

**Providing Education to Bedside Nurses on Critical Vital Signs and Sepsis to Aid in Early  
Identification and Intervention with Rapid Response Teams**

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NRS 882 Doctoral Scholarly Project

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June 19, 2023

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### **Abstract**

Sepsis is the leading cause of mortality in hospitalized patients and is associated with sentinel events. A review of the literature revealed that providing extensive education, use of Rapid Response Teams (RRT's) to respond to sepsis, as well the use of standardized protocols for treatment were beneficial in early recognition and intervention, of deteriorating patient conditions and improving overall patient outcomes. The purpose of this research project was to evaluate whether providing education to bedside nurses on critical vital signs and sepsis would increase staff knowledge of when to initiate RRT's over a 30-day period. The setting was a 423-bed non-profit acute care facility in the Midwest that serves the metropolitan area. Participants were bedside nurses within the facility. Education was provided on National Early Warning Scores (NEWS), sepsis, critical vital signs, early intervention, the rapid response nurse (RRN), and RRT role. Pre and post surveys were given to evaluate if education had any bearing on results. Data was collected for 30 days prior to intervention and 30 days after intervention. The number of RRT's called, arrests that occurred outside of the ICU, and any unplanned transfers to ICU were compared. The data revealed that after intervention was implemented the number of RRT's increased and the unplanned transfers to ICU decreased. Suggesting a relationship between staff education and early identification and intervention with RRT's. Limitations included staff participation and unit construction that displaced ICU patients to other areas of the hospital. Additionally, it was not certain if patients had NEWS or sepsis alerts prior to initiation of an RRT. More research is needed to better understand the impact of alerts on identifying deteriorating patient conditions and use of RRT's.

*Keywords: NEWS, critical vital signs, sepsis, rapid response nurse, RRT, early identification and intervention, staff education*

## **Providing Education to Bedside Nurses on Critical Vital Signs and Sepsis to Aid in Early Identification and Intervention with Rapid Response Teams**

Sepsis is the leading cause of mortality in the hospitalized patient. Every year in the United States more than 1.7 million patients are diagnosed with sepsis and of those 1 in 4 will die (National Institute of General Medical Sciences [NIGMS], 2019). Sepsis is also associated with high medical cost due to prolonged hospital stays, unplanned Intensive Care Unit (ICU) admissions, high hospital readmission rates, and lengthy therapies. Many patients will show signs several hours before deterioration occurs but are failed to be recognized by bedside staff due to lack of knowledge (Allen, 2020; Maclay & Rephann, 2017; Mushta et al., 2017).

Additionally, differing practices amongst providers and variations in use of standardized bundles account for lack of response to patient conditions and poorer outcomes (Allen, 2020; Maclay & Rephann, 2017; Mushta et al., 2017). Treating sepsis like a medical emergency and using Rapid Response Teams (RRT) to provide rapid treatment and early intervention could improve patient outcomes (Ferreira et al., 2017; Guirgis et al., 2017; Maclay & Rephann, 2017). Research indicates that standardizing care, providing extensive house wide education, and using nurse driven protocols and RRT's help to decrease unplanned ICU admissions and hospital length of stays (LOS), decrease hospital readmission rates, decrease costly medical spending, and decrease patient mortality rates and the likelihood of poor patient outcomes.

### **Overview**

#### **Problem Description**

In 2019, a need was identified at a midwestern hospital system through the nurse residency program to provide support to new nursing staff, specifically those working in high acuity, highly skilled areas such as the ICU. A pilot was implemented for a dedicated Rapid

Response Nurse (RRN) to help educate and foster new staff, while also providing early identification and intervention to changes in patient conditions to help improve patient outcomes. Education on the program was initially provided to high acuity core nurses of the step-down ICU. The COVID-19 pandemic demonstrated the role to be beneficial to the organization, but halted education on the program. Most education to date has been by one-on-one interaction. Due to lack of knowledge and many new nurses at the bedside, it is believed that the program is not well understood and underutilized.

The problem statement that guided this project was to evaluate whether providing education to bedside nurses on critical vital signs and sepsis would increase staff knowledge of when to initiate RRT's over a 30-day period. Measurable outcomes for this review included improved education of bedside nurses, increased ability to recognize signs and symptoms of sepsis in the hospitalized patient, early intervention with an RRT and sepsis bundles, standardized care, and improved patient outcomes.

### **Available Knowledge**

#### ***Nurse Education and RRT Outcomes***

A review of the literature revealed that the providing extensive education, use of RRT's to respond to sepsis, as well the use of standardized protocols for treatment were beneficial in early recognition and intervention, reducing patient mortality rates, decreasing LOS, and improving overall patient outcomes (Allen, 2020; Ferreira et al., 2017; Guirgis et al., 2017; Maclay & Rephann, 2017; Mushta et al., 2017).

Educating staff to recognize signs and symptoms of sepsis gives the ability for an RRT to be initiated in a timely manner and allows for implementation of protocols that aim to standardize care. Additionally, the use of National Early Warning Scores (NEWS) and sepsis

alerts are beneficial for nurses to help recognize changes and elicit further evaluation and follow up.

Implementation of education, standardized protocols, and RRT's significantly helped improve response time, compliance of sepsis bundle elements including obtaining blood cultures, administering fluids, and antibiotic administration (Allen, 2020; Ferreira et al., 2017; Guirgis et al., 2017; Maclay & Rephann, 2017). Use of RRT's to treat sepsis were also shown to reduce hospital LOS as well as reduce ICU admission and hospital readmission rates with a cost of care savings of over \$500,000 per year (Guirgis et al., 2017; Maclay & Rephann, 2017).

### ***Strengths and Limitations of the Literature***

Strengths of the studies reviewed included the use of bundle elements as a basis to model protocols, create education, and evaluate compliance (Allen, 2020; Ferreira et al., 2017; Guirgis et al., 2017; Maclay & Rephann, 2017; Mushta et al., 2017). Comparisons were conducted pre- and post-intervention and the sample populations represented in the studies were carefully selected to meet criteria, allowing the results to be generalized to a larger population (Allen, 2020; Ferreira et al., 2017; Guirgis et al., 2017; Maclay & Rephann, 2017; Mushta et al., 2017).

Limitations from the data included variations in hospital protocols and differing practices among providers (Allen, 2020; Guirgis et al., 2017; Maclay & Rephann, 2017). Other limitations included relying on documentation in the patient electronic medical record (EMR), as there may be delays in results and variations in real-time charting, and retrospective data for comparison that may be outdated or insufficient (Allen, 2020; Ferreira et al., 2017; Guirgis et al., 2017). There were several gaps in data related to time of recognition to time of RRT page, as well as RRT page time to time of evaluation from response and would be beneficial in future studies (Guirgis et al., 2017). Additionally, studies reviewed at a single institution may not be able to be

generalized at all programs and multi-center studies would be beneficial (Ferreira et al., 2017; Guirgis et al., 2017; Maclay & Rephann, 2017).

### **Rationale**

Nursing care is always based on research and best practice. Frameworks are used to help guide nurses and other clinicians in implementation of evidence-based practices to help improve patient outcomes. The Iowa Model of Evidence Based Practice is one of the most widely used frameworks to help create changes in healthcare (Buckwalter et al., 2017). The framework acts as a guide and provide step by step pathways to help identify a problem, determine if the problem is a priority, formulate a team, gather and analyze research on the problem, critique and synthesize the research, decide if enough research exists to move forward, implementation of the proposed practice change, and finally evaluation and dissemination of results (Cabarrus College of Health Sciences, 2022). Each step builds on the previous and creates a strong foundation for research and change (Buckwalter et al., 2017; Cabarrus College of Health Sciences, 2022). The framework helped guide this project by allowing the investigator to identify the problem, formulate a team within the organization that was vested in outcomes, implement an intervention, then evaluate the effectiveness to promote change within the organization.

Opportunity for improvement related to nursing staff education of RRTs was identified. The nursing leadership within the organization agreed this was well-aligned with the health system's strategic plan. A team was formulated within the organization that was vested in the project. The project served as a pilot. From there, the organization will evaluate the effectiveness of the project and results to promote future change within the organization.

**Purpose**

The purpose of this project was to evaluate whether providing education to bedside nurses on critical vital signs and sepsis helped to increase staff knowledge of when to initiate RRT's.

**Methods****Context**

The organization for this doctoral scholarly project was a Midwestern hospital. According to the organization's homepage, the hospital is a 423-bed non-profit acute care facility that serves the metropolitan area. Centrally located in the heart of a city, the facility admits 22,000 patients yearly and employs more than 2,400 healthcare workers and ancillary staff. The organization specializes in cardiovascular surgery, neurosurgery, women's services, cancer care, gastroenterology, orthopedics, and comprehensive diagnostic services and leads the region in surgeries and reproductive health. The organization prides itself in providing high quality patient care tailored to individual needs and have multiple awards including Magnet Designation for Nursing Excellence.

The healthcare system provides a vast array of educational opportunities and certifications to promote staff engagement and growth. Additionally, the organization has a program dedicated to project identification and implementation providing a rich environment to foster practice and policy change based on nursing driven programs, pilots, and projects.

In order to participate in project development efforts within this facility a letter of support was requested from the organization by the project investigator. A letter of support was obtained from the clinical partner for the investigator to conduct a research project to determine if providing education to bedside nurses on critical vital signs and sepsis would increase staff knowledge of when to initiate RRT's. The project served as a foundation for formal staff



education within the health system to help improve staff knowledge, aid in early identification and treatment, and improve patient outcomes.

### **Intervention(s)**

The intervention of the proposed project was to provide education to all in-patient bedside nurses within the project site chosen for implementation. Education was provided by the project investigator via PowerPoint® and included standard information on NEWS and sepsis alerts, critical vital signs, early intervention, the rapid response role, and how the RRN can be utilized.

All staff nurses were emailed using their registered employee email addresses. The email contained information about the intended project and consent to participate with a link to an anonymous survey using Survey Monkey®. There was no personal information collected by email or Survey Monkey®. Only survey response was recorded.

The survey consisted of questions related to sepsis and NEWS alerts, critical vital signs, how to respond to high alerts, what the recommended timeframe for response should be, the role of the RRN, and the RRT process. The survey served as a baseline to assess staff knowledge prior to implementing education.

Once the initial surveys were completed, the staff were provided with a PowerPoint® explaining what NEWS and sepsis alerts were, the criteria that needed to be present in the documentation to elicit these alerts, goals of notification and treatment, as well as the RRN and RRT role in the process. After education completion, a post survey with the same questions that were initially asked was provided. The time frame for education and survey participation was a 30-day period between March 20, 2023, to April 19, 2023.

**Study of the Intervention(s)**

Pre and post surveys were compared in aggregate to evaluate whether education had any bearing on the accuracy of responses. Additionally, the facility collected data pulled from the electronic medical record (EMR) and RRN documentation on all patients who had an RRT and or medical emergency. Data was collected for 30 days prior to intervention and 30 days after intervention occurred. The data was used to compare pre and post survey results on the number of RRT's called, the number of arrests that occurred outside of the ICU, and any unplanned transfers to the ICU to determine if the education provided to the staff had any effect on the overall outcomes.

**Measures**

The survey consisted of 10 multiple choice and true or false questions. The questions were created in conjunction with the site representatives specifically for this project based on the needs of the organization. Assessment items were directly based on concerns identified by the organization that suggested a gap in knowledge and underutilization of existing resources. Additionally, previous research conducted within the facility further supported the line of questioning within the survey. All questions asked pertained to NEWS and sepsis alerts, components of documentation necessary to elicit alerts, the recommended time frame for intervention and treatment, as well as role of the RRN and the RRT process. The survey had no reliability or validity measures.

**Analysis**

Quantitative data was collected and organized using Excel. Descriptive statistics were used to summarize and report results. Percentages were used to compare the number of correct responses on the survey before and after education was provided. They results were scored but

were not analyzed individually for each participant. Charts were used as a visual aid to compare pre and post intervention results and included the number of RRT's called in the 30 days prior to education and 30 days post education, with an overall goal of increased RRT's after intervention occurred.

### **Ethical Considerations**

Prior to implementation this project was reviewed by the Nebraska Methodist College Institutional Review Board (IRB). The investigators completed Collaborative Institution Training Initiative (CITI). All persons that participated in the project did so anonymously. No personal information or identifiers were collected. In addition, any data collected pertaining to the project was stored on a password protected computer. All participants who take the anonymous survey were provided with informed consent. Participation was strictly voluntary. Employment was not affected by willingness to participate. The researcher was also employed within the facility the project was implemented in. To help avoid conflict of interest and mitigate risks, all information pertaining to the project was collected anonymously.

### **Results**

Surveys and education were sent out to a distribution group of 947 potential participants. Of those, 95 people participated in the pre survey and 71 participated on the post survey.

Improvement was identified in all areas of the post education survey suggesting that education had impact on survey results. Prior to implementation of education 35% of participants reported having formal training on the RRN role in their institution compared to 62% after education was received. Additionally, 99% of participants were able to identify what elicited an RRN response in the post survey compared to 93% of participants on the pre survey. Greater than 98% of participants were able to identify critical vital signs in both the pre and post survey,

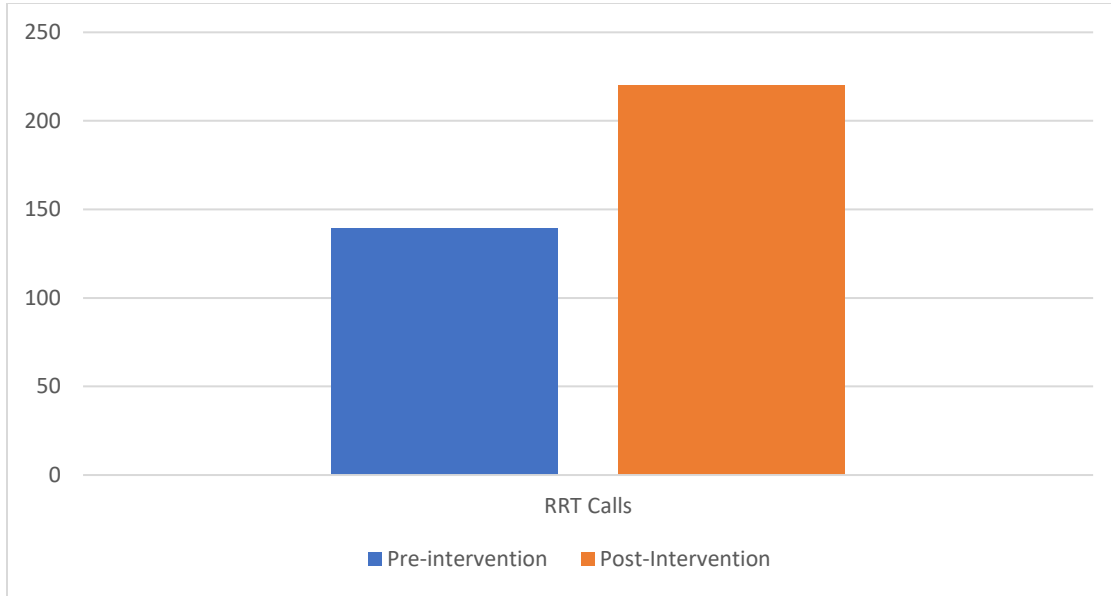
however, only 78% on the pre survey recognized to call an RRT if patients exhibited critical vital signs, compared to 89% of participants after education was received. Seventy-nine percent of participants were able to correctly identify the proper patient follow up after an RRT occurred compared to 94% in the post education survey. Finally, 58% of respondents in the pre survey reported they had two hours to stabilize a patient after an RRT prior to moving to a higher level of care, whereas 85% recognized this in the post survey.

In relation to sepsis bundles and treatment guidelines, 67% of nurses reported antibiotic initiation within one hour on the presurvey compared with 87% on the post survey. The standard fluid bolus of 30ml/kg for septic patients was correctly identified by 74% of respondents in the presurvey compared to 93% in the post education survey.

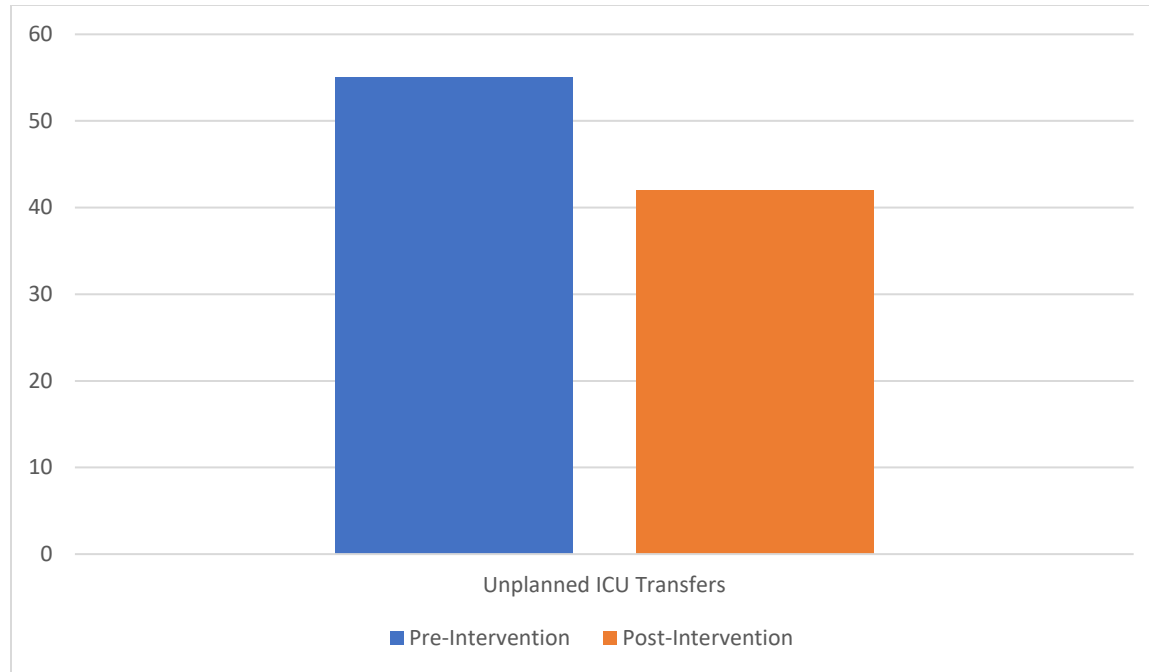
Prior to the implementation of education there were 139 RRT's called. In the 30 days after education was implemented 220 RRT's were called. Table 1 shows a comparison of the results. The increase in the number of RRT's after intervention occurred suggests that education on high alerts, critical vital signs, and RRT role/process had an influence on nurses' ability to recognize changing patient conditions and respond with an RRT.

**Table 1**

*Number of RRT Calls*



In addition to an increase in RRT’s in the 30 days post-intervention, there was a reduction in the number of unexpected ICU transfers. In the 30 days prior to intervention there were 55 unplanned transfers to the ICU; however, in the 30 days after education occurred there were only 42 unplanned transfers from inpatient areas. The information suggests that early identification and intervention could have attributed to stabilization of patients within the suggested timeframe resulting in reduction on unplanned transfers to ICU. Table 2 compares the results.

**Table 2***Unplanned ICU Transfers from Inpatient Hospital Areas*

The data showed no significance on the number on medical emergencies that occurred outside of the ICU. There were 8 medical emergencies that occurred in the pre-intervention period and 9 in the post-intervention period. It is important to note that the data did not include patients in the emergency department but did include diagnostic areas. There was no way to differentiate whether medical emergencies that occurred in diagnostic areas were inpatient or outpatient.

Data was unable to be pulled by event date only. In order to account for missing data a report was generated by patient admission date for one week prior to the 30-day window for data collection. Data was then filtered out by event date and time to capture those events in the 30-day collection period. It is possible that patients admitted prior to the data collection window were

not captured. Additionally, a new unit was opened during the intervention period and the data presented did not capture those patients. Hospital census was not available for this report.

## **Discussion**

### **Summary**

The purpose of this project was to evaluate whether providing education to bedside nurses on critical vital signs and sepsis helped to increase staff knowledge of when to initiate RRT's. Measurable outcomes included comparison of pre and post survey results as well as a pre and post-intervention comparison on the number of RRT's called, the number of arrests that occurred outside of the ICU, and any unplanned transfers that occurred to the ICU. The data was used to determine if the education provided to the staff had any effect on the overall outcomes.

Statistical significance was not performed, however, the data presented is descriptive and suggestive that a relationship exists between the intervention and overall results. All areas of the post education survey showed an increase in percentage of correct responses. Additionally, the number of RRT's significantly increased after the intervention period and the number of unplanned ICU transfers decreased. The data suggests that early identification and intervention led to an increase in RRT's that may have attributed to rapid treatment and stabilization reducing the number of unplanned ICU transfers from inpatient units. There was no relationship identified to the occurrence of medical emergencies outside of the ICU during the intervention period.

### **Interpretation**

Sepsis is the leading cause of death in hospitalized patients and is associated with high medical cost due to prolonged hospital stays, unplanned ICU admissions, high readmission rates, and lengthy therapies and treatments (NIGMS, 2019). Treating sepsis and high NEWS

alerts like an emergency and using RRT's to provide rapid treatment and early intervention can decrease sentinel events and improve patient outcomes (Guirgis et al., 2017).

Guidelines suggest that all facilities should make high NEWS and sepsis treatment part of their performance improvement (PI) measures (Society of Critical Care Medicine, 2021). Part of the RRN role in this facility is high alert investigation and follow up as well as implementation of RRT's based on patient status. The RRT allows early intervention and treatment and brings resources for the patient and staff to the bedside. The RRN serves as a staff resource providing real time support and expertise while also fostering growth and development.

Patients show signs of deterioration several hours before deterioration occurs but are not recognized by bedside staff due to lack of knowledge (Allen, 2020; Maclay & Rephann, 2017; Mushta et al., 2017). Providing education to staff helps improve knowledge on processes, procedures, and best practice. Understanding hospital resources and how to use them only gives nurses more tools to provide quality care which in turn leads to better outcomes for patients and the organization.

This project provided education to bedside nurses to see if it would help staff recognize when to initiate RRT's. After the implementation of education, the number of RRT's increased from 139 to 220 during the data collection period. There were no significant changes to the number of medical emergencies that occurred outside of the ICU; however, the number of ICU transfers decreased from 55 to 42 in the post-intervention phase. The findings suggest that perhaps by increasing education of bedside nurses they were able to identify changes to patient conditions sooner to provide early intervention and treatment. It is arguable that staff were able to intervene with RRT allowing stabilization before deterioration occurred that warranted transfer to a higher level of care.



Early recognition and intervention lead to reduced medical costs saving patients and the healthcare system money (Guirgis et al., 2017; NIGMS, 2019). Saving money and improving outcomes also increases patient satisfaction and the likelihood that patients will continue to return to the same health system for their care.

### **Limitations**

Results are not generalizable because the project was designed specifically for the context of this project. There were several limitations to report. One major limitation included staff participation. Out of over 900 potential participants, there were only 95 respondents. The results were reported in aggregate and were not paired. Not all participants completed the post survey based on the number of respondents. Additionally, all staff had access to the education regardless of project participation. There was no way to capture if education was completed without survey participation and if that had any bearing on the results.

Another limitation included that results were limited to documentation in the EMR. There was no way to differentiate in the EMR whether transfers to ICU occurred due to deterioration or due to surgical reasons that required post-operative ICU care. The results were also not able to differentiate if the patient had a high alert or RRT prior to ICU transfer. Finally, events that occurred in diagnostic areas were not able to be filtered by whether the patient was inpatient or outpatient at the time of the event.

### **Conclusions**

The revised standards for quality improvement reporting excellence (SQUIRE 2.0) were used as a framework for reporting this project. This project addressed whether providing education to bedside nurses on critical vital signs and sepsis would help to increase staff knowledge of when to initiate RRT's. The data presented suggests a relationship exists and

continued education could provide usefulness to the staff. This project could help standardize education for bedside nurses within the organization, which may help increase the ability of bedside nurses to recognize signs and symptoms of sepsis in the hospitalized patient, provide early intervention and treatment with an RRT, and improve patient outcomes. The education could become part of the competency and new hire training provided annually by the organization and serve as a basis for future studies. It may be helpful to identify which patients had a high NEWS or sepsis alert prior to RRT or transfer. It would also be beneficial to look at the time of alert to initiation of RRT. Identifying these timelines could help identify gaps in knowledge and help tailor education to the needs of the bedside staff to further promote early identification and intervention to improve patient outcomes.

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