mason (2010) reviewed 560 studies that used qualitative interviewing as the method of data collection. Studies that used content analysis (N=213) had a mean sample size of 28 with a range of 2-70 (Mason, 2010). Based on previous qualitative descriptive studies in nursing that used purposive sampling and participant interviews, an estimated sample of 15-20 participants was needed in the proposed study to reach data saturation (Cox, James, & Hunt, 2006; Cioffi, Conwayt, Everist, Scott, & Senior, 2009;Gazarian, Henneman, Chandler, 2010). The adequacy of the final sample size was assessed during the data collection and analysis process.

Recruitment of participants continued until saturation was reached, and no new insights or themes emerged.

Procedures

Institutional Review Board (IRB) approval was granted December 12, 2017 from the University of Oklahoma Health Sciences Center (OUHSC) (Appendix C). Subsequent approval was obtained from the University of Kansas IRB on December 19, 2017 to allow OUHSC to serve as the reviewing IRB for the study. Additional approval was obtained from the OUHSC IRB on February 6, 2018 after modifications were made to Appendix D: Letter of Invitation, Appendix G: Demographic Data, and Appendix H: Participant Interview Guide.

Participant recruitment. Following IRB approval the investigator provided an overview and explanation of the study purpose and the nature of recruitment and participation at a meeting

scheduled by the Chief Nursing Officer of the OUHSC medical center. Nursing Directors and Managers from each of the medical and surgical units attended the presentation. At the conclusion of the meeting permission was given for the investigator to attend staff meetings on each of the nursing units as a recruitment strategy. Permission also was obtained to email each of the nurse managers a copy of the study letter of invitation (Appendix D) and the research consent form (Appendix E). Managers were asked to forward the email containing the letter of invitation and consent form to the registered nurses who worked on their units. The investigator posted copies of the letter of invitation and consent forms on bulletin boards within each of the nursing units.

Despite strong verbal interest and support for the study from the nursing leadership group, recruitment was very slow in getting started. It was difficult to coordinate attendance at staff meetings, and many nurses reported that they had not received the email notification from their nurse manager. Staff meetings were not held every month, the investigator was sometimes not made aware of the scheduling of meetings, and on two occasions the meetings were canceled or rescheduled. Nurses also did not respond initially to the posted flyers and letter of invitation. Because initial efforts for recruitment of study participants were unsuccessful, efforts to advertise and promote the study were renewed after one month. A second email was sent to the Nurse Managers with a request to forward it on to their nurses, additional copies of the letter of invitation and consent form were posted on each of the units, and the investigator increased attempts to attend unit staff meetings.

Efforts were made to contact each of the nurse managers either while the investigator was on the unit or via email to confirm the dates and times of upcoming staff meetings. The investigator attended two day shift staff meetings on different nursing units without any

noticeable response from potential participants. Following attendance at the second evening change of shift staff meeting, clear interest in participating in the study was sparked and participants began contacting the investigator two months after IRB approval. Attendance at one subsequent day shift staff meetings seemed to generate more interest and several additional participants contacted the investigator after hearing about it from a colleague who participated. Participants were recruited over a three month period. Twenty interested nurses volunteered to participate in this study by responding via email or telephone call to the investigator.

Data collection. The investigator first read aloud the prepared telephone script (Appendix F) and asked each participant to take a few minutes to read the informed consent in its entirety. Participants were given an opportunity to ask any questions about the study or the interview process. Verbal consent was then obtained from each participant immediately prior to completing the demographic data sheet and beginning the interview. Participants were asked demographic questions (Appendix G) and open-ended questions following a semi-structured interview guide (Appendix H). Interviews were conducted ranging in length from thirty minutes to one hour. The investigator worked to ensure that each interview was scheduled at a convenient time for both the interviewer and the participant, that there was enough time for its completion, and that it was conducted in a location that minimized background noise and interruptions. Telephone interviewing has been shown to be an acceptable method of data collection that offers several potential advantages over face-to-face interviews. These advantages include participant anonymity, increased access to participants, and reduced time and travel expense (Musselwhite, Cuff, McGregor, & King, 2009; Smith, 2005; Sturges & Hanrahan, 2004). The initial plan for frequency of interviews was one or two per week.

To ensure the accuracy of the interview, maintain investigator focus, and minimize disruption in data collection, all interviews were digitally recorded with permission from the participant. A second recorder was available as backup in case any technical difficulties occurred during the interview. Sampling continued with data collection through telephone interviews from early March through late June, at which time data saturation was noted. Data saturation was determined by mutual agreement between the student investigator and the dissertation committee co-chair Dr. Jill Peltzer.

Interviews. A practice interview was conducted with a volunteer nurse from a medical-surgical unit from the hospital where the study took place. The purpose of this practice interview was to refine the interview questions for clarity and appropriateness. The practice interview revealed that the interview questions were clear, progressed in a logical sequence, were free of leading questions, and were flexible enough to allow for pursuit of unexpected themes.

Interviews began by asking participants to describe a time they provided care for a patient who experienced an episode of APD that resulted in the activation of the RRT or code blue team. Open-ended questions from the interview guide were followed. The interview questions focused on how nurses discovered the patient had a problem, what cues they noticed that indicated a problem, what things helped or hindered them in noticing, interpreting, responding, and reflecting on the situation, and how they felt about the experience.

Participants may have been reluctant to share their stories about patients they have cared for who deteriorated. Some of the outcomes were tragic. Sharing this sensitive information required a level of trust that could only be achieved after building rapport with the participant. To monitor the emotions and response of participants, the investigator paid close attention to speech and tone of voice to detect any signs of tension, frustration or anger (Irvine, Drew, &

Sainsbury, 2012). To demonstrate continued interest in what was being said, the investigator used more explicitly vocalized responses and comments to encourage the participants and guide the interview (Irvine et al., 2012). These efforts were made to establish rapport with each interview to develop a safe and comfortable environment for participants to share their perceptions and experiences (DiClicco-Bloom & Crabtree, 2006).

Field notes. Brief notes were recorded during the interview to capture impressions, and noteworthy observations during the interview suggesting that the participant was experiencing stress or sadness in telling their story (Marshall & Rossman, 2011). Brief notes were also made immediately following each interview to record the researcher's self-reflections on the interview, personal feelings, perceptions about what went well and what could be adjusted for the next interview, and any emotions or biases experienced by the researcher.

Instruments

Demographic questionnaire. Demographic questions helped characterize the sample of nurses in this study. Participant characteristics included age, birth sex, race, ethnicity, years as a registered nurse, years as a registered nurse working with adult medical-surgical patients, and highest level of nursing education. The category for years of nursing experience was guided by Patricia Benner's (1982a, 1984) novice to expert model of skill development and was used to analyze the data. According to this model advanced beginner nurses have less than two years of experience (Benner, 1982a, 1984). At this stage the nurse has gained some understanding of the contextual meaning of a situation, is able to demonstrate acceptable performance, but still relies on rules and guidelines to connect her understanding of a situation with a response. Nurses at this stage of development have difficulty fully taking in a situation and are still struggling to recognize important aspects because the situation is still too new to them (Benner, 1982a).

With two to three years of experience in the same clinical area the nurse typically moves to the competent stage. The competent nurse is beginning to recognize patterns, can identify elements of a situation that warrant further attention, and is beginning to connect her/his actions to long-range goals or plans (Benner, 1982a, 1984). A sense of mastery, conscious and deliberate planning, and an ability to manage unforeseen events in nursing practice characterize the competent nurse. With continued experience, the competent nurse moves to the proficient stage. Proficiency usually requires more than three years of experience. Proficient nurses typically have a deep understanding of situations, are able to perceive information as a whole rather than as individual components, and recognize aspects of a situation that are most salient and important. The proficient nurse has learned what to expect in different situations, can recognize when a situation differs from what is expected, and can modify care in response to changes (Benner, 1982a).

Nurses who have at least five years of experience in the same clinical area may be identified as being at the expert level of skill. The expert nurse no longer relies on rules or guidelines to understand a situation and develop an appropriate response and has an intuitive grasp of a situation with a deep understanding of the whole situation (Benner, 1984, 2001).

Interview guide. The four components of Tanner's (2006) CJM (noticing, interpreting, responding, and reflecting) provided the framework for the development of the interview guide. Individual questions were developed based on an understanding of the CJM and from operational definitions of each of these components developed by Lasater (2007) (Table 1). Semi-structured interview questions were developed to help guide the interview to provide answers to each of the research study questions.

Table 1

Clinical Judgment Model Theoretical and Operational Definitions (Tanner, 2006; Lasater, 2007)

Concept	Theoretical Definition (Tanner, 2006)	Operational Definition (Lasater, 2007)
Noticing	A nurses' expectations of a situation; a perceptual grasp of the situation	Focused observation Recognizing patterns and deviations from expected patterns Observes and monitors Information seeking
Interpreting	Making meaning of the available data of a clinical situation. Developing a sufficient understanding of the situation	Makes sense of data Compares changes with known patterns (from knowledge base, experience, intuition) Prioritizes data
Responding	Developing a course of action	Assumes responsibility Delegates team assignments Communicates Develops plans for interventions Assesses and monitors patients Adjusts treatments as indicated Demonstrates nursing skills
Reflecting	Reflecting on one's practice, behaviors, and clinical judgment	Evaluates/analyzes personal clinical performance Evaluates choices against alternatives Identifies strengths and weaknesses Demonstrates commitment to improvement

Data analysis. Core steps of data analysis in qualitative research includes preparing and organizing the data, reading and coding the data, reducing the coded data into themes and subthemes, analyzing and interpreting the findings, and representing the data visually (Creswell, 2013). A directed approach to content analysis was selected in order to extend and determine support for the CJM (Hsieh & Shannon, 2005; Patton, 2015; Tanner, 2006). Directed content analysis as described by Hsieh and Shannon (2005) was used in this study to initially code the

transcribed interviews. Consistent with a directed approach, initial coding categories were selected based on the primary aspects of the CJM: noticing, interpreting, responding and reflecting (Tanner, 2006). Lasater's (2007) operational definitions for each category were used to help code interview data in the predefined categories (Table 1).

The second level of coding involved identifying whether there were data that did not seem to fit within any of the pre-established categories. No data were identified other than that which fit within the pre-established categories of the CJM (Hsieh & Shannon, 2005). A directed approach to content analysis can present a challenge to the qualitative process. Coding the data deductively according to predetermined categories and then inductively poses some degree of risk that the initial coding will bias the identification of important text (Hsieh & Shannon, 2005). For this reason debriefing and maintaining an audit trail to show how coding decisions were made were used to help ensure trustworthiness.

Demographic data were analyzed for measures of central tendency such as the mean and median, and for frequencies or percentages. Available data include age, gender, ethnicity/race, highest level of education, highest level of nursing education, years of nursing experience, and years of nursing experience working with the adult medical-surgical patient.

Data preparation. For this study words and statements from individual interviews were the most appropriate unit of analysis (Elo & Kyngas, 2008; Graneheim & Lundman, 2004). Latent content (the underlying meaning of the text) was considered during the analysis (Graneheim & Lundman, 2004). A professional transcriptionist transcribed each digitally recorded interview verbatim. To ensure accuracy the researcher listened to each recorded interview completely while proofreading the transcript and made any needed corrections. This helped provide an overall sense of the interview as a whole and ensured completeness and

accuracy of the transcribed data (Sandelowski, 1995). After each interview was transcribed, the researcher read and re-read the transcripts multiple times. Comments from each interview were coded, organized, analyzed in an iterative manner.

Protection of Human Rights

To ensure the protection of the participants in this study the researcher adhered to the ethical guidelines and protocols put forth by the Institutional Review Board (IRB) of the participating facilities. Study approval was obtained from the Human Subjects Committee (HSC) at the Oklahoma University Health Sciences Center (OUHSC) since data collection occurred at the hospital on the campus of the OUHSC. Subsequent IRB approval was obtained from the HSC of the University of Kansas Medical Center since the research was being conducted in partial fulfillment of the dissertation requirements for the doctor of philosophy degree in nursing.

Protection of research participants. Potential participants learned about the study through attendance at a unit staff meeting, from an email, or via the letter of invitation to participate in the study. An overview of the study and its purpose, eligibility criteria, potential risks, participation requirements, and the investigator's contact information were shared on the letter of invitation and at unit staff meetings. Once nurse managers emailed nursing staff the study materials, no further interaction occurred between the managers and participants related to the study. This precaution was taken to help ensure participation was voluntary decision to participate and nurses did were not coerced into taking part in the study. Nurse managers never knew the identity of any of the participants because nurses interested in the study contacted the investigator directly by telephone or email to find out additional information about the study, as appropriate, and to schedule an interview time. Additionally, the investigator did not know the

actual name of any of the participants and could not identify anyone from their telephone numbers. Before any data collection, participants were given a copy of the research consent form. Participants were asked to carefully read the consent and ask any questions of concern or if clarification was needed. The prepared telephone script was read aloud to the participant and they were asked to read and verbally acknowledge understanding and agreement to proceed with the study.

Participants were informed about their right to confidentiality and that they could withdraw from the study at any time. Data were collected, transcribed, analyzed and reported using pseudonyms. Each participant's demographic data sheet, recorded interview, and interview transcript were identified with a pseudonym to protect the participant's identity. All interviews were audio-recorded with the participants' consent. All data files were stored in a secure, locked drawer and password-protected computer in the office of the student researcher for the duration of the study. Upon completion of the study all de-identified data were securely maintained on the Q drive at the University of Kansas School of Nursing and maintained for the timeframe required based on the requirements of the KUMC Institutional Review Board.

Issues of primary concern in this study included the assurance of confidentiality and concern for participants' emotional and psychological wellbeing. According to Cowls (1988) basic measures for assuring ethical conduct of research such as obtaining informed consent, ensuring confidentiality, and providing follow-up resources for therapeutic benefit may not be enough when a researcher examines potentially sensitive topics with participants. She urges that qualitative research addressing sensitive topics requires special attention to the potential for immediate or delayed emotional impact the interview may have on the participant and the researcher.

Several participants experienced mild emotional discomfort as they recalled personal stories of past experiences in caring for a deteriorating patient. During these instances the interview was paused to allow the participant to regain composure and verbal support was provided. Memories seemed to elicit guilt, embarrassment, sadness or grief, especially if the situation did not go well or the participant did not recognize or respond appropriately to a deteriorating patient (Corbin & Morse, 2003). To help minimize emotional distress the investigator informed participants fully about the nature of the research before the interviews. Additional strategies included asking the participant if they wanted to stop the interview, collect themselves and continue, and providing the phone number for emotional and mental health resources available through the OU Medical Center Employee Assistance Program. The investigator closely monitored participants' voice during the interview for any signs of emotional distress, such as becoming tearful or crying, sighing frequently, or becoming quiet.

Protection of the investigator. There was also the possibility that the content of the interviews would precipitate feelings of emotional distress for the investigator. Being aware of the potential for emotional discomfort that might occur through hearing personal stories is important, however, in this study the investigator did not experience any emotional distress. Because the interviews occurred over a three month period the investigator did not experience emotional fatigue as a result of the interviews (McCosker, Barnard, & Gerber, 2001). The investigator did not feel the need to debrief with a colleague faculty member or seek counseling service through the OU Medical Center Employee Assistance Program.

Methodological rigor. In qualitative research methodological rigor refers to the ways that trust or confidence in the findings of a study is established. Rigor is the means by which integrity, ethics, and competence are demonstrated (Tobin & Begley, 2005). While there are

several frameworks for evaluating trustworthiness (Guba, 1981; Lincoln & Guba, 1985; Morse, 1999; Sandelowski, 1993), this study adhered to the classic criteria pioneered by Lincoln and Guba (1985) for naturalistic research. These criteria (confirmability, credibility, dependability, and transferability) and the strategies that were used for demonstrating trustworthiness are summarized in Table 2. (Lincoln & Guba, 1985; Morse, 2015).

Table 2

Strategies for Assuring Rigor (Lincoln & Guba, 1985; Morse, 2015b)

Criteria	Strategies
Confirmability Minimal bias	<ul style="list-style-type: none"> • Meetings with faculty committee members to ensure data analysis reflects data collected • Exploration of bias and assumptions through reflective field notes • Faculty member review of coding decisions to reduce researcher bias with the initial coding of text • Audit trail: maintain a reflexive journal throughout the research process
Credibility Findings are credible and accurate	<ul style="list-style-type: none"> • Member checking. • Peer debriefing by a faculty member
Dependability Findings are reproducible; reliability	<ul style="list-style-type: none"> • An audit trail of coding decisions and theme development • Meetings with faculty committee members to explore divergent findings
Transferability Findings applicable to other contexts	<ul style="list-style-type: none"> • Rich description of participants and context

Confirmability. Confirmability refers to the degree to which research findings are grounded in the data instead of the researcher's interpretation (Lincoln & Guba, 1985).

Confirmability of the data was achieved by maintaining an audit trail. The audit trail included the maintenance of the interview recordings, transcriptions, all staged products of data coding,

reduction and analysis, and all communications between the investigator and the dissertation committee members. A reflexive journal was also kept throughout the data collection, analysis, and interpretation process to help ensure that the researcher remained reflective, objective, and aware of personal attitudes and feelings that might affect the study findings. Expertise of the dissertation committee members was used throughout the process of coding and analyzing the data to further establish confirmability of the findings.

Credibility. Credibility refers to the qualitative researcher's attention to the internal validity of a study (Lincoln & Guba, 1985; Morse, 2015). Credible studies are those that readers believe in and make decisions based on the findings (Tracy, 2010). Procedures used during this study to ensure credibility included member checking and peer debriefing.

Member checking is a method for increasing credibility. The investigator shares or "plays back" understandings and interpretations of the data with the participant to prevent any misunderstandings (Lincoln & Guba, 1985). This method has been proposed as the single most critical technique for establishing credibility (Lincoln & Guba, 1985). The investigator used member checking periodically throughout each interview by rephrasing and paraphrasing what was said. At the conclusion of each interview participants were asked if they would be willing to provide the investigator feedback on preliminary interpretations of the interview data. All of the participants agreed to being contacted again. Several attempts were made to contact participants by telephone, however many of these efforts were unsuccessful. Member checking was finally addressed by presenting the preliminary research findings to four participants who provided feedback on the interpretations to ensure that they accurately represented what was shared during the interview (Thomas & Magilvy, 2011).

Peer review, or debriefing, involves utilizing colleagues experienced in qualitative methods to review and discuss the research study methods, data analysis decisions, and interpretations (Creswell, 2013). A nursing colleague with expertise in qualitative research was asked to review several transcripts to help ensure that the coding and themes were supported by the data to support the credibility of the findings. The investigator also worked closely with members of the dissertation research committee in all phases of the research process in an effort to identify and prevent researcher bias.

Dependability. As defined by Lincoln and Guba (1985), dependability is similar to measures of reliability in quantitative research. Dependability demonstrates that the research process and findings are accurate. Dependability increases the trustworthiness of a study's findings, auditability, or the ease with which others can follow the researcher's decision-making process throughout the study. The investigator maintained a detailed audit trail of each stage of the research process to allow others to understand how concerns were approached, decisions made, and conclusions reached (Morse, 2015a; Thomas & Magilvy, 2011). Records included in the audit trail are the audio-files of all interviews, verbatim transcripts of the interviews, demographic data collection sheets, field notes, spreadsheets with coding decisions, and theme development. The audit trail used to establish dependability can also be used to determine confirmability of the study (Lincoln & Guba, 1985).

Transferability. Transferability is the criterion used to determine to what extent the research findings can be transferred to other settings or participants (Lincoln & Guba, 1985). Since the investigator cannot know the setting to which transferability may be used, the responsibility of the investigator entailed creating 'thick' descriptions to enable others to make the judgment of applicability (Lincoln & Guba, 1985). Providing a detailed description of the

research process, participants, study setting, examples of the interview data, and the findings will allow readers to determine whether the findings of the study can be transferable to other contexts (Lincoln & Guba, 1985).

Limitations

This study sampled registered nurses from adult medical-surgical units from only one medical center in South Central United States. The experiences of nurses from other hospitals or from pediatric, perioperative, critical care, or outpatient areas may be very different. Another limitation is that participants choose what information they will share during an interview. Participants may not have fully shared relevant information due to feeling embarrassed or fearful of negative consequences. If the event was perceived as extremely positive or negative in nature the participant's memory may have been skewed by other variables prior to the interview. Because participants were being interviewed about an event that occurred in the past, recall of the events may be inaccurate (Klein et al, 1989). In an effort to help overcome some of these potential limitations, participants were asked to recall a specific situation by picturing the experience in their mind (Simpson & Barker, 2007). Another limitation of this research study is the inexperience of the investigator in conducting qualitative research and the potential challenges to analyzing the data, however, this limitation was balanced by the strength of the qualitative researchers that comprised the research dissertation committee.

Summary

A qualitative descriptive design was used as the methodology for this study in which the investigator sought to describe the factors that influence nurses' ability to notice, interpret, and respond to a deteriorating patient. A discussion of the procedures that were used for participant recruitment, data collection, and the protection of human subjects was included. Measures to ensure trustworthiness and methodological rigor were explained. Finally, the qualitative

technique for analyzing the content of the participant interviews was described. A strength of this methodological approach is the potential for eliciting thick description through the semi-structured interviews which may provide answers to the research questions.

CHAPTER 4: FINDINGS

The specific aims of this study were to describe: (1) nurses' perceptions of factors that influence clinical judgment in situations of acute physiologic deterioration in the adult patient, (2) nurses' use of reflection in situations of acute physiologic deterioration in the adult patient, and, (3) nurses' strategies for enhancing clinical judgment in situations of acute physiologic deterioration in the adult patient. Three research questions guided the process for the study:

RQ1: What factors influence nurses' ability to notice, interpret, respond and reflect on situations of acute physiologic deterioration in the adult patient?

RQ2: How do nurses describe the use of reflection during and after the process of noticing, interpreting, and responding during situations of acute physiologic deterioration in an adult patient?

RQ3: What strategies would help the nurse notice, interpret and respond to cues signaling clinical deterioration?

As recommended by Hsieh and Shannon (2005) the findings are presented with excerpts from the transcripts of the interviews that demonstrate the themes and subthemes.

Sample Description

The purposive sample consisted of 20 registered nurses from the medical surgical units of an acute care teaching hospital located on a health sciences center in the Midwestern United States. One participant shared two separate stories during her interview of experiences with patient deterioration, both stories were included in the analysis. One of the early participants began the interview before the investigator realized that he did not meet all the study criteria. The results of that interview were not analyzed or reported as part of the study but were considered as anecdotal information during the discussion section.

The RN participants worked on a medical-surgical unit, had completed orientation, and had cared for a patient who experienced an episode of acute physiologic deterioration resulting in the activation of the rapid response or code blue team at the study hospital during the last year. The sample was primarily female (90%), and ranged in age from 22 to 63 years. Almost three-fourths of the participants (70%) were white. All participants identified as non-Hispanic.

Most of the participants had either an associate's or baccalaureate degree. Benner's Novice to Expert Model (2001) of knowledge and skill development was used to classify participants based on their years of nursing experience. Almost half of the participants (45%) had more than five years of experience (expert) as an RN, and 20% (n=4) of the sample had less than two years of nursing experience (advanced beginner). Eighty percent of the RNs in the study had more than two years of experience working with adult medical-surgical patients which would classify them as being competent in providing care to this population of patients (Benner). Appendix I displays the characteristics of the sample.

Findings

Analysis of interview transcripts resulted in three themes for the category of "noticing", two themes for the category of "interpreting" and three themes under the category of "responding. Research question two resulted in two themes related to "reflecting". Research question three resulted in three themes related to strategies participants recommended for improving overall response to deteriorating patients (Figure 3). This figure represents the idea that Nurses' Keen Sense of Responsibility influenced their noticing, interpreting, and responding; the umbrella that supported their decisions.

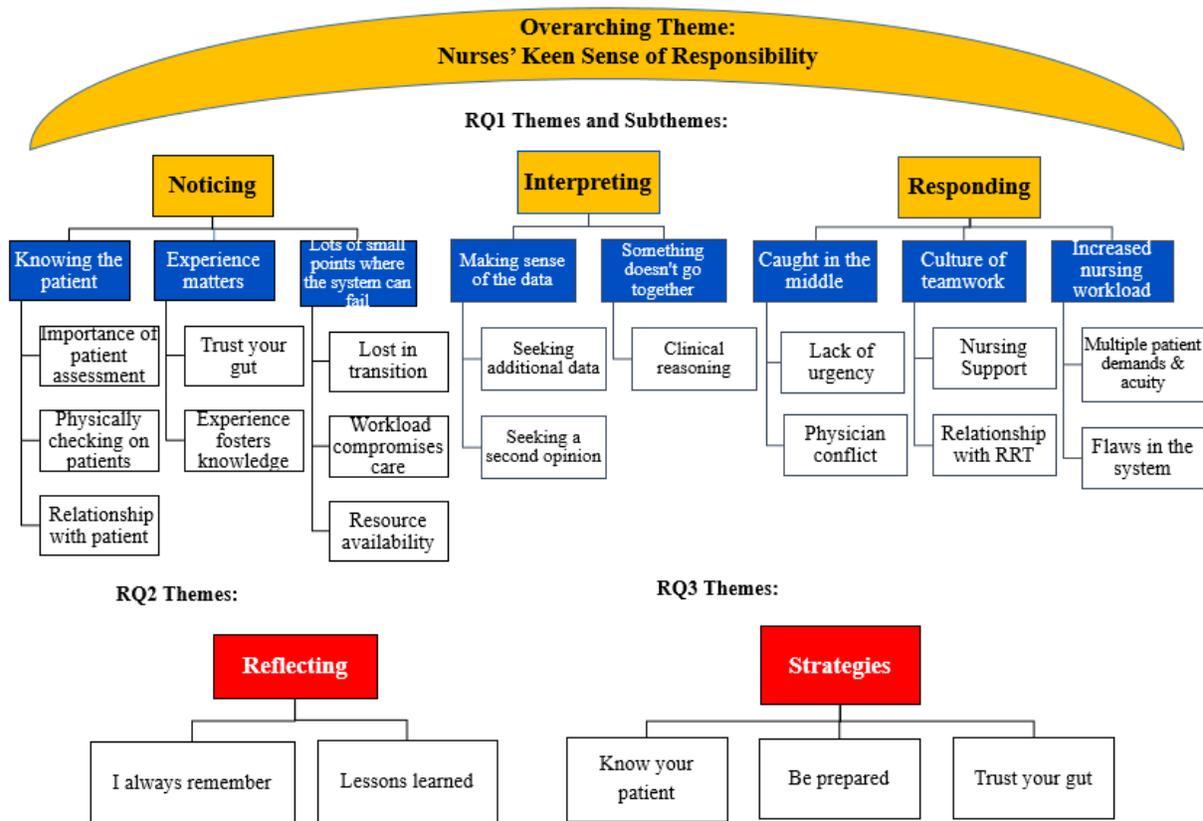


Figure 3. Overarching Theme & Research Question Themes and Subthemes

Research Question One Findings

The findings discussed in this section answer the first research question: What factors influence nurses' ability to notice, interpret, respond and reflect on situations of acute physiologic deterioration in the adult patient? An overarching theme that cut across all components of clinical judgment was Nurses' Keen Sense of Responsibility. Eight themes were developed to answer RQ1: knowing the patient, experience matters, lots of small points where the system can fail, making sense of the data, something doesn't go together, caught in the middle, culture of teamwork, and increased nursing workload.

An Overarching Theme: Nurses' Keen Sense of Responsibility

Participants' stories repeatedly portrayed the deep sense of responsibility and dedication they had for their patients. This sense of responsibility was a pattern woven throughout the narrative about the components of noticing, interpreting, and responding to patients who were deteriorating. The attitude of responsibility demonstrated participants' professional commitment to their patients' well-being that extended beyond routine patient assessments and vital sign checks and facilitated nurses' ability to notice situations of patient deterioration. Carol stated:

You go in there, have a job to help people get better, and don't let anything go wrong during your shift. This is my job. I'm not going anywhere until I make sure you're fine and stable". She added "I feel like I have to do... everything I need.... to save him. ...I don't need anything to get worse. I want him to get better. I'm not going anywhere until I make sure you're fine and stable".

Participants' commitment to and responsibility for their patient was similarly evident in their descriptions of responding to their patient. Marie described her experience during a code blue as "I kind of wanted to creep into the corner but I'm like, I can't. This is my patient." Repeated attempts to contact physicians, remaining by their patient's bedside while waiting for help to arrive, holding their ground in advocating for the needs of their patient, and placing themselves in difficult, uncomfortable, and dangerous physical positions were all identified in these stories. Nurses described climbing over things, getting down on the floor, lifting and repositioning unresponsive patients, and being covered with emesis in their efforts to care for and respond to their patients.

Having a strong sense of responsibility motivated participants to check on or physically

assess their patients more often, to seek out information from the medical record or from a nurse technician (also known as a nurse tech or unlicensed nursing assistant), and to actively pursue a physician response. Ann provided an analogy of her role as someone who makes sure that the patient safely crosses the river to their destination:

I was about to go to my break, but I told the other nurse, let me check my patient real quick and then I go to break. Check to make sure they're okay first. I just want to have that barometer for myself.

Marie also shared:

The techs do the vitals. So I will do a lot of mine, sometimes they (nurse technicians) just...you know, they get caught up in stuff and they can't get to my patients fast enough. So if I'm giving meds, I'm going in there anyway, I'll just check my own vitals. Then, I know what's going on, and...I know they're being taken care of and stuff like that.

Themes Related to Noticing

Participants described situations that ranged from subtle changes of deterioration over a period of hours to incidents of sudden, rapid onset, life threatening clinical instability. Within the component of *noticing* 48 key phrases were identified from interview transcripts. The phrases were then organized into 11 categories that describe the participants' ability to notice a change in a patient's condition. These categories were then examined further for overlap and similarity in meaning. Through this process, three themes were identified that reflected factors that influence nurses' noticing: *knowing the patient*, *experience matters*, and *lots of small points where the system can fail*. Each of these themes and their subthemes will be discussed with exemplar quotes as support for the themes and subthemes.

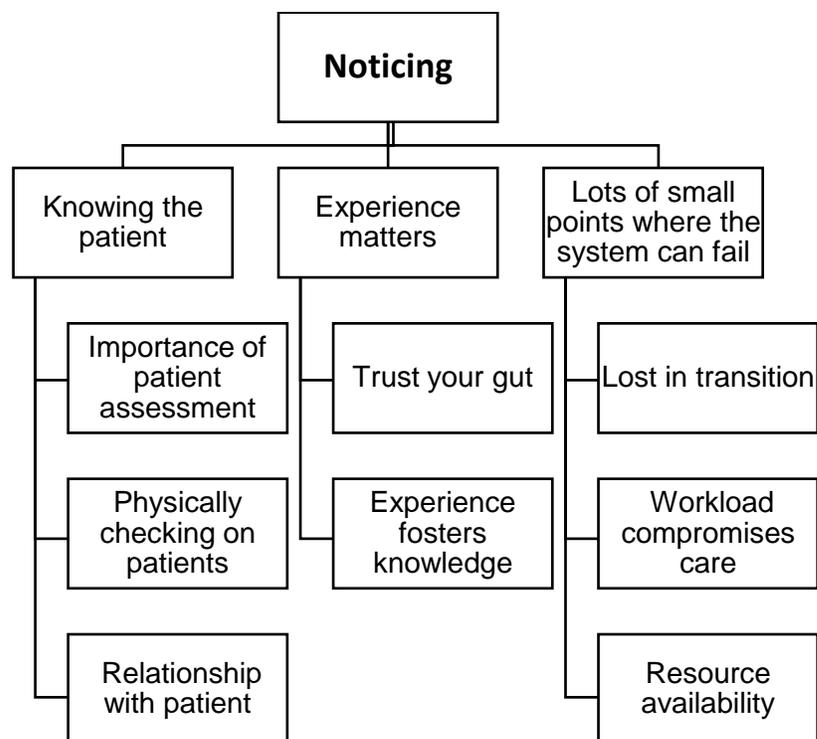


Figure 4. Themes and Subthemes for Noticing

RQ1 noticing theme 1: knowing the patient. *Knowing the patient* was a dominant theme conveyed by most of the participants. Participants described the ways they established meaningful knowledge of their patients that facilitated noticing changes in a patient’s condition. *Knowing the patient* incorporated three main subthemes: importance of patient assessment, physically checking on patients, and the nurse’s relationship with the patient.

Subtheme one: importance of patient assessment. Patient assessment is a core element of nursing practice and is the first step in determining the condition of a patient. The importance of performing a comprehensive physical assessment at the beginning of the shift was shared by multiple participants. “I always stress the importance of assessing your patient and just knowing them and what they look like” (Marie). Patient assessments allowed participants to establish a baseline. Kay stated “I was comparing it (the change) to the data that I had had in my assessment...from the time that I assessed her that morning to whenever she got back.”

Participants revealed that early indicators of deterioration can often be noticed through conversing with, observing, and physically assessing a patient. Observing a small drop of blood on her patient's sheet triggered one participant, Ellen, to further assess the patient. As she pulled the sheets off she noted, "he was soaked in blood." Noticing this change in her patient occurred even before vital signs reflected deterioration, further indicating the importance of physical assessment as an early warning strategy. Another participant, Carol, summarized the importance of assessing patients by stating:

For me, it gives me a picture. And with that assessment, I check the...whatever the surgery incision, or if the patient has a drain, or if that patient doesn't have any incision, his skin is intact, but he has some other disease going on with him. So I need to watch what can go wrong.

In addition to the importance of conducting a baseline physical assessment, several participants commented on the frequency assessments are done. The value of performing frequent physical assessments and vital signs was demonstrated by one participant:

The patient had been awake, alert, and talking. Vital signs were stable. They were doing I think every 30-minute vital signs and neuro checks on that patient at that point. There was a sudden change in cognition. He became very confused, was sweating profusely, and blood pressure went up suddenly. It had been I think in the 140s and went up to the 200s, but it was a very sudden change (Rachel).

Others stated that performing routine (required) patient assessments once per shift on a medical-surgical unit was insufficient for the acuity of their patients. "I think one of the detrimental things is that when you're a med-surg nurse who's only used to assessing your patients once a shift, then I think a lot may get lost in the 12 hours." (Mike).

Participants also voiced concerns that their colleagues were actually conducting thorough assessments. One participant, Marie, found it incredible that some nurses seem to have lost the value of physical assessment findings. “I have heard other nurses saying, like, well, the doctor asked me to listen to their lungs. Why would I do that?” Charting by exception was given as an example of how nurses could omit critical assessment details simply by checking a box that indicated “within normal limits”.

Sometimes not being able to physically assess patients caused nurses concern that changes would be missed. Barbara shared:

Sometimes it can be hard ...you have a busy unit and five patients. I’m not an intensive care nurse that has one or two patients where I can sit and watch him...Sometimes you don’t have time to adequately catch things.

She elaborated, sharing that she was able to notice her patient’s change in status when she went back to do the bath:

An hour and a half to two hours later when I came back in. He was...his breathing was different. His...he was tachypneic when we took his pressure. We went in there to give him a bath and it was, ...he’s not breathing the same.

Several factors can affect the quality of patient assessments; Angela described her challenges in her story about floating to a new unit. after report:

First of all, it was.... a busy day. I came to work, they floated me, and then I went to the third floor and they said, oh, you can go back to your floor, because we don’t need you anymore. So I went back to my floor, I took report on my patients, and then I started assessing my patients, and then they called me,...we have to move you to the fourth floor. And then I went to the fourth floor ...I had to wait for another nurse to come. I gave report to that nurse around

8:00, and then I got to the desk, to the fourth floor, at 8:30, had to find some of the nurses to get a report and all...so it was just kind of a confusing day for me. It was just, was so crazy. And then the floor wasn't my floor. That was ... my second time in, like, the whole year floating to that floor, so I was just so confused about the whereabouts of, you know... So all of that coupled together might have just, you know, made me blind to completing all the assessments to make sure the patient was okay.

Angela continued her story:

Earlier when I checked his oxygen two hours earlier it was, like, 94, but when I went in his room, it was 90. So I didn't really thought about it. And then when they came to check his oxygen saturation, looks like 80 something...I believe.

Because she didn't know her patient and had not had time to fully assess him she failed to notice the significance of the 90% oxygen saturation. The patient continued to deteriorate while she was off the unit, a rapid response call was initiated, and the patient transferred to the step-down unit because of respiratory compromise.

The importance of obtaining patients' vital signs as a component of assessing a patient was echoed by half of the participants. Being able to obtain an initial measure of vitals, recheck when a concern arose, rely on the nurse technician to communicate the vital signs, and know the vital signs trends were all mentioned as critical to noticing deterioration. Angela stated:

When you go in the morning, and you know your patient's baseline, after doing the vital signs... even if you may not know the patient at all, but, you know, you see the patient that first time, when you already know their baseline and you go back to your vital signs and their labs and see their baseline, you will know that, okay, something is not quite right with this patient.

Subtheme two: Physically checking on patients. Being able to physically check on patients was another way that participants described getting to know their patients. Samantha shared:

I'm glad that I happened to walk into the room...to check on her between the time that I gave her something, something was telling me, go ahead and check on her, you know? I don't know what it was, but...usually I won't go that fast to check on a patient, but that day I said, you know, I need to check on her. I don't know what it was

Hourly rounding (also known as intentional rounding) is one method of checking on patients. Hourly rounding involves regularly scheduled checking on patients throughout the day and night. Rounding in the study hospital is done every hour, alternating between the nurse and the nurse technician. Several participants mentioned that it was during the hourly rounding encounter that they first became aware of a change in their patient's condition. Elaine stated, "I was just doing my rounding...went in there ...to check on her and while I was in there she started kind of gasping."

Subtheme three: Relationship with the patient. Participants often indicated through their stories that it was because of their relationship with a patient that they noticed when something was different. Caring for a patient over time and continuity in patient care assignments were mentioned as ways nurses established relationships with their patients. Relationships provided nurses with a baseline knowledge and expectation of a patient's usual verbal and nonverbal behavior, typical vital signs, and response to illness. Sometimes participants noticed early, subtle changes as a result of having a relationship with a patient. Ellen explained:

This had been my fifth night in a row working with the same group of patients. ... so I knew them pretty well. And the first patient I went to see was someone that... He was, I guess,

medically cleared to go home, they were just waiting to find a SNF for him. And so I went into the room, and I walked in with the nursing assistant, because she was going around and doing her vital signs. And there was just something off with him. There was...he was normally... confused. He had some level of dementia, but he was able to speak and he was able to look at me. He was just kind of looking off at the wall, and I was, like, there's something off with him.

Kay described noticing that a patient's status had changed, "I had taken care of her for two days. So on the second day of me taking care of her, she was better than the day before. She was there, but she kind of seemed a little off."

The consequences associated with not having a relationship with or baseline knowledge of a patient stood out clearly in Becky's story.

At 3:00 my charge nurse was helping out....so she took the vitals and she was like 120s/80. My charge nurse didn't know, was not aware that she (patient) had been running very high blood pressures. She did not recognize anything was out of the ordinary. That this was an unusually low blood pressure.

Patients who were confused, nonverbal, or had an altered mental status presented a unique challenge. Participants consistently expressed how difficult it was to notice a change in these patients. Two of the participants shared similar thoughts about nurses keeping a closer eye on their patients on these patients. Marie stated:

When you have, like a patient that's nonverbal, that can't really verbalize how they're feeling...they can't really verbalize if they had changes, if anything's really going on with them...you really want to keep extra eyes on them, because they can't speak up for themselves.

Lisa's story was particularly haunting. Her patient was unable to communicate his needs and she didn't recognize what was going on until too late. The patient ended up coding and dying. Lisa shared:

...by the time I saw the change in him...it's almost like when that change of color comes, you're too late, you know. Sometimes I think when it happens, there's not always a lot of notice...or, you know, advance warning to what's happening, unfortunately.he could answer to his name, but he couldn't describe anything happening to him. And he just had a moment of really high anxiety. You know, jumping up and ripping, ... leads off and trying to pull his IV out. Just really high anxiety. And then once he settled down, it was, like, within five minutes he...I don't know, I think possibly he aspirated. I should have, at that point, called a rapid.

These examples demonstrate the potentially devastating consequences that can occur in situations where the nurse is unable to detect early signs of deterioration in patients who have an altered mental status. These patients may have an increased risk of unrecognized deterioration.

RQ1 noticing theme 2: experience matters. The second theme within the category of *noticing* suggests that nurses' intuition and experience play an important role in the detection of patient deterioration. Throughout the interviews participants indicated that they were able to notice changes in a patient's condition through "intuitive knowing" that developed from past experience in clinical practice. Participants were able to draw on this experiential knowledge to notice salient changes and patterns of deterioration. Subtle changes in an expected pattern or patient presentation triggered an intuitive feeling that something was not right. Two subthemes were identified: *trust your gut* and *experience fosters knowledge*.

Subtheme one: trust your gut. Participants acknowledged that a nurse's "gut feeling" played a role in helping them notice when their patients were beginning to deteriorate. In the present study nurses' intuition enabled them to recognize patients who were deteriorating even before changes in vital signs were noted. Nurses often identified that patients "just didn't look right" or "something was off" with a patient and then followed up by conducting an assessment or checking vital signs.

Samantha had a feeling that she needed to go back and check on her patient after giving the patient pain medication:

But this time, I don't know why I said, I need to check her, you know? See how she's doing". ...she was sleeping real quiet, so I tried to call her... and I tried to wake her up, but she was not responding. And I was, kind of worried, because when I looked at her, she was not opening her eyes at all. So I was thinking of respiratory depression.

Kay shared a story of a patient with a traumatic brain injury saying that "she just looked funny" and "I had a gut feeling". Because of her feeling that something was wrong she completed a more thorough assessment and then called for assistance from her charge nurse. The patient subsequently went into a full cardiac arrest, was administered CPR, and transferred to the ICU.

A similar story was shared by Marie, "I knew something was not right. I couldn't put my finger on it, but I just got the vitals and oxygen. He just...changed how he looked, and all I could think of was, he looks faint." Other nurses used expressions like "I walked in the room...and there was just something off with him" (Ellen), or "by the time I see patient, patient did not look good to me at all. I knew there was something going on" (Beth).

Subtheme two: Experience fosters knowledge. Participants in this study attributed past experience with similar situations as an important factor that helped them notice changes in a patient's condition. Experience affected the quality of patient assessments in terms of what the participant focused on during an assessment. Experience also established expectations for what a patient should look like after a particular surgery or procedure, and how a patient should respond to a particular medication or treatment. An experienced participant named Beth shared, "My education and background, and what is normal and what is not normal, and my experience will give me an idea".

For some participants, lack of experience limited the scope of their patient assessments so that relevant findings were missed. In response to a patient who complained of difficulty breathing Bill applied oxygen. However, he failed to notice that the patient was wheezing because he never listened to the patient's breath sounds. In this particular situation the patient was experiencing a severe allergic reaction to a medication and treatment could have been expedited had he noticed the wheezing. Similarly, a lack of experience played a role in Elaine's failure to notice that her patient was developing respiratory compromise due to an occluding tracheostomy. Elaine described her patient as "cantankerous" because she refused aspects of care and medications. The patient repeatedly asked to be suctioned throughout the shift but Elaine wasn't able to detect a change because she never listened to the patient's breath sounds and would just suction the patient. "So she liked to be suctioned. That was about the only thing she was okay with." Eventually the patient had a respiratory arrest due to an occluding mucous plug in her airway.

RQ1 noticing theme 3: lots of small points where the system can fail. *Lots of small points where the system can fail* is a theme that highlights situations and work environment

factors that influence nurses' ability to notice a change in a patient's condition. Subthemes that emerged include *lost in transition*, *workload compromises care*, and *resource availability*.

Within these subthemes several contributing factors that influenced noticing will be described. Inadequate communication at patient handoffs, competing patient demands, nurse staffing ratios, complexity of patient care, not having a nurse technician, and the absence of a family member were identified as challenges to noticing deterioration. The presence of family members and the support of a nurse technician were factors that facilitated noticing.

Subtheme one: lost in transition. *Lost in transition* identifies patient handoff situations as care transitions that place patients at greater risk for unnoticed deterioration. Twelve participant stories revealed that inadequate information, limited opportunity to ask questions, and lack of clarity during handoff were associated with the subsequent occurrence of patient deterioration. Gaps in communication during handoff contributed to nurses having incomplete knowledge of the patient. In most instances gaps in information influenced the receiving nurses' ability to establish baseline knowledge of the patient against which changes could be noted.

Multiple participants descriptions of the timing of deterioration included statements such as: "it was towards the beginning of the shift when it happened" (Thiefton), "I had just come on and her blood pressure was low at 8:00" (Mike), and "She'd just been transferred from step-down unit" (Ann). Some participants' stories suggested that the signs of deterioration may have been unrecognized or ongoing for a period of time. Beth spoke about a patient she received from the emergency department who appeared to be much worse clinically than what she was told in report:

I got a patient from ED and by the time I see patient, patient did not look good to me at all. I felt that this is not right...I felt that nurses failed to report to doctors, and doctors did not

know. I don't know. There could be something wrong in (what) they doing....Or did they not know? Did they not do their job? I'm trying to say by the time I received patient, the patient was already in bad condition. His temperature was already high. I feel like RN in the emergency department failed to give him a proper care.

Beth's situation raises the question of whether the reporting nurse was aware of the patient's condition at the time of handoff and how long deterioration might have been going on.

Stephanie shared another story where the patient's deterioration was noticed shortly after a transition in care:

Right around shift change, the patient was up to the chair. I heard a machine going off in the room, and I walked in to turn the machine off, and she was sitting up in the chair holding the emesis bag. And she was spitting into it. She was throwing up. And then she looked up at me, and I was trying to assess what all was going on in that moment, other than just her vomiting. And that's when she fell forward on the bed and we lost the pulse. I never got a chance to do a full nursing assessment on this patient because of the urgency of the situation.

In this situation the patient had been vomiting coffee ground emesis throughout the previous night shift and "her blood pressure was running borderline...it was trending downward". Stephanie was not initially concerned about the blood pressure she observed on the monitor until she was made aware of the patient's trending blood pressure changes during report. She explained "the pressure did not alert me, did not trigger me to start thinking. You know, I wasn't aware of the trend until after I got a report on her shortly before I had to call the code".

Becky described a situation in which her patient was hypertensive and required several intravenous doses of an antihypertensive medication during the shift. Becky described it as "a very busy day. We had no nurse's aide and I was running around like crazy. We were very, we

had a full load.” Her story highlights multiple factors from gaps in communication during handoff, process issues, not knowing a patient’s baseline, and workload that played a role in a particularly tragic experience. She continued her story, sharing that the charge nurse pitched in by taking some of Becky’s patients’ vital signs.

My charge nurse didn't know, was not aware that she (patient) had been running very high blood pressures, so this was an unusually low blood pressure. It went past me because my charge nurse....she didn't recognize anything out of the ordinary. It might have been poor communication...I hadn't said to her 'she's running high blood pressures.

Other factors may also have contributed to the outcomes of this situation. Even though the patient was receiving intravenous medication every four hours, the frequency of vital sign assessment did not increase but remained at the standard of every four hours. Becky further shared that because she and the charge nurse were so busy they failed to do the routine sepsis screening with the vital signs check. Sepsis screening might have alerted the nurses sooner to a significant change that the patient was experiencing. These factors combined to create a situation where this patient’s acute deterioration went unnoticed.

Subtheme two: workload compromises care. The participants described situations in which they had high patient acuity, simultaneous demands, and high nurse-patient ratios. From the participants’ viewpoint patient care can be compromised by heavy workloads by interfering with nurses’ ability to spend time with patients, pay close attention, and notice changes. High patient acuity was described as patients as being acutely ill and “considered an intensive care patient in a smaller hospital” and “we’re always taking care of very sick patients”. In these examples participants reported that they were unable to check on or physically assess the patient as often as needed. “Sometimes when a nurse has more than one patient that has something

going on, being with that one patient, taking care of him, and maybe something happens with another patient and you cannot go right away, that can be a problem” (Carol). “We may get multiple patients and multiple needs at the same time, and then we cannot be there at times, so time is a big thing. Sometimes we won’t get at a patient’s side whenever they need it.” (Beth)

Barbara summarized:

Sometimes it can be hard when you have a very busy unit of five patients... I’m not an intensive care nurse that has one or two patients where I can sit there and watch him.... it can be hard when you have five patients and don’t have time to adequately catch those things. At this hospital in particular, we have very high-acuity patients. Sometimes our med-surg floor patients in, like a smaller hospital would be considered an intensive care patient. When you have those patients...., it makes it very hard to safely monitor them.

The high acuity of two patients interfered with Angela’s ability to provide adequate surveillance over her other three patients:

I had two patients with critical labs that the night shift nurses had not reported to the doctor. Their hemoglobin was six point something and five point something. So it was a mess. I had to do two blood transfusions. I had to call the doctor and then call the lab, you know, do type and cross and all that. So I just started concentrating on that, on those patients, and forgot about the other one, you know, because I was, like, let me get this hemoglobin done.

Subtheme three: resource availability. Closely related to workload is the subtheme of resource availability. Findings revealed several contextual factors that influenced the nurses’ ability to quickly notice when a patient’s condition changed. From the perspective of participants in this study, family members presence at the bedside, support of a nurse technician,

and the use of electronic patient monitoring were all valuable resources that served to alert nurses to changes in a patient's status.

Participants described family members as important sources of information about their patients. Lori suggested that the presence of a family member could have alerted the nurses to a serious situation sooner. Lori was caring for an elderly patient with dementia who developed an acute hemorrhage shortly after having an arterial catheter removed.

It was late at night. She was very sleepy, and she didn't have any family at the bedside. It was only me and two other nurses on the unit. We like to recruit family to be there 24/7 so that if they do, you know, move around and disturb the site, like, in between our checks, they can call us in the room to check. But she had nobody at the bedside, which is dangerous. So just within that period of five minutes, she had somehow moved and bled. She had bled out a substantial amount, and she was unconscious.

Sometimes a patient's family concern prompted the nurse to check on a patient more often, as in the story shared by Marie.

His family was concerned for him because he had been in a nursing home and he.... They.... never noticed that he had an infection until he got it and ended up in the hospital. He'd almost be septic from it. And so we were talking about that, and I explained things they could look out for. After we had that conversation, I just checked on him more frequently that day.

Nursing technicians were also mentioned by several participants as invaluable in helping the nurse notice when a patient was deteriorating. In multiple situations it was the nurse technician's communication of a patient's abnormal vital signs that prompted the nurse to further investigate. "I'm glad that my tech went in 30 minutes after I did, because, you know, if she wouldn't have went in for another 30 minutes, say she was late on her vitals...., it could have

had a different outcome” (Nurse1). Not having a nurse technician, or having one who also had a heavy patient load, or who was not as reliable in reporting vital signs to the nurse could also be problematic. As one participant explained, having one nurse technician for 15 patients might mean that she wouldn’t get her patient’s vital signs for quite some time. “Some people don’t even realize until the end of the shift, wow, the tech didn’t get the vitals all day long. I’m like, oh, they didn’t? So I will just check my own vitals”(Marie). In these instances the delay in receiving the information about vital signs might delay noticing a change in patient status.

Themes Related to Interpreting

Within the category of *interpreting*, 25 key phrases were identified from the transcripts. These phrases were examined for similarity in meaning and combined to form ten categories that encompass the factors that influenced the nurses’ ability to interpret a patient’s episode of deterioration. The categories were refined to develop two themes: *making sense of the data* and *something doesn’t go together*, and three subthemes.

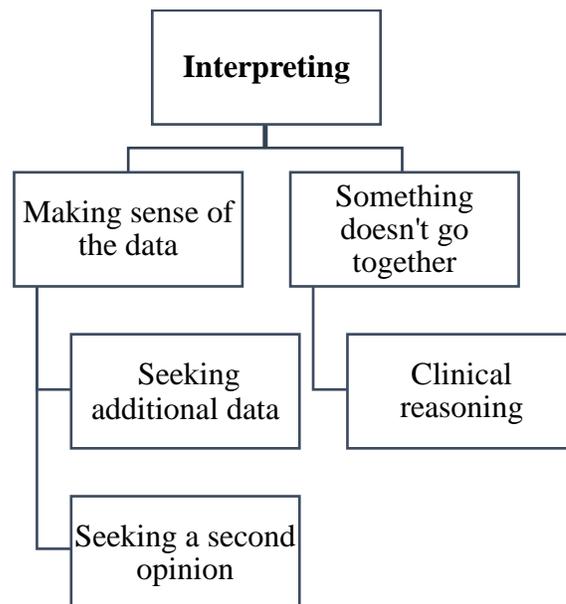


Figure 5. Themes and Subthemes for Interpreting

RQ1 Interpreting theme 1: making sense of the data. *Making sense of the data* theme captured participants' descriptions of the types of information and support they sought to help them interpret a situation of deterioration. Two subthemes reflect the activities that nurses engaged in to understand or make sense of a situation: *seeking additional data* and *seeking a second opinion*.

Subtheme one: seeking additional data. After initially noticing a change in their patient's condition, most participants (n=17) attempted to gain an understanding of the situation by collecting additional data. This period of information gathering was marked by uncertainty as each piece of information was compared to what was known or expected. In each of these examples participants collected physiological data (eg. vital signs, oxygen saturation, lung sounds, level of consciousness), or content from the medical record. Nurses with all levels of experience described the need to collect additional pieces of information unless the patient deterioration was very clear. Three participants did not seek additional data because the patient experienced a significant, abrupt, and unambiguous episode of deterioration. In situations where participants sought additional data there could be some delay involved, depending on how accessible the information was, how many different sources of information was needed, and how much time it took to gather the data.

Beth stated:

If I see something abnormal, I like to redo it (vital signs) at least in another hour. And if I see same thing again, I like to take it at least three times, making sure there is not much different, you know, from my initial assessment.

Beth's story also demonstrates the range of data she collected from multiple sources:

...And I took his temperature and vitals. His respiration was running from 25 to 40, lungs are really... lung sounds were very, very bad, and his temperature was no more than a 100. And I looked at his labs, and all labs were so bad. And his white count was, you know, 23.7 by the time I was checking. So I knew there is something going on, you know.

When the nurse technician first notified Mike that his patient's blood pressure was low, Mike asked for additional information because he knew from report that the patient "always had a low blood pressure". Mike then went into the patient's room to gather more information that would help him process what was going on: "actually, my first response was to go back in, recheck her blood pressure, double check to see when she got her last blood pressure medicine". Mike then went to the medical record to see if the patient had received any medication previously that might explain the low blood pressure. Each of these pieces of data helped the participant understand the changes that were occurring and their significance.

Subtheme two: seeking a second opinion. Multiple participants spoke of reaching out to a more experienced nurse to validate their concerns about changes they were seeing in their patients. Laura explained "the other nurse always comes and looks, so it's always good to have that second eye". Most often it was the charge nurse to whom participants turned for support. Even experienced participants sought the opinion of others when they were uncertain about patient. "I always ask experienced coworker, you know, can you look at my patient? Just go and look at my patient, does not look good to me." (Beth)

Sometimes less experienced participants recognized their lack of knowledge and the need for a second opinion. One RN shared:

So as a newer nurse, I called the charge nurse and I said, hey, you know, while I'm trying to, see if they responded to deep pain stimulus or anything like that, sternal rub. I called her up...., I'm in such-and-such room. Can you come in here?

Laura similarly spoke of her appreciation for having another nurse available.

I think it helped a lot, having... that other nurse there, too. Even if I had...wasn't too concerned or looking at it, you know, we always say out loud, hey, this patient's this, and the other nurse always comes and looks, so it's always good to have that second eye.....that somebody else might be like, you know what, we need to go check and stuff like that.

RQ1 interpreting theme 2: something doesn't go together. The second theme revealed by participants as they attempted to interpret a situation was *something doesn't go together*.

Within this theme expectations based on the participant's knowledge and experience, combined with reasoning processes helped participants interpret the changes in a patient's status.

Something doesn't go together included one subtheme: *clinical reasoning*.

Subtheme one: clinical reasoning. In this subtheme participants demonstrated the problem solving processes of clinical reasoning that guided them in assimilating information in order to interpret a situation. Participants' stories illustrated deliberate consideration that was given to analyzing, weighing, and evaluating multiple pieces of patient information to interpret situations of deterioration.

Beth received a patient from the emergency department whose clinical picture was quite different from what she had received in report. "Just looking at him... he did not look good to me at all. So I knew there is something going on, you know. Either the patient was going in sepsis or there is something happening to the patient." Her subsequent actions demonstrated the recursive nature of clinical reasoning as she rechecked the patient's vital signs, mental status, and

physical assessment and processed that information in comparison with her patient's laboratory results. This information processing occurred in a situation of relative uncertainty as she determined what was happening with her patient.

The amount and quality of information available and the nurses' experience affected the process of clinical reasoning as was conveyed by Stephanie.

I was trying to assess what all was going on in that moment, other than just her vomiting...in the midst of trying to call for help, yelling, and get her up into the bed, my mind started working, like, what was going on? And so my assumption was, because of whatever cancer she may have had in her, it may have caused a bowel perforation.

In this subtheme participants demonstrated how prior experience, knowledge of the patient, medications, and typical illness presentations facilitated the interpretation of a situation. One participant explained "When you get an unknown patient that comes in with stuff that doesn't make any sense, why is she presenting that way..., that's not a symptom of pancreatitis. That's not a symptom of cholecystitis". Thiefton compared the changes she observed in her patient to what she knew from experience. "But...his temperature, though it wasn't quite in the septic range, like, where we're supposed to be setting off an alert, it was higher than he normally ran".

Themes Related to Responding

The category of *responding* yielded 52 key phrases that identified factors impacting the response to a deteriorating patient. Three prevailing themes emerged from an examination of the descriptions provided by participants: *caught in the middle*, *culture of teamwork*, and *increased nursing workload*.

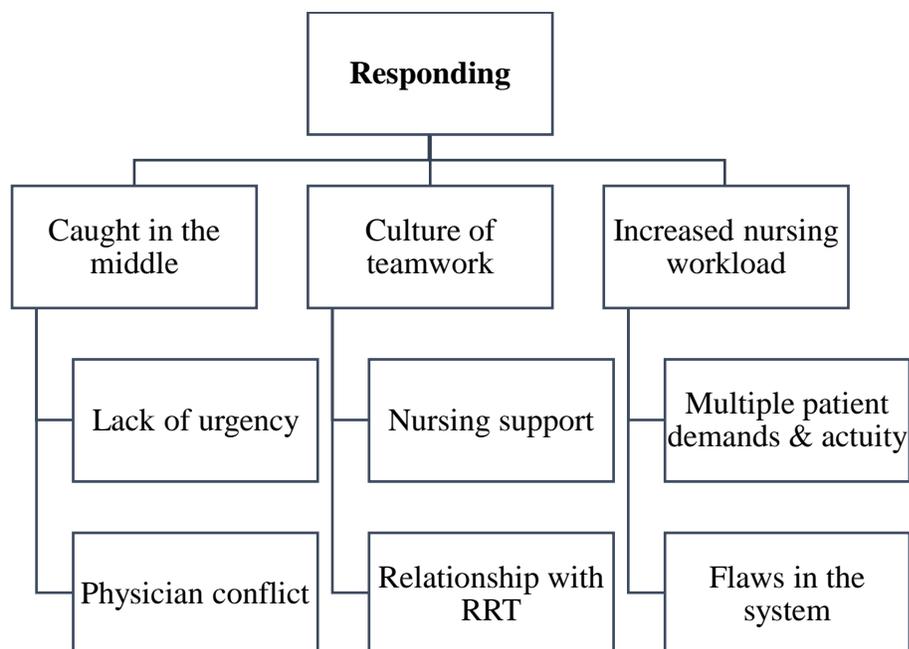


Figure 6. Themes and Subthemes for Responding

RQ1 responding theme 1: caught in the middle. Comments that fell within this theme portrayed participants' frustration with physician delays and a perceived *lack of urgency*, and *physician conflict* experienced when calling, communicating, and engaging with physicians. Each of the described examples of delayed physician response or conflict resulted in delayed responses, subsequently affecting patient outcomes negatively (code blue, CPR, transfer to the ICU, death). Mike explained how a negative interaction with a physician could lead to future hesitancy on the part of the nurse to call a physician: "because if they come in and start making you feel like a fool or something....then the next time, you're not going to be so quick to call them." Additionally, some participants described their frustration when they were unable to intervene because it was beyond the RN scope of practice. Mike's comment reflect this, "I would have liked to have started the Levophed earlier or, you know, bolus heror something like that, but that wasn't my place there." Recognizing that a patient was in a compromised position,

knowing what needed to be done, and then having to wait for physicians to respond all contributed to nurses' feelings of being *caught in the middle*.

Subtheme one: lack of urgency. Delays in responding to participants' phone calls and the frequent perception that physicians displayed a lack of a sense of urgency was echoed by ten participants. Participants' attempts to communicate changes of concern about a patient were often met by a lack of a sense of urgency from the physician. Frustration at being caught in the middle of a situation where they were concerned about a patient and unable to get a response from physicians was evident from these interviews. Participants explained that their hands were tied as they waited on a physician to return a call, physically come and check on a patient, or provide orders for the nurse to intervene.

During these situations participants described increasing the level of surveillance, checking and re-checking vital signs, reassessing the patient and making repeated attempts to contact the physician. Thiefton expressed her frustration, "We waited about, oh, it was probably an hour trying to get the doctor to page back and they wouldn't...so we made a rapid response call. Even with the rapid response people (calling)...it took at least an hour and a half to two hours out before we finally got the doctor."

Others described watching over a patient for longer periods of time. In many situations the participants went over the physician and called the rapid response team after a period of waiting. Carol shared "I couldn't get hold of the doctor, and that's when I called the rapid. I said, I need help." Similarly, Barbara expressed her decision not to wait on the physician:

I'm too concerned to wait for her to get up here. She just didn't sound very concerned.... and I was afraid that she would either take her time to get there or...I just didn't feel comfortable with this situation....So I went ahead and called a rapid."

Subtheme two: physician conflict. Personal conflict between the participants and physicians was the second most commonly expressed concern within the theme of *caught in the middle*. Stories included issues such as a lack of clarity regarding responsibility during a code blue situation, lack of guidance by the physicians, lack of respect, and demeaning and aggressive physician behavior. Multiple participants reported examples of physician behaviors that ranged from insulting, demeaning, and intimating comments to aggressive behavior that interfered with the response to a patient. As Mike described, these negative behaviors led to hesitancy to contact a physician:

So you have a whole gamut of things you would like to do before you start involving the doctors, because you're going to look like a fool if you don't have your ducks in a row.it's almost....a dumbing down, but you feel like an idiot if they say, well, when was the last blood pressure medicine and then you look and see...or her last pain medicine.

Kay's description expressed her frustration over the verbally abusive, disruptive physician behavior she experienced:

One of the code doctors decided he was going to be high and mighty while he was running the code. He's giving orders. And he decides he is going to do chest compressions. So he pushes everybody aside and does chest compressions. He decides that she is not doing...bagging the patient effectively enough. So he decides to do one-handed compressions and smash the mask onto the patient's face even farther while he is trying to do one-handed compressions. While he's giving orders to the code team.

In the examples provided participants characterized the struggles participants experienced when responding to deteriorating patients. Delays in physician response were evident as

participants sometimes waited for lengthy periods. Patient care was likely compromised during these times and when physicians behaved rudely or discourteously.

RQ1 responding theme 2: culture of teamwork. The stories shared in this study provided insight into the degree of teamwork involved in managing a deteriorating patient. Participants recalled collaboration among members of the nursing staff on a unit, working together as a team, helping care for patients. Comments within this theme reflected participants' positive feelings about the level of collaboration and teamwork between members of the nursing staff and the between the nursing staff and the rapid response team. None of the participants expressed concerns related to negative behaviors or communication from any of the RRT members. *Culture of teamwork* was derived from two subthemes: *nursing support* and *relationship with the RRT*. Participants gave many examples of how the presence of a supportive charge nurse, an experienced staff nurse, nurse technician, and a supportive rapid response team facilitated the response to a deteriorating patient. The most frequently mentioned example of teamwork was that demonstrated by the charge nurse who provided an expert second opinion, provided backup by covering other patients, and assisted with the response situation. The second most prominent category in this theme was the participants' perception that the rapid response team was a valuable resource that provided a safety net for deteriorating patients.

Subtheme one: nursing support. Participants in this study consistently portrayed working relationship with the nursing staff as being positive and supportive. When faced with situations where a patient demonstrated concerning changes, particularly in situations of ambiguity, most participants felt comfortable in reaching out to their charge nurse or another more experienced nurse. Having a supportive team represented a very large subtheme that ranged from having the assistance of a nurse technician to relying on other nursing staff when a

patient was deteriorating. Kay shared, “The staff on my floor are awesome. We...then and now, we work very, very well together, you know...everybody comes running, we don’t have to tell them to look after your other patients They do it automatically.”

Stephanie described teamwork on her unit similarly:

I will say a second after the other two nurses were coming in and the three of us were trying to get the patient back into bed, another nurse was coming by and I think we almost got the patient up into the bed, and she said, what do you need? And that’s when a fourth nurse ran down to the supply room and got us the towels and suction that we needed.

Subtheme two: relationship with the RRT. Even though many participants in this study chose to first notify the physician, almost all of the participants reported feeling supported by the RRT. Members of the RRT were viewed as having specialized training and skills, a resource for the bedside nurse, and a safety net for deteriorating patients. Hesitancy to initiate the RRT did not arise from any negative relationships with the team but rather from a cultural practice of notifying physicians first. Thiefton’s described her experience:

As a new nurse it was just overwhelming. The rapid response team that we dealt with was awesome. They were phenomenal. They showed up, they were bouncing between the two rooms, helping us as much as they could... It was really chaotic, but they were really awesome in the way they responded.”

Barbara’s comments demonstrate the value of the RRT in rescuing a patient but also in providing validity for the participants’ interpretation of a patient situation:

I’m so grateful for our rapid team, because for the most part, you know, they’re willing to come and help, and they will just help...they’ll just jump in and they will help take over, and they’ll get all the labs and do whatever you need them to do. And they help you advocate to the

doctor, so that it's not just one nurse that gets, you know, bullied by doctors, saying that, no, there's nothing wrong with this patient.

In contrast to these stories, one participant reported having experienced an uncomfortable interaction with RRT members during a previous call. Because of this experience Mike was hesitant to call about a patient unless he felt very confident that the patient was deteriorating.

RQ1 responding theme 3: increased nursing workload. Participants in this study identified multiple situational variables and workflow factors that contributed to the theme of *increased nursing workload*. Time pressures, heavy patient loads, miscommunication, lack of a nurse technician, high acuity patients, and operational failures related to processes or missing equipment and supplies were factors that contributed to this theme. Key interview findings that contributed to increased workload were categorized into two subthemes: *multiple demands and patient acuity* and *flaws in the system*.

Subtheme one: Multiple demands and patient acuity. Nine participants depicted the work environment as very demanding, with nurses juggling multiple patient responsibilities simultaneously. Barbara explained, "It's hard to balance a five-patient ratio when they're taking up all your time." Several participants mentioned the high level of acuity of their patients and multiple patient responsibilities that either delayed or interfered with an immediate response to a deteriorating patient. Others shared frustration because they did not have a nurse technician and were very busy with a "full load" of patients. A "full load" could mean very sick patients with increased care needs, multiple admissions, discharges, and transfers during the shift, or performing nursing interventions. "Sometimes we take care of nine patients in one day, because we discharge some patients, we admit new" (Carol). Some participants indicated they were busy attending to the needs of another patient and unable to check on or respond to a patient. For

example, Beth stated with frustration, “I had a sick patient and he was calling me, I was in the middle of a rapid response, and he keeps calling and calling and calling me.” Similarly Ellen described her frustration at having to divide her attention from taking report on a new admission to go to her patient that deteriorated. Ellen shared:

I hadn’t seen any of my other patients and everyone needed their evening medicines. I even had an admission that was coming in. I had taken report for the admit right before I came to see this patient, and I saw my admit, coming in... from the ER, so we had nothing really ordered or anything.

Angela’s description demonstrates being torn between multiple patient demands, “the first two patients, I saw their hemoglobin was already... six and five, so I just started concentrating on that, on those patients, and forgot about the other one, you know, because I was...let me get this hemoglobin done”. Angela had to prioritize her patients based on their level of acuity which meant that she had to delay care for one or more of her other patients. It was one of those other patients whose deterioration was unnoticed until the patient needed a rapid response call initiated.

Subtheme two: Flaws in the system. Several participants spoke about “flaws in the system” that led to delays in optimally responding to a patient. These system flaws ranged from missing supplies or equipment, poor information flow between providers, to issues related to the process for contacting a physician. In each example given there was an associated delay in the timely response to a deteriorating patient.

Some participants shared that the process by which calls went through the paging operator to the physician made it more difficult to contact a physician unless it was a rapid response or code blue team call. Ellen explained:

I think the biggest thing was getting hold of the doctor first, because with the way that the paging system works with the operator, it would have been...., almost impossible to get a hold of him with a number. The operator was taking forever. Like, it took him two minutes to get through the operator. And so I was just sitting around, like, where is the doctor? And I was, like, I can't find the doctor. Like, I can't even get a hold of the doctor.

Four participants described situations where the nurses had to search for essential supplies or equipment that was either missing, misplaced, or not readily available or malfunctioning. Lisa responded to a patient who went into a cardiac arrest requiring CPR and endotracheal intubation. Lisa shared that initially she was unable to locate the defibrillator pads on the code cart. "... we were trying to find the pads for the defibrillator...there's the drawer that says the defibrillator pads, but they were inside of a baggie under a paper." During this same situation Lisa added "When they were intubating... her throat was swelling and the ER doctor who was trying to intubate her was having a difficult time...we didn't have any medications for the intubation, and...so that was another kind of delay."

Although situations involving effective use of technology were limited, one example provided has broad implications. Becky's charge nurse offered to help take vital signs on a patient because the unit was very busy. The charge nurse was unaware that the patient's blood pressure was actually much lower than his normal range. According to Becky the patient's blood pressure was in a normally acceptable range but not normal for this patient. In order for the charge nurse to have seen that there was an alert for this blood pressure reading, she would have to have gone into the electronic medical record at the nurses' station. Because the nurse was unaware of this alert she didn't respond to the lower blood pressure.

Summary Research Question One

Participants in this study experienced many factors that either constrained or facilitated attempts to successfully resolve a situation in which a patient had clinically changed and started to deteriorate. The first research question addressed factors that influence nurses' ability to notice, interpret, and respond to episodes of patient deterioration. Findings revealed an overarching theme of Nurses' Keen Sense of Responsibility that facilitated nurses in noticing, interpreting and responding to patients. Nurses' ability to notice was strongly influenced by *knowing the patient, experience matters, and lots of small points where the system can fail.*

Facilitators such as being able to establish a baseline knowledge of a patient through performance of patient assessments and previous history of the patients shaped the ability of the nurse to detect changes. Lack of information at transitions of care and patient hand off was seen as a major constraint that made it more difficult for nurses to notice when a patient demonstrated subtle signs of deterioration. Two themes were identified as having an influence on nurses' ability to interpret a situation: *making sense of the data* and *something doesn't go together.* *Making sense of the data* describes the processes nurses used to gather additional data and feedback from experienced nurses. *Something doesn't go together* describes nurses' engagement in the cognitive processes of clinical reasoning and the ability to recognize and interpret a situation that differed from their past experience. Three themes were identified as influencing nurses' ability to respond to a situation of acute deterioration: *caught in the middle, culture of teamwork, and increased nursing workload.*

Research Question Two

How do nurses describe the use of reflection during and after the process of noticing, interpreting, and responding during situations of acute physiologic deterioration in an adult patient? Interview transcripts were analyzed for comments that demonstrated reflection-in-

action and reflection-on-action. It was clear from the interviews that all the participants had critically reflected on the experience they shared and multiple examples of reflection-on-action were identified. Surprisingly, analysis of interview transcripts did not reveal examples of reflection-in-action. It is not known whether this was because the interview questions asked did not elicit the reflective response or whether participants were unaware of reflecting during the situations as they occurred.

Many participants commented on the emotional impact of these situations and how distressed they were at the time they occurred. It was also clear that they had used these experiences to inform and improve future situations of patient deterioration. They were able to provide detailed specifics of the incident as they had attempted to work through what happened, what they thought and felt, what influenced particular actions, and how they would respond in future similar situations. Two main themes were uncovered through qualitative analysis of comments that showed participants' reflections: *I always remember*, and *lessons learned*. These findings clearly indicate that patient deterioration experiences left lasting impressions, that participants reflected back on and learned from their experiences, and the ongoing thread of the nurses' deep sense of responsibility for their patients.

RQ2 theme 1: I always remember. The most prominent theme of reflection was the emotional impact these patient experiences had on the participants. Multiple participants characterized the emotional distress as intense and long lasting. Kay's example clearly conveys her distress, "I break down, I start bawling. I was devastated as a nurse to be degraded....I had a hard time going back to work after that because I always worried, am I going to get yelled at again?" Participants described a wide range of negative emotions. For example, 13 participants shared that the experience left them feeling sad, angry, helpless, guilty, frustrated, or inadequate.

Feelings of inadequacy were described as being related to inexperience or lack of skill in these high stakes situations of an acutely deteriorating patient. One participant stated “I always have that guilt of, like, could I have done something sooner or caught something earlier or done something different.” Two participants became somewhat emotional during the interviews, and several described having had ongoing distress for some time following the event. Sometimes the negative feelings were directly related to the loss of a patient, sometimes they were due to a belief that more could have been done or could have been done better.

The most painful experiences were those where the participant believed he or she had not noticed the changes soon enough, misinterpreted the changes, or responded incorrectly. In these situations they questioned whether an event could have been prevented. Kay’s regret over not trusting her intuition was clear, “If I were to have known...if I were to have trusted my gut whenever she rolled back into the room.”

Lisa’s anguish came through as she explained:

I just felt like a failure, ... I couldn’t tell what was going on with the patient. I couldn’t communicate with him. I just felt that I wish I had a better sense of what he was experiencing. I felt like it could have gone better, you know, if we had communicated.

Angela’s guilt was equally palpable:

I felt bad.... terrible about it, because it was like, one hour after I had just...because he’s the last room on my way out to the breakroom. Maybe, you know, I didn’t do it right... I should have paid more attention, maybe ask him more questions or check. But he was confused, ...I asked him, are you okay? How are you? He said, I’m fine. But apparently he was deteriorating,..and when he said he was fine, I just walked away and, ... I should have paid more attention...I should have done something.

Even in situations where the changes in a patient were quickly noticed and the response was appropriate there was often a sense of sadness. “I felt so sad. This young man...We did everything right, everything that we could have done... he bled, and we couldn’t stop it”

(Rachel)

In other situations, participants blamed themselves for not being better prepared, for anticipating. The frustration expressed in Stephanie’s story was especially vivid.

...when I realized that she didn’t have a pulse, I yelled code. The doctor pulled the code button and he stepped out of my way. Rather than helping me to get the patient back into bed or get her down to the ground, he stepped out of my way... and out of the room. I was trying to get the patient up by myself. But when I started to go down to the ground, I realized there were gastric contents all over the floor. I was in shock about it. It was not expected. I was not expecting something like that to happen like that so fast.... anger toward that physician. Frustration that I didn’t have the suction set up on the wall, and then frustration that I couldn’t get the patient in the proper position.

Another perspective was shared by Stephanie, whose frustration went beyond what occurred during the event:

I couldn’t tell you how many times it took...you know, before they (doctors) showed up, but I do know they were notified upwards of four to five times. I also had the thought of, this poor lady.maybe we could have gotten something addressed in the middle of the night...it may not have gotten to this point.

Other participants’ anger and frustration was directed towards the nursing or medical staff:

The patient was already in bad condition. I felt that this is not right, his fever, missed by doctor and nurses as well. I felt that nurses failed to report to doctors, and doctors did not know. I don't know. There could be something wrong in they doing.... Or did they not know? Did they not do their job? His temperature was already high. I feel like RN in the emergency department failed to give him a proper care. We failed to provide right care, you know? Right care means proper care, I'm trying to say. All mixed feelings. I felt they were just lazy and they did not do their job.

Barbara's frustration over having to juggle multiple high acuity patients, not being taken seriously when calling physicians with concerns, and then having a patient "who goes south on you" was directed more towards nursing administration or nursing staffing policies that left nurses caring for too many patients:

When you have a few of those patients, it makes it very hard to safely monitor them. I feel like they put a lot of pressure on you at a med-surg level to be the first nurse...like, you're the first level to catch if something's wrong.

She went on to explain that if a nurse questions staffing:

I think if you try to stand up for yourself with those things, a lot of times ...I don't know. You're taken like you're not a team player...or you're a complainer, and they try to brush you off like it shouldn't be that big a deal. Or try to puff you up, like, hey, you can do it, and try to make you feel like it's totally possible, and it's okay. And, yeah. Sometimes it's not okay and it's not safe

RQ2 theme 2: lessons learned. In addition to the strong negative emotional response to these experiences, as shared in the previous theme, multiple participants also commented on how the situation made them more conscientious and enhanced their knowledge to improve future

responses to patients. These statements are examples: “You go through this and you say, how can I use this to improve my level of care?” and “I think afterwards..., that reflection of, you know, what we did, and I think we always reflect and want to do things better.” Within this theme participants demonstrated that they immediately began processing and analyzing the event to learn from it. Many participants sought out colleagues for feedback after the incident. Barbara shared, “I’ll talk it over with them (nurses)... once we’re not in a critical moment. I will try to go over it with them to, use it as a learning experience and find out if there’s something I could have done differently.”

Participants also described applying what they learned from these events and what they would do differently in subsequent encounters. Samantha reported, “This situation actually has made me even more aware of my other patients I’m taking care right now.” Nurses also described applying what they had learned to teach and prepare other nurses to be prepared for situations.

Summary Research Question Two

The participants in this study described multiple examples of reflecting back on their experiences with patient deterioration. Reflection-in-action was not identified in the stories shared. Two themes emerged from the stories participant’s shared: *I always remember* and *lessons learned*. Many of the participants had unsettling experiences in responding to a deteriorating patient that threatened their self-esteem, self-confidence, and emotional well-being. Others expressed frustration and anger because of their inability to provide the care they thought the patient needed while waiting on a physician to respond. Lastly, in most of the participants’ stories, learning and growth in terms of their ability to improve on future situations of patient deterioration was demonstrated.

Research Question Three

This last section addresses research question 3: *What strategies would help the nurse notice, interpret and respond to cues signaling clinical deterioration?* Participant recommendations for improving the response to a deteriorating patient were grouped into three themes: *know your patient, be prepared, and trust your gut.*

RQ3 theme 1: know your patient. The theme of *know your patient* was developed from the participants' recommendations for improving future situations when a patient is deteriorating. Fourteen participants advocated for physical assessments, vital signs, continuity in patient assignments, hourly rounding, and patient monitoring as strategies to improve nurses' knowledge of their patient to notice a change in baseline. Strategies include assessing and monitoring patients.

Patient assessment in this study was characterized as a combination of activities that participants used to evaluate a patient's clinical status, including activities such as vital sign measurement, physical examination, visual observations, and verbal interactions with a patient. The importance of assessing and monitoring patients cannot be underestimated and was recommended as a strategy by 13 participants. As Marie shared "First and foremost always assessing your patient, knowing.... their baseline...notice changes even if they're really small. Keep up with vital signs."

Comments from participants that supported this theme included "monitor patients very closely (Beth), "just doing thorough assessments (Ellen)" and, "listen to your patients, focus on one patient at a time (Carol)". Several participants stated that the standard frequency of assessments on medical surgical units was inadequate. Mike summarized this concern clearly, "I

think one of the detrimental things is that when you're a med-surg nurse who's only used to assessing your patients once a shift, then I think a lot may get lost in the 12 hours."

Assessments and monitoring provide participants with a mental picture of how their patient looked at the beginning of the shift. As Angela stated "When you go in the morning, and you know your patient's baseline.... you go back to your vital signs and their labs and see their baseline, you will know that, okay, something is not quite right with this patient." She elaborated, stating "It's always good for nurses to go back..., not only the day before, not only the shift before, but,...if you're taking care of a patient on Wednesday, go back to, like Tuesday or Monday so you can get stuff."

Even though vital signs are an essential indicator of a patient's condition, one participant advised that reliance on vital signs alone was not enough:

A lot of people assume that if people's vital signs are stable, then they're fine. Which I don't agree with at all. I've had many situations where people's vitals look good, but I'm like, there's something else going on, everything could look fine on paper, the patient could still look horrible. They could still be doing horrible.

Hourly rounding was also mentioned by several participants as a way of keeping on top of their patient's status. With patient assessments only being required once each shift, hourly rounding provides another way for nurses to gain knowledge of their patients. "I think ...well, rounding definitely helps.we round every hour, but before we leave for lunch, we should be able to round on the patient first... ..before we leave. Because it taught me a lesson (Ann)".

Continuity in patient care assignments was also suggested as one way to help nurses know their patients. Nurses who provide care to the same patients over a period of time get to know the patient better and establish a baseline for comparison. This nurse-patient relationship

may increase the amount of subtle information that the nurse knows about the patient which can guide nurses in making better clinical judgments. Carol explained that most of the time nurses try to care for the same patients: “try to keep the same assignments for patients, it’s better for the patients and for the nurse, because you already know a lot about the patient, so the next day when you come in, you know what you’re looking for.” Carol went to say that even though attempts are made to assign the same nurse with the same patient the nurses may also be assigned to another patient that is “very sick, high maintenance...something happens with the other patients and you cannot go right away.” Having another very sick patient would take up more of the nurses’ time. Nurses also have to float to other units to fill in for staffing shortages, which prevents them from caring for the same patients.

RQ3 theme 2: be prepared. Eight participants advocated for nurses to take steps to prepare themselves for situations of patient deterioration. Recommendations included being knowledgeable about unit protocols and policies, checking to make sure necessary equipment was available, obtaining additional education and training with critical situations, and deliberately anticipating what might go wrong with a patient. Lori’s recommendations for other nurses included:

For every patient a nurse comes in contact with while they have eyes on her and she is in stable condition, they should be thinking... what unstable conditions is this patient at the highest risk for? Know which situations make the patient at a higher risk...that is something whenever I train new nurses, I try really hard to impress upon them.

RQ3 theme 3: trust your gut. Within this theme comments related to the importance of nurses trusting and using their intuition as well as having the confidence to escalate concerns about a patient to a higher level of authority. Samantha advocated “if you feel in any doubt, just

stay with them (patients) a few minutes, and they should be okay before you leave the room.” As another participant stated, “If your instincts say something’s wrong, then believe that something’s wrong. You have to trust your gut.”

Trust your gut also meant taking action in getting a suitable response from physicians in order to prevent delay. Lisa stated, “Don’t be afraid to maybe overstep the mid-level, or any doctor, really, if you thought a change was happening and maybe not being responded to. Just call that rapid and get whatever support you can get.”

Don’t be afraid to escalate it if you don’t feel like you’re getting...which is kind of where I was at. I didn’t feel like I was getting the support I needed from the doctor, so I reached out to use my resources (Barbara).

Similarly, Rachel advocated:

If that physician is not listening or moving or taking the steps that you feel that he needs to do, that gives you the authority to go one step further or to tell that physician what they need to do in that situation.

Summary Research Question Three

Research question three aimed at determining what improvement strategies the participants in this study recommended. The findings indicate that not only did participants reflect back on their individual experiences but that they analyzed what could have been done better and thus improved in the future. All of the participants reported that there were opportunities for improvement in the overall response to deteriorating patients. Interestingly the strategies identified reinforced the participant’s personal sense of responsibility for improving the overall response to patients who were deteriorating: *know your patient, be prepared, and trust your gut.*

Summary

This chapter provided detailed findings from the interviews of 20 registered nurse participants as they described their experience caring for an acutely deteriorating patient. Three research questions guided the interviews to meet the primary aims of the study. The themes and subthemes for each research question can be seen in Figure 6 below. An overarching theme woven throughout each component of noticing, interpreting, and responding is Nurses' Keen Sense of Responsibility for their patients. This sense of responsibility was expressed through increased surveillance provided to their patients and enabled the participants to notice situations earlier and respond more effectively. Eight themes were developed from the narratives to answer the first research question. Three themes were identified as influential in facilitating nurses' ability to notice when a patient was beginning to deteriorate: *knowing the patient, experience matters, and lots of small points where the system can fail*. Two themes were identified as influencing nurses' ability to interpret a situation of deterioration: *making sense of the data* and *something doesn't go together*. Three themes were revealed that influenced nurses' ability to respond to a situation of patient deterioration: *caught in the middle, culture of teamwork, and increased nursing workload*.

The second research question was: How do nurses describe the use of reflection during and after the process of noticing, interpreting, and responding during situations of acute physiologic deterioration in an adult patient? Three themes emerged in response to this question: I always remember and lessons learned.

The third research question was aimed at identifying strategies nurses could recommend for improving clinical judgment in situations of patient deterioration: *What strategies would help the nurse notice, interpret and respond to cues signaling clinical deterioration?* Nurses in

this study identified three themes as important ways to improve noticing, interpreting and responding: *know your patient, be prepared, and trust your gut.*

CHAPTER 5: DISCUSSION, LIMITATIONS, AND IMPLICATIONS

In this chapter the study findings, limitations, and recommendations are discussed. Findings are examined in comparison with relevant research on patient deterioration and with Tanner's Clinical Judgment Model (2006) because it provided the framework for this study. According to the model, clinical judgment requires working through interrelated stages of noticing, interpreting, responding, and reflecting. Examination of nurses' clinical judgment in situations of acute physiologic patient deterioration using this model as a framework has not previously been done.

Three research questions were addressed through a qualitative process of analyzing the data from the individual interviews:

RQ1: What factors influence nurses' ability to notice, interpret, respond and reflect on situations of acute physiologic deterioration in the adult patient?

RQ2: How do nurses describe the use of reflection during and after the process of noticing, interpreting, and responding during situations of acute physiologic deterioration in an adult patient?

RQ3: What strategies would help the nurse notice, interpret and respond to cues signaling clinical deterioration?

Twenty participants shared their stories that illustrate the pivotal role the bedside nurse plays in recognizing early physiologic changes and in initiating a timely response to patient deterioration. Themes that emerged provide insight into factors that influence nurses' clinical judgment in the high stakes situations of acute patient deterioration. The findings from this study indicate that medical surgical nurses are in a unique position to dramatically influence the outcomes of acute physiologic patient deterioration. Participants' stories revealed that patient

deterioration on medical-surgical units is not an uncommon occurrence and that the bedside nurse is often the first person to notice signs of deterioration and initiate a response. These findings also indicated that nurses sometimes noticed when a patient was beginning to deteriorate, correctly interpreted and responded to the situation but were hindered by an inability to take action.

Discussion of Findings for Research Question One

To answer the first research question participants were asked to describe a time they cared for a patient who deteriorated and required either a rapid response or a code blue call. Analysis of the data revealed an overarching theme that encompassed all four aspects of clinical judgment: noticing, interpreting, responding and reflecting. This theme will be discussed first because of its broad implications for nurses' clinical judgment and the response to patients.

In addition to the overarching theme, eight themes addressing question one emerged. These themes provide insight into factors that can influence each aspect of clinical judgment: noticing, interpreting, and responding. Factors that influenced noticing formed three themes: *knowing the patient, experience matters, and lots of small points where the system can fail*. Two themes described factors that influenced the participants' ability to interpret situations of deterioration: *making sense of the data* and *something doesn't go together*. Factors that influenced participants' ability to respond resulted in three themes: *caught in the middle, culture of teamwork, and increased nursing workload*.

Nurses' Keen Sense of Responsibility

Findings from this study revealed an overarching theme called Nurses' Keen Sense of Responsibility. This theme highlights participants' philosophical views of their personal sense of responsibility for and commitment to patients. Comments consistently demonstrated a protective, caring, and dedicated nature. Nurses' Keen Sense of Responsibility was evident as

participants described how they noticed changes, interpreted, responded, and reflected on the experience. It influenced participants' decisions and actions. For example, in many instances the decision was to pay closer attention to a patient, physically check more frequently, perform additional assessments, seek a second opinion, or ask for assistance. Participants of all levels of experience from advanced beginner (less than 2 years) to expert (more than 5 years) (Benner, 1984) conveyed this sense of responsibility. Although nurses have traditionally been committed to responding to patient needs, it is not clear whether this characteristic was more pronounced in those who chose to participate in this study.

In 1998 Tanner provided a discussion on the historical research on clinical reasoning. This paper reviewed two prominent theoretical orientations of clinical reasoning research. One orientation consisted of research that focused on understanding how the clinician went about making decisions (Benner, 1983; Benner, 1984; Benner & Tanner, 1987). Within this body of research the concept of the clinician as a fully situated interpreter of meaning was presented. According to this perspective, nurses' clinical reasoning occurs as a situated, practice-based form of reasoning that requires general scientific and research-based knowledge as well as the ability to discern the relevance of the evidence in a particular situation as it applies to a particular patient in a specific circumstance (Benner et al., 2008). When engaging in clinical reasoning the nurse considers the specifics surrounding the patient's individual clinical course, their comorbidities, responses to treatments, and concerns as well as characteristics and relationships with members of the health care team involved. In the present study this type of reasoning was often shown through the participants' comments related to their understanding of and relationship with the patient, their family, and their nursing colleagues.

The overarching theme revealed in the present study of Nurses' Keen Sense of Responsibility relates directly to the participants' personal perspective of their role in caring for patients and supports previous findings in the literature. The influence of nurses' personal values on care delivery has been described by Benner et al. (1996) and others (Ellefsen, 2004; McCarthy, 2003; Slomka, et al., 2000; Tanner, 2006). According to this perspective, nurses' engagement in practice is determined by their values and what matters to them (Benner, 1983). What is important determines how nurses enter a situation, what they see, and how they respond. Benner (1983) further shared that nurses' assumptions, expectations and perspectives serve as a form of knowledge, predisposing them to act in a certain way in particular situations. Sometimes referred to as the nursing gaze (Ellefsen, 2004; Ellefsen, Kim, & Ja Han, 2007), this concept reflects a framework of beliefs through which nurses view patients and clinical situations. Nurses' philosophical perspectives shape how the nurse frames a situation, what is seen as important, what is recognized, valued, and engaged with in a clinical situation (Kim, Ellefsen, Ja Han, & Alves, 2008). Nurses view clinical situations through this nursing gaze which guides the process of selectively attending to patient cues and making sense of a clinical situation.

A study of critical care nurses' adherence to clinical sedation guidelines by Slomka and colleagues (2000) underscored the influence of nurses' perspectives on the administration of medications for pain and agitation. Semi-structured interviews revealed that nurses viewed clinical practice guidelines as valuable in helping assess and treat patients' anxiety, pain and agitation. In this study, however, nursing management of patient analgesics and sedatives was found to depend more on nurses' values and perspectives. Perspectives on individualizing patient care, attitudes towards pain, and value for providing comfort influenced treatment decisions more than objective protocols or guidelines for managing sedation and pain levels.

McCarthy (2003) conducted a dimensional analysis to explore the clinical reasoning of nurses caring for older patients who developed acute confusion during hospitalization. The goal was to identify factors that might explain why nurses sometimes failed to recognize acute confusion in older patients. An important assumption of the author was that nurses' failure to detect acute confusion in older patients was due to inaccurate clinical reasoning. Data were collected through semi-structured interviews with 28 nurses who worked on medical-surgical units of a community teaching hospital. Analysis of the data revealed wide variation in the clinical observations to which nurses attended, the types of interpretations they made, and the subsequent interventions they proposed and implemented. Further analysis suggested that this variation in clinical engagement was due largely to different personal perspectives nurses held regarding the expectations of health as people aged. Three main perspectives were identified as participants engaged with older patients experiencing confusion: a decline perspective, a vulnerable perspective, and a healthful perspective. Each perspective was characterized by a particular reasoning pattern that influenced nurses' thinking, what parameters they assessed, and how they responded (McCarthy, 2003)

For example, nurses in this study who viewed aging as a gradual process of declining health tended to view cognitive impairment as inevitable. These nurses tended to view the occurrence of confusion as a normal characteristic of aging instead of a concern. Other nurses demonstrated a second framework of aging labeled the vulnerable perspective. Nurses who reasoned from this framework viewed aging as a vulnerable period during which a person is under constant threat of disease and illness. Nurses whose views were aligned with the vulnerable perspective considered the possibility that confusion was pathophysiologic instead of an inevitable process of aging.

Still other nurses viewed aging as normal and an extension of adult development. Nurses who viewed aging from this perspective regarded cognitive decline as abnormal, pathological and unusual. Nurses with this framework were able to recognize subtle signs of confusion as reason for concern and quick action because they believed that all signs of confusion represented an underlying pathophysiology. McCarthy (2003) concluded that nurses' ability to identify and appreciate the significance of acute confusion in hospitalized older adults depended on the nurses' personal philosophies on health and aging. The results of her research suggest that accurate clinical reasoning is not entirely dependent on the knowledge and expertise of the nurse but is largely directed by the philosophical perspective (McCarthy, 2003)

Ellefsen (2004) further demonstrated the influence of nurses' perspectives on patient assessments, nursing decisions, and performance of nursing care. To investigate factors that guide nurses' engagement in clinical situations Ellefsen conducted a qualitative descriptive study in an acute care setting in Norway. Data were collected through participant observation, nursing documentation, and in-depth interviews. A convenience sample of six registered nurses from medical-surgical units participated in the study. Analysis revealed that nurses' frame of reference guided their clinical engagement with patients. In particular nurses' frames of reference influenced how they regarded patients, what they considered normal, what they looked for, assessed, noticed, and acted on (Ellefsen, 2004).

Tanner's (2006) model of clinical judgment suggests that nurses' clinical judgments are influenced by the beliefs, values, philosophical perspectives and knowledge the nurse brings to the situation. Specifically, Tanner (2006) explains that nurses' vision of excellent practice and their values related to a particular patient situation influence what is noticed. The findings of the current study are consistent with Tanner's model in this aspect. The present study found that

nurses' comments demonstrated a personal sense of responsibility towards their patients and directed what they noticed, what was important, how they thought, and responded to patients and to situations of deterioration. Previous research has not identified the role of nurses' sense of responsibility as a factor that influences clinical judgment in situations of patient deterioration. This finding is important because an absence of this value of responsibility towards patients may be a barrier to noticing and responding to patient deterioration. These findings are important for understanding nursing practice because different perspective will influence what problems nurses will identify and address.

Factors that influence noticing. *Knowing the patient* was a central theme related to how nurses noticed changes in a patient's condition. Knowing the patient is necessary to detect subtle changes that may indicate signs of deterioration. Consistent with Tanner's (2006) model, nurses' knowledge and understanding of the patient influenced clinical judgments by facilitating noticing of deterioration. Support for *knowing the patient* has been demonstrated in multiple studies as a way nurses identify patient deterioration (Chua, Mackey, & Liaw, 2013; Cioffi, 2000; Cioffi, Conway, Everist, Scott, & Senior, 2009; Gazarian, Henneman, & Chandler, 2010; Hart, Spiva, Dolly, Lang-Coleman, & Prince-Williams, 2016; Minick & Harvey, 2003; Smith, 2013).

Knowing the patient validated the importance of baseline knowledge of a patient against which the nurse could compare observations. The ability to notice a change in a patient's behavior, appearance, or vital signs was strongly related to how well the participant knew the patient.

Primary strategies participants reported using to gain an understanding of their patient included performing patient assessments, physically checking on patients, and establishing a relationship with patients. Over half the participants substantiated the importance of performing a physical assessment of their patients to establish a baseline. The role of physical assessment in

facilitating identification of deterioration has been shown in previous studies (Braaten, 2015; Chua et al., 2013; Cioffi, 2000b; Donohue & Endacott, 2010; Massey, Chaboyer, & Aitken, 2014).

Despite the importance of direct observation, several participants indicated that nurses often omit essential elements of the physical exam. Others shared that conducting only one assessment each shift is insufficient for the complexity of the patients. Providing direct care at the bedside is heavily dependent on factors outside the nurse such as workload and staffing patterns, which are barriers to more frequent assessments. This concern is corroborated by Braaten (2015) who found that while nurses' presence at the bedside was essential for detecting subtle changes indicative of deterioration, several perceived barriers, including high nurse-patient ratios prevented nurses from spending time with a patient.

The nursing literature raises some interesting questions about the relevance and practice of physical assessment. The American Association of Colleges of Nursing (2008) considers patient assessment a fundamental component of baccalaureate educational competencies. Graduates are expected to be able to conduct "a comprehensive and focused physical exam" (p. 31). A complete systematic physical assessment applying skills of inspection, palpation, auscultation, and percussion is taught at undergraduate and graduate level nursing programs. However, despite general agreement that assessment skills are an essential competency of RNs, findings from this study, anecdotal and research evidence suggests that in practice nurses routinely do not routinely perform the assessment skills they were taught (Giddens, 2007; Secrest, Norwood, & DuMont, 2005).

There appears to be disconnect between assessment skills taught in nursing programs compared to those that are regularly performed in practice. Although the participants in this

study reported the value in conducting patient assessments, comments about colleagues not performing assessments and these reports in the literature are concerning. The clinical implications also reflect growing concern about nurses' ability to identify patients at risk of deterioration (Cooper et al., 2010; Endacott et al. 2010; Perkins & Kisiel, 2013). Assessing for signs of clinical changes indicating deterioration is a vital skill that needs to be routinely performed on every patient.

Another means of noticing a change in patient condition was through the assessment of vital signs. Nurses' reliance on vital signs have been previously reported as important for identifying patient deterioration (Endacott, 2007). Historically the measurement of vital signs occurred during the assessment process and was a responsibility of the RN. More recently this fundamental direct care responsibility has been delegated to a nurse technician. This task reassignment may hinder nurses' ability to notice the early changes associated with deterioration. As one participant shared, the communication of the vital sign measurements to the RN is at times delayed either because the nurse technician has not taken vital signs or has not communicated them in a timely manner. This finding is consistent with Furmann's (2008) study that revealed nurses were unaware of abnormal vital signs in almost half of the patients in the study. In the present study, it was the nurses' knowledge of the patient's typical vital sign range that allowed for the early detection of deterioration. Findings that indicate nurses are removed somewhat from direct care activities prompts the question of how well current delivery of care models support nurses' ability to know their patients. Another study by Stoeffle (2012) indicated that observations and documentation of vital signs on medical-surgical units needed to be done more often than every four hours, suggesting that deterioration may have been detected earlier.

Participants in the present study expressed appreciation for checking on patients during hourly rounding as another means to know how their patients were doing. Hourly patient rounding includes intentional rounding on every patient every one to two hours around the clock in order to foresee patient needs. Hourly rounding has not been reported in the literature as a method used by nurses to identify patient deterioration, however, several participants in this study shared that it was during their rounding that a change in patient condition was noticed. This represents a new finding for the early recognition of patient deterioration. However, despite participants' acknowledgment of the benefit of hourly rounding, recent systematic review showed that medical-surgical nurses often struggle to incorporate this process into nursing practice (Toole, Meluskey, & Hall, 2016). Findings suggested that increased workload, characterized by competing tasks and priorities, time constraints, fluctuation in census and patient acuity, and low staffing levels, are barriers to consistent hourly rounding (Krepper, Vallego, & Smith, 2014).

Another way that nurses knew their patients was through developing a relationship with the person. These relationships were facilitated by continuity of patient assignments and by having cared for a patient in the past, reviewing the medical record, accurate patient hand-off report information, bedside hand-off report, and talking with family members. Participants in this study often spoke of noting a change in a patient's personality or behavior that was made possible because they knew the patient's typical expressions or behaviors.

An interesting finding of this study was the challenge participants experienced in establishing a baseline understanding of patients who are non-verbal or have cognitive deficits. Participants found it more difficult to communicate with these patients, to understand their needs, and often missed the early signs and symptoms indicative of deterioration. This finding

suggests that patients with cognitive alterations would benefit from having family members present, consistent nursing assignments, and from closer monitoring for signs of problems, changes or complications. Each of these strategies and the theme of knowing the patient are consistent with Tanner's (2006) model. Noticing is made possible when nurses' expectations of a situation are not met. These expectations stem in part from nurses' knowledge of the patient.

The second theme under noticing, *trust your gut*, highlights nurses' use of intuition when noticing a change in a patient's condition. Multiple definitions for intuition can be found in the nursing literature (Benner, 1984; Benner, 2004; Benner, Tanner, & Chesla, 1996; Epstein, 2010; Rew, 1989). A commonality among the definitions is that intuition is a personal knowing or understanding. Intuition has been characterized as an unconscious process of rapid understanding and knowledge (Mitchell 1994). Intuitive reasoning is thought to occur in the more experienced nurse who has developed an understanding of clinical situations and is acknowledged to be an important component of clinical judgment (Benner & Tanner, 1987). In the present study however, two of the eight participants who spoke about relying on intuition as a means of noticing deterioration had less than two years of nursing experience and would be classified as advanced beginner (Benner, 1984). Other studies also suggest that both novice and experienced nurses routinely report using intuition to guide clinical judgments in clinical practice (Miller, 1995; Ruth-Sahd, 1993, 1997; Ruth-Sahd & Hendy, 2005). This is an interesting finding since earlier research generally supports a positive relationship between intuition and previous clinical experience with similar situations (Benner et al., 2009; Tanner, 2006). This finding suggests that clinical experience is not the only characteristic of intuition.

Participants in this study frequently used words such as having a "gut feeling" or that a "patient just didn't look right" to describe the feeling that a patient was deteriorating. This

finding provides additional support for previous research indicating that intuition plays an important role in nurses' detection of patient deterioration. (Cioffi, 2000; Minick, 2003, Odell & Oliver, 2009). Participants' use of intuition to notice a change in patient status provides additional support for the CJM (Tanner, 2006). Experienced nurses encountering a familiar situation are able to immediately comprehend the significance of a patient change (Tanner, 2006).

The third theme identified in relation to noticing is labeled *lots of small points where the system can fail*. This theme provided insight into factors that participants expressed as barriers to noticing. This theme focused on specific challenges participants faced when a patient exhibited changes of concern. The primary example within this theme was patient handoffs. Patient handoffs have been defined as an exchange of patient information between health care professionals accompanying the transfer of care or responsibility of a patient (Cohen, 2010). These transitions of care were identified as times when unexpected changes were observed in patients. Communication failures during the transfer of care from one nursing unit to another or at a change of shift carry a high risk for handoff-related missed care, adverse events, and patient harm but have not been identified as a factor that can interfere with nurses' ability to notice changes of deterioration (Staggers, 2013).

Lost in transition describes breaks in continuity of care associated with the loss of vital information that was needed by the receiving nurse during a transition of care. Multiple participants' stories involved situations where patient deterioration was noticed very soon after a transition of care. Sometimes these descriptions involved a nursing shift change, others occurred after the transfer of a patient from one unit to another. In each of these cases the receiving nurse noticed a change in the patient's condition immediately or soon after assuming care of the

patient. This suggests that in some instances, the deterioration may have been unrecognized for some period of time and that the changes were either not noticed or not communicated at hand-off.

Lost in transition represents an opportunity for improving communication at critical junctures so that patient deterioration is recognized earlier or possibly prevented. Although not identified in the CJM as a barrier to noticing, Tanner (2006) does describe factors such as usual patterns of care and the complexity of the work environment as influencing nurses' noticing of a change. Transitions of care have not previously been identified in the literature as a barrier to noticing patient deterioration.

Workload compromises care is another example how system processes or factors can hinder noticing changes in a patient's condition. Participant narratives illustrated the challenges nurses face when trying to look after very sick patients. The findings of this study support concerns from prior studies about increased workload as a barrier to nurses spending time with their patients (Tucker & Spear, 2006; Unruh & Fottler, 2008). Other research also suggests that insufficient staffing (Braaten, 2015) and being distracted with multiple other patients' needs (Cox, James, & Hunt, 2006) are barriers to detecting deterioration by preventing nurses from spending time with patients and laying eyes on a patient.

Resource availability was characterized by the participants as the presence of a nurse technician or family member who could provide information about the patient to the nurse. Similar findings were reported by Gazarian (2010) who noted that the availability of experienced and flexible of nursing staff assisted nurses in identifying and interrupting situations of patient deterioration. Multiple participants told stories of how they were initially made aware of a

change in a patient by a nursing assistant or a family member. The value of family members as a source of critical patient information is consistent with previous research (Hart, 2014).

A surprising finding of this study was that none of the participants spoke of relying on modified early warning scores (MEWS) as a way of noticing patient deterioration. Similarly, a study by Donohue (2010) found that early warning scores were not a key component of patient assessment, and were used more to quantify deterioration once the patient's changing condition was recognized by the nurse. Considine (2015) found that many patients in medical-surgical units have physiological abnormalities that do not meet RRT activation criteria, suggesting that the earliest signs of deterioration are perhaps more subtle. This finding suggests that nurses are in key positions to notice patient changes in the early stages of deterioration and escalate care before the patient becomes critically ill. There may be several explanations for the finding that participants in the present study did not indicate being made aware of deterioration from the MEWS. Approximately one year before the study was conducted, hospital nursing leadership extended the role of the rapid response team to a 24 hour service line where RRT nurses perform regular monitoring and tracking of MEWS on patients throughout the hospital. When these scores reach a predetermined level of risk the RRT alerts the bedside nurse caring for the patient. It is not clear whether nurses at the bedside have such a reliance on the RRT nurses to detect significant abnormalities in the MEWS or whether the participants rely more on their own bedside assessments to become aware of patient deterioration. Another possibility is that the participants in this study noticed early signs of deterioration before they were reflected in vital signs that were calculated for the MEWSs. This finding poses important implications for structuring work processes to allow nurses to spend more time at the patient's bedside in practice.

Interpreting. According to the CJM, after noticing a change in a patient's condition, the nurse begins to interpret the situation using various clinical reasoning strategies (Tanner, 2006). In the present study two themes support this aspect of the model. Additionally, two themes identified factors that facilitated or interfered with the participants' reasoning ability to interpret the situations described: *making sense of the data*. and *something doesn't go together*.

Making sense of the data was a theme that provided details about strategies participants used to understand clinical situations of uncertainty. Participants used two primary strategies to make sense of the data: *seeking additional data* and *seeking a second opinion*.

In this study, participants revealed that they would search for additional patient information to assist in making sense of the situation. Seeking additional data in order to inform their clinical judgment is well described in the literature and was confirmed as an important aspect of nurses' ability to interpret a situation of deterioration (Cioffi, 2000; Endacott et al., Gazarian, 2008; Leach & Mayo, 2016). Participants repeatedly discussed how they checked multiple parameters, and gathered additional pieces of patient information such as vital signs or lab results to help make sense of a situation. In addition participants explained how the availability and accessibility of the data directly affected the time it took for participants to interpret a patient situation.

Seeking a second opinion was an important activity that reflected participants' reliance on an experienced nurse to support their clinical reasoning when circumstances were ambiguous or unclear. Clinical reasoning has been shown to occur within the social relationships including the patient, family, and a team of health care providers (Benner, Hughes, & Sutphen, 2008). This socially engaged description of clinical reasoning was apparent in the present study as participants often reached out to experienced nurses for support or confirmation of their concerns

about a patient. Having the support of an experienced and trusted nursing colleague to help interpret a situation has been shown in previous research (Astroth, 2013; Braaten, 2015; Burger et al., 2010; Gazarian et al., 2010).

Consistent with other studies, a lack of experience seemed to interfere with participants' ability to quickly interpret signs of deterioration (Endacott, et al. 2007; Ebright et al. 2004; Cioffi et al., 2006; Etheridge, 2007; Gazarian et al., 2010; Hoffman et al., 2009). In the present study less experienced participants were more likely to reach out for advice or confirmation of their reasoning. In most instances it did not appear that these consultations added significant time to the reasoning process but did appear to expedite the decision to either notify the physician or call a rapid response. The present study findings, in addition to those of previous studies, identify that less experienced nurses often lack the clinical knowledge to recognize or appreciate the relevance of alterations in a patient's condition and benefit from an experienced colleague (Benner, Tanner, Chesla, 1996; Cioffi et al., 2006; Levett-Jones et al., 2010; Purling & King, 2012).

The CJM (Tanner, 2006) describes the various types of reasoning used by nurses (analytic, intuitive, narrative) to interpret the meaning of a situation. During the process of interpreting Tanner (2006) explains that the nurse might generate several different hypotheses to make sense of the data. The nurse might need to collect additional data to help rule out hypotheses until an interpretation is reached. However, Tanner's description of interpreting a situation does not include the activity of consulting others as a means of interpreting a situation. This finding has important implications for practice. Less experienced nurses, particularly those who are just transitioning into clinical practice lack confidence or the clinical judgment skills that an experienced nurse can provide (Gillespie & Paterson, 2009; Fenske, 2013). Issues such

as experienced nurse turnover, workforce shortage projections, and the approaching retirement of experienced nurses pose significant concerns about nurses' clinical judgments in situations of acutely deteriorating patients.

Something doesn't go together was the second theme under interpreting and included components of clinical reasoning, nurses' experience, and comparing to what is known. In this theme experienced nurses' previous experience with similar patient situations enabled them to clinically reason through the episode of patient deterioration more quickly. Consistent with previous studies, participants in this study who had more experience tended to recognize patterns and notice changes of deterioration more easily (Cioffi, 2000, Cioffi, 2009, Minick & Harvey, 2003). Nurses in this study demonstrated clinical reasoning as they evaluated patient information to understand the changes they observed in a patient that is also consistent with Tanner's (2006) model.

Responding. The most significant theme revealed about responding was *caught in the middle*. Participants often conveyed frustration and a sense of powerlessness while waiting for a physician to call back or respond to see a patient. Frustration over being unable to take further action in situations where a patient was deteriorating sometimes led to additional delay in the patient's care. Nurses caught in the middle is not a new concept, having appeared in the nursing literature in the 1980s. Tristram Englehardt (1985) characterized the "between" position of the nurse as someone who is caught in an ambiguous circumstance between physicians and patients. He elaborated that this position predisposes the nurse to difficult and unmanageable conflicts (Engelhardt, 1985). In the situations described in the present study nurses experienced the stress of dealing with the demands of an acutely unstable patient while also coping with the emotional response of frustration, inadequacy, and helplessness. Under such conditions, nurses are not able

to meet the needs of the patient either because it is beyond the scope of their license or because an appropriate avenue for response is not known.

Hamrick (2000, 2001) characterizes this as moral distress, occurring when someone believes to know the appropriate course of action but cannot carry it out because of organizational barriers such as time constraints, physician power inequities, policy or legal limits. She elaborates that it can be an isolating and vulnerable position. Nurses who experience such repeated job stress and moral distress are likely to develop burnout. This finding has implications for practice and research.

Participants in this study did not voice doubts about whether they were doing the right thing in calling a physician or the rapid response team when they were concerned about a patient. This finding is unlike previous research that reported nurses experienced nervousness, anxiety, panic and uncertainty about what was occurring with their patient and what would be expected of them when the RRT arrived (Cioffi, 2000). This may suggest that nurses who have a strong sense of responsibility for their patients have higher levels of confidence in calling for help. It may also suggest that nurses whose perspective is one of being responsible demonstrate stronger clinical judgment because they are able to notice, interpret, and respond more quickly to situations of acute physiologic deterioration.

Culture of teamwork. Consistent with previous research participants who work in units characterized as having a positive culture of teamwork are more likely to respond quickly to deteriorating patients by calling for help or activating the RRT (Astroth et al., 2013; Cox et al., 2006; Gazarian et al., 2010; Jenkins, Astroth, & Woith, 2015). In the present study participants frequently spoke of working with nurses in a culture characterized as supportive, encouraging, and free from criticism. This supportive teamwork facilitated the response to patient concerns as

evidenced by the comments about colleagues stepping in and helping with a deteriorating patient, providing guidance on responding or interpreting the situation, or in watching over other patients on the unit.

Studies have reported findings of both positive and negative interactions between staff nurses and members of the RRT that have implications for delays in implementing timely treatment (Astroth, Woith, Stapleton, Degitz, & Jenkins, 2013; Chalwin, Flabouris, Kapitola, & Dewick, 2016; Jenkins, Astroth, & Woith, 2015). Support and encouragement from nursing colleagues has been shown to facilitate nurses' decisions to activate rapid response teams more quickly (Astroth et al., 2013). Nurses in several studies have reported reluctance to activate the RRT out of fear that nursing colleagues will think they are incapable of caring for their deteriorating patient independently (Astroth et al., 2013; Bagshaw et al., 2010). Poor communication between the nursing staff and the RRT has also been shown to serve as a barrier to RRT activation. Consistent with the literature (Astroth et al., 2013; Azzopardi et al., 2011; Bagshaw et al., 2010), nurses in the present study almost universally expressed appreciation for the knowledge and skills of the members of the RRT, saw them as a positive resource, and did not fear activating the team..

Increased nursing workload. Consistent with previous research (Braaten, 2015; Endacott et al., 2007; Purling & King, 2012; Smith & Aitken, 2015) participants in this study identified increased workload as a barrier to responding to deteriorating patients. Multiple factors within the work environment and work processes were identified that interfered with participants' ability to either notice or respond to a patient. The most frequently mentioned areas of workload related to insufficient nurse staffing, caring for multiple complex patients, and time pressures. These factors compromised participants' ability to check on patients, assess patients,

pay close attention to their needs, and monitor responses to care. These findings suggest that nurses in this study struggled to recognize and manage deteriorating patients due to heavy workloads that interfered with their ability to provide adequate patient surveillance. Increased nursing workload therefore, poses a considerable risk to patients.

Discussion of Findings for Research Question One

The 20 nurses in this study shared their experiences with the understanding that the knowledge gained might help improve clinical judgment in situations of acute patient deterioration. Findings from this qualitative analysis illustrate that nurses' clinical judgment is contextual and is influenced by characteristics of the nurse, the nurse's relationship with the patient, as well as elements in the work environment. Characteristics of the nurse that were identified include nurses' knowledge, experience, autonomy, and personal, philosophical perspective towards the care of patients.

Characteristics in the environment that influenced clinical judgment included lack of physician responsiveness, a culture of teamwork, nursing workload, availability of experienced nursing staff, relationship with the members of the RRT, transitions of care, and resource availability. As stories unfolded, participants' demonstrated actively incorporating nursing knowledge and intuition, collecting and evaluating multiple types of data, reasoning in transition, and reflecting on patient responses

Discussion of Findings for Research Question Two

Tanner's model of clinical judgment was completed following an extensive review of research on clinical judgment in nursing (2006, 1998). Reflection-in-action and reflection-on-action are intrinsic to the model (Tanner, 2006) and demonstrate the influence of Donald Schon's (1983) work on reflective thinking. In its broadest definition, reflection refers to the process of self-examination that involves looking back over what has occurred in practice in order to

improve (Ruth-Sahd, 2003). Schon (1983) introduced the concept of the “reflective practitioner” as one who engages in reflection as a tool for revisiting experience to learn from and for reframing complex problems of professional practice. At the heart of Schon’s work on reflection lies a critique of technical rationality. Technical rationality represents the view that professionals solve problems in practice through the application of scientific theory and knowledge gained through basic science (Schon, 1983). Schon (1983) argued that in day to day practice, professionals face unique and complex situations that cannot be solved with technical, rational approaches alone. Problems occur in unique contexts and solutions therefore are found only in the specific contexts in which the problems are framed (Schon, 1983). Consequently, he proposed a description of problem solving that described professional learning through reflective practice. Schon made a temporal distinction between “reflection-in-action” and “reflection-on-action”. Reflection-in-action is proposed as a process where practice knowledge-in-action develops. Reflection-in-action is believed to be triggered by a disruption in normal practice, a non-routine situation where the individual’s knowledge is inadequate to frame or resolve the problem. To deal with the situation the professional “thinks on her feet” by modifying and testing hypotheses to find a solution to the problem. This process of developing and testing hypotheses occurs during the experience and appears to be an almost subconscious process (Conway, 1994; Schon, 1983).

According to Tanner (2006) reflection-in-action refers to nurses’ ability to “read” a situation, to be aware of how a patient is responding to an intervention, and then adjusting the intervention based on that assessment. In her brief discussion of this component of the model, reference is made to Schon’s (1983) work on reflection-in-action. However, Tanner provides little depth of discussion related to the concept or how it would be demonstrated or recognized in

practice situations. In the present study operational definitions by Lasater (2007) were used to identify data that might represent the occurrence of reflection. Definitions used to identify phrases indicating reflection included: evaluates or analyzes personal clinical performance, evaluates choices against alternatives, identifies strengths and weaknesses, and demonstrates commitment to improvement. Analysis of the study interview transcripts did not reveal data believed to represent reflection-in-action. This indicates that the component of reflection-in-action (Tanner, 2006) was not supported by the findings in the present study. This finding was surprising since the model was based on findings from previous nursing research on clinical judgment.

Reflection-on-action presents a more traditional interpretation where reflection is seen as a process of looking back on what occurred and learning lessons from what did or did not go well. Reflection-on-action was apparent throughout the interviews in response to each of the interview questions. More specifically, participants were asked to reflect on how they felt and what they thought about the situations described in the interviews. Qualitative analysis of comments revealed most participants were able to reflect back on the patient events and their response. Reflection-on-action occurred after the patient event and caused the nurse to think about the situation and the appropriateness of the participant's response to it (Tanner, 2006). Like Benner's (1999) description of "narratives of learning", participants demonstrated in-depth review of these experiences, their response to the event, and an intent to improve future performance.

According to Tanner (2006), reflecting-on-action enables the response to a situation to become part of the nurse's clinical knowledge base that guides future practice. Reflection appeared to help participants make meaning of complex situations and to facilitate learning from

the experience. Participants in this study were able to reflectively critique their performance and aspects of care that should be incorporated into future patient situations.

The primary theme revealed through reflection was the emotional impact participants suffered from caring for an acutely deterioration patient. *I always remember* captured the painful memories and long lasting effects of these events and has strong implications for nursing practice. As previously mentioned, participants in this study often experienced negative interactions because of physicians either not returning calls, not responding to the bedside in a timely manner, or demonstrating negative behaviors. Two different issues are raised in conjunction with the theme of *I always remember*: nurse-physician collaboration and communication and nursing autonomy.

Nurse-physician relationships have been characterized as strained and adversarial for generations (Johnson & Kring, 2012), and unfortunately this study indicates that the conflict continues. Multiple participants spoke about disruptive physician behavior they had witnessed during these patient experiences. Nurses and physicians work in fast-paced, complex organizations and are confronted with complex issues that require communication, coordination, and collaboration. These factors combined with existing power differentials and hierarchical structures within the healthcare organization often lead to stress and sometimes inevitable conflict between the roles (Hendel, Fish, & Berger, 2007). Chronic, unresolved, negative experiences and disruptive physician behavior, however, can lead to chronic stress, job dissatisfaction, and nursing turnover (Nelson et al., 2008). Physician-nurse relationships have important implications for collaboration, nursing practice and patient outcomes. Evidence exists that improved nurse physician collaboration and communication is associated with better patient outcomes, improved staff morale and satisfaction, and reduced staff turnover (Dailey et al.,

2007). Knowing that a healthy, well-balanced, effective nurse-physician team offers these benefits should encourage hospitals to develop strategies to strengthen these relationships professionally.

The second issue raised within the theme of *I always remember* concerns nursing autonomy. Historically, the physician-nurse relationship has been characterized as unequal, with the physician assuming dominance in terms of status, power, authority, and autonomy.

Autonomy is central to professional and interprofessional practice in health care. For nurses, autonomy translates into the ability to act on professional knowledge to exercise nursing judgment over patient care and clinical decision making (Kramer & Schmalenberg, 2003).

Autonomy is not a characteristic of an individual nurse but rather, a function of the decision-making authority granted by the hospital or organization. This decision-making authority occurs at different levels- clinical, operational, and professional.

Clinical autonomy refers to nurses' application of independent and interdependent clinical judgment when making patient care decisions (Kramer et al., 2006). Clinical autonomy depends on nurses' knowledge and judgment and functions to directly benefit patients. Nurses who work in organizations that support greater nurse autonomy and shared decision making with physicians, report being more satisfied with their jobs, experience lower rates of burnout, and are less likely to leave their jobs (Aiken, Clarke, Sloane, Lake, & Cheney, 2008; Rafferty, Ball, & Aiken, 2001). Growing evidence also indicates a positive relationship between nurse autonomy and patient outcomes (Kramer, Maguire, & Schmalenberg, 2006; Rao, Kumar, & McHugh, 2017; Traynor et al., 2010). To achieve these outcomes nurses must be empowered by hospital administrators to apply their knowledge in autonomous practice. Each of these issues, nursing autonomy and physician-nurse relationships carry significance for clinical practice and patient

safety. The findings of this study indicate that participants developed clinical judgment as they reflected back on the experiences of caring for a deteriorating patient.

Discussion of Finding for Research Question Three

Strategies for improving nurses' clinical judgment in situations of acute physiologic deterioration were identified by all participants in this study. The identification of recommendations to improve overall response to patients reflects experiential learning from the deterioration events and is consistent with Tanner's (2006) model. The primary themes revealed as recommendations to facilitate the overall response to deteriorating patients were for nurses to *know your patient, be prepared, and trust your gut*.

Similar to previous findings (Donohue, 2010; Douw, 2015) participants placed a high priority on being able to physically assess and monitor patients. Touching, seeing, listening and observing were all recognized as essential to establishing a baseline, being aware of trends, and knowing the patient. Having a consistent patient assignment and better staffing were other recommended strategies to enable nurses to know their patients over periods of time.

A systematic review to examine the signs and symptoms underlying nurses' worry or concern in relation to early recognition of patient deterioration revealed 37 different signs and symptoms (Douw, 2015). Of significance is that all of the indicators are discovered through doing a patient assessment. These indicators included changes in respiration, circulation, mentation, agitation, pain and the subjective observations that something was wrong with a patient (Douw, 2015).

Several participants commented that patient assessments should be done more often than once each shift in order to detect early subtle changes in a patient's status. Since most hospitals have gone to 12 hour shifts this means in many cases patients are only assessed every 12 hours.

Considering the complexity of patients, the acuity of illness, and typical patient loads on a medical-surgical unit, one assessment each shift may not be sufficient. Others elaborated on the importance of knowing patients' vital signs to be able to detect changes in a patient's condition. Nurses' reliance on vital signs for identification of deterioration has also been reported in the literature (Endacott et al., 2007).

In the present study *be prepared* for the unexpected was a theme that described participants' recommendation for knowing the patient, anticipating what to expect, staying up-to-date on hospital protocols and policies, and planning for unexpected events. Being prepared included specific recommendations that developed as a result of not having been prepared in a past situation of deterioration. Recommendations included making sure that rooms were stocked with essential equipment that might be needed, being knowledgeable about clinical protocols, and gaining experience in simulated practice situations of patient deterioration. Being prepared is particularly applicable to new graduate nurses who are transitioning to practice. New graduates are likely unfamiliar with workplace protocols and processes and accessing clinical resources and are especially vulnerable to being unprepared for an episode of acute patient deterioration. Methods to facilitate being prepared could include ongoing educational classes related to common clinical scenarios where patients might experience a change in status, practice in acting in emergency situations, and review of protocols and equipment.

Trust your gut was a theme that developed from participants' past experiences in noticing subtle differences in a patient's condition. Several mentioned the importance of trusting their intuition that something was wrong and recommended going over a physician who was not responding quickly. Within this theme nurses voiced the importance of listening to that inner voice that told them something was wrong with a patient. Evidence exists that intuition plays an

important role in nurses' detection of deterioration (Cioffi, 2000; Minick & Harvey, 2003; Odell, 2009). Improved communication between physicians and nurses was identified as a component within this theme. Nurses need to feel comfortable communicating concerns about patients' clinical status, especially if their concerns are based on an intuitive feeling that something is wrong. Communicating intuitive concerns might require greater levels of confidence on the part of the nurse. As previously discussed, negative experiences with physician interaction could lead to a fear of following up on an intuitive concern. This hesitancy could lead to delays in providing appropriate care to a deteriorating patient.

Strengths and Limitations

This study has several strengths. It has produced new knowledge related to how nurses' clinical judgment is facilitated or hindered in response to an acutely deteriorating patient. Factors such as the caring perspective of the nurse has been identified as having a strong influence on all components of clinical judgment in these situations. Transitions of care have been identified as specific opportunities for changes in a patient's status to go unnoticed due to communication failures. Negative physician behaviors and nurses' sense of being caught in the middle have been identified as significant barriers to clinical judgment and the overall rescue of a deteriorating patient. These concepts need to be addressed to diminish nurses' frustration and work stress, which can then reduce chronic stress, frustration, burnout, and turnover. Modifiable work environment factors such as nurse-patient staffing based on patient acuity and nurse tech support have also been identified as facilitating clinical judgment by allowing the nurse to spend more time at the bedside to know the patient. The findings from this study can be used to positively impact changes in nursing practice so that the response to patients is improved.

There are several limitations associated with this study. This study was limited by the lack of racial/ethnic and gender diversity in the sample. As a single center study the results may not apply in different health care settings or with different patient populations. Another limitation is that the investigator is a novice. However, the investigator worked closely with members of the research team in each step of the study. Interviewer expertise is an important element in the collection of interview data and the researcher's inexperience as a qualitative researcher may also have been a limitation in this study. Another limitation of this research is that some participants who experienced a significant negative or emotional event with an acutely deteriorating patient may not have chosen to participate in this study. Nurses who questioned whether they noticed and responded appropriately may have viewed the event negatively, may have felt uncomfortable, and may not have been willing to participate in this study, therefore those stories would not have been available to analyze.

Implications and Recommendations

Acute care nurses are responsible for identifying and responding to patients at risk for acute clinical deterioration to prevent serious adverse events. Little is known about the factors that influence medical surgical nurses' ability to notice, interpret and respond to situations of acute deterioration in the acute care setting. The implications and findings of this study are important because they further the evidence base about nurses' clinical judgment in situations of acute patient deterioration. The results demonstrate the complexity of clinical judgment in high stakes situations that may be rapidly changing and ill defined. Improving nurses' clinical judgment has implications for nursing research, practice and nursing education.

Implications for the clinical judgment model. Tanner's Clinical Judgment Model (CJM) (2006) was used as the conceptual framework to describe the process of nurses' clinical

judgments in situations of acute patient deterioration. The model breaks down clinical judgment into four aspects (noticing, interpreting, responding, and reflecting) and depicts the relationship between them. Looking at the ways the participants' stories supported or varied from the CJM (Tanner, 2006) resulted in a deeper understanding of how clinical judgment is portrayed in the model and how the current findings aligned with the model. Analysis revealed that some aspects of noticing, interpreting, responding, and reflecting-on-action were supported by the data. Although the model provides some understanding of the complexity of nurses' clinical judgment, analysis also revealed that some aspects of the model, such as reflection-in-action, were not supported by the data in this study

Operational definitions used to identify and code participants' statements into the categories of noticing, interpreting, responding and reflecting came from the Lasater Clinical Judgment Rubric (LCJR) (Lasater, 2007). The LCJR is a rubric that was founded on the CJM (Tanner, 2006). The rubric was created to assess clinical judgment in nursing students during simulation exercises and has been widely used in academic settings (Adamson, Gubrud, Sieras, & Lasater, 2012; Kardong-Edgren, Adamson, & Fitzgerald, 2010). The rubric organizes clinical judgment behaviors into the four phases of clinical judgment (Tanner, 2006) and categorizes nursing actions into developmental phases of beginning, developing, accomplished, or exemplary. The LCJR has been used primarily within academic settings as a self-assessment, reflective tool for pre-licensure nursing students and as an evaluation tool for providing feedback and assessment of students' performance of clinical judgment skills during simulation activities (Adamson, Gubrud, Sidereas, & Lasater, 2012; Ashcraft et al., 2013; Vreugdenhil, J. & Spek, B., 2018). The LCJR has been validated in multiple studies with nursing students (Jensen, 2013; Miraglia & Asselin, 2015; Shin, Shim, Lee, & Quinn, 2014).

Despite having operational definitions (Lasater, 2007) it was sometimes difficult in the present study, to separate and code participant behaviors of *noticing or interpreting* from those of *responding*. For example, *information seeking* is included in the noticing domain, however, when listening to participants talk about collecting additional data to help them understand a situation this behavior seemed more closely aligned with the *interpreting* domain. Similarly, the act of seeking additional information (*noticing*) could also be viewed as a form of response and thus be coded under *responding*. Items in the *interpreting* domain such as “prioritizing data” seemed to strongly relate to the aspects of nurses’ *responding*. These challenging areas of overlap were discussed on multiple occasions with a member of the dissertation committee until consensus was reached before coding a statement into a category. Coding decisions made in the present study did not consistently align with the operational definitions in the rubric. Therefore, the usefulness of this rubric for understanding clinical judgment in nurses during actual clinical situations may be limited. Further study is warranted to help clarify the use of the LCJR with practicing nurses in actual clinical situations.

A further discrepancy between the model and the findings in this study is that the cognitive and behavioral processes used by nurses to form clinical judgments were found to be highly interrelated, overlapping, and iterative. Participants moved back and forth between the noticing, interpreting, responding and reflecting as they attempted to make sense of, prioritize, and respond to a situation. In analyzing the participant interviews it was found that aspects of noticing, interpreting, responding, and reflecting cannot easily be broken down into discrete parts as they appear in the drawing of the model. Although this was a somewhat unexpected finding, it may be that the model as currently depicted does not clearly reflect the iterative nature of the processes used during clinical judgment. This finding points to the need to revise the model to

reflect the iterative nature of clinical judgment. In addition, operational definitions for all aspects of clinical judgment need to be revised and tested so that they are valid and reliable for measuring clinical judgment in actual clinical situations.

Noticing. Tanner (2006) concluded that clinical judgments are more influenced by what the nurse brings to a situation than the objective information available. The findings from this study reveal that characteristics of the nurse influence what the nurse notices, how information is interpreted, and what is responded to, and adds support for the model (2006). The finding that nurses' personal values and perspectives heavily influence clinical judgement also is in alignment with the CJM. Another area of agreement with the CJM is that central to nurses' clinical judgments in the present study was "knowing the patient".

Interpreting. Tanner's model proposes that nurses' noticing and initial grasp of a situation triggers various reasoning processes that assist in making sense of the data. Developing an understanding of the situation correspond to interpreting in the model. The present study did not seek to identify the types of reasoning processes used by participants, however, it was clear through the stories that a variety of thinking processes were used. One area of difference between the CJM and the findings of this study was in the area of interpreting. Nurses' efforts to collect more data to help develop an understanding of the situation was viewed as an action or a response on the part of the nurse. In the model Tanner describes the act of assessing and gathering additional information as part of the process of interpreting the situation (2006).

Responding. The responding stage of the model is where the nurse takes some form of action in response to the interpretation or takes no action. Findings in the present study provide support for the model as participants responded in a variety of ways that included calling on

another nurse for assistance, rechecking vital signs, applying oxygen, calling the physician, or repeating a physical assessment.

Reflecting. Reflection comprises a large part of the model and is characterized as reflection-in-action and reflection-on-action. Participants were able to demonstrate reflection-on-action and analysis of the data indicated that this process led to reflection on their practice which helped to further develop clinical judgment for future clinical situations. Interestingly, support for the model was not found in the aspect of reflection-in-action. This finding was somewhat surprising since the model was based on a synthesis of research on clinical judgment of practicing nurses (Tanner, 1998 & 2006). One possible explanation for this finding is that there was insufficient description from Tanner related to how previous research findings demonstrated this aspect of the model. Another explanation for these findings may be the operational definition for reflection, as provided by Lasater (2007). Reflection-in-action is not distinguished from reflection-on-action operationally. Additionally, the definition provided does not seem to clearly align with Schon's (1983) detailed description of reflection-in-action. This suggests that the operational definition needs to be clarified and further tested in actual clinical practice with registered nurses. No publications exploring the use of the LCJR with nurses in the clinical practice setting with patients were found.

Reflection-in-action also needs to be further clarified in the model so that demonstration of its occurrence in actual nursing practice situations is measurable. The study interview questionnaire was developed based upon the conceptual model. The questionnaire was validated using expert opinion (members of the dissertation committee) for the appropriateness of content and wording. It was then pretested with one volunteer RN who worked in a medical-surgical unit at the study hospital. The questionnaire contains one question designed specifically to gain

insight into the participants' reflections in and on action. The findings from this study suggest that modification of this question may need to be done in order to elicit responses that demonstrate the occurrence of reflection-in-action.

In summary, the Clinical Judgment Model (Tanner, 1998 & 2006) was based on a synthesis of research on nurses' clinical judgment over several decades. The model proposes to account for the complexity of clinical judgment in nursing practice and the multiple factors that influence it. Because of concerns related to areas where there was divergence between the model and the findings of the present study, a telephone consultation was held with Dr. Tanner. This conversation reinforced her belief that the CJM was conceptualized to be a dynamic, flexible, ongoing process of noticing, interpreting, responding, and reflecting (C. Tanner, personal communication, March 25, 2019). However, this intended flexibility or recursiveness is not inherently clear or understood when viewing the diagram of the model. Therefore, revision of the model is recommended in order to make the flexibility and iterative nature of nurses' clinical judgment more clear and congruent with the findings of this study.

Recommendations for education. New graduates need to be well prepared to reason and make clinical judgments about patient situations upon entering practice as a registered nurse. However, research suggests that new graduate nurses often lack the clinical judgment skills needed to meet the demands of patient care (Fenske, et al., 2013). Nurse educators are challenged to develop effective teaching strategies to enable nursing students to develop clinical judgment skills. Data from this study present several implications for nursing educators. Reflective practice could be incorporated in curriculum so that students begin learning the skills of reflection from the beginning of their education. Nurse educators could use guided self-reflective activities to actively engage students to develop these skills. Students need to be given

opportunities to practice reflecting back on situations during and following clinical experiences in order to further develop clinical judgment skills. Reflective journaling and reflective discussions following patient simulation scenarios may also offer effective methods for developing clinical judgment.

Another important area for nurse educators to explore is in the area of teaching students the importance of performing a thorough patient assessment. Nursing students are typically taught to perform over 120 physical assessment skills, yet in clinical practice only a portion of these skills are routinely performed (Burks, 2013, Giddens, 2007; Giddens & Eddy, 2009). Students need to know how to perform an assessment and to understand how critical nurses' assessment findings are to the patient's plan of care. Very little is known about the factors that influence nurses' assessment practices in the acute care setting.

Effective teamwork and communication are important aspects of patient safety and were highlighted by the findings of this study. Interprofessional education in traditional classroom settings and in patient simulation activities offers an opportunity for nursing students to work collaboratively with students from other health professions. Case-based team-building activities centered on identification and response to acutely deteriorating patients might help build effective interprofessional communication, teamwork, and respect between nursing students and medical students.

Recommendations for research. The knowledge gained from this study lays the foundation for future research studies. Future research using reflective debriefing or journaling following rapid response or code blue events could offer additional insights into methods for developing nurses' clinical judgment skills. These clinical judgment skills might improve patient safety and outcomes in situations of acute deterioration.

Further research to evaluate the impact of specific factors on clinical judgment, to identify strategies for developing clinical judgment, and to develop instruments that measure the complex nature of clinical judgment in clinical practice are needed.

A significant area for further research is explorations of registered nurses' perspectives on performing patient assessments. Because several participants in this study commented on the fact that some nurses fail to conduct thorough patient assessments it is imperative to understand the reasons why. Research on factors that influence registered nurses' use of physical assessment skills in acute care settings is scant.

The process and frequency for obtaining vital signs and the relationship to patient outcomes in the medical surgical patient needs to be studied. The risks and benefits of continuous multi-parameter monitoring of patients on medical-surgical units offers an area of study that might enhance patient safety.

In this study transitions of care was identified as an opportunity for patient deterioration to go unnoticed for a period of time. Future research evaluating the timing of patient deterioration in relation to transitions of care and the effects of different hand-off procedures on the outcomes of patient deterioration is warranted given these findings. Optimal information needed to safely transfer patient care from one shift to the next or from one unit to another needs to be determined. Future research also needs to look at opportunities to maximize communication methods and strategies for nurse to nurse hand-offs so that information is not lost.

An unexpected finding of this study was that none of the participants mentioned relying on early warning scores as a way of being alerted to patients at increased risk for deterioration. Early warning scoring systems have been shown to perform well for predicting cardiac arrest or

death (Smith et al, 2014), however, the findings from this study suggests research is needed to evaluate system performance and effectiveness and nurses perspectives on early warning scores.

Recommendations for practice. The results of this research have implications for nursing practice, especially related to areas of accountability and competency. Identifying important barriers that influence nurses' assessment practices is needed to understand the potential relationship to failure to recognize patients at risk of clinical deterioration.

Monitoring of patient vital signs on medical-surgical units is currently based on intermittent observations and measurements. These measurements are typically done by nurse technicians and then communicated to the registered nurse. Several hours can pass between measurements, allowing signs of deterioration to go unnoticed. Consistent with the literature, the current study produced findings that indicate patients displayed changes of deterioration that may have been present for an unknown time period. Early identification of deterioration can facilitate rapid management, help reduce adverse events such as the need to transfer to the ICU, may reduce hospital length of stay and costs, and improve survival rates (Brown, et al., 2014; Subbe, Duller & Bellomo, 2017). The frequency and thoroughness of patient assessments and vital sign measurements could have contributed to this observation therefore these practices warrant further exploration.

Another critical area for practice change involves care transitions. Patients transitioning from one level of care or from one provider of care to another are susceptible to adverse events related to fragmented communication (Fuji, Abbott, & Norris, 2012; Kripalani, LeFevre, & Phillips, 2007). In the present study multiple stories revealed patients whose deterioration was identified shortly after a transition of care. Hand off reports frequently missed essential information. Efforts to improve the process of communication during transitions of care should

focus more broadly than medication errors to specifically include gaps in communication that can interfere with the nurse's ability to notice early changes of deterioration. Face to face and bedside methods of delivering hand-off information needs to be further explored along with standardizing communication.

The findings of this study are consistent with other research that suggests that reflective practice offers an opportunity for developing clinical judgment skills. The literature supports the use of reflective thinking during debriefing as a way to facilitate clinical judgment skills among students (Dillard, 2009; Mariani et al., 2013). Guided reflective thinking activities need to be incorporated in clinical practice to assist nurses in the development clinical judgment.

Additional areas for practice changes include nurse-physician communication and collaboration. Findings from this study revealed that interactions between nurses and physicians requires improvement. These findings support previous studies that identified challenges with physician and nurse communication regarding deteriorating patients (Bagshaw, et al., 2010; Endacott et al., 2007; Odell, 2014). Factors contributing to ineffective collaboration must be identified so that true collaborative partnerships can exist in health care facilities.

Interdisciplinary activities such as daily interprofessional patient rounds, joint practice committee participation, interprofessional orientation of new employees to the hospital, and written policies and protocols supporting collaboration are some suggestions for effective team communication. Nurses and physicians could also go through training together to learn to speak up and demonstrate value for each other's ideas and comments. Hospital administrators can support clinical nurse autonomy through the creation of structures and processes that involve nurses in every level of decision making (Varjus, et al., 2011).

Finding in this study suggest that resource availability is another area for research and practice. Increasing the ratio of nurse techs for each registered nurse, allowing for more flexible family visitation, and enhancing communication with family members are strategies that might enhance nurses' knowledge of the patient.

More research also needs to be done in evaluating patient outcomes in relation to nurse autonomy. This line of research is still in its infancy and could benefit from additional study designs and with varying patient populations and clinical situations.

Conclusion

Timely recognition and response to acutely deteriorating patients continues to be a major patient safety concern in hospitalized patients. The purpose of this study was to identify factors that influence the clinical judgment of registered nurses during an episode of acute physiologic deterioration in the adult patient. The investigator explored elements that influenced the clinical judgment in a sample of 20 medical-surgical nurses. The words of the participants provided richly detailed descriptions of the experiences these nurses' had in caring for acutely deteriorating patients. The study produced findings that indicate factors that influence nurses' ability to notice, interpret, and respond to acutely deteriorating patients on medical-surgical units are complex. Evidence from this study suggests that factors in the nurse, the patient, and the work environment play a role in determining effective response to deteriorating patients. Findings contribute to what is known about nurses' clinical judgment in situations of acute patient deterioration. Findings validate the need for exploration of nurses' perspectives regarding the conduct of patient assessments. Additionally, the current study illuminated the importance of further study of the association between transitions of care and episodes of patient deterioration and the use of reflection as a method for improving clinical judgment. These

discoveries may guide new approaches to identifying patients at risk of deterioration and minimizing episodes of unnoticed deterioration. Findings also suggest that research should be conducted to establish validity of the definitions of the LCJR (Lasater, 2007) for actual clinical situations requiring nursing clinical judgments. A recent conversation with Tanner (C. Tanner, personal communication, March 25 2019) affirmed that the rubric needs to be re-examined in terms of construct validity.

Surveillance of patient deterioration requires the nurse to notice changes in a patient's status, as well as recognize and interpret clinical implications of the change (Kelly & Vincent, 2011). When the signs of acute deterioration are not recognized and treated within a timely manner, serious complications such as cardiopulmonary arrest, unplanned admissions to the ICU, and even death can occur (Sankey et al., 2016). Failure to notice a patient who is deteriorating directly impacts timely activation of the RRT and patient outcomes. Early intervention in situations of acute physiologic deterioration can be improved by the ability of nurses to notice, interpret, and respond. The findings of this study indicate that delays in noticing and responding to these changes continue to occur. This study also indicates that nurses' clinical judgment in situations of acute patient deterioration involves multiple iterative steps and that it is very nonlinear. Through the stories told by participants support was found for several aspects of Tanner's (2006) CJM. Specifically, the knowledge the nurse brings to a situation greatly influences what the nurse views as important, what stands out as salient, and what is responded to. Similarly, environmental factors identified in this study such as the culture of teamwork, nursing workload, and resource availability are in alignment with Tanner's (2006) model. Finally, this study highlighted the need for additional research to understand the role early warning systems play in the response to patient deterioration.

References

- Adamson, K., Gubrud, P., Sideras, S., & Lasater, K. (2012). Assessing the reliability, validity, and use of the Lasater Clinical Judgment Rubric: Three approaches. *The Journal of Nursing Education*, 51(2), 66-73.
- Adelstein, B., Piza, M. A., Nayyar, V., Mudaliar, Y., Klineberg, P. L., & Rubin, G. (2011). Rapid response systems: A prospective study of response times. *Journal of Critical Care*, 26, 635.e611-635.e618.
- Alam, N., Hobbelenk, E., Tienhoven, A., van de Ven, P., Jansma, E., & Nanayakkara, P. (2014). The impact of the use of the early warning score (EWD) on patient outcomes: A systematic review. *Resuscitation*, 85, 587-594.
- Andersen, L., Kim, W., Chase, M., Berg, K., Mortensen, S., Moskowitz, A., . . . Donnino, M. (2016). The prevalence and significance of abnormal vital signs prior to in-hospital cardiac arrest. *Resuscitation*, 98, 112-117.
- Andrews, T., & Waterman, H. (2005). Packaging: A grounded theory of how to report physiological deterioration effectively. *Journal of Advanced Nursing*, 52(5), 473-481.
- Astroth, K., Woith, W., Stapleton, S., Degitz, J., & Jenkins, S. (2013). Qualitative exploration of nurses' decisions to activate rapid response teams. *Journal of Clinical Nursing*, 22, 2876-2882.
- Bagshaw, S., Mondor, E., Scouten, C., Montgomery, C., Slater-MacLean, L., Jones, D., . . . Gibney, N. (2010). A survey of nurses' beliefs about the medial emergency team system in a Canadian tertiary hospital. *American Journal of Critical Care*, 19(1), 74-83.
- Benner, P. (1982). From Novice to Expert. *The American Journal of Nursing*, 82(3), 402-407.

Benner, P. (2001). *From Novice to Expert: Excellence and Power in Clinical Nursing Practice*. Saddle River NJ: Prentice Hall.

Benner, P., Hughes, R., & Sutphen, M. (2008). Clinical reasoning, decisionmaking and action: Thinking critically and clinically. In R. G. Hughes (Ed.), *Patient Safety and Quality: An evidence-based Handbook for nurses*. Rockville, MD: AHRQ Publications.

Benner, P., & Tanner, C. (1987). Clinical judgment: How expert nurses use intuition. *The American Journal of Nursing*, 87(1), 23-31.

Benner, P., Tanner, C., & Chesla, C. (1997). The social fabric of nursing knowledge. *The American Journal of Nursing*, 97(7), 16BBB-16DDD.

Berwick, D. M., Calkins, D. R., McCannon, C. J., & Hackbarth, A. D. (2006). The 100,000 lives campaign: setting a goal and a deadline for improving health care quality. *Journal of the American Medical Association*, 295, 324-327.

Birks, M., James, A., Chung, C., Cant, R., & Davis, J. (2013). The use of physical assessment skills by registered nurses in Australia: issues for nursing education. *Collegian*, 20(1), 27-33.

Blackman, I., Henderson, J., Willis, E., Hamilton, P., Toffoli, L., Verrall, C., ... Harvey, (2014). Factors influencing why nursing care is missed. *Journal of Clinical Nursing*, 24, 47-56.

Bokhari, S. W., Munir, T., Memon, S., Byrne, J., Russell, N. H., & Beed, M. (2010). Impact of critical care reconfiguration and track-and-trigger outreach team interention on outcomes of hematology patients requireing intensive care admission. *Annals of Hematology*, 89(5), 505-512.

Boniatti, M., Azzolini, N., Viana, M., Ribeiro, B., Coelho, R., Castilho, R., . . . Filho, R. (2014). Delayed medical emergency team calls and associated outcomes. *Critical Care Medicine, 42*(1), 26-30.

Bowen, G. (2008). Naturalistic inquiry and the saturation concept: A research note. *Qualitative Research, 8*(1), 137-152.

Braaten, J. (2013). Cognitive work analysis to uncover constraints imposed on the activation of the rapid response team in the acute care hospital. (PhD), University of Colorado, ProQuest LLC database. (3564500)

Braaten, J. (2015). Hospital system barriers to rapid response team activation: A cognitive work analysis. *American Journal of Nursing, 115*(2), 22-32.

Brown, H., Terrence, J., Vasquez, P., Bates, D., & Zimlichman, E. (2014). Continuous monitoring in an inpatient medical-surgical unit: A controlled clinical trial. *American Journal of Medicine, 127*(3), 226-232.

Bucknall, T. K., Jones, D., Bellomo, R., & Staples, M. (2013). Responding to medical emergencies: System characteristics under examination (RESCUE). A prospective multi-site point prevalence study. *Resuscitation, 84*, 179-183.

Buist, M., Bernard, S., Nguyen, T. V., Moore, G., & Anderson, J. (2004). Association between clinically abnormal observations and subsequent in-hospital mortality: A prospective study. *Resuscitation, 62*(2), 147-141.

Burbach, B., & Thompson, S. (2014). Cue recognition by undergraduate nursing students: An integrative review. *Journal of Nursing Education, 53*(9), S73-S81.

Burger, J., Parker, K., Cason, L., Hauck, S., Kaetzel, D., O'nan, C., & White, A. (2010). Responses to work complexity: The novice to expert effect. *Western Journal of Nursing Research, 32*(4), 497-510.

Chan, P., Jain, R., Nallmothu, B., Berg, R., & Sasson, C. (2010). Rapid response teams: A systematic review and meta-analysis. *Archives of Internal Medicine, 170*, 18-26.

Chen, J., Bellomo, R., Flabouris, A., Hillman, K., Assareh, H., & Lixin, O. (2015). Delayed emergency team calls and associated hospital mortality: A multicenter study. *Critical Care Medicine, 43*(10), 2059-2065.

Cherry, P., & Jones, C. (2015). Attitudes of nursing staff towards a modified early warning system. *British Journal of Nursing, 24*(16), 812-818.

Choi, H., van Merriënboer, J., & Paas, F. (2014). Effects of the physical environment on cognitive load and learning: Towards a new model of cognitive load. *Educational Psychology Review, 26*(2), 225-244.

Chua, W., Mackey, S., & Liaw, S. (2013). Front line nurses' experiences with deteriorating ward patients: A qualitative study. *International Nursing Review, 60*, 501-509.

Chudyk, A. M., Jutai, J., Petrella, R., & Speechley, M. (2009). Systematic review of hip fracture rehabilitation practices in the elderly. *Archives of Physical Medicine Rehabilitation, 90*(2), 246-262.

Churpek, M., Wendlandt, B., Zdravec, F., Adhikari, R., Winslow, C., & Edleson, D. (2016). Association between intensive care unit transfer delay and hospital mortality: A multicenter investigation. *Journal of Hospital Medicine, 11*(11), 757-762.

Cioffi, J. (2000a). Nurses' experiences of making decisions to call emergency assistance to their patients. *Journal of Advanced Nursing, 32*(1), 108-114.

Cioffi, J. (2000b). Recognition of patients who require emergency assistance: A descriptive study. *Heart & Lung, 29*, 262-268.

Cioffi, J. (2001). A study of the use of past experiences in clinical decision making in emergency situations. *International Journal of Nursing Studies, 38*(5), 591-599.

Cioffi, J., Conway, R., Everist, L., Scott, J., & Senior, J. (2009). 'Patients of concern' to nurses in acute care settings: A descriptive study. *Australian Critical Care, 22*, 178-186.

Cioffi, J., Salter, C., Wilkes, L., Vonu-Boriceanu, O., & Scott, J. (2006). Clinicians' responses to abnormal vital signs in an emergency department. *Australian Critical Care, 19*(2), 66-72.

Clarke, S., & Aiken, L. (2003). Failure to rescue. *The American Journal of Nursing, 103*(1), 42-47.

Considine, J., Trotter, C., & Currey, J. (2015). Nurses' documentation of physiological observations in three acute care settings. *Journal of Clinical Nursing, 25*(1-2), 134-143.

Conway, J. (1994). Reflection, the art and science of nursing and theory-practice gap. *British Journal of Nursing, 3*(3), 114-118.

Cooper, S., Cant, R., Bogossian, F., Bucknall, T., & Hopmans, R. (2015). Doing the right thing at the right time. Assessing responses to patient deterioration in electronic simulation scenarios using course-of-action analysis. *Computers, Informatics, Nursing, 33*(5), 199-207.

Cooper, S., Cant, R., Porter, J., Missen, K., Sparkes, L., McConnell-Henry, T., & Endacott, R. (2013). Managing patient deterioration: assessing teamwork and individual performance. *Emergency Medical Journal, 30*, 377-381.

Cooper, S., Kinsman, L., Buykx, P., McConnell-Henry, T., Endacott, R., & Scholes, J. (2010). Managing the deteriorating patient in a simulated environment: Nursing students knowledge, skill and situation awareness. *Journal of Clinical Nursing, 19*(15), 2309-2318.

Cooper, S., McConnell-Henry, T., Cant, R., Porter, J., Missen, K., Kinsman, L., . . . Scholes, J. (2011). Managing deteriorating patients: Registered nurses' performance in simulated setting. *The Open Nursing Journal, 5*, 120-126.

Corbin, J., & Morse, J. (2003). The unstructured interactive interview: Issues of reciprocity and risks when dealing with sensitive topics. *Qualitative Inquiry, 9*(3), 335-354.

Cornell, P., Riordan, M., Townsend-Gervis, M., & Mobley, R. (2011). Barriers to critical thinking: Workflow interruptions and task switching among nurses. *Journal of Nursing Administration, 41*(10), 407-414.

Cox, H., James, J., & Hunt, J. (2006). The experiences of trained nurses caring for critically ill patients within a general ward setting. *Intensive and Critical Care Nursing, 22*(5), 283-293.

Creswell, J. W. (2013). *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*. Los Angeles: CA: Sage.

De Meester, K., Hellemans, K., Verbrugge, W., Jorens, P., Verpooten, G., & Van Bogaert, P. (2013). Impact of a standardized nurse observation protocol including MEWS after intensive care unit discharge. *Resuscitation, 82*(2), 184-188.

Devita, M., Bellomo, R., Hillman, K., Kellum, J., Rotondi, A., & Teres, D. (2006). Findings of the first consensus conference on medical emergency teams. *Critical Care Medicine, 34*, 2463-2478.

DeVita, M., Smith, G., Adam, S., Adams-Pizarro, I., Buist, M., Bellomo, R., . . . Haskell, H. (2010). "Identifying the hospitalized patient in crisis"- A consensus conference on the afferent limb of Rapid Response Systems. *Resuscitation, 81*, 375-382.

DiClicco-Bloom, B., & Crabtree, B. (2006). The qualitative research interview. *Medical Education, 40*, 314-321.

Donohue, L., & Endacott, R. (2010). Track, trigger and teamwork: Communication of deterioration in acute medical and surgical wards. *Intensive and Critical Care Nursing, 26*, 10-17.

Douw, G., Schoonhoven, L., Holwerda, T., Huisman-de Wall, G., van Zanten, A., van Achterberg, T., & Hoeven, v. d. (2015). Nurses' worry or concern and early recognition of deteriorating patients on general wards in acute care hospitals: A systematic review. *Critical Care, 19*(230), 1-11.

Downs, S., & Black, N. (1998). The feasibility of creating a checklist for the assessment of the methodological quality both of randomized and non-randomized studies of health care interventions. *Journal of Epidemiology and Community Health, 52*(6), 377-384.

Ebright, P. (2014). Patient safety in the current health care environment: Complexity of work remains an essential component. *Western Journal of Nursing Research, 36*(7), 851-854.

Ebright, P., Kooken, W., Moody, R., & Latif Hassan AL-Ishaq, M. (2006). Mindful attention to complexity: Implications for teaching and learning patient safety. *Annual Review of Nursing, 4*, 339-359.

Ellefsen, B. (2004). Frames and perspectives in clinical nursing practice: A study of Norwegian nurses in acute care settings. *Research and Theory for Nursing Practice: An International Journal, (18*(1), 95-109.

Ellefsen, B., Kim, H., & Ja Han, K. (2007). Nursing gaze as framework for nursing practice: A study from acute care settings in Korea, Norway, and the USA. *Scandinavian Journal of Caring Sciences*, 21(1), 98-105.

Elo, S., & Kyngas, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, 62(1), 107-115.

Endacott, R., Kidd, T., Chaboyer, W., & Edington, J. (2007). Recognition and communication of patient deterioration in a regional hospital: A multi-methods study. *Australian Critical Care*, 20, 100-105.

Endacott, R., Scholes, J., Cooper, S., McConnell-Henry, T., Porter, J., Missen, K., . . . Champion, R. (2012). Identifying patient deterioration: Using simulation and reflective interviewing to examine decision making skills in a rural hospital. *International Journal of Nursing Studies*, 49, 710-717.

Engelhardt, H.T. (1985). Physicians, patients, health care institutions and the people in between: nurses. In A.H. Bishop & J.R. Scudder (Eds.). *Caring, Curing, Coping*. Birmingham: AL University of Alabama Press

Fagan, K., Sabel, A., Mehler, P., & MacKenzie, T. (2012). Vital sign abnormalities, rapid response, and adverse outcomes in hospitalized patients. *American Journal of Medical Quality*, 27(6), 480-486.

Fasolino, T., & Verdin, T. (2015). Nursing surveillance and physiological signs of deterioration. *MedSurg Nursing*, 24(6), 397-402.

Fenske, C., Harris, M., Aebersold, M., & Hartment, L. (2013). Perception versus reality: A comparative study of the clinical judgment skills of nurses during a simulated activity. *Journal of Continuing Education in Nursing*, 44(9), 399-405.

Fuhrmann, L., Lippert, A., Perner, A., & Ostergaard, D. (2008). Incidence, staff awareness and mortality of patients at risk on general wards. *Resuscitation*, 77(3), 325-330.

Fuji, K., Abbott, A., & Norris, J. (2012). Exploring care transitions from patient, caregiver, and health-care provider perspectives. *Clinical Nursing Research*, 22(3), 258-274.

Gao, H., Harrison, D., & Adam, S. (2006). Evaluation of available data on physiological track and trigger warning systems. *Critical Care*, 10(S1), 415.

Gazarian, P., Henneman, E., & Chandler, G. (2010). Nurse decision making in the prearrest period. *Clinical Nursing Research*, 19(1), 21-37.

Georg, C., Karlgren, K., Ulfvarson, J., Jirwe, M., & Welin, E. (2018). A rubric to assess students clinical reasoning when encountering virtual patients. *Journal of Nursing Education*, 57(7), 408-415.

Giddens, J.F. (2007). A survey of physical assessment techniques performed by RNs: Lessons for nursing education. *Journal of Nursing Education*, 46(2), 83-87.

Giddens, J.F. & Eddy, L. (2009). A survey of physical examination techniques taught in undergraduate nursing programs: are we teaching too much? *Journal of Nursing Education*, 48, 24-29.

Girotra, S., Nallamothu, B., Spertus, J., Li, Y., Krumholz, H., & Chan, P. (2012). Trends in survival after in-hospital cardiac arrest. *New England Journal of Medicine*, 367(20), 1912-1920.

Go, A., Mozaffarian, D., Roger, V., Benjamin, E., Berry, J., Blaha, M., & Turner, M. (2014). Heart disease and stroke statistics: 2014 update. *Circulation*, 129(3), e29-92.

Graneheim, U., & Lundman, B. (2004). Qualitative content analysis in nursing research: Concepts, procedures and measures to achieve trustworthiness. *Nurse Education Today*, 24(1), 105-112.

Grundgeiger, T., Sanderson, P., MacDougall, H., & Venkatesh, B. (2010). Interruption management in the intensive care unit: Predicting resumption times and assessing distributed support. *Journal of Experimental Psychology: Applied*, 16, 317-344.

Guba, E. G. (1981). Criteria for assessing the trustworthiness of naturalistic inquiries. *Educational Resources Information Center Annual Review Paper*, 29(2), 75-91.

Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation variability. *Field Methods*, 18(1), 59-82.

Guinane, J., Bucknall, T., Currey, J., & Jones, D. (2013). Missed medical emergency team activations: Tracking decisions and outcomes in practice *Critical Care and Resuscitation*, 15(4), 266-272.

Hammond, K. (1964). An approach to the study of clinical inference in nursing, Part II: Clinical inference in nursing: A methodological approach. *Nursing Research*, 13(4), 315-319.

Hammond, K. (1966). Clinical inference in nursing II. *Nursing Research*, 15(1), 27-38.

Hammond, K., Kelly, K., Schneider, R., & Vancini, M. (1966). Clinical inference in nursing: Analyzing cognitive tasks representative of nursing problems. *Nursing Research*, 15(2), 134-138.

Hansebo, G., & Kihlgren, M. (2001). Carers' reflections about their vide-recorded interactions with patients suffering from severe dementia. *Journal of Clinical Nursing*, 10, 737-747.

Hart, P., Spiva, L., Baio, P., Huff, B., Whitfield, D., Law, T., . . . Mendoza, I. (2014). Medical-surgical nurses' perceived self-confidence and leadership abilities as first responders in acute patient deterioration events. *Journal of Clinical Nursing, 23*, 2769-2778.

Hart, P., Spiva, L., Dolly, L., Lang-Coleman, K., & Prince-Williams, N. (2016). Medical-surgical nurse' experiences as first responders during deterioration events: A qualitative study. *Journal of Clinical Nursing, 25*(21-22), 3241-3251.

Hawker, S., Payne, S., Kerr, C., Hardey, M., & Powell, J. (2002). Appraising the evidence: Reviewing disparate data systematically. *Qualitative Health Research, 12*(9), 1284-1299.

Hodgetts, T., Kenward, G., Vlachonikolis, L., Payne, S., & Castle, N. (2002). The identification of risk factors for cardiac arrest and formulation of activation criteria to alert a medical emergency team. *Resuscitation, 54*(2), 125-131.

Hoffman, K., Aitken, L., & Duffield, C. (2009). A comparison of novice and expert nurses' cue collection during clinical decision-making: Verbal protocol analysis. *International Journal of Nursing Studies, 46*, 1335-1344.

Hsieh, H., & Shannon, S. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*(9), 1277-1288.

Intuition. ((n.d.)). Merriam-Webster's Dictionary. Retrieved 8/23/2017
<https://www.merriam-webster.com/dictionary/intuition>

Irvine, A., Drew, P., & Sainsbury, R. (2012). 'Am I not answering your questions properly?' Clarification, adequacy and responsiveness in semi-structured telephone and face-to-face interviews. *Qualitative Health Research, 13*(187-106).

Jackson, S., Penprase, B., & Grobbel, C. (2016). Factors influencing registered nurses' decision to activate an adult rapid response team in a community hospital. *Dimensions of critical care nursing, 35*(2), 99-107.

Jaderling, G., Bell, M., Martling, C., Ekbom, A., Bottai, M., & Konrad, D. (2013). ICU admittance by a rapid response team versus conventional admittance, characteristics and outcome. *Critical Care Medicine, 41*(3), 725-731.

Jenkins, S., Astroth, K., & Woith, W. (2015). Non-critical care nurses' perceptions of facilitators and barriers to rapid response team activation. *Journal for Nurses in Professional Development, 31*(5), 264-270.

Jensen, R. (2013). Clinical reasoning during simulation: Comparison of student and faculty ratings. *Nurse Education in Practice, 13*, 23-28.

Johansson, M., Pilhammar, E., & Willman, A. (2009). Nurses' clinical reasoning concerning management of peripheral venous cannulae. *Journal of Clinical Nursing, 18*(23), 3366-3375.

Johnson, E., Lasater, K., Hodson-Carlton, K., Siktberg, L., Sideras, S., & Dillard, N. (2012). Geriatrics in simulation: Role modeling and clinical judgment effect. *Nursing Education Perspectives, 33*(3), 176-180.

Johnson, S. & Kring, D. (2012). Nurses perceptions of nurse-physician relationships: Medical-surgical vs intensive care. *Medical Surgical Nursing, 21*(6), 343-347.

Johnston, M., Arora, S., King, D., Stroman, L., & Darzi, A. (2014). Escalation of care and failure to rescue: A multicenter, multiprofessional qualitative study. *Surgery, 155*, 989-994.

Jones, D., Baldwin, I., McIntyre, T., Story, D., Mercer, I., Miglic, A., . . . Bellomo, R. (2006). Nurses' attitudes to a medical emergency team service in a teaching hospital. *Quality and Safety in Health Care, 15*, 427-432.

Jones, D., Bellomo, R., Bates, S., Warrillow, S., Goldsmith, D., Hart, G., & Opdam, H. (2006). Patient monitoring and the timing of cardiac arrests and medical emergency team calls in a teaching hospital. *Intensive Care Medicine, 32*, 1353-1356.

Jones, D., DeVita, M., & Bellomo, R. (2011). Rapid-response teams. *The New England Journal of Medicine, 365*(2), 139-146.

Jones, L., King, L., & Wilson, C. (2009). A literature review: Factors that impact on nurses' effective use of the Medical Emergency Team (MET). *Journal of Clinical Nursing, 18*, 3379-3390.

Jonsson, T., Honsdottir, H., Moller, A., & Baldursdottir, L. (2011). Nursing documentation prior to emergency admissions to the intensive care unit. *Nursing in Critical Care, 16*(4), 164-169.

Jutai, J., Strong, J., & Russell-Minda, E. (2009). Effectiveness of assistive technologies for low vision rehabilitation: A systematic review. *Journal of Visual Impairment and Blindness, 103*(4), 210-222.

Kalisch, B., Landstrom, G., & Hinshaw, A. (2009). Missed nursing care: A concept analysis. *Journal of Advanced Nursing, 65*(7), 1509-1517.

Karpman, C., Keegan, M., Jensen, J., Bauer, P., Brown, D., & Afessa, B. (2013). The impact of rapid response team on outcome of patients transferred from the ward to the ICU: a single-center study. *Critical Care Medicine, 41*(10), 2284-2291.

- Kelly, K. (1964). An approach to the study of clinical inference in nursing: Part I. Introduction to the study of clinical inference in nursing. *Nursing Research, 13*(4), 314.
- Kelly, L., & Vincent, D. (2011). The dimensions of nursing surveillance: a concept analysis. *Journal of Advanced Nursing, 67*(3), 652-661.
- Kim, H., Ellefsen, B., Ja Han, K., & Alves, S. (2008). Clinical constructions by nurses in Korea, Norway, and the United States. *Western Journal of Nursing Research, 30*(1), 54-72.
- Kim, S.J., Kim, S., Kang, K., Oh, J., & Lee, M. (2016). Development of a simulation evaluation tool for assessing nursing students' clinical judgment in caring for children with dehydration. *Nurse Education Today, 37*, 45-52.
- Kohn, L. T., Corrigan, J. M., & Donaldson, M. S., eds. (1999). *To Err is Human: Building a Safer Health System*. Retrieved from Washington, D.C.:
- Krepper, R., Vallego, B., Smith, C. (2014). Evaluation of a standardized hourly rounding Process (sHaRP). *Journal for Healthcare Quality, 36*(2), 62-69.
- Kutney-Lee, A., Lake, E., & Aiken, L. (2009). Development of the hospital nurse surveillance capacity profile. *Research in Nursing & Health, 32*, 217-228.
- Lasater, K. (2007). Clinical judgment development: Using simulation to create an assessment rubric. *Journal of Nursing Education, 46*(11), 496-503.
- Lavoie, P., Cossette, S., & Pepin, J. (2016). Testing nursing students' clinical judgment in a patient deterioration simulation scenario: Development of a situation awareness instrument. *Nurse Education Today, 38*, 61-67.
- Lavoie, P., Pepin, J., & Alderson, M. (2014). Defining patient deterioration through acute care and intensive care nurses' perspectives. *British Association of Critical Care Nurses, 21*(2), 68-77.

Leuvan, C., & Mitchell, I. (2008). Missed opportunities? An observational study of vital sign measurement. *Critical Care and Resuscitation, 10*(2), 111-115.

Lincoln, Y., & Guba, E. (1985). *Naturalistic Inquiry*. Beverly Hill, CA: Sage.

Lindsey, P., & Jenkins, S. (2013). Nursing students' clinical judgment regarding rapid response: The influence of a clinical simulation education intervention. *Nursing Forum, 48*(1), 61-70.

Ludikhuize, J., Smorenburg, S., de Rooij, S., & de Jonge, E. (2012). Identification of deteriorating patients on general wards; Measurement of vital parameters and potential effectiveness of the Modified Early Warning Score. *Journals of Critical Care, 27*(4), 7-13.

Malterud, K., Siersma, V., & Guassora, A. Sample size in qualitative interview studies: Guided by information power. *Qualitative Health Research, 26*(13), 1753-1760.

Marshall, C., & Rossman, G. (2011). *Designing Qualitative Research*. Washington, DC: Sage.

Mason, M. (2010). Sample size and saturation in PhD studies using qualitative interviews. *Forum: Qualitative Social Research, 11*(3), 8.

Massey, D., Aitken, L., & Chaboyer, W. (2008). What factors influence suboptimal ward care in the acutely ill ward patient? *Australian Critical Care, 21*, 127-140.

Massey, D., Chaboyer, W., & Aitken, L. (2014). Nurses' perceptions of accessing a Medical Emergency Team: A qualitative study. *Australian Critical Care, 27*(3), 133-138.

McCarthy, M.C. (2003). Situated clinical reasoning: Distinguishing acute confusion from dementia in hospitalized older adults. *Research in Nursing and Health, 26*(2), 90-101.

McCosker, H., Barnard, A., & Gerber, R. (2001). Undertaking sensitive research: Issues and strategies for meeting the safety needs of all participants. *Forum: Qualitative Social Research*, 2(1), 22.

McGaughey, J., Alderdice, F., Fowler, R., Kapila, A., Mayhew, A., & Moutray, M. (2007). Outreach and early warning systems for the prevention of intensive care admission and death of critically ill adult patients on general hospital wards. *Cochrane Database of Systematic Reviews*, 3(CD005529).

McNeill, G., & Bryden, D. (2013). Do either early warning systems or emergency response teams improve hospital patient survival ? A systematic review. *Resuscitation*, 84, 1652-1667.

Meester, K., Bogaert, P., Clarke, S., & Bossaert, L. (2012). In-hospital mortality after serious adverse events on medical and surgical nursing units: a mixed methods study. *Journal of Clinical Nursing*, 22, 2308-2317.

Merchant, R., Yang, L., Becker, L., Berg, R., Nadkarni, V., Nichol, G., . . . Groeneveld, P. (2011). Incidence of treated cardiac arrest in hospitalized patients in the United States. *Critical Care Medicine*, 39(11), 2401-2406.

Minick, P., & Harvey, S. (2003). The early recognition of patient problems among medical-surgical nurses. *MedSurg Nursing*, 12(5), 291-297.

Miraglia, R., & Asselin, M. (2015). The Lasater clinical judgment rubric as a framework to enhance clinical judgment in novice and experienced nurses. *Journal for Nurses in Professional Development*, 31, 284-291.

Mok, W., Wang, W., & Liaw, S. (2015). Vital signs monitoring to detect patient deterioration: An integrative literature review. *International Journal of Nursing Practice, 21*(3), 91-98.

Moon, A., Cosgrove, J., Lea, D., Fairs, A., & Cressey, D. (2011). An eight year audit before and after the introduction of modified early warning score (MEWS) charts, of patients admitted to a tertiary referral intensive care unit after CPR. *Resuscitation, 82*, 150-154.

Morgan, R., Williams, F., & Wright, M. (1997). An early warning scoring system for detecting developing critical illness. *Clinical Intensive Care, 8*(2), 100.

Morrison, L., Neumar, R., Zimmerman, J., Link, M., Newby, K., & McMullan, P. (2013). Strategies for improving survival after in-hospital cardiac arrest in the United States: 2013 Consensus Recommendations. *Circulation, 127*, 1538-1563.

Morse, J. (1999). Myth 93: Reliability and validity are not relevant to qualitative inquiry. *Qualitative Inquiry, 9*, 717-718.

Morse, J. (2000). Determining sample size. *Qualitative Health Research, 10*(1), 3-5.

Morse, J. (2012). Introducing the first global congress for qualitative health research: What are we? what will we do- and why? *Qualitative Health Research, 22*(2), 147-156.

Morse, J. (2015a). Analytic strategies and sample size. *Qualitative Health Research, 25*(10), 1317-1318.

Morse, J. (2015b). Critical analysis of strategies for determining rigor in qualitative inquiry. *Qualitative Health Research, 25*(9), 1212-1222.

Mozaffarian, D., Benjamin, E., Go, A., Arnett, D., Blaha, M., Cushman, M., & Turner, M. (2014). Heart disease and stroke statistics-2015 update. A report from the American Heart Association. *Circulation, 131*, e29-e32.

Musselwhite, K., Cuff, L., McGregor, L., & King, K. (2009). The telephone interview is an effective method of data collection in clinical nursing research: A discussion paper.

International Journal of Nursing Studies, 44(6), 1064-1070.

Odell, M. (2014). Detection and management of the deteriorating ward patient: An evaluation of nursing practice. *Journal of Clinical Nursing*, 24(1), 173-182.

Odell, M., Victor, C., & , & Oliver, D. (2009). Nurses' role in detecting deterioration in ward patients: A systematic literature review. *Journal of Advanced Nursing*, 65(10), 1992-2006.

Oklahoma Board of Nursing. (2017). Oklahoma Nursing Practice Act and Rules.

Retrieved from <http://nursing.ok.gov/act4.html>

Pantazopoulos, I., Tsoni, A., Kouskouni, E., Papadimitriou, L., Johnson, E., & Xanthos, T. (2012). Factors influencing nurses' decisions to activate medial emergency teams. *Journal of Clinical Nursing*, 21(17-18), 2668-2678.

Parker, C. (2014). Decision-making models used by medical-surgical nurses to activate rapid response teams. *MedSurg Nursing*, 23(3), 159-164.

Patton, M. Q. (2015). *Qualitative research & evaluation methods*. Thousand Oaks, CA: SAGE Publications, Inc.

Peris, A., Zagli, G., & Maccarrone, N. (2012). The use of Modified Early Warning Score may help anesthetists in postoperative level of care selection in emergency abdominal surgery. *Minerva Anesthesiology*, 78, 1034-1038.

Ramezani-Badr, F., Nasrabadi, A., Yekta, Z., & Taleghani, F. (2009). Strategies and criteria for clinical decision making in critical care nurses: A qualitative study. *Journal of Nursing Scholarship*, 41(4), 351-358.

Rattray, J., Lauder, W., Ludwick, R., Johnstone, C., Zeller, R., Winchell, J., . . . Smith, A. (2011). Indicators of acute deterioration in adult patients nursed in acute wards: A factorial survey. *Journal of Clinical Nursing, 20*, 723-732.

Ruth-Sahd, L. (1993). A modification of Benner's hierarchy of clinical practice: The development of intuition in the novice trauma nurse. *Holistic Nursing Practice, 7*(3), 8-14.

Ruth-Sahd, L. (1997). Fostering intuition: A role of the trauma nurse mentor. *International Journal of Trauma Nursing, 3*(1), 22-24.

Ruth-Sahd, L. & Hendy, H. (2005) Predictors of novice nurses' use of intuition to guide patient care decisions. *Journal of Nursing Education, 44*(10), 450-458.

Salamonson, Y., van Heere, B., Everett, B., & Davidson, P. (2006). Voices from the floor: Nurses' perceptions of the medical emergency team. *Intensive and Critical Care Nursing, 22*, 138-143.

Sandelowski, M. (1993). Rigor or rigor mortis: The problem of rigor in qualitative research. *Advances in Nursing Science, 16*(2), 1-8.

Sandelowski, M. (1995). Qualitative analysis: What it is and how to begin. *Research in Nursing & Health, 18*, 371-375.

Sandelowski, M. (2000). Focus on research methods: Whatever happened to qualitative description? *Research in Nursing & Health, 23*, 334-340.

Sandelowski, M. (2010). What's in a name? Qualitative description revisited. *Research in Nursing & Health, 33*, 77-84.

Sankey, C. B., McAvay, G., Siner, J. M., Barsky, C. L., & Chaudhry, S. I. (2016). "Deterioration to Door Time": An Exploratory Analysis of Delays in Escalation of Care for

Hospitalized Patients. *Journal of General Internal Medicine*, 31(8), 895-900.

doi:10.1007/s11606-016-3654-x

Schon, D. A. (1983). *The reflective practitioner: How professionals think in action*. New York: Basis Books.

Shearer, B., Marshall, S., Buist, M., Finnigan, M., Kitto, S., Hore, T., . . . Ramsay, W. (2012). What stops hospital clinical staff from following protocols? An analysis of the incidence and factors behind the failure of bedside clinical staff to activate the rapid response system in a multi-campus Australian metropolitan healthcare service. *British Medical Journal Quality Safety*, 21, 569-575.

Silber, J., Williams, S., Krakauer, H., & Schwartz, J. (1992). Hospital and patient characteristics associated with death after surgery. A study of adverse occurrence and failure to rescue. *Medical Care*, 30(7), 615-629.

Simpson, A., & Barker, P. (2007). The persistence of memory: Using narrative picturing to co-operatively explore life stories in qualitative inquiry. *Nursing Inquiry*, 14(1), 35-41.

Slomka, J., Hoffman-Hogg, L., Mion, L., Bair, N., Bobek, M., & Aroliga, A. (2000). Influence of clinicians' values and perceptions on use of clinical practice guidelines for sedation and neuromuscular blockade in patients receiving mechanical ventilation. *American Journal of Critical Care*, 9(6), 412-418.

Smith, E. (2005). Telephone interviewing in healthcare research: A summary of the evidence. *Nurse Researcher*, 12(3), 32-41.

Smith, G., Prytherch, D., Meredith, P., & Schmidt, P. (2015). Early warning scores: Unravelling detection and escalation. *International Journal of Health Care Quality Assurance*, 28(8), 872-875.

- Smith, M., Chiovaro, J., O'Neil, M., Kansagara, D., Quinones, A., Freeman, M., . . . Slatore, C. (2014). Early warning system scores for clinical deterioration in hospitalized patients: A systematic review. *Annals American Thoracic Society, 11*(9), 1454-1465.
- Smith, S. A. (2013). *Decision-Making in Acute Care Nursing with Deteriorating Patients*. (Doctor of Nursing), University of Brighton, Ann Arbor. (10057647)
- Sorensen, E., & Brahe, L. (2014). Interruptions in clinical nursing practice. *Journal of Clinical Nursing, 23*(9), 1274-1282.
- Stewart, J., Carman, M., Spegman, A., & Sabol, V. (2014). Evaluation of the effect of the modified early warning system on the nurse-led activation of the rapid response system. *Journal of Nursing Care Quality, 29*(3), 223-229.
- Sturges, J., & Hanrahan, K. (2004). Comparing telephone and face-to-face qualitative interviewing: A research note. *Qualitative Research, 4*(1), 107-118.
- Subbe, C.P., Duller, B., & Bellomo, R. (2017). Effect of an automated notification system for deteriorating ward patients on clinical outcomes. *Critical Care, 21*(1), 52.
- Tanner, C.A. (1998). State of the science: Clinical judgment and evidence-based practice: Conclusions and controversies. *Communicating Nursing Research, 31*, 14-26.
- Tanner, C. (2006). Thinking like a nurse: A research-based model of clinical judgment in nursing. *Journal of Nursing Education, 45*(6), 204-211.
- The Joint Commission. (2009). 2009 National Patient Safety Goals.
- Thomas, C., & Magilvy, J. (2011). Qualitative rigor or research validity in qualitative research. *Journal for Specialists in Pediatric Nursing, 16*, 151-155.

Thomas, M., & Fothergill-Bourbonnais, F. (2005). Clinical judgments about endotracheal suctioning: What cues do expert pediatric critical care nurses consider? *Critical Care Nursing Clinics of North America*, *17*, 329-340.

Thompson, C., Bucknall, T., Estabrookes, C., Hutchinson, A., Fraser, K., de Vos, R., . . . Saunders, J. (2009). Nurses' critical event risk assessments: A judgement analysis. *Journal of Clinical Nursing*, *18*, 601-612.

Thompson, C., Yang, H., & Crouch, S. (2012). Clinical simulation fidelity and nurses' identification of critical event risk: A signal detection analysis. *Journal of Advanced Nursing*, *68*(11), 2477-2485.

Tirkkonen, J., Yla-Mattila, J., Olkkola, K., Huhtala, H., Tenhunen, J., & Hoppu, S. (2013). Factors associated with delayed activation of medical emergency team and excess mortality: An Utstein-style analysis. *Resuscitation*, *84*, 173-178.

Tobin, G., & Begley, C. (2005). Methodological rigour within a qualitative framework. *Journal of Advanced Nursing*, *48*(4), 388-396.

Toole, N., Meluskey, T., & Hall, N. (2016). A systematic review: Barriers to hourly rounding. *Journal of Nursing Management*, *24*(3), 283-289.

Tower, M., & Chaboyer, W. (2014). Situation awareness and documentation of changes that affect patient outcomes in progress notes. *Journal of Clinical Nursing*, *23*(9-10), 1403-1410.

Tracy, S. (2010). Qualitative quality: Eight "big-tent" criteria for excellent qualitative research. *Qualitative Inquiry*, *16*(10), 837-851.

Tran, S., Deacon, N., Minokadeh, A., Malhotra, A., Davis, D., Villanueva, S., & Sell, R. (2016). Frequency and survival pattern of in-hospital cardiac arrests: The impact of etiology and timing. *Resuscitation*, *107*, 13-18.

Trinkle, R., & Flabouris, A. (2011). Documenting rapid response system afferent limb failure and associated patient outcomes. *Resuscitation*, 82(7), 810-814.

University of Oklahoma Office of Human Research Participant Protection. (2016). Special Populations, Pregnant Women and Fetuses, 7-8.

<http://compliance.ouhsc.edu/LinkClick.aspx?fileticket=rUdo8BBokRY%3d&tabid=7296&portalid=78>

Vreugdenhil, J. & Spek, B. (2018). Development and validation of Dutch version of Lasater Clinical Judgment Rubric in hospital practice: An instrument design study. *Nurse Education Today*, 62, 43-51.

Watson, A., Skipper, C., Steury, R., Walsh, H., & Levin, A. (2014). Inpatient nursing care and early warning scores. *Journal of Nursing Quality*, 29(3), 215-222.

Whittemore, R., & Knafl, K. (2005). The integrative review: Updated methodology. *Journal of Advanced Nursing*, 52(5), 546-553.

Wynn, J., Engelke, M., & Swanson, M. (2009). The front line of patient safety: Staff nurse and rapid response team calls. *Quality Management in Health Care*, 18(1), 40-47.

Yang, J., & Thompson, C. (2011). The effects of clinical experience on nurses' critical event risk assessment judgments in paper based and high fidelity simulated conditions: A comparative judgement analysis. *International Journal of Nursing Studies*, 48, 429-437.

Appendix A: Permission to Use Figure



March 13, 2017

Susan Dresser
University of Oklahoma Health Sciences Center Fran and Earl Ziegler College of Nursing
1100 N Stonewall Ave, Room 408
Oklahoma City, Oklahoma 73117

Reference #: J20376037

Material Requested: Figure

Usage Requested: Used in a dissertation proposal titled: "Factors That Influence Nurses' Ability to Notice, Interpret, and Respond to Patient Deterioration." Will be archived on ProQuest Dissertations.

Citation: Tanner C.(2006). Thinking Like a Nurse: A Research-Based Model of Clinical Judgment in Nursing. J Nurs Educ. 45(6)

Dear Susan,

Permission is granted for the requested materials and usage listed above, subject to the following conditions:

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Name on the card: _____ SVC Code: _____

Please sign and date below, keep a copy for your records, and fax to Attn: Permissions Department. Please include your reference number on all correspondence and payment information. A copy of this form **MUST** accompany payment.

Requestor accepts conditions above:

Signature: Susan Dresser **Date:** 3-19-17

Sincerely,
SLACK Incorporated
Permissions Department

Appendix B: Quality Assessment of Studies

Individual Item Scoring for Methodological Rigor in Qualitative Studies (Hawker, et al., 2002)	
1. Abstract and title: Did they provide a clear description of the study?	
Good	Structured abstract with full information and clear title.
Fair	Abstract with most of the information.
Poor	Inadequate abstract.
Very poor	No abstract.
2. Introduction and aims: Was there a good background and clear statement of the aims of the research?	
Good	Full concise background discussion; up-to-date literature review highlighting knowledge gaps.
Fair	Some background and literature review. Research questions outlined.
Poor	Some background, no aims, objectives, OR aims/objectives but inadequate background.
Very poor	No mention of aims/objectives. No background or literature review.
3. Method and data: Is the method appropriate and clearly explained?	
Good	Method is appropriate and described clearly. Clear details of the data collection and recording.
Fair	Method appropriate, description could be better. Data described.
Poor	Question method appropriateness. Method described inadequately. Little description of data.
Very poor	No mention of method, AND/OR method inappropriate, AND/OR no details of data.
4. Sampling: Was the sampling strategy appropriate to address the aims?	
Good	Details of who was studied and how they were recruited. Why this group was targeted. Sample size was justified for study. Response rates shown and explained.
Fair	Sample size justified. Most information given, but some missing.
Poor	Sampling mentioned but few descriptive details.
Very poor	No details of sample.
5. Data analysis: Was the description of the data analysis sufficiently rigorous?	
Good	Clear description of how analysis was done. Description of how themes derived/respondent validation or triangulation.
Fair	Descriptive discussion of analysis.
Poor	Minimal details about analysis.
Very poor	No discussion of analysis.
6. Ethics and bias: Have ethical issues been addressed, and what has necessary ethical approval gained? Has the relationship between researchers and participants been adequately considered?	
Good	Ethics: Where necessary issues of confidentiality, sensitivity, and consent were addressed. Bias: Researcher was reflexive and /or aware of own bias.
Fair	Lip service was paid to above (i.e., these issues were acknowledged)
Poor	Brief mention of issues.
Very poor	No mention of issues.
7. Results: Is there a clear statement of the findings?	
Good	Findings explicit, easy to understand, in logical progression. Tables, if present, are explained in text. Results relate directly to aims. Sufficient data are presented to support findings.
Fair	Findings mentioned, more explanation could be given. Data presented relate directly to results.
Poor	Findings presented haphazardly, not explained, and do not progress logically from results.
Very poor	Findings not mentioned or do not relate to aims.
8. Transferability or generalizability: Are findings of study transferable (generalizable) to a wider population?	
Good	Context and setting of study described sufficiently to allow comparison, plus high score in Question 4 (sampling).
Fair	Some context and setting described, but more needed to replicate or compare the study with others, plus fair or higher score in Question 4.
Poor	Minimal description of context/setting.
Very poor	No description of context/setting.

9. Implications and usefulness: How important are these findings to policy and practice?	
Good	Contributes something new and/or different in terms of understanding/insight or perspective. Suggests ideas for further research. Suggests implications for policy and/or practice.
Fair	Two of the above (state what is missing in comments)
Poor	Only one of the above
Very poor	None of the above

Qualitative Studies Overall Assessment Scores: High = 30-36; Med= 24-29; Low = 9-23 (Hawker et al., 2002)										
Hart, 2016	4	4	4	4	4	4	4	4	4	36
Smith, 2013	4	4	4	4	4	4	4	4	4	36
Cox, 2006	4	4	3.5	4	4	4	4	4	4	35.5
Braaten, 2015	4	4	4	4	4	1	4	4	4	33
Chau, 2013	4	4	3	3	4	4	4	3	4	33
Massey, 2014	4	3	3	4	4	4	4	4	3	33
Andrew, 2005	4	4	4	2	4	3	4	3	4	32
Cioffi, 2000b	4	4	4	2	3	3	4	3	4	31
Cioffi, 2009	4	3	4	4	2	2	4	3	4	30
Astroth, 2013	4	2	3	3	3.5	4	4	3	3	29.5
Gazarian, 2010	4	4	3	4	3.5	2	4	4	1	29.5
Cioffi, 2000a	4	3	3	2	3	2	3	3	4	27
Cioffi, 2001	4	4	3	2	4	2	3	2	3	27
Donohue, 2010	4	4	4	2	4	1	4	2	2	27
Minick, 2003	1	2	2	4	4	3	4	3	3	26

Quality Assessment of Quantitative Studies (Downs & Black, 2002)						
Quantitative Studies	Reporting (10 items) Scored 0 or 1, 0, 1 or 2 on item 5	External Validity (3 items) Scored 0 or 1	Internal Validity (Bias) (7 items)	Confounding (6 items)	Statistical Power (1 item)	Total Score
	Assesses whether information provided in the paper was sufficient to allow the reader to make an unbiased assessment of the findings.	Assess the extent to which the findings from the study could be generalized to the population from which the study subjects were derived	Addresses biases in the measurement of the intervention and the outcome	Addresses bias in the selection of study subjects	Attempted to assess whether the negative findings from a study could be due to chance	≥26 = excellent; 20-25 = good; 15-19 moderate; ≤14 poor
Hart 2014	1 1 1 0 1 1 1 1 1 1	1 1 1	0 0 0 0 1 1 1	1 0 0 0 0 0	1	17
Cooper 2011	1 1 1 1 0 1 1 1 1 1	1 1 1	0 0 0 0 1 1 1	1 0 0 0 0 0	0	16
Cooper 2013	1 1 1 1 0 1 1 1 1 1	1 1 1	0 0 0 0 1 1 1	1 0 0 0 0 0	0	16
Jackson 2016	1 1 1 0 0 1 1 1 1 1	1 1 1	0 0 0 0 1 1 1	1 0 0 0 0 0	1	16
Salamonson 2006	1 1 1 0 0 1 1 0 1 1	1 1 1	0 1 0 0 1 0 1	1 1 0 0 0 0	1	16
Fuhrman 2008	1 1 1 0 0 1 0 1 1 1	1 0 1	0 0 0 0 1 1 1	1 1 0 0 0 0	1	15
Odel 2014	1 1 1 0 0 1 1 0 1 1	1 1 1	0 0 0 0 1 0 1	1 1 0 0 0 0	1	15
Parker 2014	1 1 1 0 0 1 1 0 1 1	1 1 1	0 0 0 0 1 0 1	1 1 0 0 0 0	1	15
Rattray 2011	1 1 1 0 0 1 1 0 1 1	1 1 1	0 0 0 0 1 0 1	1 1 0 0 0 0	1	15
Pantazopoulos 2012	1 1 1 0 0 1 1 0 1 1	1 1 1	0 0 0 0 1 0 1	1 1 0 0 0 0	0	14
Wynn 2009	1 1 1 0 0 1 1 0 1 1	1 1 1	0 0 0 0 1 0 1	1 1 0 0 0 0	0	14
Ludikhuize 2012	1 1 1 0 0 1 1 0 1 0	1 1 1	0 0 0 0 1 0 1	1 1 0 0 0 0	0	13
Fasolino 2015	1 1 1 0 0 0 0 1 1 1	0 1 1	0 0 0 0 1 1 0	1 1 0 0 0 0	0	12
Jenkins 2015	1 1 1 0 0 1 0 0 1 1	1 1 1	0 0 0 0 1 0 1	1 0 0 0 0 0	0	12
Jones 2006	1 1 1 0 0 1 0 0 1 0	1 1 1	0 0 0 0 1 0 1	1 0 0 0 0 0	1	12
Jonsson 2011	1 1 1 0 0 1 0 0 1 0	1 1 1	0 0 0 0 1 0 1	1 1 0 0 0 0	0	12

(Downs & Black, 1998)

Appendix C: IRB Approval Letter



Institutional Review Board for the Protection of Human Subjects

Initial Submission – Expedited Approval

Date: December 13, 2017

IRB#: 8701

To: Susan C Dresser

Approval Date: 12/12/2017

Expiration Date: 11/30/2018

Study Title: Factors That Influence Nurses' Clinical Judgment During Episodes of Acute Physiologic Patient Deterioration

Reference Number: 673670

Expedited Criteria: Expedited Category 7

On behalf of the Institutional Review Board (IRB), I have reviewed and granted expedited approval of the above-referenced research study. Study documents associated with this submission are listed on page 2 of this letter. To review and/or access the submission forms as well as the study documents approved for this submission, click *My Studies*, click to open this study, under *Protocol Items*, click to view/access the current approved *Application*, *Informed Consent*, or *Other Study Documents*.

If this study required routing through the Office of Research Administration (ORA), you may not begin your study yet, as per OUHSC Institutional policy, until the contract through ORA is finalized and signed.

As principal investigator of this research study, you are responsible to:

- Conduct the research study in a manner consistent with the requirements of the IRB and federal regulations 45 CFR 46 and/or 21 CFR 50 and 56.
- Request approval from the IRB prior to implementing any/all modifications.
- Promptly report to the IRB any harm experienced by a participant that is both unanticipated and related per IRB policy.
- Maintain accurate and complete study records for evaluation by the HRPP Quality Improvement Program and, if applicable, inspection by regulatory agencies and/or the study sponsor.
- Promptly submit continuing review documents to the IRB upon notification approximately 60 days prior to the expiration date indicated above.

This study meets the criteria for Waiver of Written Informed Consent and is approved to be conducted without obtaining written consent.

If you have questions about this notification or using iRIS, contact the IRB at 405-271-2045 or irb@ouhsc.edu.

Sincerely,

William R. Leber, PhD

Vice Chairperson, Institutional Review Board

Study documents associated with this submission:

Study Documents			
Title	Version #	Version Date	Outcome
Appendix G Participant Interview Guide	Version 1.0	12/12/2017	Approved
Appendix C Letter of Invitation	Version 1.0	12/01/2017	Approved
Letter of Support	Version 1.0	11/16/2017	Approved
Appendix F Demographic Questionnaire	Version 1.0	11/14/2017	Approved
Appendix E Introductory Telephone Script	Version 1.0	11/14/2017	Approved
Protocol	Version 1.1	12/12/2017	Approved

Study Consent Form			
Title	Version #	Version Date	Outcome
Appendix D Consent	Version 1.2	11/30/2017	Approved

Information for Industry Sponsors: the columns titled Version Number and Version Date are specific to the electronic submission system (iRIS) and should not to be confused with information included in the Document and/or Consent title(s).

**Appendix D:
Letter of Invitation**

Dear Colleague,

My name is Susan Dresser and I am a clinical faculty member at the University of Oklahoma, College of Nursing, and a PhD student at the School of Nursing at the University of Kansas. I am conducting a research study that is investigating factors that influence registered nurses' clinical judgment in situations of acute physiologic patient deterioration. I am interested in hearing about both positive and negative experiences you may have had in these situations. The results of the study may benefit patients and the nursing profession in the future.

The purpose of this letter is to invite you to participate in the study. You are being invited to participate in this research study because of your experience providing care to a patient who developed acute physiologic deterioration and required the assistance of a rapid response team or code blue team. To participate in the study you must meet the following criteria:

- 1) Be a non-pregnant, registered nurse working at least part time in a staff nurse position on a medical or surgical unit
- 2) Have provided direct care for a patient who has experienced acute physiologic deterioration and required the activation of the rapid response team or code blue team within the last year at this hospital
- 3) Have completed hospital and unit orientation

Your participation includes one telephone interview to obtain your story of your experience with a patient who had an episode of physiologic deterioration. The interview will be audio-recorded for the purposes of data collection. Your name will not be on the recording and the recorded transcripts will be de-identified. All study materials will be maintained in secure files to protect your confidentiality. Findings from the study will be grouped together as themes

in the final report. The interview will take approximately 45-60 minutes. The recordings will be transcribed exactly as you speak the information. With your permission, you may be called to provide feedback on preliminary interpretations of what you have shared during the interview.

During the interview, you will be asked questions regarding your experience in caring for a patient who was experiencing physiologic deterioration, how you noticed the patient was deteriorating, and how you responded. Some of these questions may bring up uncomfortable or even painful memories. Throughout the interview, you should share only what YOU are comfortable sharing, and at no time will you be required to answer a question. If you feel distressed at any time, the interview will be stopped. If you believe that you need emotional or psychological counseling as a result of any emotional distress from the interview, confidential services are available for you through the OU Medical Center Employee Assistance Program at 405-271-5758.

All information you share will be strictly confidential and your name will not be on any of the transcribed interviews or final reports. You may withdraw from the interview at any time.

If you are interested in participating or have further questions about the research study please call or email me, Susan Dresser (sdresser@kumc.edu) or 405-641-4420.

**Appendix E:
Consent Form**

Consent Version, Date

IRB Number: 8701

University of Oklahoma Health Sciences Center (OUHSC)

FACTORS THAT INFLUENCE NURSES' CLINICAL JUDGMENT DURING
EPISODES OF ACUTE PHYSIOLOGIC PATIENT DETERIORATION

Susan Dresser MSN, APRN-CNS Clinical Instructor

Fran & Earl Ziegler College of Nursing

This is a research study. Research studies involve only individuals who choose to participate. Please take your time to make your decision. Discuss this with your family and friends.

Why Have I Been Asked To Participate In This Study?

You are being invited to participate in this study because of your experience as a registered nurse working in a staff nurse position on a medical or surgical unit who has provided care to a patient who had an episode of physiologic deterioration and the decision was made to call the Rapid Response Team or Code Blue Team within the last year.

Why Is This Study Being Done?

The purpose of this study is to identify nurses' perceptions of factors that influence clinical judgment during a situation where a patient experienced acute physiologic deterioration.

How Many People Will Take Part In The Study?

It is anticipated that approximately fifteen to twenty registered nurses working in staff nurse positions on medical-surgical units at the Oklahoma University Medical Center will take part in this study.

What Is Involved In The Study?

You will participate in a digitally recorded telephone interview lasting approximately 45-60 minutes. You will also be asked to answer a few demographic questions about yourself e.g., the number of years you have worked as a RN, your age, and your education level.

How Long Will I Be In The Study?

You will be involved in this study for the length of the interview, approximately 45-60 minutes. You may be contacted once after your interview to discuss the investigator's interpretation of the interviews. You can stop participating in the interview at any time.

What Are The Risks of The Study?

No invasive procedures or interventions will be conducted. There are minimal risks to participating although there may be some emotional or psychological risk to participating in this study. There is a possibility that you may feel emotional discomfort discussing your experiences in providing care to a patient who was deteriorating. Recalling some of these experiences may cause painful thoughts or memories to arise. If at any time you feel uncomfortable or if the investigator believes you are experiencing distress you will be asked if you would like to stop the interview. The interview will continue if you feel comfortable resuming it. Should you feel the need for confidential emotional or psychological counseling, the OU Medical Center Employee Assistance Program is available to you and can be reached at 405-271-5758. Additionally you are free to not answer any question or discontinue the interview for whatever reason you choose. There may be other risks that are not yet known.

Are There Benefits To Taking Part in The Study?

Although you will not benefit directly from this study your participation may contribute to a greater understanding of medical-surgical registered nurse's recognition and response to a deteriorating patient. Additionally, your participation may provide knowledge that can be used to develop interventions to improve the recognition and response of other nurses.

What Other Options Are There?

You may choose not to participate in this study.

What about Confidentiality?

Efforts will be made to keep your personal information confidential. You will select a pseudonym (code name) to protect your confidentiality and only the researcher will have access to the participant names and code names. A professional transcriptionist will transcribe the audiotaped interview and only your code name will be on the interview recording and transcript. You will not be identifiable by name or description in any reports or publications about this study. Your absolute confidentiality cannot be guaranteed as your personal information may be disclosed if required by law. There are organizations that may inspect and/or copy your research records for quality assurance and data analysis. The OUHSC Human Research Participant Program office, The OUHSC Institutional Review Board, and the OUHSC Office of Compliance may also inspect and/or copy your records for these purposes.

What Are the Costs?

There are no costs to you as a participant in this study.

Will I Be Paid For Participating in This Study?

No

What Are My Rights As a Participant?

Taking part in this study is voluntary. You may choose not to participate. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. If you agree to participate and then decide against it, you may withdraw for any reason and leave the study at any time. You will be provided with any significant new findings developed during the course of the research that may affect your health, welfare, or willingness to continue your participation in this study.

Whom Do I Call If I Have Questions or Problems?

If you have questions, concerns, or complaints about the study or have a research-related injury, contact the principal investigator, Susan Dresser at 406-641-4420. If you cannot reach the investigator or wish to speak to someone other than the investigator, contact the OUHSC Director, Office of Human Research Participant Protection at 405-271-2045. For questions about your rights as a research participant, contact the OUHSC Director, Office of Human Research Participant Protection at 405-271-2045.

Signature:

By reading this form and giving verbal agreement and acknowledgment you are agreeing to participate in this research study under the conditions described. You have not given up any of your legal rights or released any individual or entity from liability for negligence. You have been given an opportunity to ask questions. You have been given a copy of this consent document.

Appendix F: Introductory Telephone Script

This interview will give us an opportunity to talk about your experience providing care for a patient who experienced acute physiologic deterioration while working in this hospital during the last year that resulted in the decision to call the rapid response team or code blue team. Specifically, I am interested in hearing about your perceptions of things that went well, and things that did not go well, and the factors that influenced your clinical judgment in that situation. By this I mean things that influenced your ability to notice the changes that indicated the patient was deteriorating, to interpret what was going on, and to respond to the situation. I am also interesting in knowing what ideas you might have for improving your ability to notice, interpret, and respond when a patient deteriorates.

If you agree to participate in the interview I would like your permission to record the session so that your words are captured exactly. You will select a pseudonym and will not use your real name at any point during the interview.

First I would like to give you a few minutes to read the consent form. I want you to take enough time to carefully consider whether you would like to participate..... (pause for the time it takes for the participant to read the consent)

Now that you have read the consent form, do you have any questions for me? (pause) If not and if you agree to being interviewed and recorded, I am going to turn on the recording and will ask you to provide your verbal consent. I will begin by asking you a few demographic questions which will take about 1 minute to complete. Your answers will be combined with other participants to describe the group of nurses who participated. Next we will begin the interview. The interview questions have no right or wrong answers. You may skip any question, or discontinue the interview at any time.

Would you like to proceed with the interview? Alright! I'm going to ask you to provide me with your verbal consent and then let's get started!...

Appendix G: Demographic Data

This survey is designed to collect basic information on nurses' participating in this study. Data collected from this survey will be used for the purposes of the dissertation research only and your name will not be associated with your responses in any manner. The survey will be identified with a pseudonym (code name) to protect your confidentiality.

1. Participant pseudonym_____
2. Age in years:_____
3. Gender (circle one): Male Female Alternate entry
4. Race (circle one): African American Alaska Native American Indian
 Asian Native Hawaiian White Other (specify)_____
5. Ethnicity (circle one): Hispanic Not Hispanic
6. Highest education earned in nursing (circle one):
 Diploma Associate Degree Baccalaureate Degree Masters Degree Doctoral Degree
7. Highest education earned outside of nursing (circle one):
 Associate Degree Baccalaureate Degree Masters Degree Doctoral Degree
8. Years as a registered nurse (circle one)
 Less than 2 years 2-3 years >3-5 years More than 5 years
9. Years as a registered nurse working with adult medical-surgical patients (circle one)
 Less than 2 years 2-3 years >3-5 years More than 5 years
10. Years as a registered nurse working on your current adult medical-surgical unit
 Less than 2 years 2-3 years >3-5 years More than 5 years

Appendix H: Participant Interview Guide

Questions and Prompts	
Opening question	1. I'd like you to think back to a time when you cared for a patient who was physiologically deteriorating and the decision was made to call either the rapid response team or code blue team. Tell me about this event, what happened...
Prompts	Tell me more about this event...what went well? What did not go well? who all was involved, who activated the call?
Noticing	2. What were your first clues that something had changed? 3. What helped you notice the patient's deterioration? 4. Were you immediately aware that the patient was deteriorating? 5. If not, what things prevented you from noticing the changes early on?
Prompts	What else? Tell me more....staffing? culture? social rules? experience?, education, knowing the patient?
Interpreting	6. How did you interpret the situation? 7. What helped you in understanding or interpreting what was going on in the situation? 8. What hindered you in understanding or interpreting what was going on in the situation?
Prompts	Anything else? Analytic? Intuitive? Narrative?
Responding	9. How did you respond to this situation? 10. What was the outcome of your response? 11. What things contributed to your ability to respond? 12. What things prevented you from responding to the situation?
Prompts	Tell me more about this...
Strategies to Enhance Noticing, Interpreting & Responding	13. What strategies would help nurses notice, interpret, and respond to situations of patient deterioration?
Reflecting	14. At the time how did you feel about this situation? 15. What did you think about this situation?
Prompts	Tell me more about this
Closing question	16. Are there any other concerns or things you would like to discuss about noticing or responding to a patient who is experiencing physiological deterioration? 17. Would you be willing to provide feedback on my preliminary interpretations of what you've shared?

**Appendix I:
Participant Demographics**

Interview #	Pseudonym	Age	Gender	Race	Ethnicity	High EDU NRSG	High EDU Non- NRSG	YRS RN	YRS RN Med Surgical	YRS Current Unit
1	Thiefton	26	F	W	NH	AD		<2	<2	<2
2	Ann	36	F	ASIAN	NH	AD		<2	<2	<2
3	Lori	27	F	W	NH	BD		>5	>3-5	>3-5
4	Rachel	63	F	W	NH	MD	BD	>5	>5	2-3 YRS
6	Carol	45	F	W	NH	AD	BD	>3- 5	>3-5	>3-5
7	Samantha	50	F	ASIAN	NH	MSN	MD	>5	>5	>5
8	Nurse 1	41	F	OTHER	NH	AD		>5	>5	<2
9	Angela	29	F	AA	NH	BD		>3- 5	>3-5	>3-5
10	Mike	47	M	W	NH	BD	MD	>5	>5	<2
11	Elaine	26	F	W	NH	AD	AD	<2	<2	<2
12	Kay	27	F	W	NH	AD	AD	>3- 5	>3-5	>3-5
13	Laura	43	F	W	NH	AD	AD	.2-3	.2-3	.2-3
14	Ellen	22	F	W	NH	BSN		<2	<2	<2
15	Beth	34	F	ASIAN	NH	MSN		>5	>5	<2
16	Stephanie	29	F	W	NH	AD	BD	>3- 5	>3-5	>3-5
17	Lisa	43	F	AI	NH	BD	BD	>5	>5	>3-5
18	Barbara	30	F	W	NH	AD		>5	>5	>5
19	Bill	54	M	W	NH	BD	PhD	>3- 5	>3-5	<2
20	Marie	35	F	W	NH	BD	BD	.2-3	.2-3	.2-3
21	Becky	47	F	W	NH	BD	BD	>5	>5	>3-5

F=female; M=male; W=white; AA=African American; AI=American Indian; NH=non-Hispanic; AD= associate degree; BD= baccalaureate degree; MD= doctor of medicine; MSN= master of science in nursing; PhD=doctor of philosophy; YRS=years