Staff Nurses’ Perceptions of Rapid Response Teams in Acute Care Hospitals

By

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in conformity with the requirements for
the degree Master of Science

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Dedicated to my husband and entire family,

Thank you for all of your love, support and believing in me.
ABSTRACT

The purpose of the present study were to (a) explore the relationship between the frequency of use of Rapid Response Teams (RRTs) by hospital staff nurses and the support received from RRTs; (b) to investigate staff nurses’ perceptions of their individual level, group level and organizational level learning as a result of single or multiple exposures to the RRT; (c) to identify predictors of learning outcomes and (d) to identify overall impressions and advantages and disadvantages of the RRT. A mail survey was used to collect data. The response responses rate was 33%, 131 registered nurses responded to the survey (pre-test = 12, study = 119). The results of Pearson r correlation suggest that a high frequency of access of RRTs was positively related to process support ($r = .25$, $p < .01$). Also, perceived content and process support from RRTs was positively related to maintenance and building of staff nurses’ mental models regarding patient deterioration pertaining to self, group and organization. Multiple regression analyses show that sociodemographic and independent variables predict organizational learning outcomes (mental model maintenance and building). Overall impressions of the RRTs were high. A content analysis of nurses’ comments indicated that there were more advantages to having the RRTs than disadvantages. This study suggests that RRTs are influential in changing nurses’ perceptions about managing patient deterioration. Training programs for RRTs should include both content and process support, which may enhance building and maintaining mental models.
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# TABLE OF CONTENTS

Dedication.........................................................................................................................i
Abstract.............................................................................................................................ii
Acknowledgements..........................................................................................................iii
Table of Contents..............................................................................................................iv
List of Tables...................................................................................................................vi
List of Figures..................................................................................................................vii
Chapter 1: Introduction....................................................................................................1
  Theoretical Framework.....................................................................................................6
  Definition of Terms.........................................................................................................10
Chapter 2: Literature Review............................................................................................13
  Maintaining and building mental models.................................................................13
  Mental models related to managing patient deterioration..........................................16
  Influence of Rapid Response Teams on management of patient deterioration..........18
    Influence of Rapid Response Teams on staff nurses..............................................21
    Influence of Rapid Response Teams on work groups..........................................22
    Influence of Rapid Response Teams on organizations.........................................24
  Sociodemographic barriers to calling the Rapid Response Team..........................24
Chapter 3: Method............................................................................................................29
  Participants....................................................................................................................29
  Instruments...................................................................................................................30
  Design.........................................................................................................................35
  Procedure......................................................................................................................35
LIST OF TABLES

TABLE 1: Characteristics of the Sample..........................................................40
TABLE 2: Means, Standard Deviations, Internal Consistency Reliabilities, Skewness and
Kurtosis of Scales..........................................................................................43
TABLE 3: Correlations for Content and Process Support.................................47
TABLE 4: Result of Backwards Multiple Regression Analyses for Predictors of
Organizational Learning Outcomes (Mental Model Maintenance and Building)......49
TABLE 5: Results of Hypotheses Tests...............................................................50
TABLE 6: Overall Impressions of the Rapid Response Team..............................51
TABLE 7: Content Analysis for Themes and Descriptors in Registered Nurses’
Comments........................................................................................................53
LIST OF FIGURES

FIGURE 1: Factors that Influence Organizational Learning…………………………….9
CHAPTER 1

Introduction

Patient survival in non-critical care units of acute care hospitals often depends on decisions by nurses to call for emergency assistance (Cioffi, 2000a). Nurses who provide direct and continuous care at the bedside have close proximity to their patients and may be the first to recognize a deteriorating patient in need of immediate attention. Usually, nurses in critical care units are trained to identify early deterioration in a patient’s condition, but nurses who work in lower acuity units of the hospital are less likely to have adequate training and experience. Patient care units in acute care hospitals have been identified as particularly dangerous areas, where cardiac arrest and cardiopulmonary resuscitation are associated with poor outcomes (Goldhill & Sumner, 1998; Hershey & Fisher, 1982) and there is a concern that the problem is escalating (Goldhill, 2000; Institute for Healthcare Improvement [IHI], 2006; McGloin, Adam & Singer, 1999; McQuillian, Pilkington, Allan, Taylor, Short, Morgan, Nielsen, Barrett & Smith, 1998).

Studies have shown that signs and symptoms of patient deterioration may be observed by nursing and medical staff but are frequently not acted upon (Franklin & Matthew, 1994; Rich, 1999). Coombs and Dillon (2002) reported that increasing acuity of patients in open wards of hospitals and poor educational support for clinicians might be contributing factors to failure to rescue. Failure to rescue is the inability to save the life of a hospitalized patient once they have developed a complication that was not recognized early (Silber, Williams, Krakaeur & Schwartz, 1992). Cioffi (2000b) also observed that lack of staff support, few resources and inadequate knowledge are barriers to recognition of deterioration.
With increasing acuity of patients in all areas of hospitals, nurses need to be able to respond rapidly to changes in patients’ conditions (Franklin & Matthew, 1994; McGloin et al., 1999; McQuillian et al., 1998; Schein, Hazday, Pena, Ruben & Sprung, 1990). As of yet, little is known about the ability of nurses, particularly new graduates, to manage patient deterioration or their need for knowledge and support to develop their skills. This study examined the perceptions of a sample of registered nurses about the influence of Rapid Response Teams (RRTs), a newly introduced support system, on their learning outcomes.

Concerns with increasing mortality rates and awareness that early response can reduce the mortality rates has led to the development of RRTs that can be called when nurses are concerned about subtle changes that suggest deterioration of the patient, instead of waiting until more obvious signs occur (e.g., hypotension and tachycardia). RRTs have been implemented to prevent failure to rescue events (Schmid, Hoffman, Happ, Wolf & DeVita, 2007). The goal of RRTs is to bring critical care resources to any area of a hospital, which includes clinicians and equipment. By intervening early, it can lead to a decrease in cardiac and respiratory arrests, avoid Intensive Care Unit (ICU) admission, facilitate timely admission or avoid inappropriate treatment (Ontario Ministry of Health and Long-Term Care, 2007).

These teams were initially developed in Australia in the 1990’s (Cioffi, 2000b). The team responds to calls from nurses, physicians and other health care staff to patients who seem to be deteriorating and are in need of extra medical attention. The team normally consists of a registered nurse (RN), Respiratory Therapist (RT) and physician, usually from the ICU (Kirk, 2006). There are different structures of RRTs including:
ICU RN and RT; ICU RN, RT, physician and resident; ICU RN, RT, physician; ICU RN, RT and physician assistant (IHI, 2006). The RRT responds similarly to a cardiac arrest team following telephone/pager activation. RRTs are approved by the Institute of Healthcare Improvement (IHI) and the National Registry of Cardiopulmonary Resuscitation (Grimes, Thornell, Clark & Viney, 2007). In Ontario, RRTs have been implemented in most hospitals for about one to two years or longer (Ontario Ministry of Health and Long-Term Care, 2007). The Province of Ontario is currently funding 27 adult RRTs and 4 paediatric demonstration sites. According to the Ontario Ministry of Health and Long-Term Care (2007), this is the world’s largest known implementation of RRTs. The role of the RRT is to assess, stabilize, assist with communication, educate and support and assist with transfer, if necessary (IHI, 2006).

Before implementing a RRT, extensive education and training is expected to occur that clearly establishes how the team works as well as when to call the team into action (Kirk, 2006). The Ontario Ministry of Health and Long-Term Care (2007) discussed the implementation phase of RRTs in hospitals in its Quarterly Report (March 2007). Training for RRT Registered Nurses includes a course and participation in a preceptorship program developed by the Canadian Resuscitation Institute. However, all staff nurses must be prepared in managing patient deterioration and receive education on the role of the RRT. They should know when to call for help and be able to use calling criteria. Calling criteria can differ from hospital to hospital. The calling criteria endorsed by Ontario Ministry of Health and Long-Term Care can be used to standardize the early recognition process (see Appendix G).
Gaps in Research

Although some studies indicate staff nurses are satisfied with these teams and feel that they are beneficial to their practice (Daffurn, Lee, Hillman, Bishop & Baumann, 1994), the literature on the effectiveness of RRTs is mixed. Some studies show that the teams are effective in decreasing mortality rates and improving knowledge and satisfaction of nurses, but others show no differences (Ball, Kirkby & Williams, 2003; Bellomo, Goldsmith, Uchino, Buckmaster, Hart, Opdam, Silvester, Doolan & Gutteridge, 2003; Bristow, Hillman, Chey, Daffurn, Jacques, Norman, Bishop & Simmons, 2000; Buist, Moore, Bernard, Waxman, Anderson & Nguyen, 2002; MERIT study group, 2005).

Few studies are available on the effect of RRTs in improving staff knowledge or organizational support in the management of patient deterioration, but some studies have shown that inexperienced nurses who receive training construct new mental models related to communication, beliefs, values, knowledge practices (Walker, 2001; Grigsby, Westmoreland & Shiparksi, 2002). Mental model maintenance and building are concepts (Cannon-Bowers, Salas & Converse, 1990; Tomblin, 2005) that can be applied to the study of RRT effectiveness.

According to Kirk (2006) extended training is needed to provide nursing staff with a clear understanding of what to expect in terms of specific roles and function of the team and when to call on them. Since the RRT provides education and guidance, it is expected that new mental models about early detection and rapid response to patients’ conditions can be developed. This study will examine changes in nurses’ mental models for managing patient deterioration.
Purpose and Significance of Study

The purpose of this study is to a) explore the relationship between frequency of use of RRTs by hospital staff nurses and the support received from RRTs and b) to investigate staff nurses’ perceptions of their individual level, group level and organizational level learning as a result of single or multiple exposures to a RRT. It is expected that nurses who use the RRT more frequently will perceive more support (information and interaction) and more positive learning outcomes for themselves, their work groups and the organization. Better understanding of RRTs can lead to improvement in training and support. Over time, acute care hospitals might benefit from lowered morbidity and mortality rates.

Research Questions

The following four research questions will be addressed:

1. Is there a relationship between frequency of access to RRTs in Ontario hospitals and staff nurses’ perceived content and process support by RRTs?
2. What is the relationship between content and process support provided by RRTs and staff nurses’ perceptions of individual level, group level and organizational level learning related to management of patient deterioration in Ontario hospitals?
3. What factors predict staff nurses’ perceptions of individual level, group level and organizational level learning?
4. What are staff nurses’ overall impressions of RRTs and perceived advantages and disadvantages of RRTs?
Theoretical Framework

Concepts from the Learning Organization (LO) model developed by Senge (1990) and group learning processes described by Tomblin (2005) will be used in this study as background to understanding staff nurses’ perceptions of the effect of RRTs on their individual level, group level and organizational level learning about how to respond to patient deterioration (See Figure 1). According to Senge (1990), organizational learning occurs at the individual, group and organizational level. When individuals continually expand their capacity to create positive results, they encourage new and broader ways of thinking about problems, ways to solve them, and how to work together in groups toward holistic goals. Senge’s model has five interrelated dimensions, which are referred to as disciplines: systems thinking, personal mastery, shared visions, mental models and team learning. Development of these dimensions may enhance an organization’s capacity for highly effective actions (Senge, 1990). In the present study, hospitals that have implemented RRTs are engaged in organizational learning to improve early recognition and rapid response for patient deterioration at the system level. The teams are the driving force; providing the education and active support that is needed to train staff.

Systems thinking refers to a holistic approach to identifying dynamic relationships between different components of a phenomenon. This type of thinking concerns an understanding of a system by examining the linkages and interactions between elements that compromise the entirety of the system, e.g., holistic patient care. Systems thinking may be helpful for understanding the effects of organizational actions (Senge, 1990). Personal mastery refers to the learning process of expanding one’s personal capacity and improving the level of proficiency in order to achieve goals (Senge, Kleiner & Roberts,
1994). For example, people with a high level of personal mastery are able to consistently realize the results that matter most deeply to them; they are committed to life-long learning. Encouraging an organization to help employees improve their personal mastery is an important element of learning organizations. Individuals learn and through sharing with others in turn, organizational learning occurs (Senge, 1990). Shared visions refers to developing shared images of the future and guiding practices by which people hope to achieve their desires (Senge, Kleiner & Roberts, 1994). The practice of shared vision involved the skills of unearthing shared “pictures of the future” that foster genuine commitment and enrollment rather than compliance. Shared visions may improve collective actions in terms of commitments to their goals and organizational actions (Schein, 1993; Senge, 1990). An example is the vision of the RRT movement and its effect on patient care.

Mental models are deeply ingrained assumptions, generalizations, or images that influence how individuals understand the world and how they take action. For example, a nurses’ view of resuscitation, the importance of early intervention and when they feel it is necessary to take action represents a mental model of resuscitation. Mental models allow people to make inferences and decide which actions to take. They are constantly evolving, and the most important point to grasp is that they are active and shape how people act. Two people with different mental models can observe the same event and describe it differently, because they have focused on different details and have different interpretations (Senge, 1990). New learning that challenges familiar ways of thinking and acting can change mental models (Vosinadau, 2002). Experience with a RRT may change
staff nurses’ mental models about the influence of the RRT on themselves, their team and their organization.

Team learning refers to continually enhancing collective capacities and improving team effectiveness (Senge, 1990). Team learning is vital because teams are a fundamental learning unit in modern organizations. Groups typically attend to content matters that focus on getting tasks done. They also provide support to each other in order to complete group tasks. According to Tomblin (2005) groups build and maintain common mental models as they attend to the content, e.g., information, processes and group dynamics. When groups share their mental models, new practices are developed which become part of the organization’s policies and practices. In this way, effective organizational learning is achieved. In nursing, team learning is vital to participating in high stress situations such as when a RN calls the RRT for assistance.

Building and maintaining mental models, which is the focus of this study requires changing attitudes, beliefs and practices that are outdated, while reinforcing those that are current and relevant. According to Tomblin (2005), maintaining and building mental models can occur through the provision of content and process support. For example, the RRT can provide support to individuals for solving problems related to patient deterioration (content support) and to help work groups interact to solve problems (process support). This study will examine mental models related to managing patient deterioration. The result of building and maintaining mental models leads to organizational learning.
Figure 1 – Factors that Influence Organizational Learning (Senge, 1990; Tomblin, 2005)

Framework of Organizational Learning

- Systems Thinking
- Personal Mastery
- Shared Visions
- **Mental Models**
- Team Learning
  (Senge, 1990)

- Maintaining and Building Mental Models
  (Individual, Group and Organization)
  (Tomblin, 2005)

- Organizational Learning
Definition of Terms

The following are a list of terms that are adopted for use in this study:

- **Rapid Response Teams (RRTs) [Referred to as: Medical Emergency Teams (MET) in British and Australian literature]**: Rapid Response Teams are built on specialized teams of caregivers who identify and treat patients with early signs of clinical deterioration on general acute care hospital wards (Winters, Cuong, Pham, Hunt, Gullar, Berenholtz & Pronovost, 2007).

- **Staff nurse**: Registered nurses who work in healthcare organizations. For this study, the terms ‘staff nurse’ and ‘nurse’ will refer to registered nurses who work in all units of an acute care hospital except the intensive care unit, emergency room and operating room.

- **Pre-Cardiopulmonary Arrest (Patient Deterioration)**: Pre-cardiopulmonary arrest is a life-threatening event that requires rapid identification and intervention to prevent cardiopulmonary arrest (Ashcraft, 2004). Signs and symptoms would include changes in heart rate or rhythm, blood pressure, respiratory status, mental status and a sense that threatening changes are occurring (Thomas, VanOyen, Force, Ramussen, Dodd & Whidin, 2007).

- **Organizational Learning**: The process of developing, refining and sharing mental models across individual, group and organizational levels in an organization (Tomblin, 2005).

- **Content Support**: Content support is provided in data, information and knowledge procession without regard to the participation or involvement of the group members (Tomblin, 2005).
• **Process Support:** The extent to which a system is able to support or influence the proceedings of group meetings. This support is seen in changes made to verbal or non-verbal exchanges of information, attitudes, beliefs or procedures (Tomblin, 2005).

• **Mental Models:** Mental models are ‘images of reality’ or ‘reality constructions’ that correspond in varying degrees with objective reality. Mental models may vary in points of view, perspectives, beliefs and complex representations of processes. Mental models are maintained when new knowledge confirms previous mental models (Senge, 1990; Tomblin, 2005).

• **Individual Level Learning:** The process of developing and refining mental models by the individual, which may or may not be shared with other individuals (Tomblin, 2005). For example, an individual gaining new knowledge about resuscitation guidelines.

• **Group Level Learning:** The process of developing and refining mental models that are common to the individuals that compose the group (Tomblin, 2005). For example, discussing new resuscitation guidelines in a group setting.

• **Organizational Level Learning:** The process of developing and refining mental models that become embedded in the organization (Tomblin, 2005). For example, changes in policies and procedures as a result of new learning.

• **Mental Model Maintenance:** This is a form of learning in which basic routines are determined to be appropriate. New information fits into the models and confirms them (Tomblin, 2005). For example, a work process that is regularly effective for an individual would be maintained as part of routine practice.
• *Mental Model Building:* This is a type of learning in which mental models are changed to fit new knowledge and new environments or to handle disconfirming information (Tomblin, 2005). For example, implementing RRTs into hospitals, and changing individuals’ views on early intervention of patient deterioration.
CHAPTER 2

Literature Review

This chapter will first review the building and maintenance of mental models and how they might apply to managing patient deterioration in acute care hospitals. The central focus is to examine the role of the RRT in promoting mental models for managing patient deterioration at the individual, team and organizational level in acute care hospitals and some of the barriers that impede the educational process. The databases that were used to collect the articles for the literature review are the Cochrane Collaboration of Systematic Reviews, CINAHL, MEDLINE and social sciences databases. The keywords included ‘nursing & emergency response’, ‘rapid response teams’, ‘nursing & decision making’, ‘cardiopulmonary resuscitation’, ‘modified early warning score’, ‘patient deterioration’, ‘suboptimal care’, ‘failure to rescue’, ‘medical emergency team’, organizational learning’, ‘mental models’, ‘building and maintaining mental models’, ‘team building’ and ‘collaboration’.

Maintaining and Building Mental Models

Mental model maintenance and building are key concepts that underlie the present study. Mental models are not a new concept; they have been a focus of study in organizational behavior and cognitive psychology for many years. Mental models are organized knowledge frameworks that allow individuals to describe, explain and predict behavior (Norman, 1983; Rouse & Morris, 1986). They are ‘images of reality’ or ‘reality constructions’ that correspond in varying degrees with objective reality. Two people with different mental models can observe the same event and describe it differently, because they have focused on different details and have different interpretations (Senge, 1990). In
the case of an acute care hospital and patient deterioration, some nurses might opt to call for help earlier or later depending on their mental models regarding this issue.

Mental model building is a type of learning in which mental models are changed to fit new knowledge and new environments or to handle disconfirming information (Tomblin, 2005). Mental model maintenance is a form of learning in which basic routines are determined to be appropriate. New information fits into the models and confirms them (Tomblin, 2005). Whether a mental model is maintained or built upon can also be strongly related to the type of support, content or process that is received (Tomblin, 2005; Teng & Ramamurthy, 1993).

Developing and maintaining mental models is thought to occur at the individual, group and organization level (Tomblin, 2005). Individual learning may or may not be shared with others, whereas group learning of models may be common to individuals in a group. Over time, individual and group learning can be embedded in organizational practices, which are referred to as organizational learning. Mental models provide a different way to investigate the link between individual and collective learning. In his dissertation, Tomblin (2005) assessed the ability of group decision support system (GDSS) technology to support organizational learning by examining the relationship of GDSS support types (content or process) to learning at the individual, group and organizational level. Positive relationships were found between the content and process support provided by the group decision support and individual and group mental model building and maintenance.

Although literature on mental models is limited in nursing, there is some support for the concept. It is reported that teams that have similar mental models are more
cohesive and experience better group dynamics (Grigsby et al., 2002; Lim & Klein, 2006; Mathieu, Heffner, Goodwin, Salas & Cannon-Bowers, 2000; Walker, 2001). Grigsby and colleagues (2002) used a survey instrument to gather information on changes in organizations after implementing a new program, the Clinical Practice Model (CPM). CPM facilitated the creation of healthy work environments by providing an infrastructure that supports value-based, relationship-based and evidence-based practice throughout an organization. Dialogue and systems thinking focuses on key concepts in the CPM framework and it helps shift patterns of thinking, relating and practicing. Grigsby and colleagues (2002) found that many nurses changed their mental models to learn about CPM and found that when every individual recognized the patterns they play in fixing systems that are in place, they realized their actions affect organizational outcomes. The idea of CPM can be compared to RRTs in that it is a change in organizational routines and requires staff nurses to play a different role in managing patients. In this study emphasis was placed on discussing teamwork in healthcare and its affect on nursing administrators, which is directly related to CPM. RRTs are similar because teamwork and collaboration is a large part of providing quality patient care. However, Grigsby and colleagues (2002) did not discuss how CPM affects individuals or organizations and this was shown to be important when the researchers stated that it was difficult to see if changes in practice were a result of the CPM or individual changes.

Walker (2001) studied how nurses can develop a stronger, more leadership-oriented role. Shared governance was the focus of Walker’s study and mental models were used in the context of changing behavior, improving communication and replacing a traditional authoritarian model with an empowerment model to optimize the contribution
potential of each individual staff member. Walker (2001) recognized that mental models affect behavior, communication and play a role in improving dialogue. In addition, Walker (2001) found that shared governance could lead to higher job satisfaction, increased communication and retention of nurses. Although shared governance is not the focus of the present thesis, the study results can be applied to nurses who call the RRT, since they are likely to experience similar responses. Both of the foregoing studies discuss the effects of mental models on team performance in nursing.

Mental Models Related to Managing Patient Deterioration

Cues that indicate patient deterioration are often present well in advance of obvious signs. The term ‘suboptimal care’ is used to describe a lack of recognition of patient deterioration. This term applies to the lack of knowledge regarding the significance of findings relating to dysfunction of airway, breathing and circulation, causing them to be missed, misinterpreted or mismanaged (McQuillan et al., 1998). Changes in practice might explain why cues are not easily recognized. For example, Coad and Haines (1999) reported that there are more procedures are being performed on an outpatient or day surgery basis and advancements in critical care and anesthesia has enabled higher risk patients to undergo major surgical procedures that would not have been performed in the past due to their risky nature, thus exposing nurses to more acute problems. It is not clear whether nurses have the required specialty training to manage these cases. With increasing acuity of patients in acute care hospitals and a large nursing shortage, caring for and managing patients is becoming more challenging. This combined with a quickly aging nursing workforce and fewer resources makes it difficult for nurses to monitor patients closely in acute care hospitals (Aiken, Clarke, Sloane, Sochaliski,
Busse, Clarke et al., 2001). For patients who require extra attention, staff nurses may not even recognize simple cues in patient deterioration. Identifying the problem of patient deterioration has been studied and the results show that in most cases, patients deteriorated over a time period of six to eight hours and they received suboptimal care prior to calling for help (Aiken, Clarke, Sloane, Sochaliski & Siber, 2002; Ashcraft, 2004; Franklin et al., 1994; McGloin et al., 1999; McQuillan et al., 1998; Schein et al., 1990; Silber, Williams, Krakauer & Schwartz, 1992). From these studies, the major reasons for the failures in patient care were a lack of communication and assessment, organization structure, inadequate supervision and failure to seek advice (Franklin et al., 1994; McGloin et al., 1999). Therefore, the movement of RRTs was warranted as well as a shift in thinking about patient deterioration for first responders to these situations.

If a patient is deteriorating, a nurse has to quickly assess the situation and make a decision regarding care. Heuristics are especially helpful in early recognition and intervention of deteriorating patients. They consist of simple rules that the brain can use as a quick reference for making decisions where time and information is limited (Cioffi, 2000a). According to Benner and Wrubel (1982), a nurse’s clinical knowledge is embedded in the practice of nursing and perception of the clinical atmosphere is a key aspect of nursing and how a nurse responds to emergency situations. Nurses describe a ‘gut feeling’ or intuition that alerts them before sudden changes occur.

Expert nurses appear to “know” that something may be happening to a patient even before the patient exhibits established physiological and psychological cues (Benner & Tanner, 1987). The authors state that skilled knowledge relies on the development of perceptual awareness that occurs when nurses can assess a situation holistically rather
than just looking at individual pieces and trying to fit them together. This type of perceptual awareness can only be developed in the course of exposure to many different clinical scenarios. Nurses at different points in their careers will vary in their ability to recognize and respond to cues.

Grossman and Wheeler (1997) studied the process that experienced nurses used to arrive at clinical judgments. A convenience sample of the 33 expert registered nurses in a critical care setting participated in this grounded theory study. Open-ended interviews were used to obtain nurses’ responses to different clinical situations: heart failure/acute myocardial infarction, acute gastrointestinal bleed and acute pulmonary edema. The researchers found that expert nurses tended to make decisions based on multiple cues and recognized the need to establish trends and patterns rather than react to isolated cues. Expert nurses also relied on memories of past experiences and felt that judgment is a combination of critical thinking, experience and content knowledge. This was a strong study because it introduced the idea of how nurses predict patient deterioration and recovery. The methodology of using grounded theory was appropriate since individual nurses have their own ideas, perceptions and themes about patient deterioration.

Influence of Rapid Response Teams on Management of Patient Deterioration

Cardiac arrest and trauma teams have been in existence for a long time. To counter the phenomenon of suboptimal care, the Medical Emergency Team (MET) was instituted in 1990 in Sydney, Australia. The MET extended the capacity of the traditional cardiac arrest team by providing two levels of intervention: resuscitation for life-threatening emergencies and assessment and review of all calls that are not classified as immediately life threatening (Lee, Bishop, Hillman & Daffurn, 1995). The focus of the
MET was early intervention and prevention of ICU admissions (Cioffi, 2000b). Therefore, care traditionally perceived as only being available within the four walls of the ICU can be available anywhere in a hospital (Buttfield, Amos & Hillman, 2006). Patients that go to the ICU from the general wards have a higher severity of illness and mortality rate than those admitted from the operating room or emergency department (McQuillian et al., 1998; Goldhill, White & Sumner, 1999). The MET system involved critical care specialists and helps to establish the management of critically ill patients across an entire hospital; it is not acceptable to put patient’s lives at risk, every patient deserves optimal care (Hillman, 2002).

The RRT is based on the MET and has evolved from the Institute of Healthcare Improvement Initiative (2006). The RRTs are now focused on rescuing patients who are at risk before they become critically ill and who may deteriorate to the point of not being able to have their clinical crisis reversed. A recent study of a RRT composed mostly of nurses and led by physician assistants with advanced critical care skills and resuscitation equipment was associated with decreased rates of cardiac arrest as well as total and unplanned ICU admissions (Dacey, Mirza, Wilcox, Doherty, Mello, Boyer, Gates, Brothers & Baute, 2007). Jones and colleagues (2005) conducted a prospective, controlled before-and-after examination of the effects of a MET system on long term incidence of cardiac arrests and found that for every seventeen MET calls, one cardiac arrest is prevented. They also discovered that the number of calls to the MET has improved over a six-year period and it is significantly correlated with a decrease in ward patients suffering from cardiac arrest ($r = 0.84, p < 0.01$). Bellomo, Goldsmith, Uchino and colleagues (2004) found that implementing a RRT decreased adverse outcomes in the
postoperative patient population, with a relative risk reduction of 57% (p < .001). Also, the RRT decreased postoperative deaths (relative risk reduction 36.6%, p < .0178). These studies had unclear comparability between the RRT and control group; however their findings can be generalizable to most single center evaluative studies done on RRTs.

Furthermore, many studies have been completed on the outcomes of RRTs. Buist and colleagues (2002) used a pre-post test design and found that there was a decreased incidence of unexpected cardiac arrest from 3.77 per 1000 hospital admissions to 2.05 and a decreased mortality from cardiac arrests from 77% to 55%. This study was successful in comparing the RRT and the control group and did adjust some variables (e.g. admission type). The outcomes were also clearly presented and impressive. However, they only looked at a small hospital population of 300 beds. In Ontario, results from the Quarterly Report (March 2007) display that early results show the RRTs are successful in decreasing ICU admissions, decreasing ICU length of stay, decreasing ICU readmission rates and, decreasing the rate of code blues and decreasing rates in hospital mortality. The largest randomized controlled trial on RRTs published to date was conducted by the MERIT study group (2005) from Australia. In this study 23 Australian hospitals were randomized to MET or no MET and outcomes were measures at specified time intervals. This study showed that the MET system greatly increased emergency team calling but did not affect the incidence of cardiac arrest, unplanned ICU admission or unexpected death. However, outcomes with the post hoc analysis of the problems with the design and duration of the trial and the teams proved that this study had many flaws. In essence, the movement of RRTs progressed due to the mounting evidence that they are successful.
Influence of Rapid Response Teams on Staff Nurses. Few studies have been conducted on the effect of RRTs on staff nurses. However, a number of studies have been completed on nurses’ responses to METs. Daffurn, Lee, Hillman, Bishop and Bauman (1994) conducted a two year study to determine if nurses knew when to call for emergency assistance, following the implementation of a MET in acute care hospitals. Questionnaires were distributed to 141 registered nurses to determine their opinions on knowledge and use of the system. Nurses from the ICU, High Dependency Unit (HDU) and Coronary Care Unit (CCU) were excluded as pilot testing was undertaken in these areas. The questionnaires were completed at shift change and returned within 30 minutes of receiving them. Daffurn and colleagues found that nurses had a favorable attitude towards the MET, but they felt that there was insufficient education of the staff regarding the benefits of early intervention. This is a common theme in many studies in nursing; education is the most common gap for nurses when taking care of deteriorating patients. This time frame in which the nurses had to fill out the survey was quite short and shift change is a difficult time to focus on a questionnaire. The results may not be reflective of a nurse having the time to think about the answers.

In Great Britain, Cioffi (2000a) conducted a descriptive study using unstructured interviews to examine nurses’ experiences in making decisions about when to call for emergency assistance. She found that nurses questioned whether they were doing the ‘right thing’ by calling the MET and felt nervous and anxious. A “gut feeling” was described if a patient was starting to deteriorate and they relied on their past experiences to assist in their clinical decision-making skills. Nurses interviewed were also afraid that they would “feel like an idiot” so the call would not be deemed necessary. The nurses
also requested that, after an RRT call, they would like a debriefing session for their learning purposes. The debriefing session would likely help the nurses realize what they can improve on in managing deteriorating patients. Also, the debriefing session could raise any gaps in knowledge that might be present, since the resuscitation process is very fast-paced. The participants in this study were required to have five or more years of experience and this was not representative because the group of less experienced nurse was not accessed. Education is a need that has been identified by every nursing study. Salamonson, van Heere, Everett and Davidson (2005) studied Australian nurses’ perceptions of the MET. This was a descriptive study aimed at exploring nurses’ satisfaction with the MET and uncovering perceived benefits and suggestions for improvement. Overall, nurses were satisfied with the MET with the main suggestion of more on-the-job education for nurses. They discovered that experienced nurses called the MET less. Those working full time were no more likely to have activated the MET, suggesting that the amount of time spent in direct contact with patients may not be a key determinant of MET activation. This study further showed that there is a need for education in patient deterioration, but it is not specified in what specific area and what causes the nurses to call for help.

*Influence of Rapid Response Teams on Work Groups.* While there are few studies on the effectiveness of RRTs in the healthcare field, studies in other fields indicate that emergency teams can influence task performance. The military and commercial aviation industry have shown the effectiveness of the emergency teams. For example, Kanki and Foushee (1989) found that airline crews that had recently flown together performed better and that familiarity between crew members resulted in greater communication and
information exchange. This helped them to adapt their behaviors and decrease error rates. These findings appear to support the existence of shared mental models.

Another important example of team training is the military Team Dimensional Training (TDT) approach. TDT helps teams to analyze and correct their operational mistakes, while at the same time teaching team leaders to guide their members through a self-correction process (Spiker, Silverman & Tourville, 1998; Agency for Healthcare Research and Quality, 2000 Feb). TDTs function similarly to how RRTs function in that when working with a team such as the RRT, there are opportunities to teach, introduce new knowledge and guide by example.

The Crew Resource Management (CRM) model was devised from studying commercial aviation and the military. CRM training has led to increased safety-awareness attitudes, improved communication, coordination and decision-making behaviors and enhanced error-management skills (Helmreich & Merritt, 1998; Pizzi, Goldfarb & Nash, 2001; Wiener, Kanki & Helmreich, 1993). The early CRM programs educated pilots about the importance of teamwork and cockpit settings (Beaubien, Baker & Mulqueen, 2002). Essentially, the flight crew began to take control of the aircraft through use of electronic systems and pilots became the information managers who intervened when changes were necessary or unanticipated results arose (Sarter & Woods, 1992; Sarter & Woods, 1994).

The approaches to working in groups or teams that exist in the military and commercial airlines are well-documented examples of teamwork. The foregoing studies suggest that team training has an influence on effective teamwork in crisis. Given the scarcity of information on the effectiveness of RRTs on healthcare work groups, the
Influence of Rapid Response Teams on Organizations. Two randomized controlled trials have been completed on RRTs and there was weak evidence that rapid response teams are associated with a reduction in hospital mortality and cardiac arrest rates. Limitations in the quality of both of these studies render their results more suggestive than conclusive (Priestly, Watson, Rashidan, Mozley, Russell, Wilson, et al., 2004; MERIT study investigators, 2005). However, many single center reports support the notion that timely intervention may interrupt crisis events and decrease unexpected hospital mortality (Bellomo, Goldsmith, Uchino, Buckmaster, Hart, Opdam, et al., 2003; Bristow, Hillman, Chey, Daffurn, Jacques, Norman, Bishop, et al., 2000; Buist, Moore, Bernard, Waxman, Anderson & Nguyen, 2002).

Sociodemographic Barriers to Calling the Rapid Response Team

A number of previous studies on RRTs suggest that some sociodemographic factors may present barriers to decisions to call the RRT for help. Level of experience appears to play an important role when calling the RRT. Cioffi (2000a) found that less experienced nurses sought the opinions of other more experienced nurses when unsure about calling the RRT. More experienced nurses often discussed the decision with their peers and colleagues.

Feelings of fear also play an important role in calling the RRT. Cioffi (2000a) found that the uncertainty of decision-making situations contributed to many nurses’ feelings of nervousness and anxiety about what was happening to the patient and what would be expected of them when the RRT arrived. Some nurses felt panic because they
did not want the patient to die. This panic was associated with reflections on past experiences of not being able to resuscitate patients in the days when the emergency team was only called after a patient had actually arrested. Calling the RRT also can be emotionally charged. The element of emergency can also make nurses on the wards more nervous because it is not within their norm to work under such stressful circumstances (Cioffi, 2000a). Thus, the RRT implements a culture change where staff nurses are more proactive during the pre-resuscitation phase of their patients by calling the RRT.

In summary, the literature shows that mental models influence perceptions, attitudes and behaviors of individuals, groups and organizations. There are links between content and process support that is provided to promote learning and mental model building and maintenance. Some evidence was found to support these relationships in nursing. The literature on nurses’ responses to managing patient deterioration in non-critical care units in hospitals reveal some of the mental models that guide their ability to recognize cues and call for help in a timely manner. The literature on the effectiveness of the RRT in promoting mental models for managing patient deterioration is absent, but effects of RRTs on patient outcomes appear to be beneficial.

In this study, a survey of staff nurses’ perceptions of how the RRT has influenced their personal learning about management of patient deterioration and the learning of their teams and organization was conducted. Learning was assessed through examination of their mental models (both building of new mental models and maintenance of earlier models) related to content and process of learning provided by RRTs at individual, team and organizational levels. The influence of frequency of access of the RRT was also examined to determine differences in learning as a result of exposure. An open-ended
question was used to determine staff nurses’ overall perceived benefits, advantages and disadvantages of RRTs in hospitals. The following hypotheses were tested to examine the influence of RRTs on staff nurses’ perceptions of learning about management of patient deterioration. In addition, participants were asked about their overall impressions of RRTs and their perceptions of advantages and disadvantages of these teams.
List of Hypotheses

Specifically the following hypotheses were tested to examine the influence of RRTs on staff nurses’ perceptions of learning about management of patient deterioration.

H1: High frequency of access to RRTs will be positively related to staff nurses’ perceived content support and process support from RRTs.

H2a: Perceived content support by RRTs will be positively related to maintenance and building of staff nurses’ mental models pertaining to self for managing patient deterioration.

H2b: Perceived process support by RRTs will be positively related to maintenance and building of staff nurses’ mental models pertaining to self for managing patient deterioration.

H2c: Perceived content support by RRTs will be positively related to maintenance and building of staff nurses’ mental models pertaining to work group for managing patient deterioration.

H2d: Perceived process support by RRTs will be positively related to maintenance and building of staff nurses’ mental models pertaining to work group for managing patient deterioration.

H2e: Perceived content support by RRTs will be positively related to maintenance and building of staff nurses’ mental models pertaining to the organization (hospital) for managing patient deterioration.

H2f: Perceived process support by RRTs will be positively related to maintenance and building of staff nurses’ mental models pertaining to the organization (hospital) for managing patient deterioration.
H3: Sociodemographic and independent variables will predict organizational learning outcomes (mental model maintenance and building for self, group and organization).

In addition factors were identified that predict staff nurses’ perceptions of individual level, work group level and organizational level. Finally, staff nurse’ overall perceived advantages and disadvantages of RRTs in hospitals were explored.
CHAPTER 3

Method

Participants

A sample of 332 participants was recruited from a population of 11,500 registered nurses working in hospitals where RRTs are implemented. A sample size was 372 was calculated, using a standard formula for sample size estimates. Please see Appendix H for the sample size calculation used. Oversampling was done to obtain a sufficient number of eligible participants in keeping with the approach by Paxson, Dillman and Tarnai (1995) to increase response rates for a mail survey. Two reminders were sent at two-week intervals after the initial survey was mailed. Data was collected from December 2007 to February 2008.

Out of 600 surveys that were mailed, 332 surveys were returned. 201 were excluded because these individuals indicated that they currently worked in a critical care setting and, therefore, did not meet inclusion criteria. The formula used to calculate response rate was: total number of participants approached minus the ‘out of scope’ participants divided by number of valid responses (Data Analysis Australia, 2007). Out of scope participants are those who have been approached but are not a part of the target population (Data Analysis Australia, 2007). In this study, 201 surveys were subtracted, because the respondents were ‘out of scope’. Therefore a sample (pre-test = 12; study = 119) of 131 was obtained for a response rate of 33%. According to Hager, Wilson, Pollak and Rooney (2003), there is no consensus on the most acceptable response rate, but rates higher than 50% are preferable.
Participants were randomly selected by a staff member at the College of Nurses of Ontario (CNO) from an annual registration list of full time, part-time and casual registered nurses, working in hospitals with RRTs in place, who gave prior consent to be approached for research studies. Participants were selected by the staff member at the CNO based on the hospital they worked at. The release of names does not reflect implicit or explicit endorsement or support of the CNO. Participants were informed that participation in this study was voluntary and they could withdraw from the study at anytime. They were also informed that no risk was anticipated from participation and that their responses would be kept confidential and anonymous. Ethics approval was obtained from the Queen’s University Health Sciences and Affiliated Teaching Hospitals Research Ethics Board.

**Instruments**

A 58 item instrument entitled “The Relationship Between Group Decision Making Support System and Organizational Learning,” developed by Tomblin (2005) was adapted for this study. The instrument was used to assess the ability of group decision support system (GDSS) technology to support organizational learning on a sample of 139 participants in a variety of organizations. Written permission was granted by Dr. Tomblin to adapt and use the survey instrument to conform to the context of RRT. Meanings were retained when modifying items from the original instrument. An example of one of Tomblin’s items for content support was: “How frequently was the system used to discover trends or patterns?” This item was adapted to: “To what extent was the rapid response team used to discover trends or patterns in managing patient deterioration?” An example of an item for process support was: “How frequently was the system used to get
advice on communication and interaction rules during group sessions?" This item was adapted to: “To what extent was the rapid response team used to gain advice on communication and interaction with a group after you have placed a call to the team?”

The modified instrument for this study, “A Survey to Assess Staff Nurses’ Perceptions of Rapid Response Teams in Acute Care Hospitals” consisted of 46 items, rated on a 7-point Likert type scale, where 1 = never and 7 = extensive (see Appendices C & D). Items were grouped into four instruments. These included: 1) perceptions of RRT content and process support; 2) mental model maintenance and mental model building measures; 3) overall impressions of RRTs and an exploratory question; and 4) sociodemographic variables.

Perceptions of RRT Content and Process Support. Content Support was measured with a 5-item scale that was designed to assess nurses’ perceptions of the content support provided by RRTs when assisting staff to manage a deteriorating patient. Content support is provided in data, information and knowledge processing without regard to the participation or involvement of the group members (Tomblin, 2005). Examples of items in the scale are “To what extent was the rapid response team used to…”: “Gain general information about managing patient deterioration”; “Get information on caring for patients with specific problems.” The items in this scale are related to the content support provided and how staff RNs interpret information provided to them during a RRT call. It does not assess the group experience or team atmosphere set by the RRT. Knowing what type of education was provided to staff RNs and how they were supported in this respect is very important to understanding how they build or maintain mental models. In the pre-
test, the Cronbach alpha reliability was .84 and in the study the Cronbach alpha reliability was .89.

**Process Support.** Process support was measured with 4 items designed to assess the process support the extent to which a system is able to support or influence group interaction or the proceedings of group meetings. Examples of items are “To what extent was the rapid response team used to…”: “Exchange ideas and information within a group on how to handle patient deterioration” and “Generate ideas within a group on handling patient deterioration.” In the pre-test, the Cronbach alpha reliability was .91 and in the study the Cronbach alpha reliability was .94.

**Mental Model Maintenance and Building Measures.** Subscales were used to measure an individual’s mental model building and maintenance at self, group and organizational levels. Pre-test and study Cronbach alpha reliabilities were greater than .70 for all subscales (see Table 2). An open-ended question was used to determine perceived advantages and disadvantages of using RRTs.

**Mental Model Maintenance.** Mental model maintenance is a form of learning in which basic routines seem to be appropriate. New information fits into the models and confirms them (Tomblin, 2005). Mental model maintenance for self is related to what ideas the RNs maintain about patient deterioration and themselves A 6-item scale that were designed to study mental models of self. A few examples of this scale are “To what extent did the rapid response team help you to…”: “Justify your decisions on managing patient deterioration” and “Maintain your previous perspectives about managing patient deterioration.” In the pre-test, the Cronbach alpha reliability was .79 and in the study, the Cronbach alpha reliability was .94.
Mental model maintenance for group is the ideas that a group maintains when caring for a deteriorating patient. It was measured with a 6-item scale. Some examples of this scale are “To what extent did the rapid response team help the group to…”: “Maintain current group practices that you would use in a similar situation” and “Share previous beliefs, views and outlooks.” In the pre-test, the Cronbach alpha reliability was .91 and in the study the Cronbach alpha reliability was .92.

Mental model maintenance for organizations is a concept that relates to managing deterioration at an organizational level. Four items were used to assess it. Some examples of this scale are “To what extent did the rapid response team help the hospital to…”: “Support existing hospital routines” and “Monitor risks to patient safety that could lead to patient deterioration.” In the pre-test, the Cronbach alpha reliability was .70 and in the study, the Cronbach alpha reliability was .79.

**Mental Model Building.** Subscales were used to assess an individual’s mental model building at self, group and organization levels. Mental model building is a type of learning in which mental models are changed to fit new knowledge and new environments and to handle disconfirming information (Tomblin, 2005). Mental model building for self is when the ideas and concepts that a person has are built upon, and new knowledge increases their awareness of their current view of that idea or concept. A 6-item scale was used that included: “Challenge your outlook about managing patient deterioration” and “Expand your scope about managing patient deterioration.” In the pre-test, the Cronbach alpha reliability was .81 and in the study, the Cronbach alpha reliability was .92.
A 6-item scale was used to assess mental model building of groups, which refers to change in ideas and concepts within groups. A few examples of these are: “Change existing group routines for managing patient deterioration” and “Share knowledge about patient deterioration.” In the pre-test, the Cronbach alpha reliability was .81 and in the study, the Cronbach alpha reliability was .92.

Mental model building of organizations occurs when organizations change their routines based on new ideas and concepts. Four items were designed to study mental model building of organizations. Some examples are: “Cause changes to hospital routines for managing patient deterioration (e.g. establish criteria for RRTs)” and “Create new routines (e.g. staff training for RRTs).” In the pre-test, the Cronbach alpha reliability was .87 and in the study, the Cronbach alpha reliability was .83.

**Overall Impressions and Exploratory Question.** The overall impressions were measured with a 4-item scale. The overall impressions were intended to assess how RNs felt about RRTs and if they felt the RRTs helped in caring for deteriorating patients. A few examples are: “How successful has the team been in improving early recognition of patient deterioration” and “How much more knowledgeable were you as a result of having the team to manage patient deterioration.” In the pre-test, the Cronbach alpha reliability was .83 and in the study, the Cronbach alpha reliability was .84. In addition, an open-ended question “What was the greatest advantage and disadvantage from using the rapid response team?” was asked. This information was used to gather opinions that might not be accessed through the quantitative portion of this study.
Sociodemographic Data. Information was collected on such variables as age range, level of education achieved, gender, critical care experience, frequency of calling a RRT, bed size and use of calling criteria. (see Appendix G for criteria to call the RRT).

Design

This study was a prospective, correlational design. The following variables were used to assess staff nurses’ perceptions of learning about managing patient deterioration following exposure to RRTs: frequency of use (a one item question in the sociodemographic date); content support and process support; mental model maintenance and mental model building pertaining to self, group and organization (see Appendix B).

Procedure

After ethics approval was obtained, the instruments were pre-tested on a sample of nurses. Next, a sample of registered nurses was requested from the CNO. Once the study sample calculated, using the estimated population of 11,500 registered nurses working in hospitals with RRTs in place, the mail survey package was prepared.

Pre-test. A pre-test of the adapted instrument was completed before the study was conducted. Twelve RNs in a local hospital who had previous experience with a RRT were recruited by the researcher. Information about the study was given to the charge nurse on six non-critical care units. Interested volunteers contacted the researcher and were entered into the pre-test. Arrangements were made to administer the survey outside of work hours. Ethical procedures for administering the survey were used (see Appendix A). It took approximately 20 minutes to complete the survey. Eleven females and one male responded to the pre-test. After the survey was completed, participants were asked for their assessments of the instrument, including readability, comprehension, length and
practicality. Their comments and suggestions were taken into account when modifying the survey before mailing them out. Data from this sample were used to assess reliabilities of the instruments (see Table 2).

Three phrases were changed to improve clarity of the items, while maintaining the meaning of the items. Modifications included: item 5 was changed from “Keep track of or review information about managing patient deterioration” to “Stay up to date or review information about managing patient deterioration”, item 14 was changed from “Reinforce your beliefs about managing patient deterioration” to “Reinforce the value of early intervention in the management of patient deterioration”, item 36 was changed from “Provide educational programs for management of acutely ill hospital patients” to “Provide continuing education on the use of Rapid Response Teams (e.g. posters, seminars, workshops)”. Furthermore, in the sociodemographic variables, an item on bed size was added which read as item 11 “Bed size at the hospital you work at: less than 300, greater than 300”. Also, item 14 was modified from “Are there criteria for calling the RRT” to “Do you use the criteria for calling the RRT at your workplace: yes, no, comments about the calling criteria”.

Mail Survey. A mail survey was conducted over a period of two months from December 2007 to February 2008 (see Appendix D). Questionnaires were mailed to 600 RNs in Ontario hospitals. Survey procedures were based on Dillman’s guidelines for mail surveys (Paxson, Dillman & Tarnai, 1995). The survey package included, the survey instrument (see Appendix D), a letter of information (see Appendix D), consent letter (see Appendix A) and a pre-paid return envelope. A follow-up reminder on Queen’s
University letterhead was sent two weeks after the initial mailing (see Appendix E) and a second reminder postcard was sent two weeks after the first reminder (see Appendix F).

Data Analysis

Data were analyzed using the Statistical Package for Social Sciences software (SPSS 16.0) program and two-tailed tests were applied at an alpha 0.05 level of significance. Cronbach’s alpha, means, standard deviations, kurtosis and skewness were obtained for the measures. Descriptive statistical analyses were performed on the study variables. Pearson r correlation coefficients were used to explore relationships among the study variables and backwards multiple regression analyses were conducted to determine predictors of learning outcomes. Content analysis was performed on responses to the open-ended question.

Content Analysis

The content analysis approach procedure, described by Burnard (1996) was used to assess data from the open-ended exploratory question. In the initial examination of the words and phrases, the investigator looked for similarities, differences, extreme phrases and expressed experiences. Then the investigator looked for similar statements, words and phrases. Subsequently, patterns and associations were identified and the data was sorted into themes. These themes were then condensed into major categories or descriptors.

Data were analyzed for credibility, auditability and confirmability (Streubert Speziale and Rinaldi Carpenter, 2003). The thesis supervisor checked data and coding decisions for credibility, or accuracy. Auditability of data was handled by having a “paper trail” of procedures used in collecting and analyzing data. This included collecting
written responses to an open-ended question. Raw data were entered into an Excel spreadsheet and coded for storage and analysis. Finally, confirmability of data for consistency in coding and categorizing data was achieved by re-examining the data with the thesis supervisor.
CHAPTER 4

Results

Characteristics of the Sample

Table 1 presents the characteristics of the sample. Out of the 119 surveyed, 5 males and 114 females responded. Similarities, such as gender, education and participation existed between the pre-test and study group. No participants were excluded and there was minimal missing data. The sample was composed mostly of acute care registered nurses (99%) who work in hospitals who have an RRT in place. One nurse practitioner responded to the questionnaire. The ages of the participants ranged from 20 to 65 years, and there was a fairly even distribution in each age category. Most (15.1%) were in the 41-45 year age range. Sixty-two percent of the participants held a diploma in nursing as their highest education achieved. Forty-two participants were baccalaureate prepared and three held graduate degrees. There was a range of levels of experience in this study, only 1 participant (0.8%) had less than 1 year of nursing experience, 32 participants (27%) had 1 to 5 years of experience and 25 participants had over 25 years of experience. Those who had previous critical care experience (45%) had worked in different settings, such as step-down units and intensive care units. Of these, 40% had 1 to 5 years of experience.

Many (78%) of the participants reported that they did not receive any training associated with the RRT. However, 55% of participants called the RRT for assistance 5 or more times. There were only 2 RNs who had never called the RRT themselves, but participated in a RRT call with a co-worker. Furthermore, even though a majority of
participants did not receive training, 87% of participants used the calling criteria to decide whether to call for help.

Table 1

*Characteristics of the Sample*

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Table 1 (continued)

*Characteristics of the Sample*

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Description of Scales

Table 2 presents means, standard deviations, reliabilities, skewness and kurtosis of scales. Skewness is the extent to which a distribution of values deviates from the mean. Kurtosis is a measure of the peakedness or flatness of a distribution. Values of plus or minus two are acceptable for skewness and kurtosis (Cutting, 2008; SPSS, 2006). The peaked kurtosis for mental model maintenance of self reflects a high rating for this variable (M = 5.64, SD = 1.106).

All scales and subscales of the pilot and study had Cronbach alpha reliabilities greater than .70 (Nunnally & Bernstein, 1994). According to Nunnally and Bernstein (1994) reliabilities greater than .70 are acceptable. In the present study, the reliabilities for the pretest ranged from .70 to .91. The reliabilities for the study range from .79 to .94, indicating a high level of agreement between the two tests.
Table 2

Means, Standard Deviations, Internal Consistency Reliabilities, Skewness and Kurtosis of Scales

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Tests of Hypotheses

Table 3 presents means, standard deviations and Pearson’s r correlations among variables. Table 5 presents a summary of tests of hypotheses.

Correlations among Variables

See Table 5 for results of hypotheses tests. Hypothesis 1 was partially supported, indicating that there was a relationship between frequency of use of RRTs and process support (r = .25, p < .01). However, there was a positive, but non-significant relationship, between frequency of access and content support (r = .17). Only 2 respondents out of 119 never called the RRT, 9 individuals made 1 call, 9 people made 2 calls, 19 people made 3 calls, 14 people made 4 calls and most respondents (n = 65) made 5 or more calls.

Hypotheses 2a to 2f predicted positive relationships between nurses’ perceptions of content and process support provided by the RRT and mental model building and mental model maintenance for self, group and organization. Hypotheses 2a and 2b related to self were moderately supported. That is, significant positive relationships between content support and mental model maintenance (r = .62, p < .01) and mental model building (r = .67, p < .01) was found. Similarly, significant positive relationships between process support and mental model maintenance (r = .65, p < .01) and mental model building (r = .68, p < .01) were found. It appears that RRTs influenced maintenance and building of mental models of individuals who were exposed to their services.

Hypotheses 2c and 2d related to groups were moderately supported. There was a significant positive relationship between content support and mental model maintenance
(r = .70, p < .01) and mental model building (r = .76, p < .01). Significant positive relationships were also found between process support and mental model maintenance (r = .66, p < .01) and mental model building (r = .68, p < .01). Participants perceived that RRTs had a positive influence on learning outcomes of their work groups.

Hypothesis 2e and 2f related to organizations (hospital) were moderately supported. Significant positive relationships were found between content support and mental model maintenance (r = .62, p < .01) and mental model building (r = .49, p < .01). Furthermore, there was a significant positive relationship between process support and mental model maintenance (r = .57, p < .01) and mental model building (r = .45, p < .01) for perceptions about the hospital. Participants appear to see an effect of RRTs on organizational learning.

For Hypothesis 3, backwards multiple regression analyses were done to determine the predictors of organizational learning outcomes of mental model building and mental model maintenance. A backwards multiple regression analysis involves simultaneous entry of all variables into the equation, with the variables having the least impact removed at subsequent steps. The final model shows significant predictors accounting for most of the variability (Dawson & Trapp, 2004).

Predictors of Mental Model Maintenance and Building for Self. As seen in Table 4, the backward multiple regression analysis showed that mental model maintenance for self was positively predicted by process support. This model accounted for 55.8% of the variance. Mental model building of self was negatively predicted by years of critical care experience; however, mental model building of self was positively predicted by content
support provided and critical care experience. The model accounted for 65.3% of the variance.
**Table 3**

*Correlations among Variables*

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**p < .01
* p < .05
MMM = Mental Model Maintenance
MMB = Mental Model Building
Predictors of Mental Model Maintenance and Building for Group. As seen in Table 4, mental model maintenance of group was positively predicted by gender, content support and age. This model accounted for 71.8% of the variance. Mental model building of group was positively predicted by gender and content support, explaining 77.2% of the variance.

Predictors of Mental Model Maintenance and Building for Organization. Finally as shown in Table 4, mental model maintenance of organization was positively predicted by content support, which accounted for 46.9% of the variance. Mental model building of the organization was positively predicted by bed size, experience and process support, accounting for 61.6% of the variance.
Table 4

*Backwards Multiple Regression Analysis for Predictors of Organizational Learning Outcomes (Mental Model Maintenance and Building)*

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<td>.10</td>
<td>.76***</td>
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<td>Content Support</td>
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<td>MMM Group</td>
<td>Content Support</td>
<td>.61</td>
<td>.17</td>
<td>.64***</td>
</tr>
<tr>
<td>$R^2 = .72$</td>
<td>Gender</td>
<td>1.46</td>
<td>.60</td>
<td>.23*</td>
</tr>
<tr>
<td></td>
<td>Age</td>
<td>.13</td>
<td>.06</td>
<td>.20*</td>
</tr>
<tr>
<td>MMB Group</td>
<td>Content Support</td>
<td>1.00</td>
<td>.09</td>
<td>.92***</td>
</tr>
<tr>
<td>$R^2 = .77$</td>
<td>Gender</td>
<td>2.12</td>
<td>.60</td>
<td>.29***</td>
</tr>
<tr>
<td>MMM Organization</td>
<td>Content Support</td>
<td>.63</td>
<td>.11</td>
<td>.69***</td>
</tr>
<tr>
<td>$R^2 = .47$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MMB Organization</td>
<td>Content Support</td>
<td>.71</td>
<td>.10</td>
<td>.80***</td>
</tr>
<tr>
<td>$R^2 = .62$</td>
<td>Experience</td>
<td>.28</td>
<td>.09</td>
<td>.40**</td>
</tr>
<tr>
<td></td>
<td>Bed Size</td>
<td>.81</td>
<td>.36</td>
<td>.25*</td>
</tr>
</tbody>
</table>

***p < .001  
**p < .01  
*p < .05  

MMM = Mental Model Maintenance  
MMB = Mental Model Building
Table 5

Results of Hypotheses Tests

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Statement</th>
<th>Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>High frequency of access of RRTs will be positively related staff nurses’ perceived content and process support from RRTs.</td>
<td>Partial Support</td>
</tr>
<tr>
<td>2a</td>
<td>Perceived content support from RRTs will be positively related to maintenance and building of staff nurses’ mental models pertaining to self for managing patient deterioration.</td>
<td>Supported</td>
</tr>
<tr>
<td>2b</td>
<td>Perceived process support by RRTs will be positively related to maintenance and building of staff nurses’ mental models pertaining to self for managing patient deterioration.</td>
<td>Supported</td>
</tr>
<tr>
<td>2c</td>
<td>Perceived content support by RRTs will be positively related to maintenance and building of staff nurses’ mental models pertaining to work group for managing patient deterioration.</td>
<td>Supported</td>
</tr>
<tr>
<td>2d</td>
<td>Perceived process support by RRTs will be positively related to maintenance and building of staff nurses’ mental models pertaining to work group for managing patient deterioration.</td>
<td>Supported</td>
</tr>
<tr>
<td>2e</td>
<td>Perceived content support by RRTs will be positively related to maintenance and building of staff nurses’ mental models pertaining to the hospital for managing patient deterioration.</td>
<td>Supported</td>
</tr>
<tr>
<td>2f</td>
<td>Perceived process support by RRTs will be positively related to maintenance and building of staff nurses’ mental models pertaining to the hospital for managing patient deterioration.</td>
<td>Supported</td>
</tr>
<tr>
<td>3</td>
<td>Sociodemographic and independent variables will predict organizational learning outcomes (mental model maintenance and building at each of the three levels: self, group and hospital).</td>
<td>Supported</td>
</tr>
</tbody>
</table>
Overall perceptions of RRTs

Research Question 4 addressed staff nurses’ overall impressions of RRTs in hospitals and this included a survey instrument and an open-ended question. Shown in Table 6, the four-item instrument displayed that staff nurses have a very high overall impression of RRTs. The highest rated item was improving the tendency to call for help (Mean = 6.02) and the lowest mean (Mean = 5.41) was for knowledge acquisition.

Table 6

<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Success in early recognition</td>
<td>119</td>
<td>5.98</td>
<td>1.16</td>
</tr>
<tr>
<td>2. Improving tendency to call for help</td>
<td>119</td>
<td>6.02</td>
<td>1.13</td>
</tr>
<tr>
<td>3. More knowledgeable in managing patient deterioration</td>
<td>119</td>
<td>5.41</td>
<td>1.42</td>
</tr>
<tr>
<td>4. Decrease work related stress</td>
<td>119</td>
<td>5.69</td>
<td>1.59</td>
</tr>
</tbody>
</table>
Exploratory, open-ended Question

A single question was included in the questionnaire to explore staff nurses’ opinions on the greatest advantages and disadvantages of the RRTs. A total of 474 items were obtained from the 112 participants, who made comments on their questionnaires. After the items were examined, they were grouped into themes, as described in the methods section. Twenty-one themes were identified: knowledge sharing, training, educational opportunities, guidance, resources, teamwork, validation of concerns, early intervention, life saving, experience, continuity of care, essential, collaboration, conflict, speed of help, workload, available, confusing, level of stress, concerns and atmosphere. The themes were then organized into descriptors, which place the themes into broader categories. The 21 themes were reorganized into 6 descriptors: process support, patient safety, efficiency, content support, stress and interprofessional relations in rank order (see Table 7). The comments were also assessed for perceived advantages and disadvantages of RRTs.
Table 7

*Content Analysis for Themes and Descriptors in Registered Nurses’ Comments*

<table>
<thead>
<tr>
<th>21 Themes</th>
<th>Number and Frequency (%)</th>
<th>6 Descriptors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Guidance</td>
<td>159 out of 474</td>
<td></td>
</tr>
<tr>
<td>Resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teamwork</td>
<td>(34%)</td>
<td>PROCESS SUPPORT</td>
</tr>
<tr>
<td>Validation of Concerns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Early Intervention</td>
<td>119 out of 474</td>
<td></td>
</tr>
<tr>
<td>Life Saving</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Experience</td>
<td>(25%)</td>
<td>PATIENT SAFETY</td>
</tr>
<tr>
<td>Continuity of Care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Essential</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed of Help</td>
<td>80 out of 474</td>
<td>EFFICIENCY</td>
</tr>
<tr>
<td>Workload</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Available</td>
<td>(17%)</td>
<td></td>
</tr>
<tr>
<td>Adds to Confusion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Sharing</td>
<td>52 out of 474</td>
<td>CONTENT SUPPORT</td>
</tr>
<tr>
<td>Training</td>
<td>(11%)</td>
<td></td>
</tr>
<tr>
<td>Educational Opportunities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level of Stress</td>
<td>33 out of 474</td>
<td>STRESS</td>
</tr>
<tr>
<td>Concerns</td>
<td>(7%)</td>
<td></td>
</tr>
<tr>
<td>Atmosphere</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collaboration</td>
<td>31 out of 474</td>
<td>INTERPROFESSIONAL RELATIONS</td>
</tr>
<tr>
<td>Conflict</td>
<td>(6%)</td>
<td></td>
</tr>
</tbody>
</table>
Process Support. This category was used to describe nurses’ perceptions of the support provided by the RRT. Process support is evident in changes made to verbal or non-verbal exchanges of information, attitudes, beliefs or procedures (Tomblin, 2005). The descriptor Process Support ranked highest in advantages (34%) and included the following themes: guidance, resources, teamwork and validation of concerns. Appreciation of guidance was found in comments such as, “knowing that there will always be someone there to assist in a crisis”; “it's always the nurse that comes initially when you call. He/she listens to what you have to say about your patient's status, then he/she assesses the patient, reads chart and discusses the case with their team”; “It's helpful to have someone experienced [not always in our area of expertise]”. Access to resources was seen as an advantage. Two comments of interest were “RRTs provided expertise with central lines and anesthesia needs when an RRT call turned into a code blue”; “deteriorating, unstable patients once identified by an assigned nurse will receive advanced monitoring”. The role of the RRT as an effective team was noted in remarks, such as “In theory, the team is very good. In practice, it depends on who comes up. We have RN and RT and most times they are very good but sometimes not”; RRTs have “the ability to share information, ability to work with an extended team in sharing knowledge”. Validation of concerns was seen as an advantage. This was captured in comments such as “to know that someone is there to help and support you and validate what you are saying”; “On your side and be there when you need them. You know they are just a phone call away if your patient's status changes”.

Patient Safety. This category is described as a relatively recent initiative in healthcare, emphasizing the reporting, analysis and prevention of medical error and
adverse healthcare events (Institute for Healthcare Improvement, 2008). The descriptor, Patient Safety (25%) was regarded as an important contribution of the RRT and included the following themes: early intervention, life saving, experience, continuity of care and essential. Early intervention by the RRT, such as “monitoring a patient's deterioration before the patient codes”; “our surgical nurses have a tremendous amount of confidence that once we agree to call the RRT. Help has been set in motion”; “when using our own residents we question their ability to manage a deteriorating patient in a timely fashion”. An important advantage is that RRTs are lifesaving. It was stated that “the RRT saves lives and makes my day to day delivery of care less stressful when a patient is deteriorating”; “knowing there is someone there to take immediate action in cases where patients deteriorate rapidly and also when there are cases where actions can prevent further deterioration”; “the RRT can reverse impending problems and that they are available readily”. RRTs have experience and are a “backup for nurses who don’t have it”. They provide continuity of care by “daily follow-up of the patient, especially “unstable patients”. Others regard the RRT as essential. One person stated that “I feel that the RRT is extremely useful in the acute hospital setting. Although always available I feel it to be most useful during the off hours”. Another said that “the team was very encouraging and explained what and why, how they were doing tests and procedures”.

Efficiency. This category refers to allocating resources effectively to provide speedy and productive patient care. The descriptor, Efficiency (17%), seen as an advantage, was reorganized from the following themes: speed of help, workload, available and reduction of confusion. Speed of help was reflected in values such as “wait time is reduced when the RN is able to notify RRTs themselves”; “RRTs are a quick,
reliable resource to assist in managing a patient that deteriorates”. Workload is reduced when the RRT “gives the floor nurse the opportunity to care for the other patients in their workload while giving the needed information to the RRT nurse so they can assess the patient and do what is needed”. The RRT can be available quickly and “will respond quicker most of the time than the doctors would, especially when they are in house”. RRTs are “available, supportive and helpful in managing crises”. However, one disadvantage is that having the team respond can add to confusion. For example, noise and bright lights during a night call. One person stated “if one patient is failing during the night, then five others don't get rest as the lights go on and they bring this big noisy cart into the area”. Another noted “too many people are telling what should be done”.

*Content Support.* This category was described as support provided in data, information, and knowledge processing without regard to the participation or involvement of the group members (Tomblin, 2005). This descriptor, Content Support (11%), was reorganized from the following themes: *knowledge sharing, training and educational opportunities*. Regarding knowledge sharing, it was noted that “the RACE RN is a great support for the pt's and staff, providing knowledge, skills and resources”; “having another team to call to help evaluate a patient’s status before having to call a code!” is important. Having well trained RRTs is also important. Some participants noted that “team members should be well-trained and respond as quickly as they can for the assessment and carry out MD orders and treatments”; “rapid response teams can assess patients and have the authorization to write tests that will determine the patient's condition and can have the necessary steps done before patient deterioration worsens”. The RRT provides educational opportunities. One participant observed that the team
“was very willing to help educate me and work with other staff”. But another cautioned that “if staff relies too heavily on RRT, they may not be learning or retaining knowledge and skills because they feel they can wait for the RRT”. This could be a disadvantage.

**Stress.** This category is described as the amount of stress that the RN is experiencing before, during or after a RRT call. Also, it refers to the overall atmosphere of the situation. The descriptor, Stress (7%), was reorganized from the following categories: level of stress, concerns and atmosphere. Reduction of stress by the RRT is an advantage, but having to handle constraints imposed by patient deterioration can be stressful. RRTs help to “decrease stress on the job when patients begin to deteriorate. They feel like a really good support. However, it is sometimes more stressful due to time constraints and other patient's needs are not being met” when the team is called. General concerns were raised, including “RRTs are expensive programs to run”; “lack of knowledge by some staff members is not handled well by RRT members who talk down to you or tone of voice increases and can make someone feel belittled”. RRTs can influence the atmosphere. For example they “ease up concerns, re: patient situation/conditions and calm room and team to address situation with less stress and anxiety and then proceed with care”; they tend to “decrease stress and anxiety by their physical presence”.

**Interprofessional Relations.** This category is described as the relationships that are created from using the RRT, positive and negative. The descriptor, Interprofessional Relationships (6%), was reorganized from the following categories: collaboration and conflict. Items reflecting collaboration included “by having access to a team we have another professional validating our concerns especially if service is not responding to
your concerns”; “development of ongoing collaborative relationships is possible between ICU and floor RNs”. Conflict is seen as a disadvantage and is evident when “the service sometimes feel like you step on their toes and do not want the RACE team activated - so we often call the RACE team first and then notify the service”; “the doctors sometimes feel threatened as if RNs are questioning their management/treatment of the patient”.

In summary, the themes and descriptors that were discovered in the content analysis showed that there is a strong positive reaction towards the RRT. Content and process support from the RRT accounted for 45% of the comments. This suggests that these are important advantages. Similarly the role of RRTs in improving patient safety and efficiency in managing patient deterioration are important advantages. Stress associated with handling patient deterioration, interprofessional conflict and poorly prepared teams can be seen as disadvantages, but these represent less than 13% of the comments.
CHAPTER 5

Discussion

The purpose of this study was to explore the relationship between the frequency of use of RRTs by hospital staff nurses and the support received from RRTs and to investigate staff nurses' perceptions of their individual level, group level and organizational level learning as a result of single or multiple exposures to a RRT. Staff nurses' overall impressions and advantages and disadvantages of the RRTs were also investigated.

Frequency of use of Rapid Response Teams

It was hypothesized that high frequency of access to RRTs will be positively related to staff nurses’ perceived content support and process support from RRTs. The data showed that 55% of participants had called the RRT for help five or more times. This was an interesting finding, since the RRTs have been in existence in Ontario hospitals for less than one to three years, depending on the institution. The data shows that nurses are comfortable with calling for help and are using the RRT regularly. This hypothesis was partially supported in that perceived process support was positively related to frequency of access of RRTs. It suggests that the nurses in the present study feel that the support provided in improving the group dynamic and team learning will increase the frequency of use. Therefore, if the RRT had been called by 55% of the participants 5 or more times already, the process support received during these calls could be assumed to be positive because the same nurses called multiple times. No previous studies investigating the relationship between frequency of access of RRTs and content and process support have been done, but Morgan and Santiano (2006) found that nurses
were more prone to call for help because they were concerned with patient safety and if they had supportive supervisors or peers. In the context of the study, supportive supervisors and peers can also be synonymous with process support. Furthermore, nurses were less likely to call if there was a lack of resources to support the implementation of a RRT and if there was an unsupportive environment. Additionally, Cioffi (2000a) found that nurses questioned whether they were doing the ‘right thing’ by calling for help and felt nervous and anxious due to a lack of knowledge regarding how to recognize patient deterioration. According to Cioffi (2000a), content support needs to be improved. In the present study, it appears that RRTs are providing good process support, as reflected by the high frequency of use; however, more work needs to be done on providing content support.

*Mental Model Maintenance and Building with Rapid Response Teams*

It was hypothesized (2a) that perceived content support and process support (2b) from RRTs would be positively related to maintenance and building of staff nurses’ mental models pertaining to self for managing patient deterioration. These hypotheses were supported. This is consistent with Tomblin’s work (2005) on GDSS technology, where he found that content support and process support are positively related to mental model maintenance and building for self. No studies were found in the areas of mental model maintenance and building in nursing. However, Walker (2001) found that a shared leadership model supports staff nurses in extending their influence about decisions that affect their practice, work environment, professional development and self-fulfillment. The shared leadership role in this case would be the staff nurse identifying problems and
calling for help, which affects their individual practice so the support they receive can build and/or maintain their mental models.

In Hypotheses 2c and 2d, it was expected that perceived content support and process support from RRTs would be positively related to maintenance and building of staff nurses’ mental models pertaining to group for managing patient deterioration. These hypotheses were supported. This is consistent with Tomblin (2005) who found that content support and process support were positively related to mental model maintenance and building for group. Interestingly, Lim and Klein (2006) also found a direct relationship between group mental models and group performance. While they did not study maintenance and building of mental models, they showed that if individuals in a group have similar mental models, they perform better as a team. Moreover, Mathieu, Heffner, Goodwin, Salas and Cannon-Bowers (2000) found that teams or groups benefit when their members share similar mental models of the teams task. In the current study, even though group mental model building and maintenance was looked at from an individual’s point of view, it relates to work done by Lim and Klein (2006) and Mathieu and colleagues (2000) that addresses the specific area of group mental models.

Hypotheses 2e and 2f, predicted that content support and process support from RRTs would be positively related to maintenance and building of staff nurses’ mental models pertaining to organization for managing patient deterioration. These hypotheses were supported. This is consistent with Tomblin’s (2005) findings that content support and process support are positively related to mental model maintenance and building for organization. In a similar study, Grigsby and colleagues (2001) studied the introduction of Clinical Practice Models (CPM) into an organization, which support interdisciplinary
and professional practice. A survey designed to gather data about changes organizations experience after implementing CPM showed improved organizational decision making processes and an increased practice sense of empowerment with staff nurses caring for patients. Even though Grigsby and colleagues did not study RRTs or mental models, the CPM movement is similar to RRTs at an organizational level.

**Predictors of Organizational Learning Outcomes**

Hypothesis 3 predicted that sociodemographic and independent variables would predict organizational learning outcomes (mental model maintenance and building at each of the three levels: self, group and organization or hospital). These hypotheses were supported with significant results at each level.

Mental model maintenance of self was positively predicted by process support. Similar findings were discovered by Morgan and Santiano (2006) even though the support provided was not identified as process support.

Content support predicts mental model building for self. This finding indicates that when a nurse is educated specifically in patient deterioration their mental models change. Outcomes from a meta-analysis done by McArthur-Rouse (2001) showed that staff nurses need to be educated in identifying patients at risk for deterioration. The results from the current study build on the findings from McArthur-Rouse’s meta-analysis. For example, when nurses have education in patient deterioration they can build on their pre-existing notions. This study does not support work done by Dunlop, Jones and Page (2006), who found that despite content support, nurses did not initiate a MET call if the patient looked unwell and fit the calling criteria. In addition, mental model building of self was positively predicted by critical care experience. The majority of
nurses who received critical care experience (45%) obtained training in a critical care area. This shows that past experience and training can make a difference in how a nurse approaches patient care. However, years of critical care experience was negatively predicted by mental model building of self. Since the majority of nurses (40%) had worked in a critical care area for 1 to 5 years. This may suggest that nurses with expertise in managing patient deterioration have less need to build on their mental models. The level of acuity of critical care training that one has may influence their mental models, the Ontario Ministry of Health and Long Term Care (2007) released a report on the ‘Standards of Critical Care Nursing Practice.’ This report emphasizes that having critical care experience can vary by level of acuity of patients, which justifies the need for provincial standards.

Mental model maintenance of group was positively predicted by gender and age. However, there were 114 females and only 5 males. Therefore, this predictor is not representative. In this study, increased age was positively correlated with increased level of experience ($r = .81, p < .01$), suggesting that nurses in the older age group had more firmly established mental models about managing patient deterioration. Individual nurses who responded to the questionnaire felt that in the group setting, content support provided by the RRTs predicted mental model maintenance. This shows that the implementation of training programs for nurses is essential and has been the most recommended suggestions of many studies that have been released on RRTs (Cioffi, 2000a; Crispin & Daffurn, 1998; Goldhill, Worthington, Mulcahy, Tarling & Sumner, 1999; McArthur-Rouse, 2001).
Mental model building of group was positively predicted by gender and content support. As in mental model maintenance of group, gender is not representative. Content support was predicted by mental model building of group and this is a result of support provided to individual nurses and mental models changing based on new information. This finding is congruent with those reported by Lim and Klein (2006). Lim and Klein (2006) found that with support provided to groups, mental models changed so that eventually most people in the group had the similar or shared mental models.

Finally, mental model maintenance of organization or hospital was positively predicted by content support. There was no supporting data for this finding; however, this finding explains that content support does not change mental models at the organizational level. Perhaps, nurses felt that content support was not enough to change or build organizational mental models and other factors were required to build mental models. Mental model building of hospital or organization was positively predicted by content support, bed size and experience. The first finding (content support) is consistent with findings from Grigsby and colleagues (2002) and CPM. Perhaps content support predicted mental model building at the organizational level because interaction with the RRT helped nurses learn the value of the role of the organization in implementing RRTs. Experience predicted mental model building at the organizational level. This is plausible, because experienced nurses who are accustomed to organizational change may be more likely to build mental models. Also, bed size is a predictor of mental model building at the organizational level. No data was found to support this finding; however, Chan (2003) found that in a 250 bed private hospital, hospital staff indicated that leadership,
empowerment, experimentation, transfer of knowledge, teamwork and group problem solving were practiced in moderation at the organizational level.

*Overall Impressions, Advantages and Disadvantages of the RRT*

Overall perceptions of the RRT are positive and the means were quite high for this section of the study. These findings are congruent with a study done by Hodgetts, Kenward, Vlachonikolis, Payne and Castle (2002), where they found that nurses appreciated the RRTs and felt empowered to provide the appropriate response for their patient’s clinical condition.

Advantages and disadvantages of using the RRT were assessed by asking an open-ended question and using content analysis. In the current study, data from the content analysis has been very informative in showing that content and process support is evident in RRTs. From the content support, six descriptors were found: process support, patient safety, efficiency, content support, stress and interprofessional relations. Process support was the most common descriptor, which led the researcher to believe that the advantages of the RRT outweigh many of the disadvantages. In the quantitative findings, it was shown that process support of the RRT supported building and maintenance of mental models at different levels. The subjective comments showed similar findings with regard to the guidance and teamwork that is provided when the RRT arrives.

Salamonson, van Heere, Everett and Davidson (2006) discovered that the RRTs are instrumental when guiding the care of deteriorating patients and supporting staff nurses. Furthermore, validation of concerns was an interesting finding since Cioffi (2000a) found that nurses were unsure of whether they were doing the ‘right thing’ by calling for help. In the content analysis, validation of concerns put nurses at ease and they knew the RRT
would support them in any call that they made. Availability of resources was a key advantage in the current study; staff nurses felt they have resources available to them constantly. Morgan and Santiano (2006) found that a lack of resources prevented optimal utilization of METs. Cioffi (2000a) also emphasized the importance of debriefing after a RRT, which many nurses the current study feel is directly related to validation of concerns. In addition, Morgan and Santiano (2006) explain that the importance of supportive supervisors and peers can lead to MET utilization.

Patient safety, another key finding displayed the importance of the overall goal of the RRT movement. The IHI (2006) stressed that based on three reasons, the RRTs are in place: failures in planning, failure to communicate and failure to recognize deteriorating patients. Based on the themes discovered in the content analysis for patient safety, the reasons for RRTs are applicable to any situation regarding patient safety. Early intervention and life saving were key findings, which is also reflected in most of all the RRT literature on outcomes of intervention studies. Salamonson and colleagues (2006) found that immediate attention and early intervention as the most commonly identified benefits to having the MET. Furthermore, these themes address the IHI’s position on RRTs. Daffurn and colleagues (1994) were impressed with the adequate performance by the team and how rapidly they intervened. A significant advantage to the RRTs is the continuity of care they provide. The nurses who responded to the questionnaire made it clear that follow-up and continuity of care were key features of the RRTs. Perhaps, this is because when patients are followed after being seen by the RRT, they have fewer complications (Hillman, Parr, Flabouris, Bishop & Stewart, 2000).
The efficiency of the RRTs is reflected in comments about staff nurses’ workloads. Interestingly, some staff nurses found that having the RRT was an advantage in that it decreased their workload once the RRT arrived. This could be related to the fact that staff nurses could leave and care for other patients, while the RRT took over. However, this could also be seen as a disadvantage since the staff nurse is losing out on a valuable learning experience related to patient deterioration. Also, there could be a lot of confusion involved in a RRT call, since the idea of a deteriorating patient is unfamiliar to most non-critical care staff. Salamonson and colleagues (2006) also found that the efficiency and experience is highly dependent upon who comes to help from the RRT. If the RRT has a poor attitude, it does not positively add to the staff nurses’ content and process support.

Content support is another key finding discovered by the researcher. Cioffi (2000b) calls for more education to be provided to staff nurses regarding patient deterioration and this was one of the major finding of the current study. Also, in the current study, 78% of participants said they did not receive any training on RRTs. Salamonson’s (2006) findings support this idea as well because more education on medical emergencies is required. This idea is further developed by staff nurses in the current study that feel they have a lack of learning opportunities and the RRT is causing them to lose their critical thinking skills. Perhaps, this is because RRT staff takes over and does not share knowledge regarding patient deterioration. Access to medical staff can prove to be a positive or a negative outcome from calling for help; this is highly dependent upon who comes to help.
Stress was described by participants as feeling less stressed because the RRT provided an outlet to help them with patient deterioration. Salamonson and colleagues (2006) found similar results. However, Cioffi (2000a) found that nurses felt stress and anxious when they had to call the team for help. Some staff nurses in the current study felt anxious as well, when they had to call for help. Therefore, it is obvious that content and process supports were not being adequately provided and mental models were not changing for these participants.

Finally, interprofessional relations were presented in the data as primarily a disadvantage. Some staff nurses found that the RRTs were beneficial to interprofessional collaboration, as did Morgan and Santiano (2006). However, a large number of staff nurses felt that physicians became very protective of their patients and were unsupportive the RRTs. This is reflected in work done by Salamonson and colleagues (2006), where poor attitudes of staff could lead to poor patient outcomes. Furthermore, Morgan and Santiano (2006) showed that criticism or belittlement towards the nursing staff could lead to suboptimal use of the MET.

*Nursing Implications*

This study has implications for how nurses care for deteriorating patients. Since nurses access RRTs quite often it is important for nurses to understand the reasons behind calling for help and why. Overall, the first responders to patient deterioration are nurses, and the support provided could set the tone for RRT calls made subsequently.

By using the idea of mental models it was shown that mental model maintenance and building were positively related to content and process support. Few studies in nursing have addressed the issue of mental models and no studies have looked at mental
models at an individual, group and organizational levels. Nurses who have had interactions with a RRT are likely to have had either content or process support that would influence maintenance or building of their mental models regarding patient deterioration. These findings are groundbreaking for nursing because mental models can be very important components of learning in nursing.

Furthermore, sociodemographic and independent variables predict organizational learning outcomes. Since content and process supports are predictors for mental models at each of the three levels (individual, group and organization), this is new and critical data for the nursing profession. Nurses must be aware that calling for help is the beginning of maintaining and building mental models.

In addition to contributing to the literature on the importance of mental model maintenance and building, this study reveals insights into nurses’ attitudes through rich data provided on the advantages and disadvantages of RRTs. Building on the advantages and reducing the disadvantages could save lives.

**Limitations**

When interpreting the findings of this study caution should be used. Correlations were used for a portion of this study, and correlations do not necessarily imply causation. The sample was primarily female; therefore it is not representative of males. The data were collected during a holiday season (December to January), which may have affected response rates. The data was collected at one point in time and this did not capture changes or stability of perceptions. The length of time a RRT has been a part of an acute care hospital can also lead to bias, since some institutions have had a RRT in place for three years, where other hospitals have been in place for 6 months. If staff nurses have
developed different levels of experience, then his or her mental models could be at different phases. Hardly any of the respondents were new graduates, which is a population that usually calls the RRT the most (Salamonson et al., 2006). Furthermore, when the list of participants was requested from the CNO, nurses who did not work in ICU, emergency or the operating room was requested. However, many blank questionnaires were returned because since annual registration, they may now work in one of the excluded areas. The representative at the CNO said the registration list could be a year behind if a nurse changes his or her job right after annual registration. The instrument has been adapted from an instrument used for the first time in a PhD thesis (Tomblin, 2005). However, the instrument was pre-tested, with good reliabilities for this study. The comments related to advantages and disadvantages were subjective and may or may not be an accurate representation of the sample. Further research is needed to confirm the results of the study.

**Future Research**

Future research should include longitudinal studies on larger samples of male and female nurses. Also the data from this study can be used to design and test a specialized educational program on patient deterioration that includes identification and testing of content and process support. The effect of developing a training program should lead to staff nurses feeling more comfortable with caring for deteriorating patient and become more autonomous in noticing small changes in patients to prevent failure to rescue. Also, findings from the current study could be used to examine the mental models of other health care professionals and how they influence interprofessional communication. Addressing the issue of interprofessional conflict is also important and a focus group of
physicians and nurses might provide insight into professionals’ struggles with the RRT movement. Finally, studies on team building and mental model sharing would be beneficial to RRTs since it is a means for meeting goals of the RRT to promote patient safety.

Conclusion

This study examined staff nurses’ perceptions of the effect of RRT content and process support for managing patient deterioration on individuals, groups and the hospital organization. Findings showed that RRT support influenced maintenance and building of participants’ mental models for all levels, indicating that training was successful. An open-ended question on overall impressions, advantages and disadvantages of the team supported these findings. More education on managing patient deterioration is needed by staff nurses who are highly dependent upon the support they receive from the RRT staff. If staff nurses are able to build on their existing mental models of patient deterioration, it will lead to better patient outcomes. In the words of Dr. Peter Safar (1974), an originator of critical care medicine, “The most sophisticated intensive care often becomes unnecessarily expensive terminal care when the pre-ICU system fails.”
References


*Critical Care Medicine, 22*, 244-247.


*Anesthesia, 54*, 853-860.


*Clinical Nursing Research, 6*, 45-58.


APPENDIX A

Letter of Information and Consent

Dear Nurse Colleague:

I am a graduate student in the School of Nursing at Queen’s University, under the supervision of Dr. Ena Howse. I am conducting a study as part of the requirements for a master’s degree. The purpose of this study is to determine staff nurses’ perceptions about Rapid Response Teams. It is believed that these teams are helpful in promoting early recognition of patient deterioration and rapid response to changes in a patient’s condition that might lead to respiratory and cardiac arrests.

I am inviting you to participate because you are a staff nurse in a unit of an acute care hospital and will have first-hand knowledge of the influence of the Rapid Response Team on yourself, your immediate work group and your hospital. However, if you work in the intensive care unit, emergency room or operating room, you are asked to return your uncompleted survey to me in the stamped envelope that is provided. Moreover, any nurses who ‘float’ to areas of a hospital that use the rapid response teams are asked to please fill out this survey.

This study requires completion of a questionnaire, which should take about 10 to 20 minutes of your time to complete. Ticking or circling items is required for most items and short answers are required for several questions at the end of the survey.

Your participation in this study is voluntary and you may withdraw from the study at any time. Your name and address was obtained from the College of Nurses of Ontario. The College’s involvement in this research is limited to the provision of a mailing list. The College does not endorse or participate in this research in any manner.
No harm is anticipated from participating in this study, but it is expected that information from this study will increase our understanding of how Rapid Response Teams work. The long term benefit from sharing your knowledge may lead to an improvement in the care of seriously ill hospital patients.

Your responses will be kept confidential and anonymous. Surveys will be coded and stored in a locked file cabinet. Only my supervisor and I will have access to the raw data. You and your hospital will not be identified in any published reports. Your confidentiality will be protected, data complied will not be released for commercial or other purposes, and that the release of such information does not reflect implicit or explicit endorsement or support of the CNO.

By completing the enclosed survey and mailing it back in the self addressed, postage paid envelope, you will be providing implied consent to participate in this study. I would greatly appreciate your response within two to four weeks after receiving this survey.

If you require more information about the study or have concerns, you may contact me at 613-484-9026 or by e-mail at 0js28@queensu.ca; my supervisor, Dr. Ena Howse (613-533-2668, ext. 74747; howsee@queensu.ca); Dr. Cynthia Baker (613-533-2666, ext. 32669; bakerc@post.queensu.ca), Director of the School of Nursing and Dr. Albert Clark,Chair, Queen’s University Health Sciences and Affiliated Teaching Hospitals Research Ethics Board (613-533-6081). Thank you very much for your participation.

Yours sincerely,

Jagdeep K. Johal, BSc.N. M.Sc ( c )
Queen’s University School of Nursing, 92 Barrie St., Kingston, Ontario, K7L 3N6
APPENDIX B

Diagram of Mental Model Measures

Content Support → Mental Model Maintenance Self

Content Support → Mental Model Maintenance Group

Mental Model Maintenance Organization

Content Support → Mental Model Building Self

Content Support → Mental Model Building Group

Mental Model Building Organization

Process Support → Mental Model Maintenance Self

Process Support → Mental Model Building Group

Mental Model Building Organization
APPENDIX C

Instruments

Mental Model Measures

This 46-point instrument was adapted from an instrument published by Tomblin (2005) that was used to assess a group decision making model in a management setting. The adapted instrument assesses a hospital staff nurse’s perceptions of a) the extent to which a Rapid Response Team provided content support (e.g. information) and process support (e.g. promotion of communication, interactions) for managing patient deterioration before an imminent collapse; b) mental model maintenance (self, group, organization) and mental model building (self, group, organization); overall impressions of the Rapid Response Team and sociodemographic data.

Subscales

Content Support. Content support is a 5-item subscale designed to assess the perceived content support provided by RRTs when managing a deteriorating patient. Content support is provided in data, information and knowledge procession without regard to the participation or involvement of the group members (Tomblin, 2005). Cronbach’s alpha reliabilities were .84 for a pre-test and .89 for the present study.

Items for content support:

To what extent was the rapid response team used to:

| 1. Gain general information about managing patient deterioration? | Never | 1 2 3 4 5 6 7 |
| 2. Predict patient outcomes? | 1 2 3 4 5 6 7 |
| 3. Get information on caring for patients with specific problems? | 1 2 3 4 5 6 7 |
| 4. Discover trends or patterns in managing patient deterioration? | 1 2 3 4 5 6 7 |
5. Stay up to date or review information about managing patient deterioration?  

   1  2  3  4  5  6  7

**Process Support.** Process support was measured with 4 items, designed to assess the perceived process support received from RRTs when managing a deteriorating patient. This support is seen in changes made to verbal or non-verbal exchanges of information, attitudes, beliefs or procedures (Tomblin, 2005). The items address communication and interaction with other health care professionals and any advice that is received from the RRTs. In a pre-test of instruments, the Cronbach alpha reliability was .91 and in the study the Cronbach alpha reliability was .94.

Items for process support:

To what extent was the rapid response team was used to:

<table>
<thead>
<tr>
<th>Item</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Exchange ideas and information within a group on how to handle patient deterioration?</td>
<td>1  2  3  4  5  6  7</td>
</tr>
<tr>
<td>7. Generate ideas within a group on handling patient deterioration?</td>
<td>1  2  3  4  5  6  7</td>
</tr>
<tr>
<td>8. Maintain a flow of communication in a group regarding management of patient deterioration?</td>
<td>1  2  3  4  5  6  7</td>
</tr>
<tr>
<td>9. Gain advice from rapid response team members on communication and interaction with a group after you have placed a call to the team?</td>
<td>1  2  3  4  5  6  7</td>
</tr>
</tbody>
</table>

**Mental Model Maintenance.** In this study, mental model maintenance was assessed with items pertaining to self (6 items), group (6 items) and organization (4 items). Mental model maintenance is a form of learning in which basic routines seem to be appropriate. New information fits into the models and confirms them (Tomblin, 2005). Mental model maintenance for self is related to what ideas the RNs maintain about patient deterioration and themselves. In the pre-test, the Cronbach alpha reliability was
.79 and in the study, the Cronbach alpha reliability was .94. Mental model maintenance for group are the ideas that a group maintains when caring for a deteriorating patient. In the pre-test, the Cronbach alpha reliability was .91 and in the study the Cronbach alpha reliability was .92. Mental model maintenance for organizations are concepts are maintained while patient deterioration is occurring at an organizational level. In the pre-test, the Cronbach alpha reliability was .70 and in the study, the Cronbach alpha reliability was .79.

Items for mental model maintenance of self:

Regarding management of patient deterioration, to what extent did the rapid response team help you to:

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<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th>Extensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>10. Justify your decisions on managing patient deterioration?</td>
<td>Never</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>11. Verify your assumptions about managing patient deterioration?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>12. Maintain your previous perspectives about managing patient deterioration?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>13. Support your actions about managing patient deterioration?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>14. Reinforce the value of early intervention in the management of patient deterioration?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>15. Validate your point of view about managing patient deterioration?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

Items for mental model maintenance of group:

Regarding management of patient deterioration, to what extent did the rapid response team help you to:

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<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th>Extensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>22. Maintain current group practices that you would use in a similar situation?</td>
<td>Never</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>23. Support group actions and practices?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>24. Justify collective decisions and practices?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>25. Share previous beliefs, views, and outlooks?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>
26. Retain/recall knowledge on how to manage patient deterioration?

27. Evaluate knowledge on how to manage patient deterioration?

<table>
<thead>
<tr>
<th>Items for mental model maintenance of organization:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regarding management of patient deterioration, to what extent did the rapid response team help you to:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>34. Support existing hospital routines (e.g. policies, procedures) for managing patient deterioration?</th>
<th>Never</th>
<th>Extensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>35. Correct errors and improve practices related to problems in managing patient deterioration?</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>36. Provide continuing education on the use of rapid response teams (e.g. posters, seminars, workshops)?</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>37. Monitor risks to patient safety that could lead to patient deterioration?</th>
<th>1 2 3 4 5 6 7</th>
</tr>
</thead>
</table>

**Mental Model Building.** In this study, mental model building items are divided into 3 subscales pertaining to self (6 items), group(6 items) and organization (4 items). Mental model building is a type of learning in which mental models are changed to fit new knowledge and new environments and to handle disconfirming information (Tomblin, 2005). Mental model building for self is when the ideas and concepts that a person has are built upon, and new knowledge increase their awareness of their current view of that idea or concept. In the pre-test, the Cronbach alpha reliability was .81 and in the study, the Cronbach alpha reliability was .92. Mental model building for group is the process of developing and refining mental models that are common to individuals that compromise the group (Tomblin, 2005). In the pre-test, the Cronbach alpha reliability was .81 and in the study, the Cronbach alpha reliability was .92. Mental model building of organizations occurs when organizations change their routines based on new ideas and
concepts. New items were constructed for organization, following the pattern of the subscales for self and group. Literature was used to identify items that reflect maintenance and building of organization-related mental models. In the pre-test, the Cronbach alpha reliability was .87 and in the study, the Cronbach alpha reliability was .83.

**Items for mental model building of self:**

Regarding management of patient deterioration, to what extent did the rapid response team help you to:

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>16. Challenge your outlook about managing patient deterioration?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>17. Foster your creativity about managing patient deterioration?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>18. Re-orient your thinking on managing patient deterioration?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>19. Expand your scope about managing patient deterioration?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>20. Question your preconceptions about managing patient deterioration?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>21. Appreciate the views of others about managing patient deterioration?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

**Items for mental model building of group:**

Regarding management of patient deterioration, to what extent did the rapid response team help you to:

<table>
<thead>
<tr>
<th>Item</th>
<th>Rating Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>28. Create new knowledge on how to manage patient deterioration?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>29. Share new lines/patterns of thought on patient deterioration?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>30. Change existing group routines for managing patient deterioration?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>31. Create new group routines for managing patient deterioration?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
<tr>
<td>32. Analyze group performance in managing patient deterioration?</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>
33. Share knowledge about managing patient deterioration? 1 2 3 4 5 6 7

Items for mental model building of organization:

Regarding management of patient deterioration, to what extent did the rapid response team help you to:

38. Cause changes to hospital routines for managing patient deterioration (e.g. establish criteria for rapid response teams)?

39. Create new routines (e.g. staff training for rapid response)?

40. Stimulate questioning of effectiveness of changes (e.g. rapid response team) to improve management of patient deterioration?

41. Motivates staff to use the rapid response teams for managing patient deterioration and reduction of patient mortality in the hospital?

Overall Impressions. The overall impressions are a 4 item scale of a 46 item instrument that was used for descriptive statistics only. The overall impressions were a scale to assess how RNs felt about the RRTs and if they felt the RRT helped in caring for deteriorating patients. A few examples are: “How successful has the team been in improving early recognition of patient deterioration” and “How much more knowledgeable were you as a result of having the team to manage patient deterioration.” In the pre-test, the Cronbach alpha reliability was .83 and in the study, the Cronbach alpha reliability was .84.

Items for overall impressions:

42. Overall, how successful has the team has been in improving early recognition of patient deterioration? 1 2 3 4 5 6 7

43. Overall, how successful has the team has been in improving the tendency of staff nurses to call for help before patient deterioration is obvious? 1 2 3 4 5 6 7
44. How much more knowledgeable were you as a result of having used the team to manage patient deterioration?

45. Does support by the team reduce your work-related stress?

Exploratory Question

An open-ended question “What was the greatest advantage and disadvantage from using the rapid response team?” This information was used to gather opinions. The item for the open-ended questions was:

Please answer the question:

46. What was the greatest advantage and disadvantage from using the rapid response team? (please describe briefly)

Sociodemographic Data

Participants were asked to report their gender, nursing category, age range in 5 year intervals from 20 years to over 50 years, type of unit, number of people they work with per shift (excluded from analysis), education (diploma, undergraduate, graduate), experience in 5 year intervals from 1 year to over 25 years, critical care experience (yes, no, number of years), RRT availability (yes, no), training from RRT (yes, no), how many times they have called the RRT (0, 1, 2, 3, 4, 5 or more), bed size (less than 300, greater than 300) and if they use the “calling criteria” (yes, no) (see Appendix G) for criteria.

Sociodemographic Data
About You

Please answer the following questions:

1. Female ________ Male ________

2. Nursing Category (e.g. RN, RPN) ______

3. Age range:
   ___ 20 – 25  _____ 46-50
   ___ 26 – 30  _____ 51-55
   ___ 31 - 35  _____ 56-60
4. Type of Unit

5. Number of people you work with per shift:
   ___  2-5   ___  6-10   ___  11-20   ___  21-50   ___  over 50

6. Education (highest level achieved):
   - Diploma/Certificate (Please specify)
   - Undergraduate Degree (Please specify)
   - Graduate Degree (Please specify)

7. Experience
   Years of experience:
   ___ Less than 1
   ___ 1-5   ___ 6-10   ___ 11-15   ___ 16-20   ___ 21-25   ___ 26-30   ___ 31-35   ___ 36-40   ___ 41-45   ___ 46-50   ___ 51-55   ___ 56-60   ___ 61-65   ___ 66 and older

8. Critical care experience (e.g. Emergency, ICU, step-down unit, other)
   Yes ___ No___. If yes, please specify

9. Years of critical care experience (Please specify)

10. Does your hospital have a Rapid Response team?  Yes___ No___.
    If yes, how long has this system been used in your organization (if known)?

11. Bed-size at the hospital you work at:
    _____ Less than 300
    _____ Greater than 300

12. Have you received training from a Rapid Response Team?  Yes___ No___.
    If yes, briefly describe the training that you received

13. How many times have you participated in cases of patient deterioration involving the Rapid Response Team?
    ___ 0   ___ 1   ___ 2   ___ 3   ___ 4   ___ 5 or more

14. Do you use the criteria for calling the Rapid Response Team at your workplace?
    Yes_____ No_____
    Comments about the calling criteria:
APPENDIX D

Sample of Survey

A Survey to Assess Staff Nurses’ Perceptions of Rapid Response Teams in Acute Care Hospitals

Jagdeep K. Johal, R.N., B.Sc.N.
Queen’s University School of Nursing
December 1, 2008
A Survey to Assess Staff Nurses’ Perceptions of Rapid Response Teams in Acute Care Hospitals

General Instructions:

The purpose of this survey is to collect information about your perceptions of Rapid Response Teams (RRTs). It is believed that RRTs can assist nurses who do not have quick access to intensive care or resuscitation resources to respond to cues of patient deterioration and to intervene in a timely manner.

NOTE: If you work in the intensive care unit, emergency room or operating room please DO NOT fill out the survey, but return it to me using the enclosed postage-paid envelope. If you float to these areas and work in other areas of the hospital, please take the time to fill it out. Thank you!

The survey consists of an information letter and questions that ask for your views about the support you have received from a RRT in managing patient deterioration and how it has influenced your learning. In addition, it asks you to consider how the RRT has provided support and influenced learning outcomes of your work group and hospital. It should take approximately 10 to 20 minutes to answer the questions. You may skip any question that you prefer not to answer. Please be assured that your responses will be kept confidential and you will not be identified in any way.

Please return your completed survey in the enclosed, stamped envelope. You may receive a follow-up reminder two weeks after you have returned your survey. If you have already mailed your response, thank you!

Your help with this study is greatly appreciated. Thank you!
Letter of Information and Consent

Dear Nurse Colleague:

I am a graduate student in the School of Nursing at Queen’s University, under the supervision of Dr. EnaHowse. I am conducting a study as part of the requirements for a master’s degree. The purpose of this study is to determine staff nurses’ perceptions about Rapid Response Teams. It is believed that these teams are helpful in promoting early recognition of patient deterioration and rapid response to changes in a patient’s condition that might lead to respiratory and cardiac arrests.

I am inviting you to participate because you are a staff nurse in a unit of an acute care hospital and will have first-hand knowledge of the influence of the Rapid Response Team on yourself, your immediate work group and your hospital. However, if you work in the intensive care unit, emergency room or operating room, you are asked to return your uncompleted survey to me in the stamped envelope that is provided. Moreover, any nurses who ‘float’ to areas of a hospital that use the rapid response teams are asked to please fill out this survey.

This study requires completion of a questionnaire, which should take about 10 to 20 minutes of your time to complete. Ticking or circling items is required for most items and short answers are required for several questions at the end of the survey.

Your participation in this study is voluntary and you may withdraw from the study at any time. Your name and address was obtained from the College of Nurses of Ontario. The College’s involvement in this research is limited to the provision of a mailing list. The College does not endorse or participate in this research in any manner. No harm is anticipated from participating in this study, but it is expected that information
from this study will increase our understanding of how Rapid Response Teams work. The long term benefit from sharing your knowledge may lead to an improvement in the care of seriously ill hospital patients.

Your responses will be kept confidential and anonymous. Surveys will be coded and stored in a locked file cabinet. Only my supervisor and I will have access to the raw data. You and your hospital will not be identified in any published reports. Your confidentiality will be protected, data complied will not be released for commercial or other purposes, and that the release of such information does not reflect implicit or explicit endorsement or support of the CNO.

By completing the enclosed survey and mailing it back in the self addressed, postage paid envelope, you will be providing implied consent to participate in this study. I would greatly appreciate your response within two to four weeks after receiving this survey.

If you require more information about the study or have concerns, you may contact me at 613-484-9026 or by e-mail at 0js28@queensu.ca (the first character in this email address is the number ‘zero’ not the letter ‘O’); my supervisor, Dr. EnaHowse (613-533-2668, ext. 74747; howsee@queensu.ca); Dr. Cynthia Baker (613-533-2666, ext. 32669; bakerc@post.queensu.ca), Director of the School of Nursing and Dr. Albert Clark, Chair, Queen’s University Health Sciences and Affiliated Teaching Hospitals Research Ethics Board (613-533-6081). Thank you very much for your participation.

Yours sincerely,

Jagdeep K. Johal, BSc.N. M.Sc( c )
Queen’s University School of Nursing
92 Barrie St.
Kingston, Ontario, K7L 3N6
**Perceptions of the Rapid Response Team:**

Rapid response teams provide information to help staff solve problems related to patient deterioration and helps groups interact to solve problems. Thinking about your most valuable and/or extensive experiences in using the rapid response team support system, to what extent did the rapid response team help you with the following. Choose a number between 1 and 7 which best describes your view (1= Never and 7= Extensive)

To what extent was the rapid response team was used to:

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Gain general information about managing patient deterioration?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2. Predict patient outcomes?</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Get information on caring for patients with specific problems?</td>
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<td>4. Discover trends or patterns in managing patient deterioration?</td>
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<td>5. Stay up to date or review information about managing patient deterioration?</td>
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<tr>
<td>6. Exchange ideas and information within a group on how to handle patient deterioration?</td>
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<td>7. Generate ideas within a group on handling patient deterioration?</td>
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<tr>
<td>8. Maintain a flow of communication in a group regarding management of patient deterioration?</td>
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<tr>
<td>9. Gain advice from rapid response team members on communication and interaction with a group after you have placed a call to the team?</td>
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</tbody>
</table>
**Perceptions of yourself and the Rapid Response Team:**

Thinking about yourself, what is your perception of how you maintained previously learned knowledge about how to manage patient deterioration following training by or contact with a rapid response team member?

Choose the number between 1 and 7 which best describes your view (1 = Never and 7 = Extensive).

Regarding management of patient deterioration, to what extent did the rapid response team help you to:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Never</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>Extensive</th>
</tr>
</thead>
<tbody>
<tr>
<td>10.</td>
<td>Justify your decisions on managing patient deterioration?</td>
<td></td>
<td></td>
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<td>11.</td>
<td>Verify your assumptions about managing patient deterioration?</td>
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<td>12.</td>
<td>Maintain your previous perspectives about managing patient deterioration?</td>
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<td>13.</td>
<td>Support your actions about managing patient deterioration?</td>
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<td>14.</td>
<td>Reinforce the value of early intervention in the management of patient deterioration?</td>
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<td>15.</td>
<td>Validate your point of view about managing patient deterioration?</td>
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<tr>
<td>16.</td>
<td>Challenge your outlook about managing patient deterioration?</td>
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<tr>
<td>17.</td>
<td>Foster your creativity about managing patient deterioration?</td>
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<td>18.</td>
<td>Re-orient your thinking on managing patient deterioration?</td>
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<td>19.</td>
<td>Expand your scope about managing patient deterioration?</td>
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<td>20.</td>
<td>Question your preconceptions about managing patient deterioration?</td>
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<td>21.</td>
<td>Appreciate the views of others about managing patient deterioration?</td>
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</tbody>
</table>
**Perceptions of your group and the Rapid Response Team:**

Thinking about your work group, what is your perception of how the group learned to manage patient deterioration and change their views on how to handle new situations related to patient deterioration following contact with the rapid response team?

Choose the number between 1 and 7 which best describes your view. (1 = None and 7 = Extensive)

To what extent did the use of the rapid response team help the group to:

<table>
<thead>
<tr>
<th>Question</th>
<th>Never</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>22. Maintain current group practices that you would use in a similar situation?</td>
<td></td>
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<tr>
<td>23. Support group actions and practices?</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>24. Justify collective decisions and practices?</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>25. Share previous beliefs, views, and outlooks?</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>26. Retain/recall knowledge on how to manage patient deterioration?</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
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<tr>
<td>27. Evaluate knowledge on how to manage patient deterioration?</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
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<tr>
<td>28. Create new knowledge on how to manage patient deterioration?</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>29. Share new lines/patterns of thought on patient deterioration?</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>30. Change existing group routines for managing patient deterioration?</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>31. Create new group routines for managing patient deterioration?</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>32. Analyze group performance in managing patient deterioration?</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>33. Share knowledge about managing patient deterioration?</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>
**Perceptions about Your Hospital and Rapid Response Team**

Thinking about your hospital, to what extent has the rapid response teams helped the hospital to:

34. Support existing hospital routines (e.g. policies, procedures) for managing patient deterioration?  
   - Never 1 2 3 4 5 6 7 
   - Extensive

35. Correct errors and improve practices related to problems in managing patient deterioration?  
   - Never 1 2 3 4 5 6 7 
   - Extensive

36. Provide continuing education on the use of rapid response teams (e.g. posters, seminars, workshops)?  
   - Never 1 2 3 4 5 6 7 
   - Extensive

37. Monitor risks to patient safety that could lead to patient deterioration?  
   - Never 1 2 3 4 5 6 7 
   - Extensive

38. Cause changes to hospital routines for managing patient deterioration (e.g. establish criteria for rapid response teams)?  
   - Never 1 2 3 4 5 6 7 
   - Extensive

39. Create new routines (e.g. staff training for rapid response)?  
   - Never 1 2 3 4 5 6 7 
   - Extensive

40. Stimulate questioning of effectiveness of changes (e.g. rapid response team) to improve management of patient deterioration?  
   - Never 1 2 3 4 5 6 7 
   - Extensive

41. Motivates staff to use the rapid response teams for managing patient deterioration and reduction of patient mortality in the hospital?  
   - Never 1 2 3 4 5 6 7 
   - Extensive
**Overall impressions of the Rapid Response Team:**

The final questions ask about your overall impressions of the rapid response team in your hospital.

<table>
<thead>
<tr>
<th>Question</th>
<th>Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>42. Overall, how successful has the team been in improving early recognition of patient deterioration?</td>
<td>Not at all 1 2 3 4 5 6 Extremely 7</td>
</tr>
<tr>
<td>43. Overall, how successful has the team been in improving the tendency of staff nurses to call for help before patient deterioration is obvious?</td>
<td>Not at all 1 2 3 4 5 6 Extremely 7</td>
</tr>
<tr>
<td>44. How much more knowledgeable were you as a result of having used the team to manage patient deterioration?</td>
<td>Not at all 1 2 3 4 5 6 Extremely 7</td>
</tr>
<tr>
<td>45. Does support by the team reduce your work-related stress?</td>
<td>Not at all 1 2 3 4 5 6 Extremely 7</td>
</tr>
</tbody>
</table>

Please answer the question:

46. What was the greatest advantage and disadvantage from using the rapid response team? (please describe briefly)
Sociodemographic Data

About You

Please answer the following questions:

1. Female ________    Male __________

2. Nursing Category (e.g. RN, RPN) ______

3. Age range:
   ___ 20 – 25  ___ 46-50
   ___ 26 – 30  ___ 51-55
   ___ 31 - 35  ___ 56-60
   ___ 36 - 40  ___ 61-65
   ___ 41-45  ___ 66 and older

4. Type of Unit___________________________________________________________

5. Number of people you work with per shift:
   ___ 2-5  ___ 6-10  ___ 11-20  ___ 21-50  ___ over 50

6. Education (highest level achieved):
   Diploma/Certificate (Please specify)_____________________________________
   Undergraduate Degree (Please specify)_____________________________________
   Graduate Degree (Please specify)________________________________________

7. Experience

   Years of experience:
   ___ Less than 1
   ___1- 5  ___16-20
   ___6-10  ___21-25
   ___11-15  ___over 25

8. Critical care experience (e.g. Emergency, ICU, step-down unit, other)

   Yes ___ No ___. If yes, please specify_____________________________________

9. Years of critical care experience (Please specify)__________________________
10. Does your hospital have a Rapid Response team? Yes ___ No ___
   If yes, how long has this system been used in your organization (if known)?
   ____________________________________________________________________

11. Bed-size at the hospital you work at:
   _____ Less than 300
   _____ Greater than 300

12. Have you received training from a Rapid Response Team? Yes ___ No ___
   If yes, briefly describe the training that you received ________________________
   ____________________________________________________________________

13. How many times have you participated in cases of patient deterioration involving the
    Rapid Response Team?
       ____0 ____3
       ____1 ____4
       ____2 ____5 or more

14. Do you use the criteria for calling the Rapid Response Team at your workplace?
    Yes ___ No ____
    Comments about the calling criteria:
APPENDIX E

First Reminder at Two Weeks

Dear Nurse Colleague,

Recently you received my request to participate in a survey to assess the influence of Rapid Response Teams on staff management of patient deterioration. If you have filled out the survey, thank you! If not, please take a little time to complete it. Your contribution is important. If you need another survey, please email me at 0js28@queensu.ca. I look forward to your response.

Sincerely,

Jagdeep K. Johal, BSc.N., MSc. (c)
Queen’s University School of Nursing
92 Barrie Street
Kingston, Ontario
K7L 3N6
APPENDIX F

Second Reminder at Four Weeks - Postcard

Front:

Dear Nurse Colleague,

Recently you received my request to participate in a survey to assess the influence of rapid response teams on staff management of patient deterioration. If you have filled out the survey, thank you! If not, please take a little time to complete it. Your contribution is important! If you need another survey please email me at 0js28@queensu.ca. I look forward to your response.

Sincerely,
Jagdeep K. Johal, BSc.N, MSc. (c)
Queen's University School of Nursing
92 Barrie Street
Kingston, Ontario
K7L 3N6

Back:

Dear Nurse Colleague,

Recently you received my request to participate in a survey to assess the influence of rapid response teams on staff management of patient deterioration. If you have filled out the survey, thank you! If not, please take a little time to complete it. Your contribution is important! If you need another survey please email me at 0js28@queensu.ca. I look forward to your response.

Sincerely,
Jagdeep K. Johal, BSc.N, MSc. (c)
Queen's University School of Nursing
92 Barrie Street
Kingston, Ontario
K7L 3N6
APPENDIX G

Calling Criteria

The following information is the calling criteria for RRTs from the Ontario Ministry of Health and Long-Term Care (2007):

<table>
<thead>
<tr>
<th>Category</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airway</td>
<td>• Threatened</td>
</tr>
<tr>
<td></td>
<td>• Stridor</td>
</tr>
<tr>
<td></td>
<td>• Excessive secretions</td>
</tr>
<tr>
<td>Breathing</td>
<td>• Respiratory rate &lt; 8 or &gt; 30</td>
</tr>
<tr>
<td></td>
<td>• Distressed breathing</td>
</tr>
<tr>
<td></td>
<td>• Saturations &lt; 90% on = 50% oxygen or 6 liters/min</td>
</tr>
<tr>
<td>Circulation</td>
<td>• Systolic blood pressure &lt; 90 mmHg or &gt; 200 mmHg or decrease 40 mmHg</td>
</tr>
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<td>• Heart rate &lt; 40 or &gt; 130</td>
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<tr>
<td>Disability</td>
<td>• Decreased level of consciousness</td>
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<td></td>
<td>• Decrease in GCS &gt; 2 points</td>
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<td></td>
<td>• Signs or symptoms of a stroke</td>
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<td></td>
<td>• Prolonged seizures</td>
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<tr>
<td>Other</td>
<td>• Urine output &lt; 100 mL over 4 hours (except dialysis patients)</td>
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<tr>
<td></td>
<td>• Serious concern about your patient</td>
</tr>
</tbody>
</table>
APPENDIX H

Sample Size Calculation

Part 1: \[ n = \left( \frac{z}{m} \right)^2 p(1 - p) \]

Part 2: \[ n' = \frac{n}{1 + \frac{n}{N}} \]

(Source: Data Analysis Australia, 2007)