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Development of Evidence-based Rapid Response Team Protocols for Treatment of Deteriorating Adult Medical-Surgical Patients

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Abstract

Acute care hospitals in the United States and across the world are experiencing substantial increases in acutely ill patient populations requiring multifaceted medical treatments and care. This increase in number of seriously ill patients is resulting in crowded critical care units and more acutely ill patients on general medical-surgical units. Several decades ago, Rapid Response Systems were introduced to help reduce the risk of adverse outcomes in patients presenting signs and symptoms of clinical deterioration on medical-surgical units. In patients displaying symptoms of rapid clinical deterioration, members of the Rapid Response Team are often required to begin immediate intervention and treatment to prevent further decline in condition. Rapid Response Team members often intervene by ordering laboratory tests, diagnostics tests, and occasionally crucial medications to prevent deterioration into a cardiopulmonary arrest event. Therefore, in order to ensure the Rapid Response Team is performing within the proper scope of practice for each team member, evidence-based, physician-approved protocols for use by the Rapid Response Team are essential to support quality patient care. The purpose of this translation project was to examine the characteristics of rapid response calls, including the common reasons, interventions, and outcomes of the calls, and to develop and recommend evidence-based protocols to support the care provided by the Rapid Response Team.

Keywords: rapid response system, rapid response team, assessment team, Lewin's Change Theory, rapid response protocol

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Chapter I

Introduction

In the United States, approximately 5,564 hospitals are responsible for the care and outcomes of over 35 million admitted patients each year (American Hospital Association, 2017). The aging patient population and economic changes to healthcare accessibility are producing higher rates of patients seeking care in hospitals across the country. With improvements in medical technology and advances in the treatment of patients in the outpatient settings, only the most seriously ill patient populations are admitted to acute care hospitals. These patients often require complex and collaborative care (Sigma Theta Tau International, n.d.).

Increasing numbers of acutely ill patients are leading to strains on the capacities of intensive care units (ICUs) (Mullins, Goyal, & Pines, 2013; Wagner et al., 2013). A study by Phillip Mullins and colleagues (2013) found that ICU admissions increased from 2.79 million in 2003 to 4.14 million in 2009, resulting in a nearly 50% increase in ICU admissions. As a result, overflowing ICUs are required to transfer patients perceived to be the least acutely ill out of ICUs to general medical-surgical units to accommodate more acutely ill patients (Wagner et al., 2013). Determining which patients meet criteria for early transfer out of ICU is often a problematic and subjective process. Frequently, this premature transfer out of ICU results in deterioration in patient conditions and often requires transfer back to the ICU, which often leads to these patients experiencing prolonged hospitalizations and poorer outcomes (Wagner et al., 2013).

In addition to untimely transfers out of ICU, increasing numbers of acutely ill patients are admitted initially to medical-surgical units because of the lack of availability of vacant beds in ICUs (Jeddian et al., 2016; Jeddian, Sayadi, & Jafari, 2016). Nurse-to-patient ratios on general medical-surgical units are much higher than the ratios in ICU; therefore, patients needing ICU care but are admitted to medical-surgical units may not receive the level of care they need. This deficiency of care for patients that were already at greater risk for clinical deterioration has the potential to result in delays in care and can lead to unfavorable patient outcomes. As a result, clinical deterioration of medical-surgical patients and subsequent transfer to ICU may result. This deterioration could have been avoided if proper bed placement were available or determined necessary initially. Measures are needed to ensure medical-surgical nurses have the resources available to summon assistance when concerns arise regarding patient deterioration.

In 2005, the Institute for Healthcare Improvement (IHI) launched *The 100,000 Lives Campaign* in an effort to reduce in-hospital mortality and morbidity rates (Berwick, Calkins, McCannon, & Hackbarth, 2006). One of the key drivers in the campaign was the recommendation that hospitals develop Rapid Response Teams (RRTs). The IHI's intention of the RRT was to be deployed at the first inclination of patient deterioration in order to prevent adverse patient outcomes. Considering the growing acutely ill patient population receiving care on medical-surgical units, this RRT initiative was an anticipated solution to prevent unfavorable outcomes in areas outside of critical care units. Many hospitals in the United States and internationally followed this recommendation and established RRTs.

In one mid-sized southeastern hospital, RRTs were established approximately 10 years ago. The RRT at this facility consists of the Cardiac ICU charge nurse, the Medical-Surgical ICU charge nurse, the Hospital Nursing Supervisor, the Unit Director or Manager (if available),

and the charge Respiratory Therapist. The RRT at this hospital responds to calls during the day and night time hours in an attempt to prevent clinical deterioration in acutely ill patients. Members of the RRT have expressed concerns over the need for protocols to address specific interventions ordered by the RRT. The current RRT policy at this facility permits team members to perform certain diagnostic testing; however, the types of tests that the policy is referring to are not defined. Therefore, inconsistencies have been identified in the types of tests performed by the team during RRT calls.

A SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis of the identified problem was performed in the planning process for this project. A strength of the original RRT practices was the autonomy that existing during RRT evaluations to order the identified needed laboratory testing, diagnostic testing, and sometimes, medications to prevent further patient condition deterioration while waiting a call back from the attending physician. Weaknesses of the identified problem included inconsistencies in the care provided during RRT calls, a lack of time efficiency during the calls, and the implications of scope of practice guidelines on the care provided during RRT calls. An opportunity to better delineate the best care for the most common RRT calls at this facility was identified. The mission of this hospital is to improve the lives and health of the patients that seek care at this facility. Another opportunity of this project aligns with this mission by aiming to provide better care to patients receiving RRT evaluation. A potential threat of this recognized problem was the possibility of resistance from the physicians to delineate protocols for the RRT. The purpose of this translational project was to examine the characteristics of rapid response calls and develop evidence-based protocols to support immediate care provided by RRTs.

This paper discusses the literature supporting the common criteria, characteristics, reasons, interventions, outcomes, effectiveness, protocols, and legal aspects regarding RRT calls; details a theoretical framework for changing practice in the healthcare setting; and examines the RRT calls at this hospital for the reasons of the calls, the interventions performed during the calls, and the outcomes of the calls. This project also aimed to further delineate the role of the RRT with the intent of developing evidence-based physician approved protocols to aid in the treatment acutely ill patients at risk for clinical deterioration. The proposed evidence-based protocols will serve to standardize the care provided to patients during RRT calls and will provide the needed support for team members to practice within their proper scope of practice.

Background

Rapid Response Systems (RRS) were developed decades ago to identify patients that are in jeopardy of rapid clinical deterioration (International Society for Rapid Response Systems, 2017). After the realization that patients, especially those in general medical-surgical units, often suffer adverse outcomes due to unrecognized signs of deterioration, RRSs began emerging across the world. RRSs are in place to provide reliable, quality recommendations and treatments for patients experiencing deteriorating health. RRSs may be referred to as RRTs, Medical Emergency Teams (METs), Patient-at-Risk Teams (PARTs), Critical Care Outreach Teams (CCOTs), or Assessment Teams (ATs).

At the hospital of focus for this project, the RRS is most commonly known as the Assessment Team (AT); however to remain consistent with the supporting literature, the term RRT is utilized in this paper. The RRT at this facility has been active for almost a decade. The purpose of the RRT at this hospital is to evaluate and assist with patients displaying acute changes in clinical condition. The RRT is available to respond to in-house calls in the main

hospital at all hours of the day and night. The RRT personnel consists of the Cardiac Intensive Care Unit (CICU) triage nurse, the Medical-Surgical Intensive Care Unit (MSICU) triage nurse, the Nursing Supervisor, the Unit Director or Manager (if available), and the charge Respiratory Therapist.

At this hospital, the RRT policy lists several reasons the team may be called. One reason is if the healthcare provider has a general concern about a patient's clinical condition, he or she is instructed to call the RRT. Another reason a healthcare provider may call the RRT is if the patient is showing acute signs of an ST-Elevation Myocardial Infarction (STEMI). Other triggers that may lead to calling the RRT are acute changes in a patient's heart rate, blood pressure, respiratory rate, oxygenation, level of consciousness, or mental status. Patients that display acute stroke-like systems are evaluated by the specified Stroke Assessment Team, which is led by the MSICU triage nurse who initiates a physician-approved stroke protocol, and is implemented separately from that of standard RRT calls.

When a healthcare provider at this hospital, typically those on general medical-surgical units, feels a patient is at risk for clinical deterioration, the RRT is paged for evaluation of this potentially declining patient. The healthcare provider, which is typically the primary nurse, contacts the hospital operator and provides the unit name and exact room number of the deteriorating patient. The hospital operator then sends the message through the hospital paging system to the RRT members. The expectation is for the RRT members to respond to the location of the patient within five to ten minutes.

Upon arrival to the patient's room, the RRT assesses the patient with the primary care nurse. After the RRT completes a physical assessment on the patient, a review of the patient's electronic health record (EHR) is performed. From the patient's EHR, pertinent lab values, vital

sign trends, and medical history are examined. Per the policy, the RRT is required to stabilize the patient as needed; however, the policy only permits certain diagnostic tests to be performed while the RRT is attempting to contact the patient's physician. The policy also states that if the patient is nearing a Code Blue event, the RRT may implement Advance Care Life Support (ACLS) standards of care as required.

Problem Statement

Although some RRT calls require minimal intervention from the team, other calls require immediate assessment, rapid critical thinking, and urgent action and intervention to prevent the patient from further clinical deterioration; therefore, RRT protocols could improve the effectiveness of the team's evaluation while allowing the team to maintain their proper scope of practice.

Nurses on medical-surgical units often call the RRT because they intuitively feel a concern over the patient's condition without obvious indicators. Other times, clinical manifestations prompt the RRT call, and the initiation of treatment is deemed critical on the RRT's arrival to the patient's location. RRT calls of this nature require urgent action from the RRT to prevent or reduce the probability of a cardiopulmonary arrest event. These type of calls often require immediate intervention but practicing out of the scope of practice of each RRT member must be considered. For example, occasions have occurred when the RRT was called for a patient displaying a new onset of altered mental status. Upon arrival to the patient's room, the RRT determined the patient to be hypoglycemic. Instead of waiting on a returned call from the attending physician, the RRT initiated the hypoglycemic protocol, administered dextrose to the patient, and prevented the patient from deteriorating further into a life-threatening event. The hypoglycemic protocol requires an order from the healthcare provider. If the RRT had evidence-

based, physician approved protocols in place to begin treating patients, more immediate intervention and treatment could be initiated with the potential of improving patient outcomes and possibly preventing the need for transfer of the patient to congested ICUs.

Purpose of the Project

RRTs have the capability to intervene and prevent clinical deterioration. A need for specific protocols was identified to support the actions of the RRT that may require provider orders by law. Therefore, this project was established to delineate the role of the RRT, to examine the nature of the RRT calls, and to utilize the data collected in the project to develop evidence-based, physician-approved protocols to improve, standardize, and optimize the care provided to patients displaying deteriorating clinical conditions during RRT calls.

Project Aims

This translational project aimed to: (1) explore the overall nature of the RRT calls, (2) determine the most common reasons for RRT calls, (3) investigate the most common interventions performed during the calls, and (4) examine the overall outcome of the call and the discharge status of the patients requiring RRT activation. Using supporting evidence-based literature and the data collected from this project, the fifth and ultimate goal of this project was to develop evidence-based, physician-approved protocols to intervene appropriately, immediately, and within the legal scope of practice of RRT members on patients with deteriorating clinical conditions while waiting on a call back from the attending physician.

Clinical Questions

1. In adult patients receiving RRT evaluation, what were the most common reasons the calls were activated?
2. What were the characteristics of patients for whom the RRT is called?

3. What were the interventions performed during the RRT call?
4. What was the overall outcome of the call and the discharge status of the patients requiring RRT activation?
5. What were the top three reasons for RRT activation that would benefit from the development and implementation of RRT protocols?

Chapter II

Literature Review

A search of Galileo, PubMed, Google Scholar, CINAHL, and MEDLINE was conducted to identify scholarly articles detailing commonalities of RRSs. The search terms used were *rapid response system*, *assessment team*, *rapid response team*, *medical emergency team* and *rapid response protocol*. The following sections of this literature review discuss the most common criteria for calling the RRT, characteristics of the calls, reasons for calls, interventions used during the calls, outcomes of the calls, the effectiveness of the calls, types of protocols, and the legal aspects regarding RRT activations.

Criteria for Calling the RRT

Many hospitals identify a variety of criteria for activating a RRT. The Agency for Healthcare Research and Quality (2016) listed the following criteria as abnormal physiological signs for activating the response system: heart rate greater than 140 or less than 40 beats per minute, respiratory rate of greater than 28 or less than eight breaths per minute, systolic blood pressure of greater than 180 mmHg or less than 90 mmHg, oxygen saturation level of less than 90% despite supplementation, any acute change in mentation, total urine output of less than 50 milliliters in four hours, or any other generalized staff concern about a patient. Other criteria often used in hospitals for RRT activation include chest pain unrelieved by nitroglycerine, a compromised or threatened airway, seizure activity, and uncontrolled pain (Agency for Healthcare Research and Quality [AHRQ], 2016).

One public teaching hospital in New York established the RRT activation criteria to include a pulse oximetry reading of less than 90%, a respiratory rate of greater than 30 or less than eight breaths per minute, a systolic blood pressure of less than 90 mmHg, a heart rate of

greater than 140 or less than 40 beats per minute, or a change in heart rate of more than 30 beats per minute (Beitler, Link, Bails, Hurdle, & Chong, 2011). The Mayo Clinic in Rochester, Minnesota identified the criteria for activating the RRT to include staff concern, an oxygen saturation reading of less than 90%, a change in heart rate to less than 40 or greater than 130 beats per minute, a change in systolic blood pressure to less than 90 mmHg, a change in respiratory rate to less than 10 or greater than 28 breaths per minute, a new-onset of chest pain that is suggestive of cardiac ischemia, changes in level of consciousness, or stroke-like signs or symptoms (Barwise et al., 2016).

Characteristics of RRT Calls

The type of patient, age of the patient, location of the patient, time of day, admitting diagnosis, and comorbidities of the patient vary in the need for activation of an RRS. One study in New Zealand that examined 795 RRT calls found that the median age of the patients assessed by the team was 69 (Mullins & Psirides, 2016). This study determined that the majority of RRT calls occurred on medical units (60%), with the remainder of calls occurring on surgical units (35%) and other specialty areas (5%) within the hospital. The admitting diagnoses for patients requiring RRT calls were neurological in nature (30.7%), cardiovascular failure (26.7%), pulmonary or respiratory failure (22.6%), sepsis (19.2%), and the cardiac arrhythmia of atrial fibrillation (8.8%) (Mullins & Psirides, 2016).

This New Zealand study also found that the RRT calls were more likely to occur during the daytime hours between 0800 and 1600 (OR=1.47, CI 1.20-1.80, p=0.002) and evening hours between 1600 and 2400 (OR=1.40, CI 1.14-1.72, p=0.0012) compared to the nighttime hours between 2400 and 0800. The most common time of RRT calls in this study were at 1000, which led the authors of the study to conclude that this period of time was associated with more patient

interaction and ability to notice patient deterioration than other less interactive time periods during the day (Mullins & Psirides, 2016).

The study conducted at the Minnesota Mayo Clinic investigated the outcomes of patients that had a delay in the activation of the RRT (Barwise et al., 2016). This study found that the sample group with no delay in RRT activation had the most calls between 0800 and 1600. The group that had a delay in RRT activation was found to have more calls during the nighttime hours of 2400 to 0800.

A study conducted in Brisbane, Australia of 1,151 RRT activations found that the majority of calls occurred between the time period of 1600 to 0800 (62.8%) and on the weekdays (69.9%) (White et al., 2016). This study found that the median age of patients undergoing RRT activation was 66.1 and the majority of patients were male (58.5%). This Brisbane study also determined the most common medical comorbidities in patients undergoing RRT calls were chronic kidney disease (29.9%), chronic pulmonary disease (27.4%), chronic heart disease (25.3%), and diabetes mellitus (24.1%) (White et al., 2016). The study at the New York teaching hospital revealed that the most common diagnoses prior to the activation of the RRT were seizures (14%), sepsis (11.9%), arrhythmias (9.7%), pneumonia (7.7%), aspiration (5.0%), and syncopal episodes (4.8%) (Beitler et al., 2011).

A study in Melbourne, Australia revealed that 62.6% of RRT calls were male patients, 47.7% were older than 65 years of age, and 58.8% received the RRT activation greater than 72 hours after hospital admission (Le Guen, Tobin, & Reid, 2015). This study also found the most common comorbidities in patients of RRT calls were congestive heart failure (23.5%), cancer (21.3%), and chronic kidney disease (13.5%). In a French teaching hospital study, the most common initial diagnoses in patients requiring RRT activation were sepsis (25%), severe sepsis

or septic shock (21%), acute heart failure or cardiogenic shock (9%), and hemorrhage or hemorrhagic shock (8%) (Jung et al., 2016).

Reasons for RRT Calls

Many clinical manifestations trigger healthcare providers to activate the RRT. Referring back to the previously mentioned New Zealand study, the most common reasons the RRT was called were for unresponsiveness or seizures (23%), tachycardia (22%), an Early Warning Score, which detects physiological derangement, of eight or more (20%), tachypnea (18%), and hypotension (9%) (Mullins & Psirides, 2016). The Mayo Clinic study found that the most common reasons for calling the RRT in their sample group that had no delay in the rapid response activation were tachycardia and bradycardia (29%), low oxygenation and/or respiratory distress (28%), and decreased level of consciousness (23%) (Barwise et al., 2016).

In the study conducted at the New York teaching hospital, 43% of RRT calls were activated for reasons other than vital sign criteria, including staff concern of a patient's clinical presentation (46.8%) and a change in the patient's mental status (43%) (Beitler et al., 2011). In the Brisbane, Australia study, the most common reasons for RRT activation were systolic blood pressure of less than 90 mmHg (29.5%), decreased Glasgow Coma Score (20.9%), and oxygen saturation of less than 90% (19.7%) (White et al., 2016). In the study conducted in Melbourne, Australia, the most common reasons for RRT calls were an oxygen saturation of less than 90% (38.6%), systolic blood pressure of less than 90 mmHg (24.5%), and a decrease in Glasgow Coma Score of greater than or equal to two (22.2%) (Le Guen et al., 2015).

Another study of 135 patients in an urban, not-for-profit hospital determined the most common reasons for RRT activation were a temperature of greater than 100.4°F (n=26), heart rate of greater than 130 beats per minute (n=23), systolic blood pressure of less than 90 mmHg

(n=23), and an oxygen saturation of less than 90% with supplemental oxygen (n=20) (Tarver & Stuenkel, 2016). In a Midwestern Level I Trauma Center study, the most common reasons the RRT was activated were due to a change respiratory rate, temperature, oxygen saturation, and mean arterial blood pressure (Heal, Silvest-Guerrero, & Kohtz, 2017). In the French teaching hospital study, the most common criteria for activating the RRT was an oxygen saturation of less than 90% (17%), a systolic blood pressure of less than 80 mmHg (14%), and altered mental status (14%) (Jung et al., 2016).

Interventions during RRT Calls

In the review of literature for this project, some common trends in the interventions performed in RRT calls were identified. In the New Zealand study by Mullins and Psirides (2016), the most common interventions performed were obtaining an electrocardiogram (51.6%), venous blood samples (36.4%), arterial blood gases (29.3%), capillary blood glucose (22.5%), and chest X-ray imaging (19.5%). Also in this study, the most common treatment interventions performed were high-flow oxygen administration at 31.2%, establishment of an intravenous or intraosseous access at 18.0%, fluid volume resuscitation at 26.4%, maintaining a secured airway at 14.6%, and medication administration at 42.5%, with the most common medications being anti-arrhythmics (13.1%), analgesics (10.3%), beta blockers (9.5%), furosemide (9.5%), and electrolyte replacement therapy (8.5%).

In the Brisbane, Australia study, the most common actions by the RRT were performing an electrocardiogram (65.8%), drawing venous blood samples (41.9%), administering intravenous fluid boluses (29.6%), collecting arterial blood gas samples (26.8%), and ordering a diagnostic chest X-ray (24.8%) (White et al., 2016). The authors of the New York hospital study found that the most common therapeutic interventions during RRT calls were initiating

supplemental oxygen (62.9%), administering intravenous fluids (28.9%), performing intubation (16.4%), providing nebulizer treatments (13.1%), and performing suctioning (11.5%) (Beitler et al., 2011). In the French teaching hospital study, the most common interventions performed by the RRT were the administration of crystalloid intravenous fluids (22%), the initiation of antibiotics (8%), and the insertion of peripheral intravenous access (7%) (Jung et al., 2016).

Outcomes of RRT Calls

After assessment and intervention, if indicated, are completed, the outcomes or patient dispositions following RRT activations were investigated. In the New York hospital study, 55.3% of patients were transferred to a new unit after the RRT call with the most common dispositions being transfer to ICU (43.4%), transfer to an observation room (4.8%), and transfer to a telemetry unit (3.0%) (Beitler et al., 2011). Approximately 41.2% of patients remained in their predisposing room following the RRT call. The other 3.5% of patients either went to emergency surgery or cardiac catheterization, died during the RRT call, or the disposition was unknown after data collection.

The study conducted in the Midwestern level I trauma center revealed that 50% of RRT calls result in stabilization of the patient without requiring transfer to a unit for higher level of care (Heal, Silvest-Guerrero, & Kohtz, 2017). The study conducted in the urban, not-for-profit hospital determined 36% of patients remained in their current unit, 62% were transferred to a higher level of care, and 2% progressed to a cardiopulmonary arrest event (Tarver & Stuenkel, 2016).

Effectiveness of RRTs

The literature is inconclusive on whether RRTs actually improve patient outcomes and in-hospital mortality rates. In the previously mentioned New Zealand study, the incidence of

RRT calls increased from 30.3 to 44.3 per 1,000 admissions during a 12-month time period; whereas although not statistically significant (p=0.37), the rate of cardiac arrest incidents declined during this 12-month period from 0.23 to 0.085 per 1,000 admissions (Mullins & Psirides, 2016).

The study conducted at the teaching hospital in New York revealed a statically significant (p=0.004) decrease from 15.50 to 13.74 in deaths per 1,000 discharges after the implementation of the RRT (Beitler et al., 2011). The authors of this study also found that after the RRT implementation the total number of deaths in the hospital decreased by 139. Also, the number of out-of-ICU cardiac arrest events decreased from 3.28 to 1.62 codes per 1,000 after the implementation of the RRT. And, the total number of out-of-ICU cardiac arrest-related deaths decreased by 126 after RRT implementation in this hospital (Beitler et al., 2011). The study conducted in a French teaching hospital revealed that the mortality rate in the hospital decreased from 39.6 to 34.6 per 1,000 discharges after the implementation of the RRT (Jung et al., 2016).

Protocols for RRT Use

Scholarly literature discussing the effectiveness of protocols for treatment of patients undergoing RRT evaluation is limited. The Institute for Clinical Systems Improvement (2011) developed sample RRT order sets for patients being evaluated by the response team. Included in this order set are standardized orders for vital signs, blood glucose, cardiac monitoring, and obtaining intravenous access. Other more specified orders include the option for obtaining certain laboratory and diagnostic tests including a chest X-ray, electrocardiogram, complete blood count, chemistry panel, arterial blood gas, coagulation studies, lactic acid level, type and screen, and cultures, including blood and urine. This order set also includes medication

administration orders for normal saline, albuterol, nitroglycerine, naloxone, flumazenil, dextrose, metoprolol, furosemide, and lorazepam (Institute for Clinical Systems Improvement, 2011).

The Society of Cardiovascular Patient Care (n.d.) developed multiple protocols for use by an RRT. Each of the protocols includes administration of supplemental oxygen and the application of continuous pulse oximetry and cardiac monitoring. One protocol addressed respiratory distress specifically and included obtaining a stat arterial blood gas and chest X-ray, performing suctioning, and initiating a stat consultation for Anesthesia for intubation if indicated. They also developed a protocol to address symptomatic hypotension, which includes obtaining an electrocardiogram and bolusing an infusion of Normal Saline. A protocol for chest pain included obtaining an electrocardiogram, administering nitroglycerine, and detailing guidelines to follow if an ST-elevated myocardial infarction is suspected. Other protocols developed by this Society included patients experiencing altered mentation, anaphylactic shock, seizure activity, over-sedation, and septic shock. A policy detailing criteria for automatic transfer to a critical care unit was also included (Society of Cardiovascular Patient Care, n.d).

Legal Considerations of RRTs

After reviewing the literature, a limited amount of information was available on the legal considerations involved with RRTs. One common trend noted in the literature was the requirement of performing within the proper scope of practice of team members (Stolldorf, 2008). In order to adhere to a healthcare provider's legal scope of practice, the development of protocols for immediate use in the case of a deteriorating patient in the absence of a physician is a permissible alternative (Bellomo, Hillman, & DeVita, 2011). Physician-approved treatment protocols and algorithms for RRT use may expedite management of care and prevent further clinical deterioration. These types of protocols range from obtaining intravenous access and

transferring the patient to a location for higher level of care to initiating interventions and diagnostic treatments and procedures. Development of RRT protocols can also aid in standardization of care provided during RRT calls (Bellomo et al., 2011).

Synthesis of the Literature

When examining other facilities that utilize RRTs, some of the most common criteria for initiating the RRT were found to be tachycardia or bradycardia, tachypnea or bradypnea, hypertension or hypotension, oxygen desaturation, change in level of consciousness, seizure activity, and chest pain (AHRQ, 2016; Beitler et al., 2011; Barwise et al., 2016). The most common characteristics of RRT activations were that they occur most often in the day time hours and in the older adult patient population (Barwise et al., 2016; Mullins & Psirides, 2016). Congestive heart failure and chronic kidney disease were found to be common comorbidities in patients undergoing RRT activation (Le Guen, Tobin, & Reid, 2015; White et al., 2016). Sepsis, neurological conditions (i.e. seizures), and cardiovascular conditions (i.e. congestive heart failure) were common admitting diagnoses for patients requiring RRT evaluation (Beitler et al., 2016; Jung et al., 2016; Mullins & Psirides, 2016).

The most common reasons for activation of the RRT were a change in neurological status, changes in heart rate, decrease in oxygen saturation, significant change in blood pressure, and generalized staff concern (Barwise et al., 2016; Beitler et al., 2011; Jung et al., 2016; Mullins & Psirides, 2016). The most common interventions performed were electrocardiographs, venous blood draws, arterial blood gases, increased oxygen support, and administration of intravenous fluids (Mullins & Psirides, 2016; White et al., 2016). Other interventions listed in the literature were the administration of nebulizer treatments, obtaining chest X-rays, obtaining blood glucose, and establishing intravenous access (Beitler et al., 2011; Mullins & Psirides, 2016).

When examining the outcome or disposition of the patient, the research supported similar results in patients that were able to remain on their current unit (Heal et al., 2017) and patients that required transfer to a critical care area after RRT evaluation (Beitler et al., 2011). The overall effectiveness of RRTs in improving in-hospital mortality rates was disputing. Some of the literature supported RRTs as effective tools in reducing in-hospital mortality (Beitler et al., 2011; Jung et al., 2016; Mullins & Psirides, 2016), while others found no improvement in mortality rates.

Several limitations were noted in this review of literature. Many scholarly articles discussed RRT use in countries other than the United States; therefore, the review of literature for this project revealed limited information on the nature of RRT calls in the U.S. Only online resources, nil scholarly journal articles, were found to discuss development of treatment protocols for initiation by the RRT. The literature discussing legal considerations for RRTs in acute care facilities was almost nonexistent. A lack of supporting literature on each RRT topic was determined, which reiterated the need for additional, up-to-date research to support this subject.

Theoretical Framework

The implementation of a change in practice requires planning and a purposeful and collaborative effort to ensure success (Mitchell, 2013). Change is necessary for continuous improvement in practice and using evidence to improve patient outcomes. Identifying a suitable change theory to provide the framework for initiating and implementing a change will improve the likelihood of a successful outcome (Mitchell, 2013).

Kurt Lewin, also known as the father of social psychology, is considered a pioneer in the development of change theories and their impact on improving practice (Mitchell, 2013;

Petiprin, 2016). Developed in the 1940s, Lewin's most influential theory was the Change Theory. Lewin developed a three-stage process for implementing change in a variety of settings. The three stages included an Unfreeze-Change-Refreeze process (Figure 1). Completion of each stage is imperative for implementing a successful change in practice. Preparation for each stage allows for an easier transition into the new practice.

The first stage, Unfreezing, involves preparing employees or an organization for the upcoming change (Carpenter, Bauer, & Erdogan, 2009). This initial phase in the change process is based off of communicating the plan for change to those that will be affected by the change. Preparing the organization or affected employees will ease the transition to the new way of practice. When employees are well-informed about the change, they are more likely to understand the need for the update and adapt to the change in practice. Developing a sense of urgency for the change is also key during this Unfreezing stage. If the employees are made aware and educated about the need for change, there will be more buy-in and participation in the change process (Carpenter et al., 2009).

The second stage, Change, includes the actual implementation of the new method of practice (Carpenter et al., 2009). The way in which the change is executed depends upon the type of change taking place. The actual change process may be stressful to those affected or involved in the change. Therefore, providing support during the change process is important for maintaining buy-in and participation from those involved. Celebrating small wins during the change in practice will help maintain momentum until the transition is completed. During this stage, obstacles are likely to arise. Although these obstacles should be anticipated during the planning process with strategies in place to resolve them as they occur, some challenges may still

happen. In these events, continuing to provide support will help to ease the transition and overcome the unexpected obstacles (Carpenter et al., 2009).

The third stage, Refreezing, is the final stage of Lewin's Change Theory (Carpenter et al., 2009). When the change has been completely implemented and the participants involved have accepted the change, the refreezing process can occur. This stage is essential for long-term success and permanence of the change. During this stage, celebrating and publicizing success of the change is important. Sharing successful results of the change with those involved in the process will help to ensure longevity of the change. Rewarding those involved in the change process that are compliant with the new change in ways as simple as verbal encouragement will help maintain sustainability of the change (Carpenter et al., 2009).

After obtaining physician approval, the proposed change of implementing evidence-based protocols for use by the RRT will be executed based upon Lewin's Change Theory including his Unfreezing, Change, and Refreezing phases. The Unfreezing phase will incorporate buy-in and support from members of nursing administration and hospital physician staff. Communication with other RRT members, including ICU Charge Nurses, Nursing Supervisors, and Charge Respiratory Therapists, will occur so that they are aware of the anticipated change in practice during RRT calls. Educating these key players on the need for change in this method of practice will also occur during this stage. The expectation is that the key players will also appreciate this need for change in practice.

Although the plan for this project only extends to the stage of development of the RRT protocols, a second stage of this project is anticipated to implement the newly developed protocols for use in the acute care setting. If permitted to proceed to the second phase of this project, the members of the RRT will be provided educational sessions on the new protocols,

including information on the methods in which they were developed and the literature supporting their content. After all members of the RRT have attended an educational session, the new protocols will be instituted and available for use by the RRT. The staff utilizing the new protocols will be supported and encouraged to seek guidance, ask questions, and offer suggestions as needed. As obstacles arise during the change process, immediate action will be taken to resolve any barriers to the utilization of the protocols that occur.

If the second phase of this project is authorized and the change in practice of RRT protocols occurs, the third stage, Refreezing, of Lewin's Change Theory will follow. In order to ensure that the use of the new RRT protocols remains a part of daily practice, the members of the RRT will be provided with information regarding the success of the utilization of the new protocols. Words of encouragement and celebrations of success will be provided to those team members that utilize the protocols effectively.

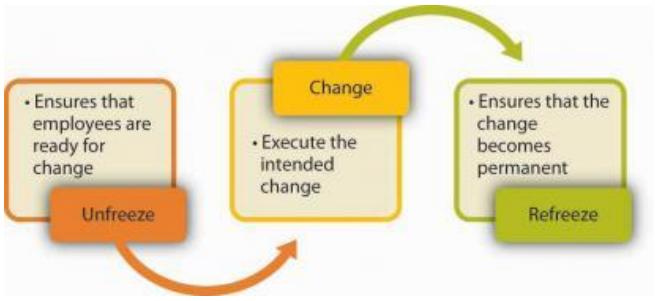

Figure 1: Lewin's Change Theory (Carpenter et al., 2009)

Chapter III

Methodology

With RRTs now established in hospitals across the country, one of the goals of this project was to improve the quality of care provided to patients during the RRT calls. The idea for this project derived from the author's identification of a need to improve the effectiveness and efficiency of RRT calls. Therefore, the methodology of this project was based on examining clinical data to improve and standardize the care provided to patients during RRT calls.

With the initial aim of this project being to examine the nature of the RRT calls, the first phase of this project included a retrospective chart audit of all adult patients receiving evaluation by the RRT over a five-month time period. In this chart audit, the most common reasons for RRT activation, the age and gender of the patients receiving RRT calls, the admitting diagnoses of these patients, the comorbidities of patients requiring RRT evaluation, the interventions performed during the RRT call, and the outcome of the RRT call were recorded. The electronic health record (EHR) at this facility, Cerner®, was utilized as the source for data collection. Access to the electronic health record, Cerner®, for data collection was approved by the Risk Attorney and Director of Corporate Compliance at the facility.

The electronic medical records of the patients who received RRT evaluation were audited in Cerner® by this principle investigator. At this hospital, the CICU charge nurse is responsible for documenting the reason for the RRT call, the interventions performed during the call, and the outcome or disposition of the patient at the conclusion of the call. All of this information is printed in the form of a daily RRT report at this hospital. Also, the Hospital Nursing Supervisor provides a brief synopsis of the RRT calls that occurred during each 12-hour shift in the end-of-shift report that is sent to hospital administrators. Through collaboration with the Director of

Critical Care and the Critical Care Administrative Assistant at the facility, the patients receiving RRT activation during this five-month time period were determined by records kept by the Administrative Assistant.

Sample

The data collection sample utilized for this project was all patients that underwent evaluation by the RRT over a five-month period of time beginning after Institutional Review Board (IRB) approval was obtained at both the hospital in which the data collection took place and Georgia College and State University in Milledgeville, Georgia. A total of 100 patients undergoing RRT evaluation were investigated over a five-month time period for this project. There were no identified risks to the patients used in the patient sample for this project; therefore, no informed consent was required. All human subjects' protection and Health Insurance Portability and Accountability Act (HIPAA) compliance principles and regulations were adhered to.

Confidentiality of Data

The data collected for this project included only clinical information. No personal health information (PHI) or identifying information was included in the data collection phase for this project, with the exception of a random identification number given to each patient by this principle investigator. The identification numbers were assigned to each patient's data collection form and were able to be linked to the records kept by the Critical Care Administrative Assistant at the facility. The data was collected onsite at the hospital and was placed in an electronic form, which is discussed later in this paper, and stored in a personal, password-protected computer to safe-guard confidentiality. The personal laptop used for collecting data was locked in this principle investigator's home during periods when data collection was not taking place.

Setting

The data collection took place at a 350-inpatient bed, Level II Trauma Center in Northeaster Georgia. A Memorandum of Understanding was already established between this facility and Georgia College and State University. Data was collected onsite at the hospital in a secure location using a hospital-based computer in the Care Logistics department.

Data Collection Tool

The data collection tool used for this project was an electronic form developed by the author/principle investigator for this project (see Appendix A). The general information included on the form was the patients' age, gender, admitting diagnoses, and comorbidities. The information on the form specific to the RRT calls that was included were the reasons for the RRT activation, the interventions used during the call, and the outcomes and patient disposition of the call. No PHI was included on the form. Once the data collection process was completed, the information was coded and entered in the Statistical Package for the Social Sciences (SPSS) software and in Microsoft Excel for data analyzation of descriptive frequencies. The most commons reasons for RRT activation, the most common characteristics of patient requiring evaluation from the RRT, the most frequently used interventions during the calls, and the outcomes and discharge statuses of the patients requiring RRT activation were determined through calculations of the sum of each variable. Age was the only continuous variable examined for this project; therefore, the mean and standard deviation were determined for this variable.

Protocol Development and Implementation

After the three most common reasons for RRT activation and the most commonly used interventions during these calls were determined, evidence-based protocols were developed to

evaluate and begin intervening on these key patient problems. The order-sets in the protocols were based upon the most common interventions currently used during RRT calls at this facility along with protocol recommendations by the Institute for Clinical Systems Improvement (2011) and Society of Cardiovascular Patient Care (n.d.) and through evidence-based literature supporting the interventions listed in each protocol. The protocols were submitted to nursing administration, to include the Director of Critical Care and the Chief Nursing Officer. The protocols will be available for approval from hospital physician staff, including the Chief Medical Officer, Chief of Hospitalists, and Chief Intensivist and implementation for the RRT.

Chapter IV

Results

The following chapter of this project details the results of the retrospective chart audit of RRT calls at this Level II Trauma Center hospital. The results are based on 100 RRT calls that occurred over a five-month time period from March through July of 2017. The following sections within this chapter include a discussion of the characteristics of the sample of patients reviewed for this project, logistics surrounding the times and locations of the RRT calls, and specific details pertaining to the calls.

Patient Characteristics

Specific characteristics about the patients requiring RRT evaluation were examined to meet Aim I of this project plan, which sought to explore the overall nature of RRT calls. Both the age and gender of the patients were recorded. The admitting diagnoses of the patients undergoing RRT evaluation were also recorded to determine if any trends were noted. Also, the medical histories of the patients requiring RRT evaluation were investigated. Significant comorbidities, including hypertension, diabetes mellitus, congestive heart failure, chronic obstructive pulmonary disease, cancer, coronary artery disease, cardiovascular accident, chronic kidney disease, and end-stage renal disease, were recorded. Less significant comorbidities, like gastroesophageal reflux disease and hyperlipidemia for example, were not recorded in this study. All of the patient characteristics investigated in this project are displayed in Table 1.

Age and gender. Of the 100 RRT calls investigated for this project, the gender variation of patients requiring RRT evaluation were 57% male and 43% female. The ages of patients requiring RRT evaluation ranged from 22 to 95. The mean age of the 100-patient study sample was 62.28 and the standard deviation was 17.24.

Admitting diagnoses. When examining the admitting diagnoses of patients requiring RRT calls, 19 percent of patients were admitted for neurological reasons, which included altered mental status, stroke-like symptoms, status epilepticus, closed head injury, intracranial hemorrhage, and delirium. Respiratory related illnesses accounted for 18 percent of admitting diagnoses including respiratory distress/failure, chronic obstructive pulmonary disease exacerbation, pneumonia, asthma exacerbation, and pneumothorax.

Cardiac abnormalities and infectious processes each accounted for 15 percent of admitting diagnoses for patients receiving RRT evaluation. Types of cardiac admissions included chest pain, myocardial infarction, hypertensive emergency, arrhythmias, congestive heart failure exacerbation, and hypotension. Admitting diagnoses related to infection included sepsis, gangrene, cellulitis, wound dehiscence/post-operative infection, osteomyelitis, and fever. Gastrointestinal and genitourinary admitting diagnoses attributed to 14 percent of admissions and included abdominal pain, nausea/vomiting/diarrhea, gastrointestinal bleed, cholangitis, mesenteritis, urinary tract infection, and urinary retention. The remaining 19 percent of patients requiring RRT evaluation were admitted for oncological, orthopedic, renal, surgery, or other diagnoses including diabetic ketoacidosis, deep vein thrombosis, anemia, and falls.

Comorbidities. As mentioned previously, only major medical histories were recorded for this sample patient population, with less life-threatening comorbidities omitted. Of the 100 patients in this study sample, the leading comorbidity among this population was hypertension at 69 percent. Diabetes mellitus was found to affect 37 percent of the study sample. Congestive heart failure was the third leading comorbidity affecting 30 patients out of 100. Cancer and chronic obstructive pulmonary disease (COPD) were each found in 26 percent of the study sample. Other major comorbidities discovered in patients requiring RRT evaluation were

coronary artery disease (n=17), chronic kidney disease (n=16), cerebrovascular accident (n=11), and end-stage renal disease (n=10).

RRT Call Logistics

During the data collection phase of this project, specific details about the logistics surrounding the RRT calls were examined to also meet Aim I of this project. The time of the day in which the RRT call occurred was recorded. Also, the day of the week of the call and the nursing unit upon which the RRT was summoned to was examined. Each of these RRT call logistics are displayed in Table 2.

Time of day. Because of the commonality of 12-hour shifts in the hospital setting, the RRT calls were categorized between 7:00am to 7:00pm and 7:00pm to 7:00am. Of the 100 RRT calls examined, 57 percent of calls occurred during the nighttime hours from 7:00pm to 7:00am. The remaining 43 percent of calls occurred during the dayshift hours from 7:00am to 7:00pm.

Day of week. When investigating the days of the week in which RRT calls occurred, Friday (n=20), Thursday (n=19), and Saturday (n=17) were found to be the days with the most frequently occurring calls. The remaining 44 RRT calls were divided between Sunday (n=15), Tuesday (n=11), Monday (n=10), and Wednesday (n=8).

Nursing units. The nursing units where the RRT was summoned to were also examined. The majority of calls occurred on the Progressive Care Unit and accounted for 21 percent of calls. The second most common unit for RRT calls was the Cardiology unit at 14 percent of calls. The third most common unit seeking assistance from the RRT was the Nephrology/Urology/Gynecology unit at 10 percent of calls. The remaining RRT calls occurred on the units of Neurosciences (n=9), General Surgery (n=9), Nurse Residency Unit (n=9), Orthopedics (n=8), Oncology (n=7), Pulmonary (n=6), Medical A (n=5), and Mother-Baby Unit

(n=1). The Pediatrics unit was discovered to have placed one RRT call. This call was included in this study because the patient evaluated by the RRT was an adult patient that was overflowed to the Pediatrics unit due to a lack of available adult inpatient beds.

RRT Call Characteristics

During the data collection phase for this project, several characteristics of the RRT calls were examined. The specific reasons leading to the primary nurse activating the RRT and the interventions performed during the calls are discussed in detail in the following sections. Also, a discussion of the outcomes of the RRT calls and the discharge status of the patients receiving RRT evaluation are included. All of the characteristics of RRT calls are displayed in Table 3.

Reasons for RRT activation. The reasons behind what prompted primary nurses to activate the RRT were examined to meet Aim II of this project, which focused on determining the most common reasons for RRT calls. Several RRT calls were placed due to changes in condition in more than one body system. For example, numerous calls were noted to be activated due to tachycardia and tachypnea, or for decreased level of consciousness and hypotension. Therefore, reasons for calls are listed by both number of patients and total number of abnormal system symptoms.

Of the 100 RRT calls reviewed in this study, 54 patients displayed some type of respiratory distress symptom. Some patients displayed more than one respiratory distress-related symptom during a single call (e.g. desaturation and dyspnea, or tachypnea and hypoxia) for a total of 76 distress symptoms in the sample of 100 patients. Abnormal respiratory symptoms were recorded sometimes as respiratory distress (n=16), and other times as a specific symptom like desaturation (n=27), labored breathing (n=1), tachypnea (n=11), shortness of breath (n=9),

hypoxia (n=3), dyspnea (n=7), and apnea (n=2). Therefore, all abnormal respiratory symptoms were grouped into one category: respiratory distress.

Approximately 43 out of the 100 patients examined in this study displayed one or more cardiac symptom. Some patients displayed more than one cardiac symptom within a single call (e.g. tachycardia and hypotension), which lead to a total of 49 cardiac symptoms out of the 100 patients studied. In 22 cases, the RRT was called for an arrhythmia, which included bradycardia (n=4), tachycardia (n=12), supraventricular tachycardia (n=2), atrial fibrillation with rapid ventricular response (n=3), and runs of ventricular tachycardia (n=1). In 19 cases, the RRT was activated due to the patient being hypotensive. Some patients were evaluated because of hypertension (n=4). And, new onset of chest pain resulted in four RRT activations.

Changes in neurological status were the third leading reason for activating the RRT with a total of 40 patients out of 100 displaying at least one neurological abnormality. Some patients displayed more than one neurological abnormality (e.g. agitation and disorientation), therefore the total number of neurological abnormalities recorded were 48. Because of the differing types of changes in neurological status, multiple types of neurological symptoms were grouped into one category and labeled "change in mental status." This category included disorientation (n=1), decreased level of consciousness (n=20), lethargy (n=4), unresponsiveness (n=10), confusion (n=2), agitation (n=1), and altered mental status (n=4). Another reason documented for activating the RRT was for seizure-like activity (n=6), which included jerking movements (n=1) and tremors (n=2).

Numerous other reasons (n=32) for activating the RRT were recorded while analyzing each call. For example, some additional reasons found for calling the RRT that occurred in more than one call were diaphoresis (n=5), fever (n=4), uncontrollable pain (n=4), anxiety (n=2), and

post-operative bleeding (n=2). Other random reasons with only one RRT activation included calls like weakness, nausea, decreased urine output, low body temperature, dizziness, etc.

Interventions during calls. To meet Aim III of this project, the interventions performed during each of the 100 RRT calls were examined. The majority of RRT calls required more than one intervention to be performed to prevent further patient deterioration. Similar to the most common reason for activating the RRT being for respiratory symptoms, the most common interventions performed during RRT calls were respiratory in nature (n=88). Supplemental oxygen was utilized in 44 RRT calls including simply increasing the liters of flow via nasal cannula (n=6), initiating high-flow nasal cannula (n=1), and placing the patient on a Venturi mask (n=1). In numerous cases, supplemental oxygenation methods had to be progressed to a more advanced method of oxygen support. For example, some patients were placed on nonrebreather masks (n=16) initially but had to be advanced to Bilevel Positive Airway Pressure (BiPAP) support (n=20). In 34 RRT calls, an arterial blood gas was performed by the team. On some occasions, a breathing treatment was initiated (n=7) to open airways and reduce wheezing. And, suctioning (either nasotracheal, oropharyngeal, or endotracheal) was performed on three patients.

Medications (n=58) were also noted to be given during numerous RRT calls. Normal Saline intravenous boluses were recorded most frequently (n=10). Intravenous furosemide (n=9) was also administered during multiple RRT calls. Intravenous lorazepam (n=6), metoprolol (n=5), naloxone (n=4), and morphine (n=3) were also reported to be administered during RRT calls. Other medications recorded as administered during at least two RRT calls were hydromorphone, methylprednisolone, acetaminophen, levetiracetam, diltiazem, atropine, and

50% dextrose. Labetalol, heparin, nitroglycerine, diazepam, diphenhydramine, flumazenil, and haloperidol were each given once during RRT calls.

Diagnostic tests (n=51) were performed during multiple RRT calls. The most commonly occurring diagnostic test was found to be a portable chest x-ray (n=21). Electrocardiograms (n=15) were found to be the second most commonly occurring diagnostic test during RRT calls. Other diagnostics found to be performed during RRT evaluations were computed tomography (CT) of the head (n=9), CT of the chest (n=4), CT of the abdomen (n=1), and echocardiogram (n=1).

Another common intervention discovered during data collection was conducting laboratory testing (n=34). Although documentation was limited regarding which specific laboratory tests were ordered, the medical records indicated "labs" were drawn during multiple RRT calls (n=5). In some medical records, specific laboratory tests were documented as completed including complete blood count (n=6), comprehensive metabolic panel (n=3), brain natriuretic peptide (n=3), blood glucose (n=4), troponin (n=3), and blood cultures (n=3). Other laboratory tests that were noted during at least one RRT call were basic metabolic panel, D-dimer, prothrombin time/international normalized ratio, lactic acid, urinalysis, and urine and sputum culture. The lack of documentation of laboratory testing during RRT calls is discussed in further detail in the "Limitations" section of this paper.

A variety of other interventions (n=14) were found to be performed during RRT calls. For example, miscellaneous interventions included but were not limited to placing the patient in Trendelenburg, straight catheterization, placing the patient on telemetry, and intravenous catheter placement were listed as performed. On nine RRT calls, no interventions were documented. It is uncertain whether no interventions were actually required or if there was simply a lack of

documentation of any interventions performed (also discussed in the "Limitations" section of this paper). Interestingly, many RRT calls (n=30) included the physician responded to the bedside to assess the patients' change in condition.

Patient outcomes of RRT calls. The outcome of each RRT call was recorded during data collection to meet Aim IV of this project, which sought to examine the overall outcomes of the RRT calls. The majority of patients (n=56) were able to remain in their current room without requiring transfer to an area for higher level of care. The second largest percentage of patients (n=38) were transferred to the Intensive Care Unit requiring higher level of care. On two occasions out of the 100 RRT calls examined, the patients deteriorated into a "Code Blue" event, were resuscitated, and then transferred to the Intensive Care Unit. Two patients required transfer to the Progressive Care Unit. One patient was transferred to the Cardiology Unit. And, one patient expired during the RRT call due to a "Do Not Resuscitate" order.

Patient discharge status. The final disposition or discharge status of each of the 100 patients receiving RRT evaluation was recorded. The majority of patients were ultimately discharged home (n=53). The second most commonly occurring patient disposition was expiration (n=18), with most being withdrawal of care to natural expiration (n=14) and some being a "Code Blue" event followed by death (n=4). Multiple patients undergoing RRT evaluation were discharged to the Nursing Home (n=10). Some were discharged to subacute rehabilitation facilities (n=8). A total of five patients were discharged hospice, including inpatient hospice (n=3) and home with hospice (n=2). The remaining patients undergoing RRT evaluation were either transferred to a Long Term Acute Care facility (n=3) or to another hospital (n=3) either for higher level of care, like for extracorporeal membrane oxygenation (ECMO) treatment, or due to transferring to a veteran's hospital because of veteran's status.

Clinical Question 1

Clinical question one examined what the most common reasons for activating the RRT were in the adult medical-surgical patient population. The most common reason nursing units sought assistance from the RRT was for respiratory distress symptoms (n=76). These symptoms included desaturation, labored breathing, tachypnea, shortness of breath, dyspnea, hypoxia, and apnea. The second most common reason was for cardiac symptoms (n=49). These symptoms included arrhythmias, hypertension, hypotension, and chest pain. The third most common reason for summoning the RRT was for neurological symptoms (n=48). These symptoms included change in mental status and seizure-like activity.

Clinical Question 2

Clinical question two examined the common characteristics of patients for whom the RRT was activated. When examining the characteristics of the 100 patients undergoing RRT evaluation, males (n=57) were found to be evaluated more frequently than females (n=43). The ages of patients seen by the RRT were between 22 and 95, with the mean age being 62.28. Patients undergoing RRT evaluation were found to be admitted to the hospital for many different reasons including neurological (n=19), respiratory (n=18), cardiac (n=15), infection (n=15), gastrointestinal/genitourinary (n=14), and a variety of other diagnoses (n=19). The most common comorbidities of patients undergoing RRT evaluation were hypertension (n=69), diabetes mellitus (n=37), congestive heart failure (n=30), cancer (n=26), and chronic obstructive pulmonary disease (n=26). Other less frequently noted comorbidities were coronary artery disease (n=17), chronic kidney disease (n=16), cerebrovascular accident (n=11), and end-stage renal disease (n=10).

Clinical Question 3

Clinical question three examined the interventions performed during the RRT calls. Over 250 interventions were reported as being performed in the 100 RRT calls examined in this study. The most frequently performed interventions were respiratory-related (n=85) including increasing supplemental oxygen (n=44), obtaining arterial blood gases (n=34), and administering breathing treatments (n=7). Medications were commonly administered (n=58) during RRT calls with Normal Saline boluses (n=10) and intravenous Lasix (n=9) being the most common. Diagnostic tests were performed in many RRT calls with chest x-rays (n=21) and electrocardiograms (n=15) accounting for the most frequently performed tests. Laboratory tests (n=34) were recorded as performed during numerous RRT calls. Other miscellaneous interventions (n=14) were recorded during some RRT calls. Some RRT calls (n=9) required no interventions, which was either due to improvement in patient condition, an active "Do Not Resuscitate" order, or to a lack of documentation in the electronic health record. And, on many occasions (n=30), the physician responded to the bedside after being notified by the RRT.

Clinical Question 4

Clinical question four examined the result of the call and the overall outcome of the call and the discharge status of patients requiring RRT activation. Immediately following the RRT call, the majority of patients (n=56) were stable enough to remain in their current room. On numerous occasions (n=38), patients had to do be transferred to the Intensive Care Unit for a higher level of care. On two additional occasions, these patients deteriorated into a "Code Blue" event, were successfully resuscitated, and then transferred to the Intensive Care Unit. The remainder RRT calls resulted in either transfer to the Progressive Care Unit (n=2), transfer to the Cardiology Unit (n=1), or death (n=1) due to a "Do Not Resuscitate" order. The majority of patients were able to be discharged home (n=53) at the conclusion of their hospitalization.

Clinical Question 5

Clinical question five investigated the top three reasons for RRT activation that would benefit from evidence-based protocol development for use by the team. The top three changes in patient conditions and reasons for activating the RRT that would benefit from RRT protocol development and implementation are for respiratory distress symptoms, cardiac symptoms, and neurological symptoms. The respiratory distress protocol necessitates a primary focus on improving oxygenation and determining the cause of the respiratory distress symptoms. The main reasons found for summoning the RRT related to cardiac symptoms were arrhythmias, abnormalities in blood pressure, and new onset of chest pain. Diagnostic testing (e.g. electrocardiogram) and laboratory testing (e.g. electrolytes, cardiac enzymes) would be useful on an RRT protocol to expedite the care of patients displaying cardiac symptoms during RRT calls. Because this particular facility already has a specific "Stroke Alert" protocol and policy in place, it would be beneficial for the RRT to have a protocol in place to manage the care of patients displaying other changes in neurological status (e.g. decreased level of consciousness, new onset of confusion or agitation, and seizure-like activity).

Other Findings

Of the 100 RRT calls examined in this chart review, it was noted that on several occasions, the RRT intervened and likely decreased the chances of patient death. For example, on four different RRT calls, the patients undergoing RRT evaluation required intubation after arriving to the Intensive Care Unit. On a different four RRT calls, patients were transferred to the Intensive Care Unit and experienced a "Code Blue" event within 24 hours after arriving to the critical care area. And on two separate RRT calls, the patients' condition deteriorated into

"Code Blue" events, were resuscitated, transferred to the Intensive Care Unit, and were able to be discharged after recovering.

Another finding during the data collection for this project was that eight patients required more than one RRT evaluation during their hospitalization. Two patients required two RRT evaluations during the same shift. One of these patients experienced desaturation and required a second RRT call for worsening desaturation and dyspnea. The second patient required RRT evaluation for lethargy initially, followed by a second call for worsening lethargy, hypotension, and hypoxia. This patient experienced a "Code Blue" event on arrival to the Intensive Care Unit after the second RRT call. Two of the eight patients requiring more than one evaluation from the RRT actually required three RRT calls during their hospitalization.

Chapter V

Discussion

With the increasingly ill patient population seeking medical care causing limitations in critical care unit bed vacancies (Mullins, Goyal, & Pines, 2013; Wagner et al., 2013), it is crucial to determine effective strategies to better manage patients at risk for clinical deterioration on general medical-surgical units. Rapid Response Teams are in place in most hospitals to aid in this critical need. However, utilizing the RRT in the most effective ways for optimal patient outcomes requires congruency and standardization of care during RRT calls. Therefore, this project identified three primary reasons (respiratory, cardiac, and neurological changes in condition) that the RRT was most often summoned for, and steps were taken to develop evidence-based protocols according to the most common interventions found to be performed at this facility during the 100 RRT calls that were examined and consistent with the literature regarding the treatment of patients exhibiting these symptoms in the acute care setting.

Respiratory Symptoms Protocol Development

Discovered to be the most common clinical reason for activation of the RRT, respiratory distress symptoms occurred in 54 percent of patients requiring evaluation by the team. Therefore, a Respiratory Symptoms Protocol (see Appendix B) was developed to begin treating patients with symptoms of, but not limited to: desaturation, dyspnea, tachypnea, shortness of breath, labored breathing, and use of accessory muscles. Treatment orders in this protocol include the administration of supplemental oxygen to maintain oxygen saturation levels at 90 percent or higher. Setting the minimal goal oxygenation level at 90 percent allows for the inclusion of COPD patients, whose standard goal oxygen saturation range is from 88 to 92 percentage (Abdu & Heunks, 2012; Adams, Sutter, & Albertson, 2011; Mitchell, 2015; National

Institute for Health and Care Excellence, 2016). Supplemental oxygenation methods found to be utilized in the RRT calls examined in this project were nasal cannula, high-flow nasal cannula, Venturi mask, nonrebreather mask, and BiPAP. Each of these oxygenation methods are listed on the protocol with an indication to advance the method of support as needed until reaching the satisfactory oxygenation level of 90 percent or higher.

The Respiratory Distress Protocol order-set also includes a stat order for an arterial blood gas (ABG). Obtaining an ABG in a patient with respiratory distress symptoms can aid in determining the proper treatment of impaired gas exchange, ineffective ventilation, and abnormal acid-base balances (Foster & Prevost, 2012; Mohammed & Abdelatief, 2016). A stat portable chest x-ray is included in this order-set. Chest radiography will help determine if certain conditions, like infiltrates or pulmonary edema, are contributing to the distress symptoms (Horlander & Gruden, 2016). Although contacting the physician provider should be presumed, this order is stated on the protocol for clarification and to serve as a reminder for members of the RRT.

Other respiratory-related interventions were found to be performed on patients during the RRT calls that were examined including administering breathing treatments and suctioning to clear obstructive secretions. Therefore, the protocol contains an order for a stat one-time dose of Albuterol 2.5mg nebulizer treatment for patients exhibiting wheezing. Nebulized albuterol can help relieve or reduce symptoms of wheezing, cough, and shortness of breath in patients with respiratory distress (Adams, Sutter, & Albertson, 2011). An order for nasopharyngeal and oropharyngeal suctioning is also included on the protocol and indicated for patients that are unable to clear secretions either due to ineffective cough or inability to cough (Potter, Perry, Stockert, & Hall, 2013).

Cardiac Symptoms Protocol Development

The second most common reason for activating the RRT at this facility was found to be due to cardiac-related symptoms at 43 percent of the 100 calls investigated. Therefore, a Cardiac Symptoms Protocol (see Appendix C) was developed with an indication to treat patients exhibiting signs and symptoms of cardiac abnormalities. Symptomatic hypotension, arrhythmias, and a new onset of chest pain were determined to be the most common cardiac reasons for summoning the RRT.

Within the Cardiac Symptoms Protocol, the symptomatic hypotension portion of the protocol has specific indications for patients exhibiting a systolic blood pressure of less than 80 mmHg or a mean arterial pressure (MAP) less than 60 and at least one hypotensive symptom, including dizziness, diaphoresis, fainting/syncope, pallor/ashen skin color, blurred vision, or a decreased level of consciousness. The initial order in the order-set requires verification of the accuracy of the blood pressure by evaluating multiple sites and ensuring the appropriate cuff size is being used according to the patient's body habitus. Blood pressure cuffs that are too wide in proportion to the patient's arm circumference can result in falsely low blood pressure readings (Andrews, DeWitt, Czerwien, Bijelic, & Latman, 2011); therefore, verifying accuracy of the patient's blood pressure is necessary before initiating treatment.

Once the blood pressure reading is verified, the next order in the order-set includes ensuring adequate intravenous (IV) access or obtaining IV access if needed. This order in the order-set basically serves as a reminder to RRT members to verify that the patient's IV is functioning properly for the administration of an IV fluid bolus and in the event that the patient experiences further rapid clinical deterioration. The third order in this order-set instructs the RRT members to place the patient on a cardiac monitor to observe for changes in cardiac rhythm

in this symptomatic hypotensive patient population. Patients displaying symptomatic hypotension have the potential for further deterioration; therefore, cardiac monitoring should be initiated (Cone, Brice, Delbridge, & Myers, 2015).

The next two orders in the symptomatic hypotension treatment order-set are aimed at correcting hypovolemic-induced hypotension. For patients without a known medical history of congestive heart failure (CHF) or end stage renal disease (ESRD), the patient can receive a one-time stat 500 milliliter (ml) IV bolus of 0.9% Normal Saline. Patients with volume depletion without shock should be administered an initial 500 ml IV fluid bolus of isotonic solution for hypotension (de Moya, 2013). For patients with a known history of CHF or ESRD, the patient can receive a one-time IV fluid 0.9% Normal Saline bolus of 250 ml. Patients with increased potential for fluid volume overload should be administered smaller IV fluid boluses (250 ml) for treatment of hypotension (Krause, 2015).

The next order in the hypotensive symptoms protocol order-set includes performing a 12-lead electrocardiogram (EKG). In hypotensive patients, completing a 12-lead EKG can determine whether certain arrhythmias or ischemia could be affecting perfusion (Grossman & Rosen, 2011). Other orders in this order-set include monitoring the patient's vital signs every 5 minutes until the symptoms resolve or until the blood pressure returns to the patient's baseline and reminding team members to remove any topical medications that could be contributing to the patient's hypotension (e.g. nitroglycerine or fentanyl patches). And similar to the Respiratory Distress Symptoms Protocol, an order to notify the physician provider is included as a reminder to RRT members to page the attending physician.

The next section in the Cardiac Symptoms Protocol includes the evaluation and treatment of arrhythmias. These order-sets are intended for patients exhibiting new onset of a sustained

heart rate of greater than 120 beats per minute (BPM), a sustained heart rate of less than 50 BPM, atrial fibrillation, atrial flutter, supraventricular tachycardia (SVT), or runs of ventricular tachycardia (V-tach). Each of these order-sets include possible suggestions for the physician provider upon notification of the patient's change in condition. The decision was made by this protocol developer to initially veer toward the conservative angle in which orders to place as active orders on these proposed protocols in an attempt to have increased support from physician staff members for the approval of the protocols. The anticipation is to add the suggested orders into the active order-set after the physician staff becomes more accustomed to the RRT treatment protocols and comprehends the possible benefits of the protocol use during RRT calls.

For patients experiencing a new onset of tachycardia (sustained heart rate of > 120 bpm), orders to obtain a 12-lead EKG and to notify the physician provider are listed. The next orders in this order-set are based on possible suggestions for the physician provider upon notification of the patient's change in condition. The listed suggestions are to obtain an order for telemetry monitoring (if the patient is not already on telemetry), a one-time dose of metoprolol 5mg IV, and to obtain CBC, CMP, and Magnesium labs.

For patients displaying a new onset of SVT, orders to obtain a 12-lead EKG and to attempt vagal maneuvers (e.g. cough, bear-down) are in place. Vagal maneuvers can elicit an autonomic response and decrease the heart rate (Frisch & Zimetbaum, 2017). The other active order in this order-set includes notifying the physician provider. Some suggestions that are listed to offer to the physician provider include obtaining a telemetry order, a one-time dose of metoprolol 5mg IV, and obtaining the labs of CBC, CMP, and Magnesium. Another option listed to suggest to the physician is the administration of Adenosine for patients that are experiencing symptomatic tachycardia. The American College of Cardiology in conjunction

with the American Heart Association have established guidelines advising medical professionals to attempt vagal maneuvers and/or administer IV Adenosine to patients with SVT of unknown mechanism (Page et al., 2016). The same guidelines for treating SVT also include administering IV beta blockers, like Metoprolol, for hemodynamically stable patients. A statement reminding RRT members that this particular facility now has a policy instated that requires a physician to be physically present at the bedside of the patient in order to administer a dose of Adenosine. Because this is a relatively new change in practice at this facility, the developer of this protocol determined the reminder to be necessary.

Consistent with the previous two cardiac arrhythmias listed, the treatment orders for patients with symptomatic bradycardia (HR < 50 bpm) include obtaining a 12-lead EKG and notifying the physician provider. The possible suggestions listed upon notification of the physician are to obtain an order for telemetry and for a one-time dose of Atropine 0.5mg IV push (American Heart Association, 2005). Atropine is an anticholinergic drug that is the first-line treatment in Advanced Care Life Support (ACLS) algorithms for treating bradycardia; however, the administration of Atropine is contraindicated in patients with a high degree atrioventricular block, like second degree type II or third degree (Carron & Veronese, 2015; Pozner, 2017). Therefore, this order in included in the list of possible suggestions for the physician. Also listed as a suggestion in the protocol, transferring the patient to ICU should be considered in the event that transcutaneous or transvenous pacing is deemed necessary.

For patients experiencing a new onset of atrial fibrillation or flutter, active orders for obtaining a 12-lead EKG and notifying the physician are in place. Possible suggestions for the physician include obtaining an order for telemetry (for patients not already being monitored) and administering an IV bolus of Cardizem. A Cardizem bolus injection of 0.25 mg per kilogram of

the patient's body weight is standard for reducing the rapid ventricular response within 30 minutes of administration (Hines et al., 2016; Likourezos & Marshall, 2014). The standard Cardizem bolus dosing in this facility is 10 mg IV push for patients weighing less than 60 kg and 20 mg IV push for patients weighing greater than 60 kg. Because this dosing is familiar to nurses in this facility, the developer of this protocol chose to use this dosing for consistency. For patients sustaining in atrial fibrillation or flutter, a reminder is included to suggest transferring the patient to the Cardiology Unit where continuous IV antiarrhythmic medications can be administered if needed.

Per the results of the data collected for this project, runs of V-tach was also determined to be a reason for summoning the RRT and was, therefore, included in the Cardiac Symptoms Protocol. Like other arrhythmias, standing orders for a 12-lead EKG and notifying the physician provider are in place. Possible suggestions for the physician include obtaining CMP and Magnesium labs and transferring the patient to a cardiac-focused unit.

The RRT was also found to be activated for patients experiencing a new onset of chest pain. The Cardiac Symptoms Protocol is intended for use in patients exhibiting any new onset of substernal chest pain consistent with that of myocardial infarction and/or pain radiating to the back, neck, jaw, or arms. The active orders in the order-set include obtaining a 12-lead EKG, applying supplemental oxygen via nasal cannula, and obtaining stat labwork for cardiac markers, including troponin, creatine kinase (CK), and CK-MB. Each of these orders are recommendations from the American Heart Association and American College of Cardiology for treating patients with acute coronary syndrome (Amsterdam et al., 2014). Expectantly, notifying the physician provider is included as an active order in the order-set with possible suggestions for telemetry (if not already ordered) and nitroglycerine 0.4 mg sublingual every five

minutes as needed for three doses, as per recommendations from the American Heart Association and American College of Cardiology (Amsterdam et al., 2014).

Neurological Symptoms Protocol Development

Determined to be the third most common reason for activating the RRT, a Neurological Symptoms Protocol was developed for use by the team (see Appendix D). This protocol is indicated for patients exhibiting any sign or symptom of a change in mental status including but not limited to disorientation, lethargy, unresponsiveness, confusion, agitation, or decreased level of consciousness. As mentioned previously, this facility already has a stroke symptoms specific protocol in place; therefore, these types of symptoms were excluded from this protocol.

For patients experiencing a new onset of lethargy, unresponsiveness, or any other sign of decrease in level of consciousness, the first order in the order-set includes obtaining the patient's vital signs. A stipulation is in place with this order to refer to the Cardiac Symptoms Protocol or the Respiratory Symptoms Protocol for patients with abnormal blood pressure, heart rate, or oxygen saturation findings. The next order in the order-set includes obtaining the patient's blood glucose level. This particular facility already has an established Hypoglycemia Protocol, so this order directs the RRT to initiate this protocol if indicated. The next order directs the team to obtain a stat ABG to determine if carbon dioxide retention and/or acidosis is contributing to the change in mental status (Ignatavicius & Workman, 2015).

The RRT generally investigates any recent medication administrations in patients displaying changes in mental status. For patients determined to be experiencing symptoms of oversedation and/or respiratory depression secondary to opiate administration, an active order is in place to administer Narcan (naloxone) 0.4 mg IV push. Narcan has the ability to reverse opioid activity and improve a patient's level of alertness within minutes (Pawasauskas, Stevens,

Youssef, & Kelley, 2014). For patients displaying symptoms of oversedation and/or respiratory depression secondary to benzodiazepine administration, an active order is listed to administer Romazicon (flumazenil) 0.2 mg IV push. Romazicon is a benzodiazepine receptor antagonist that reverses the effects of benzodiazepines very quickly after administration (Greller & Gupta, 2017). Notifying the physician provider is also an active order in the order-set with possible suggestions for the provider including obtaining a stat CT of the head and labwork of CBC, CMP, ammonia level, and lactic acid level (Potter et al., 2013).

Similar to patients displaying a decreased level of consciousness, patients displaying a new onset of disorientation, agitation, or confusion should initially have their vital signs evaluated by the RRT and the Cardiac Symptoms Protocol and Respiratory Symptoms Protocol should be referred to for patients with abnormal blood pressure, heart rate, or oxygen saturation readings. This order-set also includes obtaining a blood glucose level and initiating the Hypoglycemia Protocol if indicated. The third order in the order-set includes notifying the physician provider and possible suggestions for the provider for treating the patient's current condition. These suggestions include a CT of the head without contrast, labwork (CBC, CMP, ammonia, and lactic acid levels), and an ABG. If the patient's safety is of concern, the RRT may need to suggest restraints to protect the patient from harm. And for patients displaying signs of extreme agitation, Ativan 0.5 mg IV push may be suggested to the provider because Ativan has been shown to control violent behavior and reduce acute episodes of agitation (Jenson & Clough, 2016).

The results of this chart audit indicate that multiple RRT calls were activated for patients displaying seizure-like activity. Therefore, an order-set was developed specifically for the management of these patients. The first active order in the order-set includes ensuring the

patency of the patient's airway during episodes of seizure-like activity. This order also guides RRT members to refer to the Respiratory Symptoms Protocol if the patient is experiencing desaturation. The second order in the order-set includes obtaining the patient's blood glucose level and initiating the hospital's Hypoglycemia Protocol if indicated. The next order instructs the RRT members to administer one dose of Ativan 0.5 mg IV for seizures lasting five minutes or longer. Benzodiazepine therapy (specifically lorazepam) is the preferred drug class for the initial treatment of seizure activity (Pillow, Kimmel, Doctor, & Howes, 2017). Notifying the physician provider is an active order in the order-set with possible suggestions for the provider including a stat CT of the head without contrast and a urine drug screen (to rule out substance withdrawal symptoms). Another suggestion for the physician is other anticonvulsant medication options. This suggestion was included on the protocol because levetiracetam and diazepam were also noted to be given during several RRT calls investigated at this facility.

Limitations

Several limitations were determined during the data collection, statistical analysis, and results write-up phases of this project. The facility where this project took place has already established a specified "Stroke Alert" protocol for patients displaying stroke-like symptoms (e.g. unilateral weakness and facial drooping). The healthcare team members that respond to a "Stroke Alert" are the same team members as the standard RRT; however, instead of the Cardiac Intensive Care Unit (CICU) triage nurse being primarily responsible for overseeing and documenting the call, the Medical-Surgical Intensive Care Unit (MSICU) triage nurse is responsible. The MSICU triage nurse follows a specific protocol, orders the appropriate diagnostic and laboratory testing per the protocol, and documents the events and outcome of the call on a paper form. When this protocol was implemented many years ago, the nursing staff at

the facility were educated to call a "Stroke Alert" specifically when patients are presenting stroke-like symptoms. A limitation found while collecting data for this project was that the nursing staff were not always signifying the need for a "Stroke Alert" when contacting the hospital operator to page the RRT. Therefore, any patients examined by the RRT displaying stroke-like symptoms were omitted from the patient sample for this project because this type of protocol is already instituted. Reeducating nursing staff members on clarifying the appropriate team to page could resolve this issue.

As mentioned, the standard practice in the facility where data collection occurred for this project is for the CICU triage nurse to document the events of the RRT call in a specific section in the electronic health record. Of the 100 RRT calls examined, only eight calls were found to have been documented by the CICU triage nurse. Even in these eight correctly documented RRT calls, the electronic health record had to be searched thoroughly to determine other specific details surrounding the calls. Details of the other 92 patients requiring RRT evaluation were obtained through scouring over the electronic health record and through documentation from the Nursing Supervisor shift reports.

The most concerning limitation discovered was the tremendous lack of documentation in the electronic health record for a change in patient condition on behalf of the patient's primary nurse. On numerous occasions, there was no notation from the primary nurse of the events surrounding the patient's deterioration in condition and the interventions performed for the patient. Also, on many patients that required transferring to the Intensive Care Unit, no nursing notes were found to document the patient's transition to a higher level of care from the primary nurse. This alarming lack of documentation necessitates further investigation and has been identified as an area for future research and quality improvement.

Implications for Practice

The results of the data collected in this project and the newly developed evidence-based protocols were presented to the Critical Care Director and the Chief Nursing Officer at this facility where this area in need of quality improvement was identified. If approval is obtained from these hospital administrators, the evidence-based protocols will be accessible for presentation and approval by hospital physician staff. If approval of the protocols is obtained from supporting physicians, the protocols will be available for implementation for the RRT at this facility. The ultimate goals of this project were to develop evidence-based protocols for use during RRT calls to standardize and optimize the care provided to patient during RRT calls, to ensure the RRT members are practicing within their proper scope of practice, and to achieve an overall improvement in patient outcomes.

Conclusion

The purpose of this translational research project was to investigate the characteristics of RRT calls and develop RRT protocols in order to improve and standardize the care provided to patients during the calls. Evidence-based protocols were developed for the most common reasons the RRT was activated. The results of this retrospective chart audit and the latest supporting literature were utilized to develop the Respiratory, Cardiac, and Neurological Symptoms Protocols. Expectantly, these protocols will serve to optimize the care provided to patients during RRT calls and will result in improvement in overall patient outcomes, which supports the overall mission of the facility where this project took place.

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Table 1

Patient Characteristics

Variable	Frequency (*n*)
Gender	
Male	57
Female	43
Admitting Diagnosis	
Neurological	19
Respiratory	18
Cardiac	15
Infection	15
GI/GU	14
Other	19
Comorbidities	
Hypertension	69
Diabetes mellitus	37
Congestive heart failure	30
Cancer	26
Chronic obstructive pulmonary disease	26
Coronary artery disease	17
Chronic kidney disease	16
Cerebrovascular accident	11
End-stage renal disease	10

Table 2

RRT Call Logistics

Variable	Frequency (*n*)
Time of day	
7am-7pm	43
7pm-7am	57
Day of week	
Monday	10
Tuesday	11
Wednesday	8
Thursday	19
Friday	20
Saturday	17
Sunday	15
Nursing Unit	
Progressive Care Unit	21
Cardiology	14
Neph/Uro/Gyn	10
Neurosciences	9
General Surgery	9
Nurse Residency Unit	9
Orthopedics	8
Oncology	7
Pulmonary	6
Medical A	5
Mother-Baby Unit	1
Pediatrics	1

Table 3

RRT Call Characteristics

Variable	Frequency (*n*)
Reason for call	
Respiratory distress	76
Cardiac	49
Arrhythmias	22
Hypotension	19
Hypertension	4
Chest pain	4
Neurologic	48
Change in mental status	42
Seizure-like activity	6
Other	32
Interventions	
Respiratory	88
Nonrebreather mask	16
BiPAP	20
Increased nasal cannula liters	6
High-flow nasal cannula	1
Venturi mask	1
Arterial blood gas	34
Breathing treatment	7
Medications	58
Normal saline bolus	10
Furosemide	9
Lorazepam	6
Metoprolol	5
Naloxone	4
Morphine	3
Other	21
Labs	34
Other	14
MD to bedside	30

Patient Outcome of RRT Call	
Remained in room	56
Transfer to ICU	38
Code Blue/Transfer to ICU	2
Transfer to PCU	2
Transfer to Cardiology	1
Expired	1
Patient Discharge Status	
Discharge home	53
Expiration	18
Nursing home	10
Subacute rehab	8
Hospice	5
Transfer to LTAC	3
Transfer to another hospital	3

Appendix A

Rapid Response Team Data Collection Tool

Patient #: _____

Date of call	
Time of call	
Age	
Gender	
Original Unit	
Admitting Diagnosis	
Comorbidities	
Reason for the RRT Call	
Interventions during the RRT Call	
Outcome of the RRT Call	
Disposition/ Discharge Status	

Appendix B

Respiratory Symptoms Protocol

Indication:

For patients exhibiting any sign or symptom of respiratory distress including but not limited to:

- Desaturation
- Dyspnea
- Tachypnea
- Shortness of breath
- Labored breathing
- Use of accessory muscles

Orders:

1. Provide and increase supplemental oxygen support to **maintain 02 sat ≥ 90%.**

   ___ Nasal Cannula (up to 6 Liters)
   ___ High-flow Nasal Cannula
   ___ Venturi Mask
   ___ Nonrebreather Mask
   ___ BiPAP

2. Arterial Blood Gas (ABG) Stat

3. Portable Chest X-ray Stat

4. **Notify** Physician Provider.

Symptom Specific Orders:

- For wheezing:

  Albuterol 2.5mg nebulizer x 1 dose Stat

- For gastric secretions or vomiting in the mouth, or gurgling sounds with inspiration and expiration, and the patient is unable to clear secretions via coughing:

  Perform nasopharyngeal or oropharyngeal suction PRN.

Appendix C

Cardiac Symptoms Protocol

Indication:

For patients exhibiting signs and symptoms of symptomatic hypotension, arrhythmia, or new onset of chest pain.

Symptomatic Hypotension:

For patients with a Systolic Blood Pressure of < 80 mmHg or a MAP < 60 and at least one of the following symptoms:

- Dizziness
- Diaphoresis
- Fainting/syncope
- Pale/Ashen
- Blurred vision
- Decreased LOC

Orders:

1. Verify accurate blood pressure by evaluating multiple sites and ensuring appropriate cuff size.
2. Ensure adequate IV access or obtain IV access if needed.
3. Place on cardiac monitor (LIFEPAK 20) if bedside monitoring is unavailable.
4. For patients **WITHOUT** a known medical history of **CHF or ESRD**,
    - ***Administer 0.9% Normal Saline 500ml IV Bolus x 1 Stat***
5. For patients **WITH** a known history of **CHF or ESRD**,
    - ***Administer 0.9% Normal Saline 250ml IV Bolus x 1 Stat***
6. Perform 12-Lead EKG
7. Monitor vital signs every 5 minutes until symptoms resolve or BP returns to baseline.
8. Remove any topical medications that may contribute to hypotension (e.g. Nitroglycerine patch, Fentanyl patch).
9. Notify Physician Provider.

***Arrhythmias*:**

For patients exhibiting any of the following new onset of changes in cardiac rhythm:

- Sustained HR > 120
- Sustained HR < 50
- Atrial Fibrillation
- Atrial Flutter
- SVT
- Runs of Vtach

Tachycardia (Sustained HR > 120):

- **Order**: 12-Lead EKG
- **Notify** Physician Provider. Possible **suggestions**:
  - Telemetry order (if patient not already on tele)
  - Metoprolol 5mg IV x 1 dose
  - Labs: CBC, CMP, Mag

SVT (Sustained HR > 150):

- **Order**: 12-Lead EKG
- Attempt Vagal Maneuvers (cough, bear-down)
- **Notify** Physician Provider. Possible **suggestions**:
  - Telemetry order (if patient not already on tele)
  - Metoprolol 5mg IV x 1 dose
  - Labs: CBC, CMP, Mag
  - If patient is symptomatic, suggest Adenosine. Physician must be at the bedside per hospital policy if Adenosine is administered.

Symptomatic Bradycardia (Sustained HR < 50):

- **Order:** 12-Lead EKG
- **Notify** Physician Provider. Possible **suggestions**:
  - Telemetry order (if patient not already on tele)
  - Atropine 0.5mg IV Push x 1 dose
  - For symptomatic bradycardia, suggest transfer to ICU.

Atrial Fibrillation/Flutter:

- **Order:** 12-Lead EKG
- **Notify** Physician Provider. Possible **suggestions:**
  - Telemetry order (if patient not already on tele)
  - Cardizem IV Push:
    - For patients < 60 kg, 10 mg IV push over 2 minutes.
    - For patients ≥ 60 kg, 20 mg IV push over 2 minutes.
  - For sustained A-Fib/Flutter, suggest transfer to Cardiology Unit.

Runs of Ventricular Tachycardia:

- **Order:** 12-Lead EKG
- **Notify** Physician Provider. Possible **suggestions:**
  - Labs: CMP, Mag
  - Transfer to Cardiology, PCU, or ICU

***Chest Pain*:**

For patients exhibiting any new onset of substernal chest pain consistent with that of myocardial infarction and/or pain radiating to the back, neck, jaw, or arms.

- **Order:**
  - 12-Lead EKG
  - 02 via Nasal Cannula for comfort
  - Labs: Troponin, CK, and CK-MB Stat

- **Notify** Physician Provider. Possible **suggestions:**
  - Nitroglycerine 0.4 mg SL every 5 minutes PRN x 3 doses.
  - Telemetry order (if patient not already on tele)

Appendix D

Neurological Symptoms Protocol

(Excluding Stroke-related symptoms)

Indication:

For patients exhibiting any sign or symptom of change in mental status including but not limited to:

- Disorientation
- Lethargy
- Confusion
- Decreased LOC
- Unresponsiveness
- Agitation

New onset of Lethargy/Unresponsiveness/Decreased LOC:

Orders:

1. Obtain vital signs (for patients with abnormal 02 sat, BP, or HR, refer to *Cardiac or Respiratory Symptoms Protocols*)

2. Obtain blood glucose via Accucheck (initiate *Hypoglycemia Protocol* if indicated)

3. Obtain Stat ABG

4. For patients displaying symptoms of oversedation and/or respiratory depression secondary to opiate administration, administer **Narcan (naloxone) 0.4mg IV Push x 1 dose.**

5. For patients displaying symptoms of oversedation and/or respiratory depression secondary to benzodiazepine administration, administer **Romazicon (flumazenil) 0.2mg IV Push x 1 dose.**

6. **Notify** Physician Provider. Possible **suggestions:**
    - Stat CT of the Head without contrast
    - Labs: CBC, CMP, Ammonia, Lactic Acid

New onset of Disorientation/Agitation/Confusion:

Orders:

1. Obtain vital signs (for patients with abnormal 02 sat, BP, or heart rate, refer to *Cardiac or Respiratory Symptoms Protocols*)

2. Obtain blood glucose via Accucheck (initiate *Hypoglycemia Protocol* if indicated)

7. **Notify** Physician Provider. Possible **suggestions:**

    - Stat CT of the Head without contrast
    - Labs: CBC, CMP, Ammonia, Lactic Acid
    - ABG
    - Restraints if patient safety is a concern (Violent/Non-violent)
    - Ativan 0.5mg IV x1 dose

New onset of Seizure Activity:

Orders:

1. Ensure patency of airway (For desaturation, refer to *Respiratory Symptoms Protocol*)

2. Obtain blood glucose via Accucheck (initiate *Hypoglycemia Protocol* if indicated)

3. For seizures lasting 5 minutes or longer, administer **Ativan (lorazepam) 0.5mg IV x1 dose**

4. **Notify** Physician Provider. Possible **suggestions:**

    - Stat CT of Head without contrast
    - Urine Drug Screen
    - Other anticonvulsant medication options