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Effects Of Rapid Response Teams on Patient Outcomes After Nursing Education

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EFFECTS OF THE RAPID RESPONSE TEAM ON PATIENT OUTCOMES AFTER NURSING EDUCATION

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EFFECTS OF THE RAPID RESPONSE TEAM AFTER NURSING EDUCATION

An Abstract of Scholarly Project by
Abby L. Zeb

The main purpose of this study was to review the number of calls of the rapid response team (RRT) and the potential change in cardiac arrest rates before and after education of the floor nurses concerning RRT. A quantitative study was completed using a retrospective chart review to observe the number of calls of the RRT as well as patient cardiac arrest rates after education of the floor nurses concerning the RRT. Chart reviews were conducted on all rapid response calls seven months after nursing education was complete and during a seven-month period one year after completion of nursing education. Data was analyzed using Statistical Analysis Software (SAS). Data analyses included chi-square analyses. When analyzing the number of rapid response calls, a chi-square test was done and showed significance in the number of rapid response calls after nursing education [$\chi 2(2) = 8.2472$, $p = 0.0162$]. The results support the main research question of after educating nurses about the RRT, did the number of call increase and was the increased sustained one year later. There were no significant results in the data regarding improvement in cardiac arrest rates after nursing education. The results of this study may not be repeated in other hospitals that use a rapid response team. The number of participants in this study was small. This study showed that educating the nurses once helped increase utilization of the RRT; however, there was indication that yearly education may be needed. The data one year later showed a decline in the number of calls from the period immediately after education but remained higher than the pre-

education period. Providing the education to nurses yearly and to newly hired nurses as part of the orientation process can help ensure that the RRT continue to be utilized.

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Chapter I

Introduction

Description of the Clinical Issue

Approximately 43 million adverse events happen each year in hospitals worldwide and are accountable for increasing hospital length of stay, decreasing quality of life, and increasing mortality rates (Forster et al., 2003; Vincent et al., 2001). These statistics led hospitals in Australia to develop medical emergency teams (MET) that respond to patients who shows signs of physiologic instability. Research from the late 1990s showed cardiopulmonary arrests were often preceded by signs of physiologic instability (DeVita et al., 2004). Research conducted by Schein et al. (1990) found clinicians had observed new complaints or signs of deterioration eight hours prior to the event for 85% of the patients who experienced cardiopulmonary arrest. Between 44,000 and 98,000 inpatient hospital deaths annually are the result of missed changes in a deteriorating patient that could have been avoided (Byrne et al., 2007). Failure to identify and respond to a deteriorating patient and deliver intensive care has led to an increased risk of adverse outcomes in hospitalized patients that could have been prevented if patient deterioration had been recognized and responded to sooner (Massey et al., 2014). The rapid response team concept was first introduced in Australia by Dr. Kenneth Hillman in the early 1990s. Hillman was becoming concerned with the

number of patients who were experiencing cardiac arrest on the medical ward. He began asking what events were occurring in the time prior to the patient's cardio-respiratory arrests and what intervention could be done to stop these deteriorations before the patient arrests (Winters & DeVita, 2011).

There are many issues that have encouraged the need of rapid response teams. Simmonds (2005) recognized this problem, "The failure in planning, communicating, and recognizing deteriorating patient conditions has led to failure to rescue" (p.41). Healthcare has responded by bringing rapid response teams to the bedside to help before cardiac or respiratory arrest occurs. Franklin and Mathew (1994) reported "66% of patients had abnormal signs and symptoms within six hours of cardiac arrest" (p. 245). Buist et al. (2004) observed that certain abnormal clinical signs, such as altered level of consciousness, hypoxia, tachypnea, hypotension, and bradycardia, were related to increased risk of hospital mortality. A study by Bellomo et al. (2004) concluded "early detection of warning signs along with proactive management reduced postoperative emergency transfers to the intensive care unit by fifty-eight percent and deaths by thirty-seven percent" (p. 916).

Medical emergency teams were introduced to improve patient outcomes by recognizing patients showing physiological deterioration before a cardiac or respiratory event (Hillman et al., 2005). These teams were led by physicians and brought critical care expertise to the bedside of the rapidly deteriorating patient. Preventing the patient from experiencing a cardiac arrest was the goal.

Hospitals in the United States formed similar teams called rapid response teams (RRT). An informal RRT was first implemented in a hospital in central Texas in 2005

(Angel, 2016). RRTs help to lower inpatient mortality rates by identifying and treating patients who are not in the intensive care unit and who are at risk for physiological deterioration (Mailey et al., 2006). The average age of the hospitalized patient on a general medical floor is 65 to 69 (NHS, 2016). The aging population has increased the number of complex acute and chronic diseases. These patients may be admitted to the general medical floor and can deteriorate quickly. They are at a disadvantage because of scope of practice issues, resource availability, and the high nurse to patient ratio (Hillman, et al., 2001). A rapid response is called by the bedside nurse when the patient shows signs of distress or changes in vital signs. The bedside nurse is also encouraged to call a rapid response if they have a "gut" feeling that something is not right. The intensive care nurse is usually the primary responder. The RRT is composed of an intensive care nurse, respiratory therapist, and, at some hospitals, a physician. The goal of the team is to aggressively intervene to reduce the number of cardiac arrests and ICU admissions (Mailey et al., 2006). This is done by bringing ICU expertise to the bedside of a deteriorating patient on the medical ward.

The Institute for Health Care Improvement (IHI) launched the 100,000 Lives Campaign in December of 2004. The IHI is an organization that leads to healthcare improvement throughout the world. The 100,000 Lives campaign was started with the goal to significantly reduce morbidity and mortality in American health care. The idea of the campaign was to save or extend as many as 100,000 lives over an eighteen-month period. One of the steps of this campaign, to decrease harm and deaths, was to call the RRT at the initial sign of patient deterioration. In 2008, a requirement by the Joint Commission was for hospitals to implement a process that allowed health care workers to

acquire help from specialists when their patient's condition was deteriorating (Stolldorf, 2008). This led to development of RRTs in hospitals across the nation.

Significance

According to the Robert Wood Johnson Foundation (2006), the increasingly common use of RRTs in hospitals is simultaneously saving patients' lives and boosting the nursing profession. Hospital staff nurses have always relied on each other for advice when they are worried about their patients. Nurses support each other by confirming a coworker's judgement and offering guidance or help when needed. This kind of help and support has become established in hospitals across the world because nurses are calling for help early on, which may lead to crises being avoided. This is done by calling a hospital's RRT when a patient initially starts to show signs or symptoms of worsening conditions. According to Simmonds (2005), rapid response teams have been shown to reduce the incidence of cardiac arrests outside the ICU by 50%. Nurses recognize that RRTs are an essential outcome even if cardiac arrests were unchanged (Shapiro, Donaldson, & Scott, 2010). Nurses have voiced profound relief that RRTs were accessible to accelerate patient care.

Prior to the initiation of rapid response teams, the bedside nurse had only a few options when a patient was quickly deteriorating. The first call was the attending physician. The physician might have been slow to respond to the call or unavailable to come assess the patient. The second option was trying to handle the patient's rapid decline using the resources at hand. The problem is that many nursing units may not be adequately staffed with the resources to deal with rapidly declining patients. The third option was to call a code blue, which is not appropriate in all situations.

RRTs are not only a critical element regarding patient safety they can also help nurses feel more comfortable and at ease in a stressful work environment. A study by Stolldorf (2006) reported when medical floor nurses know that the RRT is available when needed, comfort is provided to them and they feel supported (p.8). Staff members benefit because they know an experienced critical care nurse is available when they have questions, someone they can have confidence in, and they can get a second opinion when they need one (Stolldorf, 2016, p.8) There is also more emphasis on shared learning, and this indicates that support is crucial in critical and challenging situations. Participants in a study by Stolldorf (2016) noted that learning occurs during RRT calls through instruction and observation (p.9). The RRT teaches staff how to better manage deterioration and help them learn how to reduce the workload associated with care of acutely ill patients.

Specific Purpose

The purpose of this study is to (a) examine the number of rapid response team calls before nursing education, (b) examine the number of RRT calls seven months after completion of nursing education as well as one year after education was complete, and (c) examine cardiac arrest rates before and after nursing education. The findings of this study will help to determine the effectiveness of nursing education of RRTs and help determine if more education is needed.

Theoretical Framework

In 1966, Avedis Donabedian projected the idea of looking at structure, process, and outcome to evaluate the quality of healthcare (Ayanian & Markel, 2016). Quality of care must be defined to evaluate it. Donabedian (1987) defined quality "as the technical performance of the professional practitioner to social standards of practice" (p.1745).

Donabedian also believed it should include the interpersonal relationships between patient and professional. This model has three components to evaluate the quality of care: structure, process, and outcomes. Donabedian (1987) states "this three-part approach to quality assessment is possible only because good structure increases the likelihood of good process, and good process increases the likelihood of a good outcome" (p. 1745). This model explores outcomes that occur because of structure and process. U.S. hospitals have a structure that has been characterized as complex, with fragmented systems and inherent risks, leading to adverse events (Jonas, Goldsteen, & Goldsteen, 2007). According to Donabedian (1987), the structure of care "includes the physical facility and operations related to the array of programs that provide care" (Stone et al., 2007, p. 573). Joint Commission accreditation of the hospital and board certification of physicians are ways that structure can be assessed. Team involvement and roles of each team member are applied to the structure of the rapid response team. Donabedian's model of care is appropriate to use when looking at the effectiveness of RRTs in the hospital setting.

According to the Donabedian model, process defines how structure is put into practice (Stone et al., 2007). Process can include the different skills of each team member and the interventions that they are able to perform. Process and outcome actions are observed and approved by the National Quality Forum and National Committee for Quality Assurance.

Outcome discusses the conclusions of the health care provided to the patient (Stone et al., 2007). For example, patient outcomes could be influenced by the processes that are used.

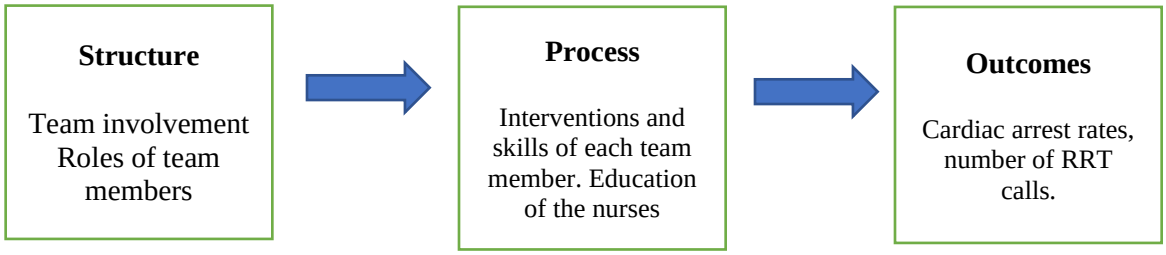

Figure 1. Key variables and their relationships to RRTs.

Project Questions

The purpose of this study is to evaluate the rapid response teams regarding cardiac arrest rates before and after education of the floor nurses about the purpose of the RRT. The goal of the study is to examine the relationship of rapid response teams and cardiac arrest rates before and after education was conducted. The practice questions being examined are as follows:

1) After the completion of nursing education, was there an increase or decrease in cardiac arrest rates?
2) Seven months after nursing education was completed, was there an increase or decrease in the number of RRT calls?
3) Has the RRT initiation rate increased or decreased in the one year past nursing education?

Definition of Key Terms

The following are definitions of various terms that will be used throughout the paper.

Rapid response team: "team of clinicians who bring critical care expertise to the bedside" (IHI, 2018).

Cardiac arrest: sudden cessation of function of the heart (NHLBI, 2019).

Logic Model

Table 1 Logic Model

Resources	Activities	Outputs	Outcomes	Impact
The following will be needed to successfully complete the project:	To assess the problem, the following will be done:	Once the activities are implemented the following will occur:	The previous activities will lead to the following outcomes:	If completed and implemented appropriately, the following will occur:
-Education materials for hospital employees on the topic of RRT and when to activate. -Relationship with Mercy Hospital. -Relationship with intensive care unit director, manger, and IT department.	-Hospital representatives will collect data regarding rapid response calls. - Hospital representative will collect data regarding in-hospital cardiac arrests.	-Education of staff nurses and hospital workers when a rapid response call is appropriate. -Educating family members and visitors of their ability to make a rapid response call.	- Majority of the hospital staff will participate in the RRT education. - There will be a reported decrease of in-hospital cardiac arrests.	- There will be a sustained decrease in cardiac arrests that occur on hospital units. - There will be a sustained increase in the number of rapid response calls to identify early warning signs of patient deterioration.

Summary

Rapid response teams were developed to intervene before the patient deteriorates to the point of cardiac arrest. Intervening early in situations where patients are showing signs of rapid deterioration can lead to a decrease in cardiac arrest rates as well as preventing transfers to the intensive care unit and emergent intubations. Rapid response teams have been implemented in many hospitals to activate appropriate resources to patients experiencing acute deterioration. The overall purpose of this study is to educate

hospital staff, family members, and visitors about calling the rapid response teams and then to assess what effects the rapid response team had on patient outcomes.

Chapter II

Review of Literature

Literature Synthesis

The goal of rapid response team implementation is to improve the outcomes of patients, reduce the risk of extending hospital length of stay, reduce unnecessary intensive care unit admissions, reduce cardiac arrests or mortality, and thus provide better patient care while reducing costs. Few studies have been conducted in the United States regarding rapid response teams and patient outcomes. The research available regarding the effects of RRTs on patient outcomes dates back ten to fifteen years. There is little recent data regarding this subject. The primary concept reviewed was the effect of rapid response teams on patient outcomes and adverse events including cardiac arrest, mortality, and length of stay. Other topics included a cost-effective analysis of rapid response teams and family involvement in the RRT. A search of literature was performed using CINAL plus full text and PubMed. Terms such as rapid response team, rapid response system, medical emergency team, and critical care outreach team were used in the search.

Patient Outcomes

Hospital-based health care in America is ever changing based on technology, health advancements, cost, and increasing demand for nurses. The health care system is

always striving for improved outcomes. RRTs are one way to help achieve these outcomes. Cardiac arrest, increased length of stay, in-hospital mortality, and unplanned admission to the intensive care unit are all adverse events. RRTs were designed to decrease adverse events. According to Simmonds (2005), RRTs have been shown to reduce the incidence of cardiac arrests outside the ICU by 50% and prior to ICU transfer by 25% to 30%. According to Chen et al (2009), half of adverse events are preventable.

A study conducted at Thomas Jefferson University hospital in Philadelphia showed that when rapid response calls increased throughout the hospital, non-ICU code blue and intubations decreased (Avis et al., 2016). A similar study by DeVita et al. (2004) was conducted to evaluate the incidence and outcomes of cardiopulmonary arrests since the implementation of a rapid response team. In this study, the RRT involved eight members that included physicians, nurses, and respiratory therapists. The incidences of cardiopulmonary arrests and emergencies with fatal outcomes were compared both before and after the implementation of the rapid response team. The results showed there was a "17% decrease in cardiopulmonary arrests, from 6.5 to 5.4 per 1000 admissions ($p=0.016$)" (DeVita et al. 2004, p. 253). The study also showed that prior to the implementation of the rapid response team, 55.2% of patients survived cardiopulmonary arrest and post-implementation had 58.9% of patients surviving a cardiopulmonary arrest (DeVita et al, 2004).

Mailey et al. (2006) conducted a study at Henry Ford Hospital in Detroit, Michigan. The study was conducted to implement a rapid response team in the hospital and to "contribute to a 25% reduction in the hospital standardized mortality rate in conjunction with other 100,000 lives campaign" (Mailey et al., 2006, p. 178). The rapid

response team consisted of a single nurse responder with the intensive care unit fellow as a resource. The results of the study showed hospital mortality rates trended down from 2.8% to 2.4% (Mailey et al., 2006). It also showed the goal of a 25 % reduction in hospital standardized mortality rates was achieved. Implementation of the rapid response team has decreased the length of hospital stay by half a day (Mailey et al., 2006).

Buist et al. (2002) conducted a study "to determine whether earlier clinical intervention by a rapid response team prompted by clinical instability in a patient could reduce the incidence of and mortality from unexpected cardiac arrest in hospital" (p. 137). The rapid response team consisted of two doctors and one intensive care unit nurse who "attended to clinically unstable patients immediately with resuscitation drugs, fluid, and equipment" (Buist et al, 2002, p. 139). The results showed before the rapid response team was implemented, unexpected cardiac arrest was 3.77 per 1000 hospital admission. This result decreased to 2.05 per 1000 after the implementation of a rapid response team (Buist et al, 2002). The study concluded, "in clinically unstable inpatients early intervention by a medical emergency team significantly reduces the incidence of and mortality from unexpected cardiac arrest in hospital" (Buist el al, 2002, p. 140).

In contrast, there are studies that show no change in patient outcomes when implementing an RRT. A study completed by Evans (2013), showed the mortality rate after a rapid response intervention was statistically smaller and the number of patient deaths was significantly lower. However, the data analysis did not produce significant evidence of a rapid response impact on the number of code blue calls or the number of admissions to the ICU (Evans, 2013). In the study by Devita et al. (2004), the number of fatal arrests did not change; 33% of patients died on the same day as the arrest.

A study conducted at St. Luke's Hospital in Kansas City, MO, took place between January 1, 2004 to August 31, 2007. A total of 24,193 patient admissions were evaluated prior to an implementation of a rapid response team. A total of 24,978 hospital admissions were evaluated after the implementation of an RRT. After the rapid response team implementations, hospital-wide code blue rates decreased from 11.2 to 7.5 per 1000 admissions (Chen et al., 2009). "This was not associated with a reduction in the primary end point of hospital-wide code rates" (Chen et al., 2009, p. 151). The study concluded that implementation of a rapid response team was not associated with a reduction in hospital wide code blue rates and mortality (Chen et al., 2009).

Hillman et al. (2005) conducted a study to determine if rapid response teams could decrease the incidence of cardiac arrests, unplanned admissions to the intensive care units, and death. The findings showed the introduction of the rapid response team had no effect on cardiopulmonary arrests (1.64 versus 1.31, p=0.736), unplanned ICU admissions (4.68 versus 4.19, p=0.599), and unexpected deaths (1.18 versus 1.06, p=0.752) (Hillman et al, 2005).

Many of the studies mentioned in the literature take place in a single hospital. This could relate to the success rates of the rapid response teams because the sample size was small. Interestingly, one study involved twenty-three hospitals, which showed no effect of the rapid response team on adverse outcomes. Hospitals have different ways of implementing the team. Some hospitals assign a physician to the rapid response team while some were composed of intensive care nurses and respiratory therapists. This could have affected the outcomes of the event. All the studies were quantitative and most used small sample sizes. There is conflicting research about the effects that a rapid

response team has in adverse outcomes. There is not much research from the last five years available.

Cost-Effective Analysis of the Rapid Response Team

Staffing an RRT requires either additional staff or adding additional responsibilities to existing staff. A study by Spaulding and Ohsfelt (2014) was conducted to "provide analysis for both total personnel costs associated with different rapid response teams and also the effectiveness compared to existing code blue teams" (p.194). The study concluded those "rapid response teams that shared personnel with the traditional cardiac arrest team, yet also added new personnel, provided better care at a reduced cost when looking at quality-adjusted life years six months after cardiac arrest" (Spaulding & Ohsfelt, 2014, p. 202).

Bonafide et al. (2014) conducted a study aimed to "model the financial costs and benefits of operating a rapid response team and determine the annual reduction in critical deterioration events required to offset the rapid response team costs" (p. 235). The results of the study showed "patients who had critical deterioration cost $99,773 more during their post-event hospital stay than transfers to the ICU that did not meet critical deterioration criteria" (Bonafide, 2014, p. 239). The annual cost for operating a rapid response team ranged from $287,145 for a nurse and respiratory therapist team with concurrent responsibilities to $2,358,112 for a nurse, respiratory therapist, and ICU attending physician freestanding team (Bonafide, 2014). A rapid response team that consists of a nurse, respiratory therapist, and ICU fellow with concurrent responsibilities cost $350,698 per year, equivalent to a reduction of 3.5 cardiac death events (Bonafide,

2014). This study concluded the cost of operating a rapid response team can be justified by the money saved by reducing critical deterioration events.

Another study conducted by Evans (2013) examined the concept of establishing a rapid response team impacting hospital costs and patient length of stay. The results showed that with the establishment of a rapid response team, annual hospital costs increased by $23 per day, per patient (Evans, 2013).

There are some gaps in the research for this topic. The study conducted by Evans (2013) showed an increase of $23 per day per patient, but the study did not address the average cost of code blue events, emergent intubations, and other adverse effects that rapid response teams can prevent. Again, these three cost effectiveness studies were conducted at a single hospital. The study conducted by Bonafide et al. (2014) was the most beneficial study. It covered the cost of critical deterioration events. The study also addressed the cost of rapid response teams with the team composed of a nurse and respiratory therapist, a nurse, respiratory therapist and a physician, and a nurse, respiratory therapist, and an intensive care unit fellow. Another gap is there is not much current research about the topic. Rapid response teams have been around since the 1990s but have been implemented in the United States starting around 2007. Most of the research about the success of rapid response teams is from that time. The rapid response system was first introduced in Australia, so a lot of the research available are studies that took place in that country.

Family Implementation

Family members have key insight and knowledge of their loved one's normal behavior and can recognize important changes before the clinician. When family

members can directly activate rapid response teams, improvement may be observed in reduced preventable code blue rates and adverse events. Recent studies of US children's hospitals with rapid response teams in place found that 69%–77% have some form of family activation process in place (Chen et al., 2005). Most of the literature involving family activated rapid response teams is positive; however, there are only a small number of studies, and data from only a few present outcomes.

Brady et al. (2015) conducted a study to develop and evaluate the success of a family-activated RRT. The study was conducted over a six-year period and compared family-activated rapid response calls verses clinician activated calls. The results concluded patients with family-activated rapid response calls were transferred to the intensive care unit less commonly than those called by the clinician. The most common reason for the call, from both family member and clinicians, was clinical deterioration. Families also reported that lack of communication from clinicians and a dismissiveness between the care and family as reasons for activating the rapid response teams. The authors concluded that family activations were infrequent and not a burden on rapid response teams. The family-called rapid response were able to recognize clinical deterioration and communication failures between the care team and family.

Gerdik et al. (2010) conducted a study that implemented family-and-patient activated rapid response teams in a level one trauma center. During the study, 25 rapid response calls were initiated by the patient or family member, and 48% were called by the patient, and 52% were called by the family member. There was an observed decrease in non-ICU code blue rates. There was no change in survival to discharge rates and no

change in rates of mortality. There was positive patient and family satisfaction with the process which was expressed in a survey.

Are Rapid Response Teams Beneficial or Not?

A majority of the research reviewed showed an improvement in patient outcomes when rapid response teams were utilized. There is research that shows no significant benefits. Shah, Cardenas, Kuo, and Sharma (2011) conducted a study comparing outcomes of over 16,000 non-obstetric hospital admissions and 70,000 patient days for the control period to 45,000 similar admissions and more than 161,000 patient days after implementing an RRT. The findings "indicated no significant difference in code rates (0.83 vs 0.98 per 1,000 patient days, p=0.3) during the two data collection periods" (Shah, Cardenas, Kuo, & Sharma, 2011, p. 1365). A separate study, conducted in a multicenter analysis of over 4,600 patients, by Kim et al. (2013) also concluded that rapid response teams did not reduce the mortality of patients following cardiac arrest.

Summary and Future Directions

Rapid response teams are utilized in most hospitals throughout the United States. The question of do they improve patient outcomes remains. There are conflicting research studies demonstrating that rapid response teams are beneficial to improving patient outcomes by reducing mortality rates, reducing the length of stay, and by reducing the cost to the hospital. However, there are also studies that prove that rapid response teams have no effects on patient outcomes and cost the hospital more money per patient each year. What is not known is the effectiveness of rapid response teams in the United States, especially the effectiveness of RRTs today. Most of the research was conducted outside of the United States and most of the research took place five to ten years ago.

More research needs to be conducted on examining rapid response calls and how early recognition of deterioration may save a patient an admission to the intensive care unit.

Chapter III

Design

Methodology

The objective of this study was to review the number of calls of the RRT and cardiac arrest rates before and after education of the floor nurses. Patient outcomes reviewed were patient cardiac arrest rates. This design was chosen because it allowed data that had already been recorded to be studied and involved summarizing the data, subjecting it to appropriate statistical analysis and drawing inferences (Sarkar, 2014).

Project Research Design

A retrospective chart review study was done to observe the number of calls of the RRT as well as patient cardiac arrest rates. A retrospective chart review study is a useful method when data has been recorded in a structured database and an analysis of the data elements needed to be done (Sarkar, 2014). Chart reviews have extended and consolidated the scientific evidence base by evaluating disease characteristics and course over time as well as treatment outcomes (Sarkar, 2014).

Chart reviews were conducted on all rapid response calls seven months after nursing education was completed and during a seven-month period one year after completion of nursing education. The information gathered from the audits included three factors of information to answer the research questions. The first research question

is after nursing education was completed, was there an increase in the number of RRT calls? The number of rapid response calls was recorded seven months after nursing education as well as seven months before the education was implemented.

Additional information will be gathered from the chart audits to answer the second research question: has the RRT initiation rate increased in one year past nursing education? Rapid Response Team calls were recorded in a seven-month period one year after the nursing education was completed.

The last amount of information gathered from the chart audits provided information to answer the third research question: after nursing education was completed, was there a decrease in cardiac arrest rates? The number of cardiac arrests involving the rapid response patients was recorded

Sample

The setting for this study was a community hospital in the Midwest with a RRT that was implemented in 2009. The average number of rapid response calls per month is 15. Nursing education for all nurses working in non-critical care areas was completed in October 2017. Chart audits were conducted to determine the number of RRT calls over the seven-month period before the education was complete, seven months after education was complete, and over a seven-month period one year after education complete. The chart audits included cardiac arrest rates seven months after nursing education was complete. The data collected was securely stored in an Excel spreadsheet.

Inclusion and Exclusion Criteria

Inclusion criteria for the study was all adult inpatient individuals that were involved in a rapid response call. Patients involved in a rapid response call who were

under the age of eighteen were excluded from the study. Patients who are not inpatient status in the hospital were also excluded from the study.

Protection of Human Subjects

The patients involved in collecting data from the audit's privacy were fully protected throughout this research study. All data collected remained anonymous. Authorization to proceed with this study was obtained through the Irene Bradley School of Nursing and the Institutional Review Board of Pittsburg State University as well as the Mercy Hospital Institutional Review Board. The information collected from the chart audits was kept in a locked area where it could not be accessed by anyone but the researcher, and documentation was under passcode during the process. All personal health information was removed from the data collected.

Instruments

The researcher performed chart audits and stored the data in an Excel spreadsheet. Data should be collected in a format that keeps all individual records separate but allows for easy compiling (Gregory, Horn & Kaprielian, 2019). Research conducted from chart audits inolved a variety of statistical measurements. An electronic spreadsheet format was customized to do these calculations. In this research project, an Excel spreadsheet was used to store the data collected to keep it organized and easily accessible. Data was analyzed using Statistical Analysis Software (SAS).

Procedure

The research proposal was approved by the Irene Ransom Bradley School of Nursing and the University Institutional Review Boards (IRB) and the Mercy Hospital Institutional Review Board before chart audits were conducted.

The researcher needed access to the electronic medical record utilized by the institution. Approval was also needed from the institution as well as the director of critical care. Establishing a relationship with the information technology department at the institution was an important aspect for the researcher to collect data with ease. A lock box was needed to secure the data collected, if any information was written on paper or printed. Only the researcher had access to the information. Documentation was accessed by a passcode and performed on a secure server.

Chart audits were conducted on rapid response calls over a period of twenty-one months to evaluate the cardiac arrest rates and number of calls. The first seven-month audits occurred before the education of the floor nurses. This will be the control group. The second seven-month audit occurred after the education. The final seven-month audit occurred one year after the education was complete. These were the variables. Data was collected and recorded in an Excel spreadsheet with each patient being numbered. If the patient suffered a cardiac arrest it was recorded in the spreadsheet. Other factors noted of the rapid response call patient were age, gender, body mass index, diabetes diagnosis and heart disease diagnosis. The excel spreadsheet where the data is stored did not contain any patient identifiers. Data collected was stored on a passcode-protected computer to which only the researcher had access.

Treatment of Data

The plan for this study was to collect data from chart audits on patients who were involved in a rapid response call. Data collected from the variable and control group will include whether the patient suffered a cardiac arrest, age, gender, BMI, and if there was a diagnosis of diabetes or heart disease. The data collected was stored in an Excel

spreadsheet. When data collection was complete, statistical analysis was conducted using Statistical Analysis Software. Data analyses included chi-square analyses.

Evaluation Measures Linked to Objectives

Evaluation methods for this study were meant to be done to help determine if the education of floor nursed was beneficial, if RRT calls increased or decreased and if there was a change in cardiac arrest rates. The goal of the RRT is to "prevent deaths outside the intensive care unit by providing a resource team that can be called to a patient's bedside" (Thomas, VanOyun-Force, Rassmussen, Dodd & Whildin, 2007, p. 20). Determining if the rapid response patients had a lower number of cardiac arrest rates vs the control group showed great benefit for the rapid response team. Research has shown RRT to be beneficial to patient outcomes while other research has showed no significance in patient outcomes. This study attempted to determine if better educating medical floor nurses about the RRT increased the number of RRT calls and improved cardiac arrest rates at a single hospital in the Midwest.

Outcomes/Evidence-based Measures Are Appropriate for Objectives

The goal of the study was to examine the relationship of rapid response teams and cardiac arrest rates before and after education was conducted**.** This study involved chart audits that examined the relationship of the RRT and specific patient outcomes after nursing education. The data collected was statistically analyzed to show if initiation of a rapid response call improved cardiac arrest rates and also the number of calls initiated before and after nursing education was completed.

Plan for Sustainability

The research for this project was conducted at 240-bed hospital in the Midwest. The dissemination of the results was accomplished through a presentation to the critical care council at the facility. The critical care council included the director and manager of the critical care units, the lead physician of the intensivist groups, as well as the director of respiratory therapy. The results presented helped administrators determine if the education completed by the floor nurses increased the number of rapid response team calls. If not, they can determine if further education is needed on the purpose of the rapid response team, as well as the criteria for calling a rapid response.

Summary

According to Sarkar (2014), a retrospective chart review allows the data that has already been recorded to be studied and involves summarizing the data, subjecting it to appropriate statistical analysis and drawing inferences. This was used in this study to observe the effectiveness of education of floor nurses about the RRTs in relation to cardiac arrest rates and volume of calls. Chart audits were conducted at a 240-bed hospital in the Midwest. The sample population included patients who were involved in a rapid response call. The control group was the RRT calls prior to nursing education. The data collected included cardiac arrest rates, number of calls, as well as variables such as age, gender, BMI, and diabetes or heart disease diagnosis. The data collected was presented in a Power Point presentation at the facility where the research was conducted. The goal was to determine if the education of the floor nurses about RRTs improved cardiac arrest rates and volume of calls. The data presented to the administrators helped

determine if the education regarding the RRT was effective or if more education is needed regarding the RRT.

Chapter IV

Results

The purpose of this study was to review the number of calls of the rapid response team (RRT) and the potential change in cardiac arrest rates before and after education of the floor nurses concerning RRT. The practice questions that were examined are as follows:

1) Seven months after nursing education was completed, was there an increase in the number of RRT calls?

2) Has the RRT initiation rate increased in the one year past nursing education?

3) After the completion of nursing education, was there an increase or decrease in cardiac arrest rates?

Study Participants

Chart audits were conducted on all rapid response calls seven months before nursing education was conducted, seven months immediately after nursing education was completed, and over a seven-month time frame one year after nursing education. The total number of rapid responses in this 21-month time frame was 89. There were 18 calls in the seven-month period before the nursing education, 40 calls in the seven-month period immediately after nursing education, and 31 calls in the seven-month period one year after nursing education. Data was collected using the EPIC electronic health record.

Of the patients in the pre-education group (n = 18), 55.66% were male and 44.46 % were female. Of the patients in post-education group (n = 71), 54.93% were male while 45.07% were female. All patients involved in the rapid response call were between the ages of 29 and 94. The mean age for the female patients involved during the pre-education group (n = 8) was 76.75 (sd = 7.55). The mean age of the male patients in the same group (n = 10) was 64.9 (sd = 13.87). The mean age for the female patients in the post-education group (n = 32) was 69.22 (sd = 12.88). The means age of the male patients in the same group (n = 39) was 66.74 (sd = 15.53).

Analysis of Questions

Statistical Analysis Software (SAS) was used for the data analyses. A significance level of $p < 0.05$ was established for all statistical procedures. Chi-square tests were completed for the number of rapid responses before and after nursing education as well as the number of code blue calls for cardiac arrest before and after nursing education.

Rapid Response Calls After Nursing Education

When analyzing the number of rapid response calls, a chi-square test was done and showed significance in the number of rapid response calls after nursing education [$\chi 2(2) = 8.2472$, $p = 0.0162$]. The first research question: Seven months after nursing education was completed, was there an increase or decrease in the number of RRT calls? During the period of seven-months immediately after nursing education, rapid response calls increased (n = 40). The second research question: Has the RRT initiation rate increased or decreased in the one year past nursing education? During the seven -month period one year after completion of nursing education, rapid response calls remained

higher (n = 31) than the pre-education period (n = 18) but decreased from the period immediately after. (n = 40).

Table 2

Group	Frequency	Percent
Pre-education	18	20.22
Immediately after education	40	44.94
Post education	31	34.83

Chi-square test for equal proportions

Chi-square	8.2472
p value	0.0162

Cardiac Arrest

The third research question looked at the number of cardiac arrests over time: after completion of nursing education, was there an increase or decrease in cardiac arrest rates? A Chi-square analysis showed no significance in improvement of cardiac arrest rates [$\chi 2(2) = 0.046$]. The number of cardiac arrests before nursing education was 15, immediately after education there were 14, and one-year post education there were 14.

Body Mass Index, History of Diabetes and Heart Disease

Body mass index (BMI), history of heart disease, and diabetes were recorded when conducting chart reviews to determine if there was significance in comorbidities of obesity, heart disease, and diabetes. These are three major comorbidities that have the

potential to negatively impact one's health. When examining whether the patients had a diagnosis of diabetes, a chi-square analysis was conducted. The percent of patients (n = 52) with a diagnosis of diabetes was 58.43% while the percent (n = 37) without a diagnosis of diabetes was 41.57%. There was no significance [$\chi 2(2)$ 1.0136, p = 0.6024). The percent of patients with a diagnosis of heart disease (n = 32) was 35.96% while the percent (n = 57) without heart disease was 64.04%. There was no significance [$\chi 2(2)$ = 0.7426, p = 0.6898).

Body mass index (BMI) was recorded for each patient involved in the rapid response calls. In the pre-education period, the mean BMI was 33.88 (sd = 7.944). In the post education period, the mean BMI was 30.03 (sd = 9.8827).

Overall, the results support the main research question of after educating nurses about the RRT, did the number of call increase and was the increased sustained one year later. There were no significant results in the data regarding improvement in cardiac arrest rates after nursing education.

Chapter V

Discussion

Outcomes

The purpose of this study was to examine the number of RRT calls before nursing education, examine cardiac arrest rates before and after nursing education, and examine the number of RRT calls seven months after completion of nursing education as well as one year after education was complete. The study utilized data from chart audits.

Overall, the rapid response team was utilized more after the nurses were educated on the purpose of the team and given scenarios when a call would be appropriate. Before the nursing education took place, the number of rapid response calls was 18. This was likely due to nurses not being familiar with the team and the help they are able to offer when a patient's condition is deteriorating. It is necessary for bedside nurses to monitor and trend changes and properly recognize when changes in a patient's condition necessitate care. Bedside nurses must critically think and use clinical judgment consistent to the patient's condition to correctly identify changes in a patient's baseline condition. Training and maintaining skills to handle patient deterioration leads to better patient care. "Visual tools and assessment systems assist bedside nurses in rapid assessment of patient condition and increase their focus on subtle patient changes"

(Garvey, 2015, p.143). Educating nurses to identify subtle changes can lead to better patient outcomes.

Educating nursing about the rapid response team and how to recognize subtle changes in a patient's condition led to more utilization of the rapid response team and an increased number of rapid response calls. Over the seven-month period immediately after nursing education, the number of rapid response calls increased to 40. This was likely due to the rapid response team and purpose being fresh in the nurses' minds. Continuing education magnifies a nurse's expertise to also enhance problem-solving and patient care. It ensures that nurses are current practitioners of safe and knowledgeable care. Retaining proficiency in any skill needs regular evaluation of the skill. Educating nurses on the rapid response team and scenarios on when to call can keep the skill up to date allowing for better utilization of the rapid response team.

In the seven-month period one year after nursing education of the rapid response team was complete, the number of calls was 31. While this was a decrease from the period immediately after the education, the number is higher from the pre-education period. This shows that the nursing education was effective but also suggests that refresher courses semi-annually or annually may be needed for the nurses to retain the knowledge.

This study showed no significance in a decrease of cardiac arrest rates after the nursing education of the rapid response team was complete. DeVita et al. (2004) had different results showing a "17% decrease in cardiopulmonary arrests, from 6.5 to 5.4 per 1000 admissions (p=0.016) after implementing the RRT" (p. 253). In this study there were 15 cardiac arrests in the period before the education, 14 in the period immediately

after education, and 14 in the period one year after education. These results are similar to Hillman (2005) which showed the rapid response team had no effect on cardiopulmonary arrests. The result of this study suggests the education should focus on early signs that may suggest patient deterioration rather than only the purpose of the team.

The study showed no significance in comorbidities such as heart disease, diabetes, and obesity effecting the outcomes. It was expected that the chart audits conducted on the rapid response calls would include patients with a prior history of heart disease, diabetes, and obesity. The small sample size of this study could explain these results.

Observations

Overall, this study provided useful data and information about educating nurses on the rapid response team and how that affects patient outcomes. The main objective of the study was to observe if the number of rapid response calls increased after nursing education and if the number of calls remained higher one year after the education. There was significance in the data proving this occurred. This outcome shows that educating nurses about rapid response teams reinforces the importance of calling for help when needed. It is crucial to educate nurses about the rapid response team and how critical it is for awareness of a patient's subtle changes in level of consciousness, vital signs, cognitive function, or abnormal lab finding to be reported. Nurses should not delay activating the rapid response team. Quick action could save a life or prevent long recoveries.

Educating the nurses about a quick response in patient deterioration may have improved the number of cardiac arrests. While in comparison with the number of rapid response calls, the cardiac arrest rates were fewer. They were not changed by educating

the nurses about the rapid response team. The expected findings were that the number of cardiac arrest rates would significantly decrease after nursing education. That was not the case. They remained unchanged. This could be because of the small sample size and the possibility that not all rapid response calls were captured for this study. The small sample size could also explain why comorbidities did not show significance. Better tracking of the rapid response calls could have led to more significant results.

Evaluation of Framework

The proposed theoretical framework to examine the effect of nursing education of the rapid response team on patient outcomes was the Donabedian model. Based on Donabedian's model, there is structure that involved the rapid response team. The structure of the team involves each member's role, including the nurses and staff who are implementing the team. The process involves the education of the nurses, as well as the interventions performed by the rapid response team during the call. These both led to the outcome, which included the increased number of RRT calls after nursing education and cardiac arrest rates. According to Donabedian (1987) "this three-part approach to quality assessment is possible only because good structure increases the likelihood of good process, and good process increases the likelihood of a good outcome" (p. 1745). This model explores outcomes that occur because of structure and process. The components of this model cannot stand independently. Clinical decision-making influences the outcomes the same as the notification of the rapid response team. The structure of the team can also influence the outcomes. Rapid response teams generally involve an ICU nurse, a respiratory therapist, and the ICU clinical manager. The expertise of the team can prevent further deterioration of a patient and lead to a decreased rate in cardiac arrest.

The process was the main area of focus for this study. The process of how educating nurses about the rapid response team can lead to increased utilization of the team as well as decrease cardiac arrest rates. Although the statistical analysis did show that the use of the RRT decreased cardiac arrest rates when comparing rapid response calls and cardiac arrest calls, there was a lower number of cardiac arrest calls.

This framework was effective in guiding this study. There are other variables that can affect the outcome of decreased cardiac arrest rates and increased utilization of the rapid response team. One way to decrease cardiac arrest rates would be to add an intensivist to the rapid response team. Some facilities have an intensivist-led RRT. The hospital where this study took place does not have an intensivist on the rapid response team. A study by Mankidy et al. (2020) showed implementing an intensivist-led RRT significantly decreased the overall cardiac arrest rate relative to the rate under a nurse-led RRT model. Another method for increasing the utilization of the rapid response team would include educating patients and family member on their ability to call the team. Studies involving patient and family activation is limited regarding improvement in patient outcomes. Some data suggest "increased patient or family calls result in earlier intervention for patient deterioration" (Vorwerk, 2016, p.42). Clinicians have raised concerns that allowing the patient and family to activate the RRT might result in a significant increase in calls, some of which may be unrelated to clinical deterioration, which is not supported by research (Vorwerk, 2016).

Evaluation of Logic Model

The logic model proposed in chapter one was supported by the results. Resources that were identified to successfully complete the project were education material about

the RRT that was provided to the nurses. This allowed for better understanding of the knowledge the nurses were given about the team and when to call. A relationship with the ICU director and manager was essential in completing this study. They helped with running reports to identify patients who were involved in the rapid response calls. Activities that helped assess the questions were chart audits conducted by this researcher. The data was collected from reports ran by the ICU manager and information technology department. Outputs that followed included educating nurses about the RRT. The activities lead to an increased utilization of the rapid response call. The hope was to find a decrease in cardiac arrest rates which did not occur in this study. The impact was that the study would show a sustained decrease in cardiac arrests which did not occur. Another impact was to see a sustained increased in the number of rapid response calls one year after nursing education. The data showed there was still an increase in rapid response calls one year after nursing education verses the pre-education period.

Limitations

This project study had a few limitations. The first being the study was conducted at a single medical center in the Midwest. The results of this study may not be repeated in other hospitals that use a rapid response team. The second limitation involved the number of participants in this study. The number of rapid response calls was small. This was likely due to lack of a tracking method of rapid response calls. There is no charge code for the RRT; therefore, if the rapid response call was not charted in the narrator, there is no way to audit those calls. This could have caused the number of rapid response calls that were captured to be decreased. The third limitation regarding lack of significance in cardiac arrest rates could be related to small sample size.

Implications for Future Research

Future research should be conducted to observe effects of rapid response teams on patient outcomes after nursing education. Future research should include a larger sample size. More research should be conducted about the education the nurses receive about the rapid response team. Teaching them to recognize more subtle changes in a patient's condition may improve cardiac arrest rates. More research is needed to detect best practices for early intervention for at-risk patients. Finally, future research that may affect cardiac arrest rates would involve changing the composition of the RRT by adding an intensivist.

Implications for Nursing

Clinical nurses who work in noncritical care areas are an important role when it comes to preventing the events leading to a patient's cardiac arrest. They are the first healthcare team members who become mindful of at-risk patients' subtle changes in vital signs, level of consciousness, abnormal lab findings, or cognitive function. Their decision to call the RRT without waiting could be vital in saving patient lives. Bedside nurses generally have a thorough knowledge of patients that includes their history, treatment plan, and physical assessment findings. These can be relayed to the RRT and physicians to allow quick intervention and hopefully stop further deterioration. Thoroughly educating nurses about the rapid response team and teaching them to recognize early signs of deterioration can improve patient outcomes and cardiac arrest rates. This study showed that educating the nurses once helped increase utilization of the RRT; however, there was indication that yearly education may be needed. The data one year later showed a decline in the number of calls from the period immediately after

education but remained higher than the pre-education period. Providing the education to nurses yearly and to newly hired nurses as part of the orientation process can help ensure that the RRT continue to be utilized.

Education is needed for all nurses, including the rapid response nurse on the proper area in the electronic medical record to capture the rapid response call. If the rapid response call is not documented in the proper narrator, it is not possible to collect data about the rapid response call.

Summary

The purpose of this study was to examine the number of rapid response team calls before nursing education, examine cardiac arrest rates before and after nursing education, and examine the number of RRT calls seven months after completion of nursing education as well as one year after education was complete. The findings helped determine if the nursing education about RRTs was effective. This was determined by collecting data through chart audits of rapid response calls that occurred before education, immediately after education, and over a seven-month period one year after completion of education. The number of calls increased, which proved the education to be effective. However, there was no change in the cardiac arrest rates, which may indicate a need to educate nurses about recognizing early deterioration rather than just educating nurses about the function of the rapid response team. The results also showed that nurses should be educated about the RRT yearly and as part of new nurse orientation.

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