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Elizabeth Amaka Azie
University of Texas at Arlington

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Creation of a Structured Rapid Response Team with Early RRT Activation

Elizabeth Azie, MS, APRN, AGACNP-BC

College of Nursing and Health Innovation, The University of Texas Arlington

NURS 6621

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Faculty Project Adviser: Dr. Welch, Elizabeth, DNP, APRN, MBA, ACNS-BC

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Abstract

Cardiac arrest, unanticipated admissions to the intensive care unit, and mortality account for about 50% of serious inpatient adverse events (Ko et al., 2020). Efforts to prevent in-hospital cardiopulmonary resuscitation require a system to identify deteriorating patients and include an appropriate interventional response, such as a rapid response team (Andersen et al., 2019). A well-structured rapid response team (RRT) has five categories that include: team structure, organizational culture, expertise, communication, and teamwork (Jackson, 2017). A community hospital in Texas has been challenged in its attempts to have a well-structured RRT and had an increase in cardiac arrest. A quality improvement bundle was initiated to evaluate these challenges. The bundle includes the creation of a structured RRT for early activation, an educational process on early warning signs relating to activation of RRT, and creating an RRT communication sheet. The quality improvement project implementation included a small convenience sample of 30 registered nurses in the medical-surgical-telemetry units and was evaluated based on a pre- and post-implementation design. Data were collected manually and from electronic health records. Statistical analysis was performed using a Wilcoxon signed rank and Friedman test. Friedman's test revealed a significant increase in post-implementation knowledge levels. There was a significant increase in "Yes" responses and a decrease in "No" responses compared to pre-knowledge among $N = 30$ nurses, $\chi^2(1) = 21.498, p < .001$. A significant difference was also observed in confidence levels pre- and post-implementation, $\chi^2(1) = 70.588, p < .001$.

Keywords: cardiopulmonary arrest, structured rapid response team, educational training

Creation of a Structured Rapid Response Team with Early RRT Activation

In the United States (U.S.), 48,000 to 98,000 patients die annually due to medical errors and preventable cardiopulmonary arrest ([CPA]; Ko et al., 2020). Cardiac arrest, unanticipated admissions to the intensive care unit (ICU), and mortality account for about 50% of serious inpatient adverse events (Ko et al., 2020). Andersen et al. (2019) reported that 50% to 60% of inpatient cardiopulmonary resuscitation (CPR) are cardiac-related, while 15% to 40% are due to respiratory insufficiency. Efforts to prevent in-hospital CPR require a system to identify deteriorating patients and include an appropriate interventional response, such as a rapid response team (Andersen et al., 2019).

In Texas, there are 5,369 out-of-hospital cardiac arrests (OHCAs) requiring CPR annually from 13 communities, a median of 2,762 per community (Huebinger et al., 2022). Additionally, a community hospital in Texas had 95 in-hospital cardiopulmonary arrests (IHCAs) in one year, requiring the intervention of CPR (Quality Improvement, 2022). Failure to recognize, plan, and communicate when a patient's condition deteriorates can contribute to hospital mortality (Institute for Healthcare Improvement, 2023). The rapid response team (RRT) is a team of clinicians who bring critical care expertise to the bedside when needed to reverse acute clinical deterioration (Institute for Healthcare Improvement, 2023). However, some community hospitals have been challenged in their attempts to have a well-structured RRT. These challenges have been known to be associated with ineffective functioning and poor outcomes associated with these RRTs (Jackson, 2017). A well-structured RRT includes five categories identified by Jackson (2017). The five categories include team structure, organizational culture, expertise, communication, and teamwork (Jackson, 2017).

A local community hospital in Texas had challenges establishing a well-structured, effective RRT. The organization's quality improvement team reported a 30% increase in RRT calls over the 2022 calendar year compared to the prior year, 2021. There was also a concurrent increase in unplanned patient transfers to a higher level of care. Recognizing early clinical deterioration indicators in patients and intervening quickly can reduce ICU transfers and improve health outcomes (Douw et al., 2015). Failure of nurses ability to recognize and intervene in a timely manner results in a delay in activating the RRT. Although there is no current structured RRT, this local organization wanted to use a well-structured RRT to decrease CPR incidences resulting in transfers to a higher level of care. Each RRT member must fully understand their role, structure, and responsibilities for the team to succeed (Jackson, 2017).

Literature Review

A systematic literature search focused on RRT teams' structure, interventions, education, and communication in acute care settings for early recognition of patients experiencing acute clinical deterioration was conducted. The search was performed across three disciplines, namely nursing, medicine, and education, which were deemed most appropriate for the project's Population, Intervention, Compare, Outcome, Time, and Setting (PICOTS). The databases searched included CINAHL (Cumulative Index to Nursing and Allied Health Literature) Complete, PubMed, MEDLINE, and the Cochrane Library collection. The search terms used for relevant literature included: hospitalized adult patients, rapid response teams, acute care settings, medical-surgical units, early recognition, clinical deterioration, cardiac arrest, failure to recognize, unplanned intensive care unit transfers, patient mortality, effective communication strategies, and rapid response team structure and nurses. A delimiter was patients aged 18 years and over.

The inclusion criteria were articles published in English between 2017 and 2022, research articles less than five years old, peer-reviewed, randomized controlled trials (RCTs), systematic reviews, quantitative and qualitative studies, abstracts available, and full free text. The initial search with two criteria yielded 140 articles. A second search using all the search terms except quantitative and qualitative studies yielded 60 articles. The third search, with the addition of quantitative or qualitative studies to the search terms, yielded 25 studies. Eleven out of the 25 studies were excluded as not immediately relevant. One original article from 2015 and one from 2016 were included as their content is relevant to the proposed project. Fourteen articles were identified that addressed the significance of the structure of RRT teams, the education process for early RRT activation, and the use of RRT communication tools to enhance the effectiveness of the RRT and improve patient outcomes in the acute care setting. These studies are summarized in Table 1.

Synthesis of Evidence

The purpose of the literature review was to find studies that examine the factors that contributed to the success of an RRT team, including the formation of a structured RRT for prompt activation, education on early warning signs related to activating the RRT, and the development of an RRT communication sheet. The review of relevant literature has shown differences in the RRT team structure in acute care hospitals, the impact of educational training on RRT teams, and the significance of using RRT communication sheets, such as debriefing tools after each RRT event to assess team performance and identify areas for improvement. According to several studies (Davis et al., 2015; Hall et al., 2020; Mitchel et al., 2019; Smith & McSweeney, 2016), most RRT teams are comprised of a nurse, a respiratory therapist (RT), and a physician. In a study conducted by Chalwin et al. (2020), the redesigning of the RRT team was

found to be effective in enhancing its quality. The study's approach encouraged improved communication between team members and nurses, and a better understanding of roles and responsibilities among the team members. As a result, the interactions between the RRT team and the nurses improved, and the RRT members better understood their roles.

Effective RRT performance requires educational training on the early warning signs associated with RRT activation and intervention (Clayton, 2019; Olsen et al., 2019; Pascua, 2021; Tilley & Spencer, 2020). Educating RRT members and nurses on early recognition, activation, and response to RRT activations is imperative (Olsen et al., 2019; Pascua, 2021). Post-educational training has been shown to improve early recognition and activation of RRT significantly. However, non-ICU and novice nurses may feel unprepared and intimidated, hindering RRT activation (Clayton, 2019; Tilley & Spencer, 2020). The studies showed that effective interventions, such as focused education and a dedicated interdisciplinary RRT, have successfully reduced these barriers and increased nurses' confidence in RRT activation.

During interactions between RRT members and users, non-technical skills domains, including communication and cooperation, are crucial (Chalwin et al., 2020). To improve teamwork and communication among RRT members, the implementation of team training and structured handoff tools such as debriefing and checklists are vital (Conoscenti et al., 2021; Neville et al., 2020; Przednowek et al., 2021). The utilization of these tools has been shown to significantly reduce handoff-related safety errors and communication errors among team members, thus enhancing overall patient outcomes and team effectiveness (Conoscenti et al., 2021; Neville et al., 2020; Przednowek et al., 2021). To mitigate communication errors that may lead to delayed RRT activation, the Situation, Background, Assessment, Recommendation (SBAR) communication tool has been recommended to improve nurses' communication skills in

the activation process (Shahid & Thomas, 2018). The results of the studies have demonstrated that using the SBAR tool can improve situational awareness and patient outcomes by effectively conveying important information to clinicians.

Creation of a Structured RRT for Early Activation

Chalwin et al. (2020) conducted a study to describe and assess a multifaceted re-design of a rapid response system (RRS), which focused on improving the quality of RRT members, and member-use communication and cooperation. The redesign objectives were to encourage a better understanding of roles and responsibilities amongst RRT members, improve the identification of those roles to staff, and improve communication with the RRT team members and nurses (Chalwin et al., 2020). The three components of the redesign include regular RRT meetings, badge identification of RRT members' roles, and a structured handoff report from the RRT members to nurses for patients remaining on the floor at the end of an RRT event. The researchers reported that the RRT redesign produced improvements in interactions between members of RRT and the nurses. The findings suggested that refinement and improvement of the RRT are possible but should be an ongoing interactive effort supported by staff training (Chalwin et al., 2020).

Davis et al. (2015) conducted a quality improvement (QI) study to determine the effectiveness of a novel RRT program design in decreasing non-intensive care unit (non-ICU) CPA and overall hospital mortality. The study was conducted in two urban university hospitals with 500 medical-surgical beds. The RRT created by the hospital for the study includes a critical care nurse, an RT, and a unit charge nurse. The unit charge nurse was not a primary RRT responder but responded when RRT was called in the specific unit (Davis et al., 2015). Additionally, the unit charge nurse made rounds on each shift and assessed patients at risk of

clinical deterioration. The primary responders assessed the patient during RRT activation and communicated with the hospital-designated code blue physician for further orders and escalation of care (Davis et al., 2015). Furthermore, charge nurses from each inpatient unit received training as unit-specific RRT members (Davis et al., 2015). Annual competency education for staff included early identification of patients experiencing acute clinical deterioration in non-ICUs. One of the primary reasons for inpatient hospitalization was the capability to observe and monitor patients to identify clinical deterioration and prevent CPA. Davis et al. (2015) reported a decreased incidence of non-ICU CPA and an unchanged incidence of CPA in the ICU. There was a decrease in hospital mortality (2.12% to 1.74%, $p < 0.001$). Including non-ICU charge nurses as members of the novel RRT and universal RRT education effectively decreased the incidence of non-ICU CPA and overall hospital mortality.

A systematic review was conducted by Hall et al. (2020) to compile evidence regarding the influence of RRTs on failure to recognize (FTR) incidents. FTR, as a measure of patient safety, is mortality following cardiac arrest and treatable in-hospital complications (Hall et al., 2020). Early intervention can reduce avoidable morbidity and mortality in non-intensive care hospital settings, which is a fundamental tenet of RRT (Hall et al., 2020). Although the RRT team's makeup may vary depending on institutional policy and guidelines, it typically consists of a nurse, a doctor, and RT (Hall et al., 2020). The successful implementation of RRTs may be hindered by cultural barriers and conventional hierarchical models of patient monitoring and rapid response (Hall et al., 2020). Organizational efforts to train nursing staff and improve support for the RRT indicate that lasting culture and process changes are driven by educational efforts (Hall et al., 2020).

A descriptive cross-sectional study conducted by Mitchel et al. (2019) analyzed the

composition of RRTs in five hospitals located in the Northeastern region of the United States. The study's primary objective was to examine the RRT's structure, composition, and function across the country. The study results indicated significant differences in the RRT's structure and leadership among the hospitals analyzed. However, most RRTs included a critical care nurse, an RT, and a provider, with percentages of 79%, 86%, and 74%, respectively. Additionally, some teams consisted of a critical care physician, while others had various team members (Mitchel et al., 2019). The success of an RRT in enhancing patient outcomes relies on the team members' expertise and structure. An efficient RRT should possess a well-balanced mix of skills to enable proper diagnosis, management, and triage of acutely deteriorating patients. The study also discovered that registered nurses (RNs) led 21% of RRTs, while 19% were led by a critical care physician or a resident. As a result, the researchers recommended developing evidence-based practice guidelines on the RRT's structure and function to optimize outcomes for in-hospital patient deterioration, despite the variations in RRT structure (Mitchel et al., 2019).

Smith and McSweeney (2016) conducted a study to identify factors influencing the development of RRTs in hospitals and to understand how RRT costs are evaluated. The study found that in 10 out of 15 hospitals, a critical care charge nurse without any patient care assignment attended all RRT calls, while in five hospitals, a designated rapid response nurse with a primary RRT role attended all calls. The optimal structure and function of RRTs are crucial to supporting quality nursing care and enhancing patient safety in hospitals.

Education Process on Early Warning Signs Relating to Activation of RRT

Olsen et al. (2019) systematically reviewed 21 qualitative research studies. The review aimed for a better understanding of how healthcare professionals perceive facilitators and barriers affecting the effectiveness of the RRT. The barriers reported by the reviewers include

inconsistent education for RRT team members, unavailability of consistent education and training for nursing staff, and inconsistent RRT team members. Facilitators for an effective RRT team include collaboration and trust among the team members, continuous evaluation and interprofessional training, and feedback (Olsen et al., 2019).

Pascua (2021) conducted a study using quantitative and qualitative methods to identify the competency of nurse crisis responses associated with conducting clinical assessment and decision-making models in activating RRT. One of the study objectives included evaluating factors contributing to the nurses' decision to activate RRT and the reasons to escalate care. The researchers determined that nurses' knowledge, experience, and understanding of how to obtain help directly affected nurses' decision-making. Both quantitative and qualitative findings support that recognizing signs of deterioration is the major factor in determining a nurse's next step in activating RRT. The success of RRT in improving patient outcomes depends on the timely identification of patient deterioration status and prompt team activation (Pascua, 2021). The use of RRT has contributed to meaningful RRT outcomes, and nurses play a vital role in observing and clinical decision-making.

Tilley and Spencer (2020) conducted a literature review on perceived barriers to RRT activation among nurses. The review aimed to investigate the major barriers nurses face when seeking additional assistance and resources to manage and stabilize clinically deteriorating patients. Patients often experience acute changes in their baseline an average of 6.5 hours before a critical event, such as cardiac arrest, and about 70% of the critical events are preventable (Tilley & Spencer, 2020). Some identified barriers to RRT activation included a lack of consistent RRT education among nurses, an established chain of command, uncertainty of when to call to RRT, less nursing experience, and increased workload for the ICU and medical-surgical

nurses. Nurses who received education on when to activate an RRT and what happens with RRT activation were more likely to have a positive unit culture about the effectiveness of RRT. Education is important in minimizing barriers to RRT activation (Tilley & Spencer, 2020).

Clayton (2019) conducted a study utilizing the synergy theoretical framework on overcoming barriers impeding the nurse activation of RRTs. Management of rapid patient deterioration requires prompt recognition and swift response by bedside nurses and specially trained personnel, who successfully intervene to improve patient outcomes. The activation of RRT by bedside nurses can improve patient outcomes. However, barriers like lack of preparedness and intimidation from expert nurses can hinder activation. Focused education and a dedicated interdisciplinary RRT can reduce these barriers and improve patient care. Increasing organizational awareness of the benefits of RRT can also increase nurse activation and responsiveness rates (Clayton, 2019).

A study conducted by Longstreth et al. (2023) aimed to improve patient outcomes by reducing nurse hesitancy to call the RRT. The study was conducted at a hospital in the northeastern part of the United States, with a proactive RRT program in place. However, the RRT members noticed that nurses often hesitated to call for help despite seeing early signs of patient deterioration. They also expressed confusion about the automatic trigger system and when they should activate the RRT. After recognizing this gap in practice, the researchers recommended several solutions to improve the situation. These included organizing educational programs for new and experienced nurses, clarifying the role of the RRT, and encouraging staff to call for help even when there may not be an apparent reason. Additionally, they suggested creating a standardized communication process for passing on information and debriefing after each RRT event. As a result of implementing these changes, the study discovered that the percentage of

nurse-initiated proactive calls to the RRT increased significantly from 45% to 53%. Although there were no significant differences in the number of bedside interventions, step-down unit transfers, or ICU transfers before and after the practice change, the percentage of patients who received bedside interventions increased slightly. The study's findings emphasize the significance of education and communication in enhancing patient outcomes (Longstreth et al., 2023).

Creation of an RRT Communication Sheet

Neville et al. (2020) conducted a study to improve patient safety by reducing communication-related errors in an acute care hemodialysis unit. The study utilized clinical team training and a structured handoff tool to enhance teamwork and communication. Implementing structured communication tools, such as checklists, briefings, debriefings, and escalation algorithms, resulted in a statistically significant difference between pre-implementation and post-implementation audit and safety event data. The study showed a consistent decrease in handoff-related safety events, with a 50% reduction target in communication-related errors. The findings revealed that the post-intervention group had a significantly higher handoff tool usage and completion rate. Before the intervention, handoffs were performed only 43% and 33% of the time, while post-intervention, there was an increase to 93% and 97%, respectively (Neville et al., 2020). The baseline safety event reports showed an average of 2.75 communication-related safety events per month, but after the intervention, there were zero reported communication and handoff-related patient safety events (Neville et al., 2020).

Another study by Przednowek et al. (2021) aimed to improve emergency care in a community setting by implementing a rapid post-code debrief process. The study found that debriefing is an effective tool for improving performance, promoting teamwork, and identifying areas for improvement (Przednowek et al., 2021). Standardizing the debriefing process helps

create a supportive team culture, provides time for regrouping, and increases peer and leadership support. The study evaluated several aspects of resuscitation procedures, including equipment, medication, staffing issues, and emotional support provided after the codes. To collect data, the participants completed a seven-item survey before, six months after, and one year after the intervention. They also completed a rapid post-code debriefing form using a standard format (Przednowek et al., 2021). The responses were measured on a scale of 0-10, and individual responses were tracked. After implementing the debriefing protocol, the results showed a significant increase in overall satisfaction with code-response performance. Participants reported a score of 6.661 ($SD = 2.028$) before the protocol and 7.90 ($SD = 1.359$) after the implementation (independent t -test = 5.069, $p < 0.001$) (Przednowek et al., 2021). The study concluded that implementing a post-code debriefing increased overall satisfaction with how codes were conducted. Further studies in community and academic-based emergency department (ED) settings are needed to further explore these complex relationships (Przednowek et al., 2021).

Shahid and Thomas (2018) conducted a study to examine the effectiveness of the SBAR communication tool for healthcare handoffs. The study aimed to identify communication challenges in clinical settings, assess the use of the SBAR tool for handoffs, and compare it to other communication tools. Effective communication is crucial in providing safe and effective patient care. In hospitals, interdisciplinary teams manage patients with complex needs. Team members must communicate consistently, clearly, and concisely to ensure everyone understands the patient's clinical information. The SBAR communication tool promotes a common language among team members, encouraging shared decision-making and conflict resolution, ultimately improving patient satisfaction and outcomes (Shahid & Thomas, 2018). Shahid and Thomas (2018) reported that unsuccessful communication could lead to delayed RRT activation and

increased in-hospital deaths. Structured SBAR protocols for nurses presenting patient cases during patient deterioration and activation of RRT have resulted in shorter review times during RRT events. However, using the SBAR tool requires training of team members to ensure clear communication. It involves a culture change to adopt and sustain structured communication formats by all healthcare providers. The authors suggest that educating nurses on how to use the SBAR tool to communicate critical information to clinicians could improve situational awareness and patient outcomes (Shahid & Thomas., 2018).

According to a study conducted by Conoscenti et al. (2021), healthcare professionals' opinions on technical and non-technical responses during emergencies, and the value of post-crisis debriefing, were examined. The study aimed to identify errors, develop strategies to improve individual and team performances, and ultimately enhance patient care. The debriefing process is crucial for clinicians to reflect on their knowledge, skills, attitudes, and teamwork and analyze and correct any system, attitude, or behavioral issues that may have initiated errors. The survey results were analyzed using descriptive statistics, chi-square tests, or Fisher's exact tests from 148 healthcare workers, with a response rate of 25% (Conoscenti et al., 2021). The study found that 55% of respondents believed resuscitation guidelines were fully implemented, while 64% found the teaching program sufficient (Conoscenti et al., 2021). Additionally, 97% of participants acknowledged the importance of teamwork dynamics, 79% recognized the significance of personal performance, and 52% viewed emergencies as opportunities for professional growth. Regarding leadership, 45% of respondents deemed it crucial, with 41% implementing debriefing and 85% finding it useful (Conoscenti et al., 2021). According to most surveyed healthcare professionals, the study concluded that post-crisis debriefing could promote a reflective and lifelong learning culture and significantly enhance the quality of the RRT.

Project Question

For the multidisciplinary team that responds to RRT activations, does education of early warning signs related to activation of RRT along with other aspects of a ‘structured RRT’ such as team roles and job descriptions clarity and delineation, and use of RRT communication sheet, when compared to the current practice of RRT with no designated team roles, result in activation of appropriate RRT, use of RRT communication sheet, measurement of pre and post knowledge of activation of RRT, and improvement in patient outcomes, over eight weeks post-implementation, in an acute care community hospital in Texas?

Objectives

The project objectives include (a) the creation of a job description for the RRT and its members, (b) the provision of care provider education on early warning signs and activation of RRT, (c) the creation of an RRT communication sheet, (d) use of the communication sheet, and (e) include stakeholders in the creation of the RRT, job descriptions, and the communication sheet.

Framework

The Plan-Do-Study-Act (PDSA) model for improvement framework was used as a guide for the implementation of this RRT-proposed project. The model originated from the engineering and manufacturing world (Yu & von Schroeder, 2021). Most healthcare systems use the PDSA for QI to enhance the quality of patient care (Knudsen et al., 2019). The purpose of the PDSA cycle is to structure the improvement process using experimental learning as a methodology (Knudsen et al., 2019).

The first stage of the cycle, Plan, involves the identification of the gap and the changes needed for improvement. For the project, the planning involves identifying the need to develop a

structured multidisciplinary RRT to respond to RRT calls on the medical-surgical floors to improve patient outcomes. It also involved providing education training for the nurses to increase their knowledge about early recognition of acute clinical deterioration of patients and the use of practical communication skills among the team members.

The Do cycle involved implementing and testing the proposed interventions to close the gap and collect data for statistical analysis. The implementation included the structuring of a new RRT, and the analysis included appropriate team members, communication, and patient outcomes. The Study cycle measured and analyzed data collected, compared results, and summarized the intervention results. The Act cycle examined the success of the outcome and the need for additional changes to achieve the implementation outcomes (see Appendix A).

Methods

Project Design

This QI project aimed to assess the effectiveness of a structured RRT with early RRT activation. The team received educational training for early recognition and RRT activation. A pre- and post-implementation design was utilized. The data collected was analyzed to measure the impact of the project's intervention on the knowledge of early warning signs and RRT activation, completion of the RRT communication sheet, and decreased mortality. To evaluate the impact that may affect the successful implementation of the project, the Doctor of Nursing Practice (DNP) student utilized the Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis (see Appendix B). The risk management plan was developed to evaluate the project implementation's risk, probability, impact, mitigation, and contingency (see Appendix C). Additionally, the barriers and facilitators that may affect the translation of the proposed project were addressed by assessing the organizational readiness to change in having a structured RRT

(see Appendix D). The project lead facilitated and helped to improve the organizational readiness for change. A Gantt chart was used to plan and communicate the detailed project implementation timeline (see Appendix E), and a budget was created to cover the estimated expenditure for the project implementation (see Appendix F).

Population

The project's target population was the RN staff nurses and the charge nurses. The charge nurses were 21 years old, and employees of the hospital with a minimum of three years of experience as registered nurses, and two years of experience in the charge nurse role. These individuals had current cardiopulmonary resuscitation certification and advanced cardiovascular life support skills and certification. Also included in the criteria were nurses employed within the healthcare system in the staffing resource pool who sometimes fill in as charge nurses on the medical-surgical floors. The exclusion criteria were licensed vocational nurses working on the medical-surgical floors and nurse administrators.

Setting

A local community acute care hospital in Texas was the setting for creating a structured RRT with early activation of RRT calls. The hospital, located in a suburban area, is affiliated with one of the largest not-for-profit health systems in southeast Texas. The health system comprises of seventeen hospitals, eight cancer centers, three heart and vascular institutes, twenty-seven sports medicine and rehabilitation centers, and other outpatient and rehabilitation centers. The community hospital has over 800 hundred affiliated physicians and 900 clinical and non-clinical staff. As one of the primary hospitals in its county, its staff provides health care services in medical, surgical, cardiovascular, neurological, pediatrics, and rehabilitation to a diverse population of over 500,000 thousand people. It is a 179-bed hospital with three medical-

surgical floors. Each of the medical-surgical floors has 30 beds. The nurses on these floors work a 12-hour shift, and each shift has a designated charge nurse who does not have a patient assignment.

Measurement and Analysis

The data was collected from the project site's Cerner electronic health record (EHR) database. All RRT events are recorded in the EHR by the nursing staff as required by the facility policy and guidelines. The outcome variables vital in evaluating the project's outcomes were the number of patients requiring transfer to a higher level of care, patients stable to remain on the floor, and patient mortality. The pertinent outcome variables were retrieved from the Cerner database. The data was collected pre- and post-implementation from the EHR database. The DNP student does not need permission to use the Cerner EHR database for data collection as the facility has approved the implementation of the project (see Appendix G).

Cerner, the EHR software used at the hospital, can facilitate the data collection process for clinical projects and is safe and effective in providing data reliability (Queiroz et al., 2019). Though Queiroz et al. (2019) mentioned that Cerner EHR could provide data reliability, there was no statistical test done in the study to validate the EHR system. Umberger et al. (2019) used the Cerner EHR to collect data in their study to enhance screening and research data for early identification of sepsis, and no statistical test was done for validity. The quality and reliability of data extracted electronically from EHR repositories is system-specific (Brundin-Mather et al., 2018). Though EHR reliability is often recognized as critical, validation studies have not been widely reported in the published literature for many systems (Brundin-Mather et al., 2018). Therefore, neither statistical reliability nor statistical validity testing was reported by using this tool. However, the tool was considered valid (face validity) because it measured the outcome

variable that answered the PICOTS. Face validity is a subtype of construct validity that examines how much the measurement method includes all the relevant elements vital to the measured concept (Grove & Ciper, 2020).

Intervention

Before the implementation phase of the QI project, the DNP student completed the human rights training (see Appendix H), obtained a project site and received the approval of the site's internal institutional review board (see Appendix I), and acquired a clinical advisor. In week one of the implementation phases, from August 21, 2023, to August 27, 2023, an email was sent to the RRT members about the educational training (see Appendix J). An email was also sent to nurses informing them of the project implementation and the expectations (see Appendix K). In week two, from August 28, 2023, to September 3, 2023, the DNP student met with the Chief Nursing Officer (CNO) and the ICU, medical-surgical floors, and RT managers and informed them of the project implementation. The DNP student also asked for their support in making the RRT members under their supervision available to attend the educational training. In addition, the team lead introduced the RRT activation communication checklist sheet to be completed by the RN upon activation of the RRT before the team arrives (see Appendix L) and the post-RRT debriefing evaluation sheet (see Appendix M). The managers were asked to encourage and support the nurses in completing the forms.

After meeting with managers and emailing nurses, the project lead visited each medical-surgical floor and attended nurses' shift huddles. During these visits, the project lead reinforced the importance of early recognition and activation of the RRT team and the use of SBAR communication. The nurses were also introduced to the RRT activation communication checklist sheet. A questionnaire was distributed to evaluate nurses' knowledge of appropriate RRT

activation and confidence level in completing the communication sheet (see Appendix N).

Nurses were asked to complete the questionnaire before the end of their shift if they were off the next day, or within 24 hours if they were working the next day. The DNP student collected the questionnaires daily, assuring confidentiality. Responses were recorded on the Dashboard as pre-and-post-data, with each nurse identified as Nurse 1, Nurse 2, and so on (see Appendix O). The DNP student used week three from September 4, 2023, to September 10, 2023, to distribute, collect and review the pre-intervention data.

Role on the Team

As the team leader, the project lead utilized the PDSA model to guide the project implementation. The team comprised of six members from various disciplines, including a hospitalist, an ICU nurse practitioner (NP), an RT, an ICU nurse, a charge nurse from the medical-surgical floor, and a chaplain. The project lead worked alongside a nurse educator for training opportunities. To ensure attendance at the training, the lead met with nursing directors from the ICU and medical-surgical floors, and the CNO and discussed implementing the structured RRT in the hospital system. An email script was sent to the team reminding them of the project proposal, and their inclusion as RRT team members. The team received project updates through email and all virtual or face-to-face meeting, were organized and led by the project lead. During face-to-face meetings, the project lead discussed the implementation process and each team member's specific roles while addressing any questions or concerns. The project team lead collected and analyzed all project data.

RRT Team Members' Specific Roles.

The hospitalist and the ICU NP led the structured RRT within the hospital,

and responded to all RRT activations within five minutes. The ICU NP received a brief report about the patient, including their code status and events leading to the RRT, and conducted a quick assessment while other RRT team members were in the room. While the RRT event was ongoing, the hospitalist reviewed the patient's chart outside the room. The ICU NP or the hospitalist ordered diagnostic tests like chest radiograph (CXR), electrocardiogram (EKG), computed tomography scan (CT scan), magnetic resonance imaging (MRI), and laboratory tests as necessary. The ICU NP was responsible for intubating the patient and ordering the necessary medications for rapid sequence intubation. The hospitalist entered the transfer/admission orders and notified the ICU intensivist about patients who needed to transfer to a higher level of care. The ICU NP accompanied the ICU nurse and RT to diagnostic tests such as CT and MRI if the patient was intubated and stable for the test before transferring to the ICU. For patients who do not need to be transferred to a higher level of care, the ICU NP and hospitalist discussed the plan of care with the unit charge nurse and the patient's primary nurse. After each RRT event, there was a debriefing led by the hospitalist and ICU NP to improve the team's performance and provide the best possible care to patients. The nurse who initiated the RRT was invited to participate in the debriefing.

The ICU nurse responded to all RRT activations in the hospital within five minutes. Once in the patient's room, the nurse assessed the patient and communicated the findings to the healthcare provider if unavailable during the RRT event. The ICU nurse came prepared with an emergency kit that included intubation supplies and rapid-sequence medications in case they were needed. If airway protection was necessary, the ICU nurse drew and administered the rapid sequence intubation medication under the direction of the ICU NP. The ICU nurse also accompanied the patient to any necessary diagnostic tests and assisted in transferring the patient

to a higher level of care in the ICU. The ICU nurse educated the floor nurses during RRT events and debriefing, emphasizing the importance of early recognition and activation of RRT to improve patient outcomes. The nurses were also encouraged to complete the RRT activation checklist form before RRT arrival.

During an RRT activation, the charge nurses responded to RRT calls on their specific unit and remained with the patient until other RRT members arrived. They also ensured that the necessary equipment, such as the crash cart, masks, gloves, and isolation gowns (if required), were available in front of the patient's room. The charge nurse collaborated with the patient's nurse to set up a suction, and supplies for drawing labs and checked the patient's vital signs and blood sugar before the RRT team arrived. For the patients who were stable and remained on the floor, the charge nurse continued to monitor them closely and communicated any clinical changes to the hospitalist/NP. The ICU nurse and unit charge nurse collaborated with the hospital Operation Administrator for bed assignment if the patient needed to transfer to the ICU. For a portable chest X-ray, the ICU nurse and the unit charge called the X-ray technician. The charge nurse was responsible for completing the RRT debriefing communication sheet. Follow-up education for the nurses during RRT events and debriefings was also the responsibility of the charge nurse as an RRT team member.

The RT responded to all RRT calls within five minutes and provided respiratory support and management of advanced oxygen requirements such as bilevel positive airway pressure (BiPAP) and vapotherm. They also obtained arterial blood gas and administered nebulizing treatments. The RT assisted the ICU NP during intubation and managed the ventilator during patient transfer. The RT also accompanied intubated patients and those on BiPAP and vapotherm to diagnostic tests before transfer to a higher level of care. The chaplain responded to all RRT

activations within the hospital and offered emotional support to the staff, patients, and their family members.

Required Education

The structured RRT team members required education training during the project implementation. The educational session started from week four September 1, 2023, to September 17, 2023. Each education session was in person using PowerPoint presentations and a case study scenario (see Appendix P). Video clips from Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) were incorporated into the education PowerPoint presentations. An email was sent for permission to use the videos (see Appendix Q). The Dew conference room on the first floor of the east tower was used for the training. The education director approved using the conference room. There were two education sessions during the day; the first was at 1030 and the second at 1600. Education sessions for the night shift were at 2200. The chaplain attended the education training during the day. The nurses attended the training sessions during their scheduled shifts. The nurse buddy system was used to ensure the continuation of patient care during the educational training. An arrangement was made with the unit managers for coverage to enable the nurses to attend the training. Also, the RTs attended the training during their scheduled shifts. The RT's buddy system was used to facilitate training attendance. The DNP student provided complimentary light refreshments/on-the-go meals during training sessions.

The education session was held during weekdays for five days in week four. Each session of the education lasted 45 minutes and was provided by the DNP student. There was a total of fifteen sessions. Each session had a sign-in sheet and an education timeline to ensure that the content of the education training was covered during each session. The DNP student scheduled a

physical meeting with RRT members within weeks five and six from August 28, 2023, to September 23, 2023, to follow up on the education training and answer any questions or concerns.

During these three weeks, the DNP student scheduled two mock RRT activations with a scenario in an empty room on one of the medical-surgical floors to enable RRT members to practice their roles and complete the RRT communication sheets. After each practice scenario, a debriefing was held to evaluate the team's effectiveness and make necessary changes for team improvement. Data on each team member's completion of their roles and the communication sheets was collected from the two mock RRT activation events. The visits to the medical-surgical floors and nursing huddles occurred in weeks five and six. The DNP student scheduled the visits once a shift for ten visits. The project implementation was over eight weeks, and data on the RRT activation events and outcomes was collected by the DNP student from week five through week 13, September 24, 2023, through November 24, 2023.

The DNP student collected pre- and post-implementation data on RRT activities in all the RRT activation locations for the project. Forty pre-intervention baseline data and fifty-seven post-intervention were collected from the hospital's EHR system, Cerner. The data collected includes demographic variables and clinical characteristics. The demographic variables include the patient's age and gender. The clinical characteristics data include the reason for the activation and the use of the communication checklist (see Appendix R). For easy recognition of the patients and to maintain confidentiality, each patient in the data collection was de-identified as RRT 1, RRT 2, and so on (see Appendix S). From October 9, 2023, to November 24, 2023, forty-five days post-implementation, all pre- and post-implementation data collected was

recorded on a spreadsheet as an encrypted document in the DNP student's work computer with a password only known to the DNP student for data analysis and evaluation.

Statistical Analysis

The eight-week QI project utilized one group pre-implementation and post-implementation design. Descriptive statistics were calculated, encompassing frequencies and percentages for categorical variables, and means, medians, and ranges for continuous variables (see Appendix T). These statistics were computed for nurse participant demographics, patient demographics, clinical characteristics, and attributes of RRT activations. Pre- and post-implementation knowledge and confidence assessments were also included. A nonparametric *t*-test, Friedman and Wilcoxon Signed rank test, and the Statistical Software Package for the Social Sciences (SPSS) software were used. The threshold value for statistical significance was calculated using $p < 0.05$ or less. The DNP student sought additional assistance from a statistician to effectively analyze all the data.

Wilcoxon Signed Rank tests were employed to evaluate differences between pre- and post-implementation knowledge responses. The Wilcoxon Signed Rank test is suitable for paired data analysis, particularly when dealing with ranked data, non-normal distributions, or when assumptions of normality are not met. This test involves ranking the absolute differences between paired observations and comparing the sum of positive and negative ranks. A rejection of the null hypothesis indicates a statistically significant difference between the groups or time points being compared. Additionally, Friedman's test was used to compare ranks between nurses' knowledge of appropriate RRT activation and confidence level in completing the RRT communication checklist.

Ethical Considerations

Ethical considerations were essential throughout the study to safeguard patient confidentiality. Approval for the project was obtained from both the hospital and educational institutional review board committees. The proposal was also reviewed and approved by the Graduate Nursing Review Committee (GNRC), a sub-committee of the university's institutional review board (see Appendix U). Human Subjects training was completed before starting the project to ensure adherence to ethical standards.

Results

Project Outcomes

The project outcome was evaluated to see if the creation of a structured RRT resulted in an appropriate RRT being called, the use of an RRT communication sheet, increased knowledge of activation of RRT, and improved patient outcomes with RRT activation over eight weeks post-implementation in the community hospital. Demographic information was collected from 30 nurses who completed pre- and post-implementation questionnaires. Most participants were female (93%), with 67% aged between 24 and 30, and 33% aged between 31 and 50. Analysis of hospital RRT activations indicated that prior to implementation, the age distribution of patients was as follows: 13.3% were aged 45-65, 56.7% were aged 66-78, and 30% were aged 80-99. Following implementation, patient ages were distributed as follows: 16.7% aged 32-48, 36.7% aged 51-69, 23.3% aged 70-80, and 23.7% aged 81-100 (see Appendix V).

Pre-implementation, respiratory reasons constituted the primary cause for RRT activations (56.7%), followed by cardiovascular (23.3%) and neurological (16.7%) reasons. Post-implementation, respiratory-related activations remained predominant (46.7%), followed by cardiovascular (30%) and neurological (23.3%) reasons. Respiratory issues remained the primary

cause for RRT activations pre- and post-implementation, constituting 56.7% and 46.7% of activations, respectively. Cardiovascular and neurological reasons were also notable causes.

Before implementation, RRT activations were distributed as follows: 30% in location A, 26.7% in location B, 30% in location C, and 13.3% in other locations. Post-implementation, the distribution was 30% in location A, 43.3% in location B, 23.3% in location C, and 3.3% in other locations. All activations, both pre-and post-implementation, involved inpatients. The three medical-surgical floors are identified was location A, B, and C.

Before implementation, 85% of patients with RRT events were transferred to a higher level of care, while 15% remained stable on the floor. Post-implementation, 78.9% were transferred to a higher level of care, and 21% remained stable on the floor. Data from CPR resulting from RRT events were collected. The pre-implementation collected monthly from September 2022 to November 2022 showed a total of three CPRs, two in October and one in November. During the implementation from September 24 2023 to November 24, 2023, there was one CPR in the month of October. There was no CPR in the month of September pre- and during the implementation (see Appendix W).

Friedman's test indicated a significant increase in post-implementation knowledge levels. There was a significant increase in "Yes" responses and a decrease in "No" responses compared to pre-knowledge among 30 nurses, $\chi^2(1) = 21.498, p < .001$. Significant differences were observed in confidence levels pre- and post-implementation, $\chi^2(1) = 70.588, p < .001$ (see Appendix X). Post-intervention, 65% ($N = 37$) of nurses completed the RRT communication checklist/sheet during activations. The RRT communication sheet was introduced during the project, thus no pre-implementation data were available. Though the statistical analysis did not show a significant difference in the total number of pre- and post-implementation CPR because

of missing data in some months, a clinical significance was seen in patient outcomes.

Discussion

The QI project aimed to improve the effectiveness of the RRT over eight weeks. The implementation included providing educational training on early warning signs, specifying team roles and job descriptions, and using an RRT communication sheet. After creating the structured RRT team, team members were provided with educational training. Pre- and post-implementation questionnaires were utilized to assess the nurses' knowledge of activating the appropriate RRT team and their confidence levels in completing the RRT communication sheet/checklist. The results showed a significant increase in the activation of the appropriate RRT team and the nurses' confidence in completing the RRT communication sheet/checklist. However, it was found that only about 65% of the RRT communication sheet/checklist was completed during the implementation, which was unexpected. This phenomenon might be related to the lack of time and frequent turnover of new nurses on the implementation units.

There was a slight increase in the number of RRT activations during the implementation phase ($N = 57$) compared to the pre-implementation ($N = 40$). This increase can be attributed to the nurses' improved knowledge of activating the appropriate RRT teams, which resulted in a decrease in the number of CPRs on the medical-surgical floors. Also, before implementation, 85% of the patients were transferred to a higher level of care, while 15% remained on the floor. In contrast, during implementation, 78.9% of patients were transferred to a higher level of care, and 21% remained on the floor. This indicates that there was a decrease in the number of patients transferred to a higher level of care during implementation and an increase in the number of stable patients who remained on the floor.

Summary

Key Findings

The strength of this QI project was the ability to create a multidisciplinary structured RRT team, provide educational training for the team members, and support the team and the nursing staff during RRT events. A mock RRT was also conducted before the implementation to ensure that each team member performed their specific roles. The debriefing after the mock RRT training and during each RRT event provided feedback to the team members and the nursing staff. Including charge nurses on each medical-surgical floor as RRT members increased the nurses' knowledge and confidence level while providing education and support to their colleagues during the RRT events. This was also instrumental in decreasing the fear the floor nurses have of being judged by the ICU nurses or RRT members during rapid response events. The use of the questionnaire aided in evaluating the nurses' knowledge of the activation of appropriate RRT and confidence level in completing the communication sheet/checklist. Though the project did not reflect any other gaps or problems, it will continue as the result of the data demonstrated improvement in patient outcomes as evidenced by the increased nurses' knowledge on the activation of appropriate RRT, confidence in completing the RRT communication sheet/checklist, and the significant clinical improvement in the number of RRT events that resulted in CPR.

Implications for the Future

As shown by this QI project, a structured RRT is crucial for the effectiveness of an RRT team for early intervention. Including the nurses as RRT team members demonstrated that nurses could directly impact the early recognition and intervention of patients experiencing acute clinical deterioration and activation of RRT for early intervention. The educational training

provided to the RRT team, and the delineation of each team member's specific role were effective in the team function during the RRT event which resulted in improved patient outcomes. The hospital can sustain the structured RRT team and provide annual educational training to the team members and other nursing staff on early recognition of signs of patients experiencing acute deterioration and activation of RRT for early intervention. The training can also be included in the educational requirement for the new nurses during new employee orientation. Case studies of patients experiencing acute clinical deterioration can be used during the training to enhance the learning for new nurses. A competency test should be included during the training to assess the basic knowledge of nurse's early recognition and activation of appropriate RRT after the educational training. The hospital should continue implementing the project for a longer period of one to two years to evaluate significant patient and clinical improvements.

Limitations

The QI project had several limitations. The project was implemented over a short period of eight weeks, which was not enough time to see significant results. The shortage of nurses, which increased after the COVID-19 pandemic, and the nurse-patient ratio on the medical-surgical floor also made it challenging for the nurses to complete the RRT communication sheets/checklist, once the RRT was activated, and before the team's arrival. Moreover, some of the managers on the floor were initially not supportive of the nurses completing the RRT communication sheet/checklist, which led to some nurses being reluctant to follow through. Additionally, the use of float pool nurses may have contributed to the lack of adherence completing the RRT communication sheet/checklist. The small sample size of nurse participants was also a weakness of the project because it limited the generalizability of the findings.

Conclusion

A QI project was initiated to enhance the structure and effectiveness of the RRT within a community hospital to improve patient outcomes. The plan involved creating a structured RRT team with specific roles for each member, providing education for early RRT activation, and developing an RRT communication sheet. The literature review emphasized the importance of early recognition, activation, and response, and the use of communication tools like handoff checklists, debriefing sheets, and SBAR to improve communication among team members and nurses. Most RRT teams include critical care nurses, respiratory therapists, and physicians. It was found that RRT teams differ based on organizational culture but should include team structure, expertise, communication, and teamwork, however, most RRT teams include critical care nurses, respiratory therapists, and physicians.

The RRT plays a crucial role in delivering prompt, high-quality care to patients in critical condition. To enhance the structure and effectiveness of the RRT within a community hospital, a QI project was implemented to improve patient outcomes. The project involved creating a structured RRT team with specific roles for each member, providing education for early RRT activation, and developing an RRT communication sheet.

The literature review revealed the importance of education on early recognition, activation, and response, and highlighted the need for communication tools like handoff checklists, debriefing sheets, and SBAR to improve communication among team members and nurses. It was found that RRT teams differ based on the organizational culture, but should include team structure, expertise, communication, and teamwork.

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Table 1*Systematic Review Evidence Table*

	Author Citation	Design & aim or hypothesis & major Variations	Population & Setting & Sample Size	Interventions	Measurements (e.g., tools to assess outcome tool to assess outcome)	Results &/Or Recommendations	Strength & Limitations	Evidence Level* & Quality Rating**
1	Chalwin et al. (2020)	SR To further the understanding of what underlies the variability in outcomes from complication management & suggest recommendations based on current evidence.	Adults, age 18 yrs & older Acute care N = 52 studies	Selected studies tabulated to highlight important similarities & differences between the studies & grouped by type of intervention Findings synthesized to provide a narrative, relevant to the research question	Binary outcome measure, RRs, ORs, & RD.	Mortality and FTR rates declined significantly in all hospitals. Early identification of sepsis markers improved patient outcomes.	Strength: Adequate studies Limitations: Strength & limitations not reported Inadequate statistical analysis to validate result	Level III B

Author Citation	Design & aim or hypothesis & major Variations	Population & Setting & Sample Size	Interventions	Measurements (e.g., tools to assess outcome tool to assess outcome)	Results &/Or Recommendations	Strength & Limitations	Evidence Level* & Quality Rating**
2 Clayton (2019)	Qualitative To identify barriers impeding nurses activation of RRT for clinically deteriorating patients	none	Use of synergy framework to identify the barriers that affect nurses' ability to recognize patient deterioration & appropriately activate RRT	none	Barriers that affect patient care indicate failed synergy between patient needs & nurse skills. Standardizing a process post-code pause highlights the importance for staff cohesiveness & promotes organizational safety culture Rounding and SBAR communication tools provide early warnings of patient decline & provide coaching opportunities from experienced colleagues to bedside nurses	Strength: Adequate studies Limitations: Strength & limitations not reported Inadequate statistical analysis to validate result	Level III B

Author Citation	Design & aim or hypothesis & major Variations	Population & Setting & Sample Size	Interventions	Measurements (e.g., tools to assess outcome tool to assess outcome)	Results &/Or Recommendations	Strength & Limitations	Evidence Level* & Quality Rating**
3 Conoscenti et al. (2021)	Descriptive, cross-sectional self-reporting survey To identify critical issues among responders & to detect the attitudes of the personnel toward the recent debriefing implementation	78-bed multi-specialist medical institute <i>N</i> = 148 surveys	QI & IRB approval 593 survey developed & emailed to physicians, nurses, aides, & unit clerks Results analyzed for accuracy: compliance & assessment of training, teamwork & leadership, professional dev. & debriefing Response recorded as: yrs of service, clinical role, & emergency experience	Validity check by quality team Chi-square, descriptive statistics, SAS 9.4	25% survey response rate (148 HCWs) Employed > 10 yrs 85% <5 yrs in emergencies 75% adequate teaching program 64% 97% of all participants see teamwork effectiveness 79% see leadership improvement 41% agree debriefing implemented 85% see debriefing as useful tool	Strength: Use of statistical tools to evaluate result Adequate number of participant Limitations: Low survey respondent rate Survey not generated from systematic review Data presented are personal opinions of the respondents May not reflect the actual practice of the institute	Level III B

Author Citation	Design & aim or hypothesis & major Variations	Population & Setting & Sample Size	Interventions	Measurements (e.g., tools to assess outcome tool to assess outcome)	Results &/Or Recommendations	Strength & Limitations	Evidence Level* & Quality Rating**
4 Davis et al. (2015)	Correlational study To explore the effectiveness of a novel RRT program design to decrease non-ICU CPA and overall hospital mortality	Two urban University hospitals with 500 medical/surgical beds	Study conducted from the start of fiscal year 2005 to 2011. 2007: implemented RRTs as part of a novel resuscitation program. Charge nurses from each inpatient unit underwent training as unit-specific RRT members. Inpatient staff received annual training in RRT concepts: surveillance &	Linear regression, Pearson correlation coefficient, <i>Stats Direct</i> software	Non-ICU CPA Incidence: Decreased ICU CPA: unchanged. Hospital mortality: decreased (2.12% to 1.74%, $p < 0.001$). Yearly change RRT activations: change in code blue activations for each inpatient unit ($r = -0.68, p < 0.001$)	Strengths: Adequate sample size Use of statistical analysis to validate results Adequate study time: 4 years Limitations: No further recommendation for future studies, no limitations mentioned	Level III A

Author Citation	Design & aim or hypothesis & major Variations	Population & Setting & Sample Size	Interventions	Measurements (e.g., tools to assess outcome tool to assess outcome)	Results &/Or Recommendations	Strength & Limitations	Evidence Level* & Quality Rating**
			recognition of deterioration Data collection & result evaluation				
5 Hall et al. (2020)	SR To synthesize the evidence on the impact of RRTs in failure to rescue effects	<i>N</i> = 10 studies	Literature search and ROL by reviewers, data collection, analysis	None	SR found the implementation of RRTs resulted in decreased hospital mortality, Cas, & ICU transfers Clear communication and teamwork improve the success of RRT Education of the nurses drives lasting culture and change process	Strengths: Studies for review include 3 meta analysis, 3 systematic reviews, & four single studies Limitations: Inability to include RCTs in the SR study Methodological quality of each study included is moderate to good, Result not supported by statistical analysis	Level III B

Author Citation	Design & aim or hypothesis & major Variations	Population & Setting & Sample Size	Interventions	Measurements (e.g., tools to assess outcome tool to assess outcome)	Results &/Or Recommendations	Strength & Limitations	Evidence Level* & Quality Rating**
6 Longstreth et al. (2023)	<p>QI & Evidence-based</p> <p>To decrease nurse hesitancy to call the RRT as measured by the number of proactive calls to the RRT.</p>	A 690-bed, university-affiliated teaching hospital	<p>Education, planned handoff communication, debriefing, & good catch emails used as educational strategies Standard communication process developed by IT for during and post RRT event</p> <p>Six months follow up education for nurses to sustain focus</p>	<p>Pre & post implementation data collection</p> <p>Descriptive statistics & <i>t</i> tests</p> <p>Chi-square, Kruskal–Wallis <i>H</i> test & APACHE II</p>	<p>Post study, monthly proactive RRT calls increased ($\chi^2 [1, n = 1,964] = 14.6085, p = .000159$).</p> <p>Bedside interventions, unscheduled transfers, & Acute Physiologic & Chronic Health Evaluation scores did not differ.</p> <p>Education, structured handoff communication, & acknowledging good catches reduced nurses' reluctance to call the RRT proactively</p>	<p>Strength:</p> <p>Use of adequate statistical analysis to support the study result</p> <p>Adequate sample size</p> <p>Use of evidenced-based RRS modules (TeamSTEPPS & IHI) for training</p> <p>Limitation:</p> <p>Single facility study</p> <p>nursing shortage affect pre & post survey results</p> <p>APACHE 11 scores were retrospectively hand calculated</p>	<p>Level III</p> <p>A</p>

Author Citation	Design & aim or hypothesis & major Variations	Population & Setting & Sample Size	Interventions	Measurements (e.g., tools to assess outcome tool to assess outcome)	Results &/Or Recommendations	Strength & Limitations	Evidence Level* & Quality Rating**
7 Mitchel et al. (2019)	Prospective cross-sectional internet-based study To characterize RRS structure, composition, and function across the United States with an additional focus on managing patients during and after IHCA.	A cohort of preidentified clinicians involved in their hospital's adult RRS across the United States. <i>N</i> = 103 surveys <i>N</i> = 103 hospitals <i>N</i> = 30 States	80-item questions on RRT activators, response & post-IHCA management 104 surveys sent out over 7 months 109 returned, 6 duplicate discarded 103 used for study evaluation (90% response rate) 30 states participated	chi-square & SPSS	The study demonstrated substantial variations in RRT team members and activators Most hospitals have RRT team with a provider, a critical care nurse, and an RT	Strength: Study data collected & managed using Research Electronic Data Capture, a secure, web-based application designed to support data capture for research studies Limitations: No limitation mentioned in the study by the researchers	Level III A

Author Citation	Design & aim or hypothesis & major Variations	Population & Setting & Sample Size	Interventions	Measurements (e.g., tools to assess outcome tool to assess outcome)	Results &/Or Recommendations	Strength & Limitations	Evidence Level* & Quality Rating**
8 Neville et al. (2020)	SR To improve patient safety by reducing communication-related errors in an AHU in an academic medical center.	AHU within an 811-bed academic medical center <i>N</i> = 26 RNs <i>N</i> = 6 Technicians	Team members attend CTT for teamwork & communication Structured handoff tool implemented to improve communication among nurses to reduce communication-related pt. safety events. Data analyzed with descriptive statistics pre & post intervention for comparison	Binary outcome measure, RRs, ORs, & RD.	CTT & structured handoff tool used to guide nurse-to-nurse care transitions lead to a reduction in communication-related safety events during handoffs There was a statistically significant difference between the pre & post-intervention groups of handoff tool usage and completion & a consistent decrease in handoff-related safety events after implementation.	Strength: Creating a dialysis handoff checklist uniquely contributes to the handoff communication literature. Limitations: CTT not attended by physicians & NPs due to schedule conflict Potential in data collection due to only RNs attending the CTT	Level III A

Author Citation	Design & aim or hypothesis & major Variations	Population & Setting & Sample Size	Interventions	Measurements (e.g., tools to assess outcome tool to assess outcome)	Results &/Or Recommendations	Strength & Limitations	Evidence Level* & Quality Rating**
9 Olsen et al. (2019)	SR To evaluate how healthcare professionals perceive potential facilitators & barriers within limbs of a RRS	<i>N</i> = 21 studies	Five different databases searched, search terms: RRS facilitators & barriers CASP tool for study appraisal	CASP tool	Results: Clear leadership, interprofessional trust, & collaboration are crucial for a successful RRS Clear protocols, feedback, continuous evaluation, & training as indicated by facilitators	Strength: Study included HCP perceptions of RRS from 10 different nations, more than 20 hospital systems & professions, levels of experience, & RRS structures Thus, providing a broad picture of facilitators & barriers & increasing analysis transferability Limitations: Choice of search terms might have failed to identify studies with additional critical insights	Level III B

Author Citation	Design & aim or hypothesis & major Variations	Population & Setting & Sample Size	Interventions	Measurements (e.g., tools to assess outcome tool to assess outcome)	Results &/Or Recommendations	Strength & Limitations	Evidence Level* & Quality Rating**
10 Pascua (2021)	Quantitative & Qualitative Aim: Assess nurses' crisis response competency, decision-making & factors affecting RRT activation. Analyze RRT impact and improve protocol design	Acute care hospital: 500-bed capacity on the medical-surgical units N = 333 RRT reports	Literature to support the study was searched Data collection: RRT reports gathered Activating nurses & respondents identified Study questionnaire to activating nurses & respondents Data collected from survey & reviewed	Descriptive statistical analysis SPSS 26	Results: Nurses demonstrates keenness on the reliability of their assessment findings before deciding to activate RRT Junior staff nurses were found to seek senior nurses help in validating assessment data & decision to activate RRT Senior nurses demonstrated confidence in responding to crisis situation Recommendations: Post briefing essential part of improving process	Strength: Large study sample Recommendations for future study Limitation: Data collection method risk for bias	Level III A

Author Citation	Design & aim or hypothesis & major Variations	Population & Setting & Sample Size	Interventions	Measurements (e.g., tools to assess outcome tool to assess outcome)	Results &/Or Recommendations	Strength & Limitations	Evidence Level* & Quality Rating**
11 Przednowek et al. (2021)	Qualitative Study Aimed to assess: Baseline satisfaction resuscitation performance	Two community-based EDs $N = 178$ pre- & post-debriefing protocol	Two data collection processes: Completion of a 7-item survey distributed pre-intervention, 6-months post-intervention, and 1-year post-intervention, and Completion of a rapid post-code debriefing form	Independent-sample t-tests Chi-square S.P.S.S. version 25 two-tailed coefficient Alpha p -value of 0.05 Descriptive statistical analysis SPSS 26	A total of 178 pre- & post survey received: Pre-protocol 79(44.4%) Post-protocol: 51(51.5%) 6 months, 48(48.5%) 12 months Post-debriefing code performance increased from $M=6,661$, to $SD=2.028$ to $M=7.90$, $SD=1.359$ (independent t - test = 5.069, $p<0.001$)	Strength: Adequate statistical analysis to support study results Limitations: Finding may not have the external generalizability to non-community-based ED settings Survey has no unique identifier Survey not filled out by all eligible staff Participants roles during the debriefing not identified in the study	Level III B

Author Citation	Design & aim or hypothesis & major Variations	Population & Setting & Sample Size	Interventions	Measurements (e.g., tools to assess outcome tool to assess outcome)	Results &/Or Recommendations	Strength & Limitations	Evidence Level* & Quality Rating**
12 Shahid & Thomas (2019)	<p>Review Study</p> <p>Aim: To identify challenges using SBAR tool for effective communication among healthcare providers during patient care handoff and transfer. Compare it with other communication tools to assess effectiveness and limitations.</p>	<p>Adults, age 18 yrs & older Acute care N = 52 studies</p>	ROL	None	<p>The SBAR communication tool reduces adverse events in hospitals and is endorsed by medical associations. It creates a shared mental model and can be used in various clinical settings. Training and culture change is needed to sustain its use.</p>	<p>Strength: Identified how SBAR help in effective patient care in different settings. Compared SBAR tool with other communication tools for patient handoff</p> <p>Limitations: Discussed SBAR communication tool handoff between nurses and physicians and not communication tools</p>	Level III B

Author Citation	Design & aim or hypothesis & major Variations	Population & Setting & Sample Size	Interventions	Measurements (e.g., tools to assess outcome tool to assess outcome)	Results &/Or Recommendations	Strength & Limitations	Evidence Level* & Quality Rating**
13 Smith & McSweeney (2016)	Qualitative Aim: To identify influencing factors in organizational development of RRT structure and function, and to describe evaluation of RRT costs.	Acute care setting <i>N</i> = 27 participants	Nurse executives & experts from 15 hospitals were interviewed to study their decision-making processes for RRT structure & function. Interviews were recorded & analyzed using content analysis & constant comparison. Demographic data were analyzed using descriptive statistics.	Binary outcome measure, RRs, ORs, & RD.	Mortality and FTR rates declined significantly in all hospitals. Early identification of sepsis markers improved patient outcomes. Recommendations: Future research should focus on clarifying differences in team structure and estimating costs & benefits effectively.	Strength: Adequate studies Limitations: Strength & limitations not reported Inadequate statistical analysis to validate result	Level III B

Author Citation	Design & aim or hypothesis & major Variations	Population & Setting & Sample Size	Interventions	Measurements (e.g., tools to assess outcome tool to assess outcome)	Results &/Or Recommendations	Strength & Limitations	Evidence Level* & Quality Rating**
14 Tilley & Spencer. (2020)	SR Aims to explore barriers to RRT activation and how those barriers might be overcome	N = 40 Studies	Extensive ROL using PRISMA. Data collected & analyzed	PRISMA for ROL	Identified barriers RRT activation: No consistent education for nurses Hospital chain of command Uncertainty about when to call RRT Perceived need to justify reason to call RRT Increased work load for Nurses on medical-surgical floors Negative past experience with RRT call Unsupportive unit culture Less nursing experience	Strength: Adequate sample size Recommendations for future research Comprehensive literature search Limitations: No report on strength & limitations of the study	Level II A

Notes. AHU = Acute hemodialysis unit. APACHE II = Acute physiology and chronic health evaluation. CAs = cardiac arrests.

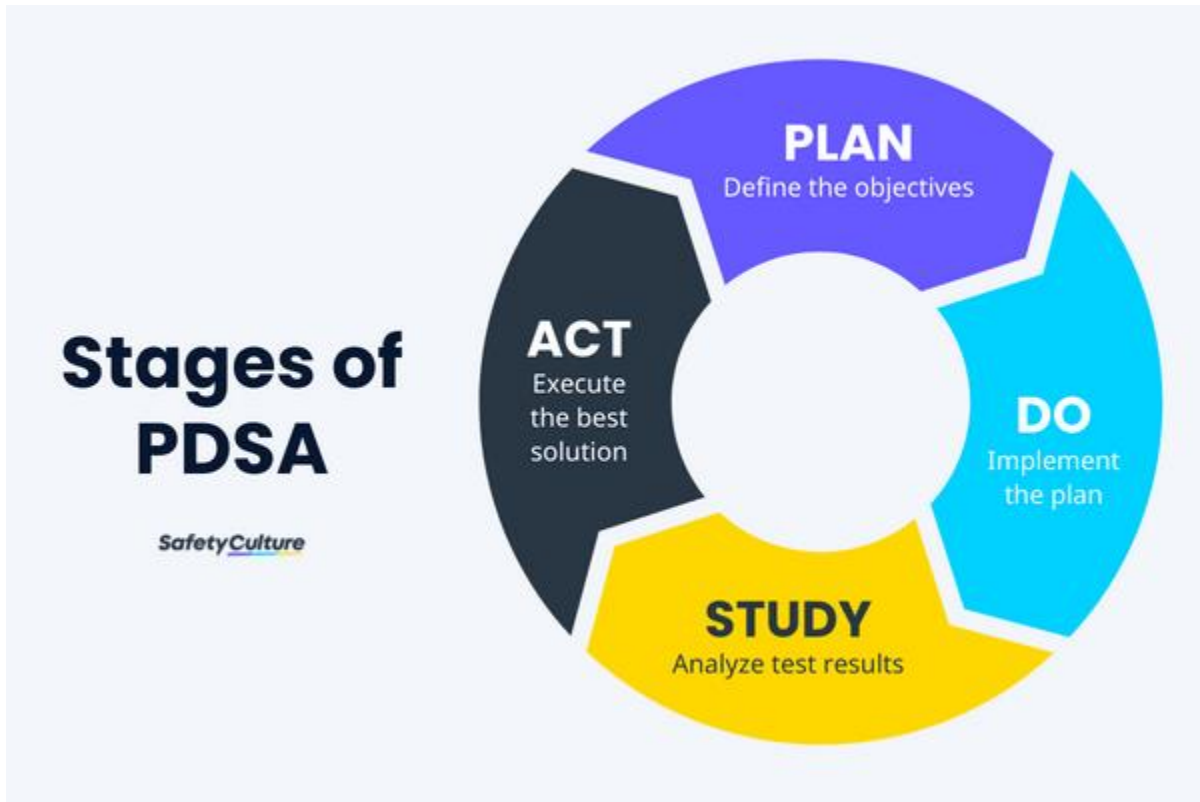
CERQual = Confidence in the Evidence from Reviews of Qualitative Research. CTT = Clinical team training. CPA =

cardiopulmonary arrests. D = days. FTR = failure to rescue. GRADE = Grading of Recommendations Assessment, Development, and Evaluation. ED = Emergency department. ICU = intensive care unit. IHCA = In-hospital cardiac arrest. IHI = Institute for healthcare improvement. IRB = Institutional review board. IT = Information technology. OR= odds ratio room. PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses. RD = risk difference. ROL = review of literature. RRS = rapid response system. RRs = risk ratios. RRT = rapid response team. QI = Quality improvement. SAS = Statistical analysis system. SBAR = Situation background assessment recommendation. SR = systematic review. TeamSTEPPS = Team strategies and tools to enhance performance and patient safety. Yrs. = Years

* Evidence Level: Levels I, II, or III. **Quality Rating: A, B, C).

Appendix A

PDSA Framework



Appendix B

Strengths, Weaknesses, Opportunities, and Threats (SWOT)

SWOT Analysis

Strengths	Weaknesses
<ol style="list-style-type: none"> 1. Adequate financial and budget planning 2. In-person RRT educational training using case study scenarios 3. Use of handouts to enhance learning 4. Cost-effective and timesaving 5. Leadership support 6. Existence of a Structured RRT in the hospital 7. High-quality healthcare outcomes and patient safety 	<ol style="list-style-type: none"> 1. Low staff attendance rate for in-person educational training 2. Inadequate or unavailability of time for staff to receive the RRT training 3. Low staff satisfaction 4. Lack of employee morale
Opportunities	Threats
<ol style="list-style-type: none"> 1. Promote and improve patient care and satisfaction 2. Increase nurses' confidence level and morale 3. Decreased unplanned ICU transfers 4. Promote and facilitate teamwork 5. Effective team communication 6. Employee accountability improved 7. Increased early identification and activation of RRT 	<ol style="list-style-type: none"> 1. Lack of employee interest in attending in-person educational training 2. Failure to use knowledge learned 3. Educational concepts may be difficult to understand 4. Staff failure to adapt to change 5. Low staff satisfaction/lack of employee morale

Note. SWOT is the acronym for Strengths, Weaknesses, Opportunities, and Threats. Strengths and Weaknesses are internal to the facility; opportunities and threats are external to the facility.

Appendix C

Risk Management for Threats and Weakness

Risk Management

Risk	Probability	Impact	Contingency Plan to Address Threats
Low attendance rate of in-person educational training for RRT members, debriefing by the nurses, and completion of the RRT activation checklist	Likely	Significant	Educational training is made mandatory for all RRT, and attendance is tracked through a sign-in sheet. Nurses are encouraged to complete the activation checklist and attend debriefing.
Lack of staff morale and low staff satisfaction	Likely	Significant	Encourage and provide opportunities for staff to ask questions about the training. Reward staff for positive behavior.
Educational concepts may be difficult to understand	Likely	Moderate	Develop educational training content based on the identified gap that needs improvement. Use of power points and handouts as post-training resources.
Training strategies are not conducive for employees.	Likely	Minor	Meet with RRT members physically to address any questions or concerns. Visit medical-surgical floors and follow up if the nurses have questions about RRT activations.
Failure of staff adaptation to change	Likely	Significant	Incorporate RRT educational training into mandatory annual staff education competency. DNP student is available to support staff after training, answer questions and encourage compliance.

Appendix D

Organizational Change Readiness Assessment

Sponsorship regularly comes from a senior level such as the President.	4
Leadership is provided from the highest senior levels that have direct responsibility for change.	4
There is a strong sense of urgency for change from the senior staff.	4
The organization has a culture that emphasizes continuous improvement.	5
Any planned change initiative has clear objectives that are consistently communicated.	5
Management strongly believes the future should look different from the past.	5
Management has a clear vision of the future and can mobilize the necessary resources.	5
The change effort connects to other major initiatives underway or being planned within the organization.	4
Management is willing to change critical business processes.	5
All employees are supported when taking risks, being innovative and looking for new solutions.	5
The organization has successfully implemented major changes in the past 12 months.	5
Employees enjoy working in the organization and the level of individual responsibility and team spirit is high.	5
The organization is always experimenting and new ideas are easily implemented.	4
Organization decisions use a participatory process, are made quickly and it's clear when the decision is made.	4
Employees have been extensively cross trained and have a good understanding of each other's role in the organization	4
Employees view change as an opportunity	5
Employees work across boundaries with little trouble	5
Total Points	78

The assessment was used to evaluate the organization's ability to change when change is needed. 5 = excellent. 4 = good. 3 = okay. 2 = need help. 1 = have problem.

Appendix F

Budget

Planning and Development Budget	\$750.00
Total Revenue – management allocated	\$750.00
Total staff needing RRT Training	15
Total staff for in-person RRT training	15
Total staff coming in from home for training	Not applicable
Total staff receiving RRT training on a workday	15
Staff attending training on a workday following education time scheduled by the project leader	No extra cost – staff attending training on a scheduled regular paid workday
Education Department Staff, if needed	No cost – hospital resource staff on a regularly paid workday
Conference Room for Education Training	No cost– Hospital resource
Supplies:	
Papers – Total cost for education handouts	\$150.00
Breakfast/Lunch provided for 15 staff training on a workday	\$600.00
Total Expenses	\$750.00
Total Surplus (+)/Loss (-)	Surplus \$0.00/Loss \$0.00

Note: Estimated budget prepared to cover potential expenses for the project implementation.

Appendix G

Facility Project Approval Letter

November 17, 2022

To Whom It May Concern,

This letter is to inform you that Elizabeth Azie, APRN, has been approved by Memorial Hermann Sugar Land Hospital as a clinical site to complete her quality improvement project required with her degree program at The University of Texas Arlington. We will support her proposed project on implementing a proactive, rapid response team rounding to improve patient outcomes.

Please let me know if you need any further information.

Thank you,

Rochelle Chamberlain

Rochelle Chamberlain, MSN, RN, NPD-BC
Director of Hospital Education and Magnet Designation

Appendix H

Human Subject Training Certificate



Human Subjects Protection Training (HSP) Training Complete

This document certifies that Elizabeth Azie completed the training entitled "Human Subjects Protection Training (HSP)" in its entirety on February 26th, 2023.

Certificate ID f00e44a8707d9e4300a160a1f9aa9d1c was generated by Electronic Research Administration on behalf of The University of Texas at Arlington.

Appendix I

Facility Institutional Review Board Letter of Approval

Laura K. Lincoln <laura.k.lincoln@uth.tmc.edu>

Sun 3/5/2023, 8:38 AM

Azie, Elizabeth Amaka

Dear Elizabeth Azie, MS AGACNP,

Thank you for registering "*Creation of a structured multidisciplinary rapid response team (RRT) and RRT Activations*" with the UTHHealth Houston Quality Improvement Project Registry. The submission does not meet the regulatory definition of human subjects research and therefore does not need to be submitted to the UTHHealth Houston Committee for Protection of Human Subjects (CPHS) for review and approval. Please submit a project completion report at the end of the project.

Nursing QI projects conducted at Memorial Hermann may require additional review and project work should not commence until you have been notified by the QI contact person at your campus. JoAnn Mick, Nurse Scientist is copied on this email. Please contact Dr. Mick if you have questions or if you do not hear from your campus QI contact within two weeks.

As a reminder, QI findings may be published, but do not report or represent the project as research.

Good luck with your project!

To access QI Project No. 2023-1863, use this

link: <https://redcap.uth.tmc.edu/surveys/?s=zTrkC3ohCpbkkqoc&var=qdohy67fg>

Appendix J

Email Script to the RRT Members

Hello everyone,

My name is ----- . I work as an NP in the ICU, and some of you may have seen me during RRT and code blues on the floor. Currently, I am pursuing my DNP at the University of Texas at Arlington, and I am working on a project to create a structured RRT for the hospital. The primary goal of this project is to improve patient outcomes by intervening early in acute clinical deteriorating patients.

Evidence suggests that a structured multidisciplinary RRT is crucial in providing support to nurses on the medical-surgical floor and improving patient care. For successful RRTs, we require the support of medical staff, critical care nurses, respiratory therapists, and medical-surgical nurses. Therefore, the structured team will include the hospitalist, the ICU NP, ICU nurses, charge nurses on the medical-surgical floor, respiratory therapists, and the chaplain.

I have already discussed the project with the ICU director, the directors on the medical-surgical floors, and the Chief nursing office (CNO), and I have received approval. I am excited to work with each one of you toward the successful completion of this project. To ensure everyone understands their specific roles, there will be nine educational training and four scheduled physical meetings. I will also be available to answer any questions or concerns you may have. You can reach me at any time through the work email that I used to send this message. I regularly check my work email on my cell phone and will try my possible best to reply to your questions or concerns within 30 minutes.

Thank you for taking the time to read this, and I am looking forward to working with you to create a structured RRT team.

Sincerely,
Elizabeth

Appendix K

Email Script to Registered Nurses

Hello Nurses,

I am a nurse practitioner working in the ICU. I have been present during RRT and code blue situations, so some of you may already know me. As a DNP student at the University of Texas at Arlington, I am working on a project to develop a structured RRT to improve patient outcomes. The RRT team will include ICU nurses and charge nurses from each medical-surgical floor, as studies have shown that nurses play a crucial role in patient care and spend the most time with patients.

To assist the primary nurse in ensuring that the patient's basic information and events leading up to the RRT activation are available, I plan to introduce an RRT activation checklist to be completed each time the team is activated. This will prevent delays in early intervention by the RRT team.

During the RRT events, the RRT team will use the opportunity to educate the nurses on the importance of early recognition and activation of RRT teams. Additionally, there will be a debriefing at the end of each event to evaluate the intervention and discuss improvements.

I will be visiting each medical-surgical floor and attending shift huddles to introduce the form and remind the nurses of the importance of early recognition and activation of RRT. If you have any questions about the structured RRT, the checklist form, or the project's implementation, please don't hesitate to ask. The medical-surgical directors are aware of the project implementation and the checklist form. I'm excited to visit each of you and have productive floor visits and shift huddles.

Respectfully,
Elizabeth

Appendix L

Floor Nurse RRT Activation Checklist Form

Was the patient assessed within 30 minutes before RRT activation? Yes No

If no was the assessment completed within the last 4 – 6 hours? Yes No

Is the reason for RRT activation related to respiratory insufficiency? Yes No

Oxygen saturation < 90% Respiratory Rate < 8 or > 25

Is the reason for RRT activation related to cardiovascular insufficiency? Yes No

Systolic Blood pressure < 90 or > 180 Heart rate < 40 or > 140

Is the reason for RRT activation related to neurological problems? Yes No

Acute change in mental status Seizures Unresponsiveness

Is the reason for RRT activation related to any other nurses' concerns? Yes No

Acute abdominal distension Intractable nausea and vomiting Fall with injury

Acute Gastrointestinal bleeding Family concerns Patient Concerns

What medications did the patient receive within an hour of RRT activation?

Pain Medication Sleeping medication Antihypertensive medication

Insulin Sedation from surgery/procedures Antipsychotic

Does the patient have recent laboratory test results? Yes No

If yes, fill in the following recent laboratory results:

Sodium level Potassium level Blood sugar

Please ensure the following are available in the room before the RRT team's arrival:

Suction setup Crash cart Patient has a working peripheral IV

The patient has an identification armband and a do-not-resuscitate arm band if applicable.

Completed by: Sign _____ Date: _____
Time: _____

Form to be completed by the floor nurse that activated the RRT team.

Appendix M

Rapid Response Team Debriefing Form

Was communication clear and effective before the team responded? Yes No

Was communication clear and effective during the event? Yes No

Were roles and responsibilities understood by all RRT team members? Yes No

Was situational awareness maintained? Yes No

Was the workload efficiently/effectively distributed? Yes No

Did the team ask for or offer help when needed? Yes No

Were errors made or avoided? Yes No

Issue	Action to be Taken	Date to complete Action	Person Responsible
What went well?			
What didn't go well?			
What could we do better next time?			
Discussion with the nurse that activated RRT			

Additional Comments: _____

Completed By: _____ Role: _____

Debriefing form to be led by RRT Team Hospitalist/ICU NP. Form to be completed by RRT ICU/Floor Charge Nurse

Appendix N

Nursing Assessment Questionnaire

Structures RRT Team (Appropriate knowledge of RRT activation and completion of the RRT communication Sheet) Questionnaire

I appreciate your participation in this project. The purpose of the project is to evaluate if the creation of a structured rapid response team with a job description for early activation, education on early warning signs relating to activation of RRT, and the creation of an RRT event communication sheet, will result in appropriate RRT being called, use of RRT communication sheet, increased knowledge of activation of RRT, and improved patient outcomes with RRT activation.

This brief survey will take approximately 5 minutes to complete. Your answers to these questions are anonymous and confidential. Please answer the question to the best of your knowledge. You are required to pick only one answer to each question except where indicated to pick more than one answer. Please indicate your answer by putting a circle around the answer.

Do the following patients meet the criteria for appropriate RRT Activation?

1. Patient admitted on the floor and threatening to leave against medical advice.
Yes / No
2. Patient having difficulty breathing with oxygen saturation less than 90 % on room air.
Yes / No
3. Family members quarreling in the hallway or inside the patient's room.
Yes or No?
4. Patient with a new-onset or have a history of seizures and experiencing seizures.
Yes / No
5. Patient having active bleeding and complaining of generalized weakness and dizziness.
Yes/No
6. A family member that fell in the patient's room or inside any building within the hospital.
Yes/No
7. Patient with a heart rate greater than 140 or less than 40.
Yes/No
8. Patient with acute change in mental status.
Yes/No

9. Patient agitated and combative towards staff. **Yes/No**
10. Patient with a SBP less than 90 mm Hg and DBP less than 40 mm Hg
Yes/No

The following five questions refer to how competent you are in completing the RRT communication sheet. Rate your confidence from low to high on a scale of 0-10. (**0 – 3 = low confidence, 4 – 6 = medium confidence, and 7 – 10 = high confidence**)

1. How confident do you feel about completing the RRT communication sheet independently?
 - a. **Low**
 - b. **Medium**
 - c. **High**

2. How confident do you feel about completing the RRT communication sheet with help?
 - a. **Low**
 - b. **Medium**
 - c. **High**

3. How confident do you feel asking another RN to complete the RRT communication sheet for your patient?
 - a. **Low**
 - b. **Medium**
 - c. **High**

4. How confident are you that the RRT communication sheet will be completed before the RRT team members arrive?
 - a. **Low**
 - b. **Medium**
 - c. **High**

5. How confident do you feel that completing the RRT communication sheet will be beneficial to RRT intervening early to improve patient outcomes?
 - a. **Low**
 - b. **Medium**
 - c. **High**

Appendix O

Nurses Responses for Knowledge and Confidence Level Assessment

Pre-and Post-Implementation Nurse Response on Knowledge and Confidence Level Assessment Dashboard

Partici pants	Pre- knowl edge “yes” Total	Post- knowl edge “yes” Total	Pre- knowl edge “No” Total	Post- knowl edge “No” Total	Pre- confid ence “Low” Total	Post- Confid ence “Low” Total	Pre- confid ence “Medi um” Total	Post- Confid ence “Medi um” Total	Pre- confid ence “High ” Total	Post- confid ence “High ” Total
1	8	7	2	3	0	0	5	0	0	5
2	4	7	6	3	2	0	3	0	0	5
3	7	7	3	3	0	0	4	0	1	5
4	2	6	8	4	3	0	1	5	1	0
5	9	7	1	3	2	1	2	2	1	2
6	6	7	4	3	1	0	2	0	2	5
7	4	8	6	2	2	0	2	0	1	5
8	2	4	8	8	1	0	0	1	4	4
9	5	7	5	3	1	0	1	1	3	4
10	6	7	4	3	3	0	2	0	0	5
11	6	6	4	4	2	0	1	0	2	5
12	7	6	3	4	3	0	2	1	0	4
13	2	7	8	3	1	0	1	1	3	4
14	8	8	2	2	2	0	1	1	2	4
15	7	8	2	3	1	0	3	3	1	2
16	6	9	4	1	1	0	0	1	4	4
17	7	8	3	2	0	0	3	0	2	5
18	5	8	5	2	2	0	2	0	1	5
19	6	8	4	2	0	0	4	0	1	5
20	3	8	7	2	0	0	2	0	3	5
21	5	5	5	5	0	0	3	0	2	5
22	4	7	6	3	2	0	0	0	3	5
23	2	7	8	3	2	0	1	2	2	3
24	4	8	6	2	3	0	1	0	1	5
25	1	3	9	7	1	1	2	1	2	3
26	1	7	9	3	0	2	4	1	1	2
27	3	7	7	3	2	0	2	1	1	4
28	3	3	7	7	0	0	1	3	4	2
29	6	2	4	8	1	0	1	3	3	2
30	7	4	3	6	1	1	2	3	2	2

N = 30 nurses who participated in responding to the questionnaire

Appendix P

PowerPoint Educational Outline for the Structured RRT Members

IMPROVING PATIENT OUTCOMES

AN EDUCATIONAL TRAINING SESSION FOR THE STRUCTURED RAPID RESPONSE TEAM

Elizabeth Azie, MS, APRN, AGACNP-BC

Objectives

- Overview of the RRT Team
- Specific RRT role delineation
- Significance of teaching/Teaching Opportunities
- Importance of effective communication (SBAR)
- Case study scenario to emphasize team roles/responsibilities
- Understanding early recognition, assessment, and intervening in patients experiencing acute clinical deterioration to improve patient outcomes (Video)
- Completion of communication sheet/Debriefing Tool

Effective RRT Components

- Multidisciplinary Team
- Critical care expertise at the patient's bedside 24/7
- Specified Team Roles
- Early Response, Evaluation, and Intervention
- Effective communication and collaboration among team members, and staff
- Educate and supports the nursing staff

Effective RRT Components

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RRT Team Members

- Hospitalist
- ICU NP
- ICU nurse
- Medical-surgical floor charge nurse
- Respiratory Therapist
- Chaplain

Functions of the RRT

- Responds timely to urgent and emergency patient needs
- Teaches, coaches, and mentors non-ICU nurses
- Proactive rounding

When RRT Responds

- Bring expertise to the bedside
- Early Intervention to acute clinical deteriorating patients
- Decrease out-of-ICU CPA
- Educate, coach, and mentor non-ICU nurses
- Determine patient disposition such as:
 - Transfer the patient to a higher level of care
 - Leave the patient on the floor and handoff to the primary nurse
 - Revise the treatment plan

- ahrq.gov

RRT Estimated Response Time Once Activated

- Hospitalist/ICU NP responds within 5 minutes
- Unit Charge Nurse responds within 2 minutes
- ICU Charge responds with an emergency intubation box within 5 minutes
- Respiratory Therapist arrives within 5 minutes
- EKG Technician responds within 5 minutes
- Chaplin arrives within 5 minutes

Proactive Rounding

- Why proactive rounding?
- To build trust and improve cordial relationships between nurses, and RRT
- Assess and monitor high-risk patients,
 - = patients for whom nurses have concerns
 - = patients discharged from ICU
 - = Post-surgical patients

Specific Role of the RRT Team Members

- Role of the Hospitalist – Team Lead
 - = Expert support for the team
 - = Chart review
 - = Medication orders
 - = Assist in ordering diagnostic and laboratory tests
 - = Patient disposition
 - = Notify receiving physician on patients needing transfer to HLC
 - = Initiates transfer orders
 - = Review test results
 - = Educate, coach, mentor non-ICU Staff

Specific Roles cont.

- ICU Nurse Practitioner
- Responds to RRT activation within 5 minutes
- Assess patients, update the hospitalist on patient condition
- Order diagnostic and laboratory tests
- Order medications
- Intubate patient if needed
- Accompany patients to diagnostic tests, transfer to HLC
- Educate, coach, mentor RRT/non-ICU staff
- Lead debriefing

Specific Roles cont'd

ICU Nurse

- Response within 5 minutes with the emergency intubation box
- Communicates with the unit charge nurse
- Obtain brief patient information and events leading to RRT activation.
- Perform a quick, comprehensive assessment using ABCDE methodology
- Communicates findings to the Physician/NP using SBAR
- Continuous monitoring with the use of a portable Zoll monitor
- Initiate physician/NP orders and recommendations
- Educate, coach, mentor non-ICU Staff

ICU Nurse Role cont'd

- Request or recommends that Physician/NP come to the bedside if airway protection is needed
- Ensures medication for intubation is available in the emergency intubation box
- Collaborates with radiology for stat Chest x-ray before or post-intubation
- Collaborates with the unit charge to ensure documentation of RRT event
- Communicates with OA for bed assignment if there is a need for ICU/IMU transfer

Specific Roles of RRT

Unit Charge Nurse

- Respond to RRT within 2 minutes of RRT activation.
- Collect information about the reason for the RRT activation
- Ensure the patient has the most recent vital signs
- Stay with the patient until the ICU charge nurse arrives.
- Communicates with the ICU Charge nurse (SBAR)
- Communicates with the patient's family
- Communicate with OA for bed assignment
- Ensure nurse-to-nurse handover report
- Ensure RRT event documentation in EHR
- Educate, coach, mentor non-ICU Staff

Specific Role cont'd

Respiratory Therapist

- Obtain ABG, continuous oxygen saturation monitor
- Give nebulizer treatment per physician's orders
- Prepare to assist the physician with intubation
- Manage the ventilator on the unit and during patient transfer to the ICU
- Communicates with the ICU RT before transfer

Specific Role cont'd

- Chaplain
- Responds to RRT activation within 5 minutes
- Stays with patient's family during stabilization
- Provide emotional support to the patients, families, and nursing staff
- Participates in debriefing

Significance of Teaching

- Improves effective implementation and management of RRTs members
- Provides bedside education and mentoring for floor nurses.
- Responsibility of all RRT members
- Improves the ability of nurses to provide effective care

Teaching Opportunities for non-ICU Nurses and RRT Team Members

- During RRT Events
- Debriefing after RRT Events
 - = Did each RRT member complete their assigned responsibility during the event?
 - = What went well (Teamwork, effective communication, mutual respect)
 - = What went wrong
 - = RRT members discussion with the nurse that activated the RRT
 - = How do we prevent repeating the same mistake in the future

Communication

SBAR: Situation Background Assessment Recommendation

- A framework for communication between healthcare team members about a patient's condition.

ihi.org

Case Study Scenario

- A 67-year-old black male with a past medical history of chronic obstructive pulmonary disease (COPD), Type II Diabetes, and newly diagnosed hypertension on lisinopril. He presented to the emergency room with difficulty breathing and a dry cough times two days.
- Chest x-ray was concerning for pneumonia, and he was started on antibiotics and admitted to the medical-surgical floor with a diagnosis of community-acquired pneumonia.

Case study scenario cont'd

- The patient arrived on the floor at 1930 pm. Initial vital signs on the floor: Temp 98.2, Heart Rate 78; Respiratory Rate 16; Blood pressure 145/98, oxygen saturation 97% on oxygen 2 liters nasal cannula, and blood sugar 98mg/dl. RN completed the initial assessment and documented her finding that vital signs were within normal limits. Then he was given his nighttime medications, which include lisinopril.
- During the next vital sign check within four hours, the patient complained to the nursing assistant that he has worsening difficulty breathing and felt like his tongue was swelling.

Case Study Scenario cont'd

- Vital signs: Temp 98.2, Heart rate 108, Respiratory rate 32, oxygen saturation 90% on 2 liters.
- The RN was notified and immediately came to the patient's room and noted that the patient had increased work of breathing.
- RRT quickly activated by bedside RN

RRT Team arrives: Charge nurse/Primary RN Use of SBAR

S: Situation

Dr. Jarvis, this is Mr. Davis, a 67-year-old black man. RRT was called for a complaint of difficulty breathing and tongue swelling. He has increased work of breathing and is on oxygen 5 liters per nasal cannula. He is awake and alert, follow simple commands, and speaks in a full sentence.

SABR Communication cont

B: Background

He was admitted with community-acquired pneumonia to the floor at 19:30 pm from the Emergency room.

PMH: COPD, Type II Diabetes, and newly diagnosed hypertension on lisinopril. His last dose of lisinopril was at 2100. Current vital signs Temperature 98.2, HR 108, RR 32, BP 150/95, Oxygen saturation 90% on 2 liters but increased to 93% on 5 liters

SBAR Communication cont

A: Assessment

He is awake, alert, following commands, and able to stick his tongue out, but I am concerned he is allergic to Lisinopril.

R: Recommendation

- I think he will need stat ABG, Chest -ray, EKG, and the following labs (CBC, CMP, troponin, mag, phos, BNP). He may also benefit from Neb treatment and steroids.
- Do you have additional recommendations and orders for Mr. Davis?

RRT expected Action

The unit charge nurse responds to the patient's room in 2 minutes, obtains a brief report from the RN, and events leading to the RRT call, obtain a quick assessment and vital signs, including oxygen saturation, increased oxygen to 10 liters per nasal cannula, and stays with the patient until the RRT team arrives. Ensures crash cart, suction, and other supplies are in the room. Ensures patient has a working peripheral IV access. All the Team members arrived within 5 minutes, and the ICU nurse arrived with an emergency intubation box. The charge nurse/primary RN presents the patient using SBAR. ICU NP/Nurse completes a quick assessment using ABCDE mythology. ICU NP updates the hospitalist on the patient's condition. A decision was made to intubate the patient for airway protection. The RT prepared the patient for intubation. Rapid sequence intubation medication ordered by the NP.

Expected RRT Action cont

- Patient's wife was called and updated on the patient's condition and on her way to the hospital. The ICU nurse medicated the patient prior to intubation. Before the intubation, the charge nurse notified the house supervisor of the need for an ICU bed. The hospitalist notified the ICU intensivist of the need to transfer the patient to a higher level of care. The patient was successfully intubated and transferred to the ICU accompanied by the ICU NP, ICU nurse, and the RT. The patient's wife was met by the chaplain upon her arrival and taken to the ICU to see the patient and meet the ICU team. The patient was reassessed by the RRT 5 minutes post-hypoglycemia treatment. The RRT team meet after the patient was transferred to the ICU for debriefing, and the primary RN that activated the RRT was recognized during the debriefing.

Debriefing

The RRT members responded within the estimated time frame. Each team member performed their role, and the ICU charge nurse effectively communicated with the Physician using the SBAR. The patient was intubated for airway protection and transferred to the ICU. The early recognition, activation of RRT, RRT response, and early intervention by the Physician prevented the potential respiratory arrest.

Post RRT Intervention

- Did patient remain on the floor
 - Yes or No
- If yes, start post-RRT Management
 - RN to monitor vital signs – Every 2 hours x 2, then every four
 - Re-assessment –Every Hour x 2, then every four hours
 - Monitor blood sugar every two hours x 2, then every four hours
 - Unit charge nurse continues to monitor patient
 - Call RRT if condition worsens

Measures of Success

- Early Recognition of a deteriorating patient
- Early Activation of RRT
- Early RRT Intervention
- Effective Communication Skills
- Early Physician/NP Intervention
- Prevention of potential Respiratory arrest
- Prevention of Unplanned ICU Transfer and decrease mortality.

Discussion

- Open Discussions with RRT Members
- Thought Process
- Thoughts?

Note: In the case study scenario, early identification of acute clinical deterioration leads to early activation of RRT and early intervention to prevent potential respiratory arrest and improved patient outcome.

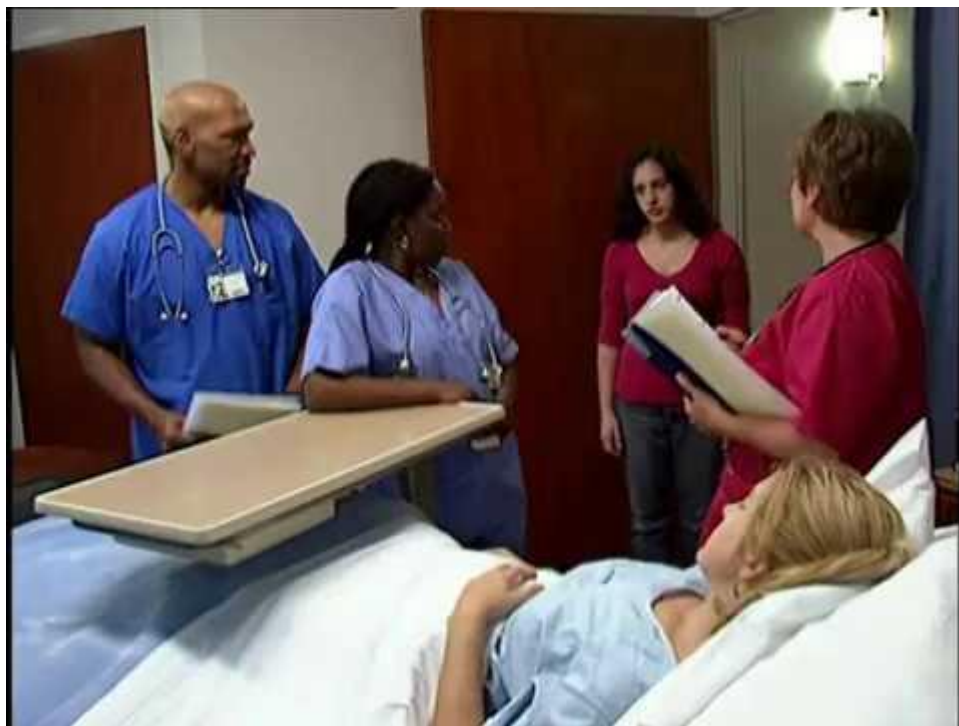
TeamSTEPPS RRT Videos

Let's Wrap it up by Watching these Brief
RRT Training Videos!!

Appropriate RRT Activation and Response



Inappropriate RRT Response



Appreciation and Feedback for Early Recognition



Further Discussions and



Appendix Q

Permission to Use

RE: permission to use - [Ticket#: 20230629-5287]

Ask AHRQ (AHRQ/OC) <askahrq@ahrq.hhs.gov>

To: 'Elizabeth Azie'

Fri, Jun 30 at 7:56 AM

Hi,

Thank you for your inquiry to AHRQ. Your message has been forwarded to the appropriate Team member who will respond to your request.

Thank you,

Bryan Jansen (AHRQ)

From: noreply-info@ahrq.hhs.gov <noreply-info@ahrq.hhs.gov>

Sent: Thursday, June 29, 2023, 12:18 PM

To: Ask AHRQ (AHRQ/OC) <AskAHRQ@ahrq.hhs.gov>

Subject: permission to use - [Ticket#: 20230629-5287]

New Public Inquiry Submission

Submission Details:

Category: TeamSTEPPS

Subject: permission to use

Type: Ask a Question

Submission Date: Jun 29, 2023 – 12:17 pm

Name: Elizabeth Azie

Phone: 7132406286; **Email:** bethazie@ymail.com

Inquiry:

I am a DNP student and writing a proposal on RRT structure and education. I am interested in using some of the slides and video clips on TeamSTEPPS to educate the RRT. Do I need permission to use the slides and videos?

Your immediate reply will be highly appreciated.

Elizabeth

Appendix R

RRT Activations and Clinical Characteristics

Pre- and Post-Implementation Rapid Response Team Activation Data Dashboard

Intervention	Patient	Age	Gender M= 1 F=2	Activation Reason Resp=1 Cardio=2 Neuro=3	Complete Communication Sheet Yes=1 No=2
Pre	RRT 1	77	1	1	2
Pre	RRT 2	81	1	1	2
Pre	RRT 3	88	2	3	2
Pre	RRT 4	76	2	2	2
Pre	RRT 5	66	1	1	2
Pre	RRT 6	78	1	1	2
Pre	RRT 7	80	1	2	2
Pre	RRT 8	85	2	2	2
Pre	RRT 9	89	1	1	2
Pre	RRT 10	98	1	3	2
Pre	RRT 11	74	2	1	2
Pre	RRT 12	67	2	1	2
Pre	RRT 13	65	2	2	2
Pre	RRT 14	67	1	3	2
Pre	RRT 15	87	1	1	2
Pre	RRT 16	76	1	2	2
Pre	RRT 17	77	1	1	2
Pre	RRT 18	72	2	2	2
Pre	RRT 19	85	2	3	2
Pre	RRT 20	66	1	1	2
Pre	RRT 21	45	1	1	2
Pre	RRT 22	78	2	2	2
Pre	RRT 23	89	1	1	2
Pre	RRT 24	66	2	1	2
Pre	RRT 25	59	1	3	2
Pre	RRT 26	60	1	3	2
Pre	RRT 27	77	1	1	2
Pre	RRT 28	67	2	1	2
Pre	RRT 29	72	2	1	2
Pre	RRT 30	77	2	3	2
Pre	RRT 31	75	2	1	2
Pre	RRT 32	92	2	2	2
Pre	RRT 33	87	2	1	2

Intervention	Patient	Age	Gender M= 1 F=2	Activation Reason Resp=1 Cardio=2 Neuro=3	Complete Communication Sheet Yes=1 No=2
Pre	RRT 34	88	1	3	2
Pre	RRT 35	66	1	1	2
Pre	RRT 36	56	1	1	2
Pre	RRT 37	49	2	2	2
Pre	RRT 38	80	1	2	2
Pre	RRT 39	67	2	1	2
Pre	RRT 40	78	1	1	2
Post	RRT 1	72	2	1	1
Post	RRT 2	68	2	2	1
Post	RRT 3	88	2	1	1
Post	RRT 4	81	2	3	1
Post	RRT 5	67	1	1	1
Post	RRT 6	60	1	1	1
Post	RRT 7	74	1	2	1
Post	RRT 8	48	2	3	1
Post	RRT 9	66	1	3	1
Post	RRT 10	89	2	1	1
Post	RRT 11	91	1	1	2
Post	RRT 12	67	2	1	2
Post	RRT 13	61	1	1	2
Post	RRT 14	89	1	1	1
Post	RRT 15	67	1	3	1
Post	RRT 16	69	2	2	1
Post	RRT 17	84	1	1	2
Post	RRT 18	72	1	2	2
Post	RRT 19	70	1	2	2
Post	RRT 20	90	1	1	1
Post	RRT 21	54	2	2	1
Post	RRT 22	80	1	3	1
Post	RRT 23	76	1	1	2
Post	RRT 24	51	2	1	1
Post	RRT 25	44	2	3	1
Post	RRT 26	37	1	1	2
Post	RRT 27	32	2	1	1
Post	RRT 28	78	1	2	2
Post	RRT 29	67	2	1	1
Post	RRT 30	47	1	1	2
Post	RRT 31	88	2	1	1
Post	RRT 32	96	2	1	1

Intervention	Patient	Age	Gender M= 1 F=2	Activation Reason Resp=1 Cardio=2 Neuro=3	Complete Communication Sheet Yes=1 No=2
Post	RRT 33	77	1	2	1
Post	RRT 34	59	2	1	2
Post	RRT 35	78	2	1	1
Post	RRT 36	65	1	1	2
Post	RRT 37	82	1	3	1
Post	RRT 38	88	1	1	1
Post	RRT 39	45	1	1	1
Post	RRT 40	65	1	2	2
Post	RRT 41	44	2	1	1
Post	RRT 42	35	1	1	1
Post	RRT 43	77	1	1	1
Post	RRT 44	89	1	2	2
Post	RRT 45	100	1	2	1
Post	RRT 46	88	2	2	1
Post	RRT 47	65	1	2	2
Post	RRT 48	72	1	1	1
Post	RRT 49	68	2	1	2
Post	RRT 50	61	2	1	1
Post	RRT 51	66	1	1	2
Post	RRT 52	56	2	1	2
Post	RRT 53	72	1	1	2
Post	RRT 54	80	1	1	1
Post	RRT 55	81	2	1	2
Post	RRT 56	89	1	3	1
Post	RRT 57	71	1	1	1

Note: Card = Cardiovascular. F = Female. M = Male. Neuro = Neurological. Resp = Respiratory.
Pre = Pre-intervention. Post = Post-intervention.

Appendix S

Anonymity Master Code List for DNP Project

Patient De-identifier Codes

Patient	Codes	Event Location (A, B, C, D)
	RRT 1	
	RRT2	
	RRT3	
	RRT4	
	RRT5	
	RRT6	
	RRT 7	
	RRT 8	
	RRT 9	
	RRT 10	
	RRT 11 continues	

Note: Master code list to ensure de-identification of patients requiring RRT activation

A = Medical-Surgical Floor 1. B = Medical Surgical Floor 2. C = Medical-Surgical Floor 3

Appendix T

Frequency Distribution of Knowledge and Confidence Level Assessment

Table T1

Pre- and Post-knowledge Yes Total

		Participant	Frequency	Percent	Valid Percent	Cumulative Percent
Pre-Yes						
Valid	1	2	6.7	6.7	6.7	
	2	4	13.3	13.3	20.0	
	3	3	10.0	10.0	30.0	
	4	4	13.3	13.3	43.3	
	5	3	10.0	10.0	53.3	
	6	6	20.0	20.0	73.3	
	7	5	16.7	16.7	90.0	
	8	2	6.7	6.7	96.7	
	9	1	3.3	3.3	100	
	Total	30	100.0	100.0		
Post Yes						
Valid	2	1	3.3	3.3	3.3	
	3	2	6.7	6.7	10.0	
	4	2	6.7	6.7	16.7	
	5	1	3.3	3.3	20.0	
	6	3	10.0	10.0	30.0	
	7	12	40.0	40.0	70.0	
	8	8	26.7	26.7	96.7	
	9	1	3.3	3.3	100.0	
		Total	30	100.0	100.0	

Table T2*Pre- and Post-Knowledge "No" Total*

	Participants	Frequency	Percent	Valid Percent	Cumulative Percent
Pre-No					
Valid	1	1	3.3	3.3	3.3
	2	3	10.0	10.0	13.3
	3	4	13.3	13.3	26.7
	4	6	20.0	20.0	46.7
	5	3	10.0	10.0	56.7
	6	4	13.3	13.3	70.0
	7	3	10.0	10.0	80.0
	8	4	13.3	13.3	93.3
	9	2	6.7	6.7	100.0
	Total	30	100.0	100.0	
Post-No					
Valid	1	1	3.3	3.3	3.3
	2	7	23.3	23.3	26.7
	3	13	43.3	43.3	70.0
	4	3	10.0	10.0	80.0
	5	1	3.3	3.3	83.3
	6	1	3.3	3.3	86.7
	7	2	6.7	6.7	93.3
	8	2	6.7	6.7	100.0
	Total	30	100.0	100.0	

Table T3*Pre- and Post- Confidence Low Total*

	Participants	Frequency	Percent	Valid Percent	Cumulative Percent
Pre-Low					
Valid	0	8	26.7	26.7	26.7
	1	9	30.0	30.0	56.7
	2	9	30.0	30.0	86.7
	3	4	13.3	13.3	100.0
	Total	30	100.0	100.0	56.7
Post-Low					
Valid	0	26	86.7	86.7	86.7
	1	3	10.0	10.0	96.7
	2	1	3.3	3.3	100.0
	Total	30	100.0	100.0	

Table T4
Pre- and Post-Confidence Medium Total

	Participants	Frequency	Percent	Valid Percent	Cumulative Percent
Pre-Medium					
Valid	0	3	10.0	10.0	10.0
	1	9	30.0	30.0	40.0
	2	10	33.3	33.3	73.3
	3	4	13.3	13.3	86.7
	4	3	10.0	10.0	96.7
	5	1	3.3	3.3	100
	Total	30	100.0	100.0	
Post-Medium					
Valid	0	14	46.7	46.7	46.7
	1	9	30.0	30.0	76.7
	2	2	6.7	6.7	83.3
	3	4	13.3	13.3	96.7
	5	1	3.3	3.3	100.0
	Total	30	100.0	100.0	

Table T5
Pre- and Post-Confidence High Total

	Participants	Frequency	Percent	Valid Percent	Cumulative Percent
Pre-High					
Valid	0	4	13.3	13.3	13.3
	1	10	33.3	33.3	46.7
	2	8	26.7	26.7	73.3
	3	5	16.7	16.7	90.0
	4	3	10.0	10.0	100.0
	Total	30	100.0	100.0	
Post-High					
Valid	0	1	3.3	3.3	3.3
	1	1	3.3	3.3	6.7
	2	5	16.7	16.7	23.3
	3	2	6.7	6.7	30.0
	4	7	23.3	23.3	53.3
	5	14	46.7	46.7	100.0
	Total	30	100.0	100.0	

Note: Cumulative frequency tables on the variable for knowledge and confidence level assessment.

Appendix U

Graduate Nursing Review Committee Approval Letter

From: Plonien, Cynthia Gail <plonien@uta.edu>

Sent: Monday, July 24, 2023 7:31 PM

To: Azie, Elizabeth <exa6145@mavs.uta.edu>

Cc: Behan, Deborah Fern <dgreen@uta.edu>; Eades, Tamara L <eades@uta.edu>

Subject: GNRC Approval Decision - Azzie

Elizabeth

Great news! Your DNP Project Proposal has been approved by the CONHI GNRC. Attached is the formal letter stating your project was approved with no Conditions. Also included is the GNRC Rubric used in the discussion of your Proposal.

We are looking forward to the implementation of your project next semester. Instructions for the next steps related to Practicum 1 will come to you from Dr. Tammy Eades.

Congratulations, great job.
Nice Project!

Dr. Plonien

*Cynthia Plonien DNP, RN, CENP
Clinical Associate Professor
Director, Doctorate Program of Nursing Practice
Chair, Graduate Nursing Review Committee
UTA Faculty Senator
College of Nursing and Health Innovation
University of Texas at Arlington*

Appendix V

Demographic Characteristics of Nurses and Patients

Pre- and Post-Implementation Demographic Characteristics

Characteristic	n	%
Pre-Implementation RRT		
Age		
45-66	10	25
67-75	8	20
76-84	12	30
85-92	8	20
98-99	5	5
Total	40	100
Gender		
Female	17	42.5
Male	23	57.5
Total	40	100
Post-Implementation RRT		
Age		
32-48	8	14
51-61	8	14
65-67	8	14
68-72	9	16
74-80	8	14
81-88	8	14
89-90	8	14
Total	40	100
Gender		
Female	24	42
Male	33	58
Total	57	100
Nurse Participants		
Age		
24-26	9	30
27-29	7	23
30-32	7	23
33-35	2	7
42-45	3	10
48-50	2	7
Total	30	100
Gender		
Female	28	93
Male	2	7
Total	30	100

Note: $N = 40$ for pre-implementation patients for RRT activation. $N = 57$ for post-implementation patients for RRT activation. $N = 30$ for nurses participants pre- and post-implementation. RRT = Rapid Response Team.

Appendix W

Rapid Response Activation Events, Patient Disposition, and CPA

Monthly Total Number of RRT Activation, Patient Disposition, and CPAs

Date	Intervention	Unit Name	RRT "Total" Count	Transfer "HLC" Total	Stable "ROF" Total	"CPA" Total
September 2022	Baseline	Med-Surg	0	0	0	0
October 2022	Baseline	Med-Surg	24	20	4	2
November 2022	Baseline	Med-Surg	16	14	2	1
September 2023	Intervention	Med-Surg	4	3	1	0
November 2023	Intervention	Med-Surg	29	22	7	1
December 2023	Intervention	Med-Surg	24	20	4	0

CPA= Cardiopulmonary Arrest HLC = Higher Level of Care ROF = Remain on the Floor
 RRT = Rapid Response Team

Figure 3

Pre-and Post-Implementation Total number of monthly RRT Activation

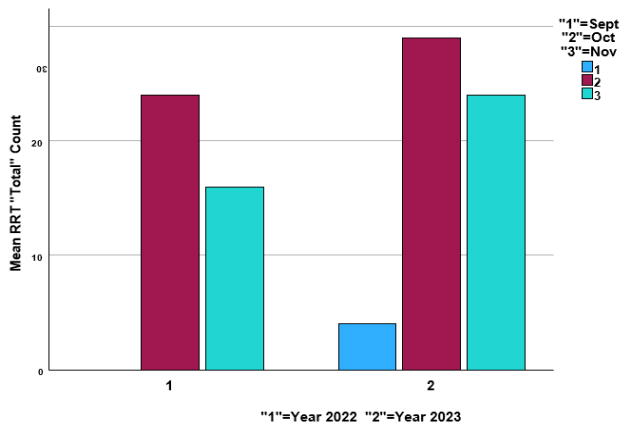
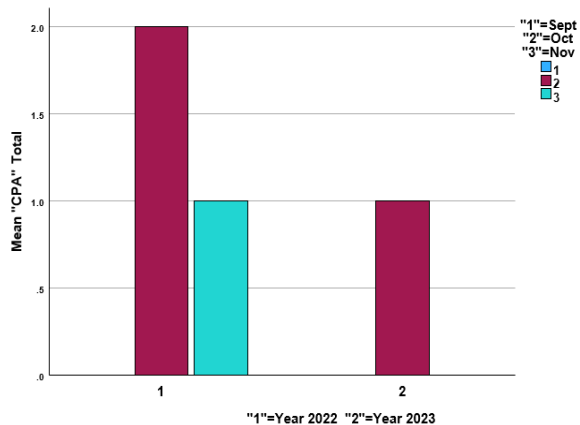


Figure 4

Pre-and Post-Implementation Total number of monthly CPA



Appendix X

Friedman Rank and Wilcoxon Signed Rank Test Results

Table

Variations in Total Pre-and Post-Statistical Results on Participants Knowledge and Confidence Level Assessment

Variable	n = 30	Mean Rank	χ^2	df	Asymptotic Significance
Pre-Knowledge Yes		2.47			
Post-Knowledge Yes		3.27			
Pre-Knowledge No		2.48			
Post-Knowledge No		1.78			
Total	n=30		21.498	3	P<.001
Pre-Confidence Low		3.30			
Post-Confidence Low		1.68			
Pre-Confidence Medium		3.88			
Post-Confidence Medium		2.93			
Pre-Confidence High		3.83			
Post-Confidence High		5.37			
Total	n=30		70.588	5	P<.001

Note: $N = 30$. χ^2 = Chi Square. df = Degree of Freedom. The Friedman Test is used test for differences between groups when the dependent variable being measured is ordinal.

Figure 1
Pre-knowledge "yes" total, Post-knowledge "Yes" total Related-Samples Wilcoxon Signed Rank Test Summary

Total N	30
Test Statistic	276.000
Standard Error	36.998
Standardized Test Statistic	3.068
Asymptotic Sig.(2-sided test)	.002

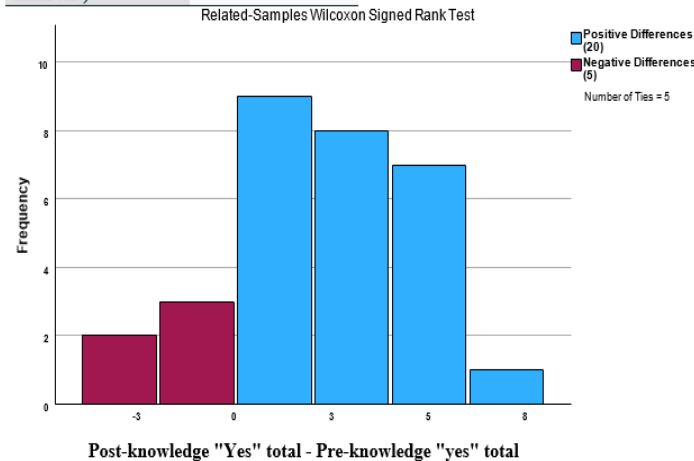


Figure 2
Pre-knowledge "No" total, Post-knowledge "No" total Related-Samples Wilcoxon Signed Rank Test Summary

Total N	30
Test Statistic	50.000
Standard Error	34.841
Standardized Test Statistic	-2.870
Asymptotic Sig.(2-sided test)	.004

