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Factors Leading to Rapid Response Team Interventions in Adult Medical-Surgical Patients

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The effectiveness of a Rapid Response Team Intervention (RRTI) in preventing transfer to a higher level of care and decreasing in-hospital mortality has not been firmly established. This retrospective exploratory study examined differences between medical-surgical patients who had an RRTI and those who did not. Results yielded 5 statistically significant differences ($P \leq .05$) between the 2 groups as well as a large variation (range, 0-238 minutes; SD = 87.73 minutes) between time of documentation of RRTI criteria to time in calling an RRTI. **Key words:** *clinical deterioration, patient deterioration, rapid response system, rapid response team*

INTRODUCED in the 1990s, rapid response teams (RRTs) were not widely used until the mid-2000s when the Institute for Healthcare Improvement named Rapid Response Team Intervention (RRTI) as 1 of 6 “Saving 100,000 Lives Campaign” bundle items.¹ RRTI is a patient safety practice in which a specialized team is summoned by a direct care provider to intervene when a patient has shown signs of clinical deterioration. The team initiates rapid assessment, and appropriate interventions are undertaken to prevent transfer to a higher level of care, cardiac/

respiratory arrest, or death.² Rapid response has become an expected standard of patient care because the practice fulfills The Joint Commission standard requiring acute care hospitals to “develop a system to respond to patients deteriorating outside the intensive care unit (ICU) setting.”³

Unfortunately, The Joint Commission mandate to create a system to respond to patient deterioration, fulfilled by many hospitals through RRTIs, has not been shown conclusively to prevent transfer to critical care units (CCUs), nor reduce mortality.⁴ The question of RRTI being a true “quality initiative” remains unanswered because of lack of evidence supporting the success of RRTIs.

Some hospitals have opted to implement patient acuity monitoring systems such as the Medical Early Warning System (MEWS) or other types of patient surveillance to intervene early in situations of clinical deterioration. This practice also has met with mixed results. In a study of more than 1000 patients post-ICU stay, researchers found that although staff increased the number of clinical observations documented (more complete electronic medical record [EMR] charting) postimplementation of MEWS scoring, there was not

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a statistically significant decrease in serious adverse events.⁵

INTENDED IMPROVEMENT

Because of inconclusive findings about RRTI, this study attempted to identify factors common to patients who had an RRTI to predict patients at risk for clinical deterioration. Using this information to develop an improved proactive risk assessment could lead to earlier intervention. Thus, the potential for positive patient outcomes, namely, preventing transfer to the ICU or reducing in-hospital mortality, would be increased.

Study questions

The research question guiding this study was “Are there significant differences in demographic characteristics and selected clinical parameters (vital signs, level of consciousness, etc) between medical-surgical adult inpatients who required RRTI and those who did not?” A secondary question was “What is the timeliness of response to indicators of clinical decline?”

METHODS

Setting

The setting was an urban 443-bed community not-for-profit hospital. There are 3 medical-surgical units in the hospital varying in size from 32 to 39 beds. Each medical-surgical unit uses the same skill mix to care for patients of similar acuity levels with a variety of medical and surgical diagnoses. Hours per patient day varies by less than 0.5 hours per patient day across the 3 units. The RRT at this hospital consists of a critical care RN and a respiratory therapist. Both the hospital and university institutional review boards granted the study exempt status, as it used only archival data.

Study plan

An exploratory retrospective case-control (1 case:3 controls) design was used. Medical record reviews of adult medical-surgical RRTI

(case) and control patients were completed. A data collection spreadsheet was developed for recording the information extracted from the hospital’s EMR for 3 sets of variables: descriptive, study hospital RRTI criteria, and clinical independent predictor variables. Descriptive and inferential statistics were computed by a contracted statistician.

RRTI patients ($n = 135$) were identified from the monthly list of RRTI patients for the time period of July 1, 2013, to June 30, 2014. By spanning 12 months, any possible seasonal changes in patient population, such as an increase in patients with influenza between the “influenza season” of October to March, were mitigated. Control patients ($n = 331$) included patients cared for in these same units during the same time period who did not require RRTI. Using a random number table, controls were selected in a 3:1 ratio based on patient admission dates that correlated with the admission date and length of stay (LOS) of the RRTI patient.

Variables

Data were collected for 3 sets of variables: demographic, hospital RRTI criteria, and clinical independent predictors. Descriptive data were obtained to describe the 2 groups and determine if demographic differences also may be factors that place patients at risk. Demographic variables included gender, age, and outcome of the RRTI. Hospital RRTI criterion variables included vital sign data and other criteria for an RRTI call per policy such as acute changes in the level of consciousness within 4 hours prior to the RRTI call. Regarding the vital sign data collection, 2 of the medical-surgical units have manual entry of the data; the largest of the 3 units (39 beds) has implemented an automated download of vital sign information into the EMR.

Clinical independent predictor variables included history of opioid use, substance abuse, chronic pulmonary disease, cardiac disease, psychiatric/mental illness, diabetes, and active medications on the electronic medication administration record (eMAR). Additional clinical independent predictor variables were

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related to admission from the emergency department (ED) and transfer from the CCU. The inclusion of these clinical independent predictor variables was based on a literature review of factors that cause hospitalized persons to be more vulnerable or at risk for deterioration and complications.

Literature has shown 2 fundamental difficulties of managing patients with substance abuse history: (1) believing a patient's self-report of pain is difficult because of health care provider bias against those who abuse drugs, and (2) there are no established guidelines for health care team members to follow when trying to cover the current pain experience without knowing the amount of illicit drug taken outside of the hospital.⁶ Therefore, patients are at risk for deterioration, especially respiratory compromise, due to the initial undertreatment of pain related to lack of caregiver knowledge of "where to start." This can cascade to patients using their own illicit drugs to find relief, thus leading to over-sedation, respiratory depression, or respiratory arrest.⁶

Another population at high risk for adverse events while hospitalized are patients with known comorbidities that affect airway and gas exchange as well as chronic cardiac disease.⁷ In a comprehensive literature review spanning 5 decades of research regarding development of frameworks to describe and define adverse events and physiologically unstable patients, future researchers were encouraged to examine preexisting conditions as a factor to consider when developing clinical deterioration prediction frameworks.⁷

Patients with mental illness who are being treated by non-mental health care physicians during inpatient hospital stays are particularly vulnerable.⁸ Research has described the added complexities of oncology patients with chronic psychiatric problems of depression, bipolar disease, and schizophrenia in a case study format.⁸ One case study described delayed treatment by an oncology patient due to her mental illness, which then led to a more debilitated state, increasing risk for in-hospital complications.⁸

Finally, the literature guided the addition of prescribed medications by drug class as a study variable because of the added risk these medications pose to patients. Medication classes known to adversely affect respiratory rate, sedation level, heart rate, and blood pressure and place patients at higher risk for in-hospital adverse events included opioids, sedatives, benzodiazepines, antiemetics, antiepileptics, and antihypertensives.

Three clinical independent predictor variables were chosen on the basis of personal communications about practices of proactive rounding at a local hospital: patients who were admitted from the ED within 8 hours of RRTI or who had been transferred from a CCU within 8 hours of RRTI (if extubated in previous 24 hours), and those who had been transferred from a CCU within 8 hours of RRTI and had a total LOS in the CCU of more than 7 days (regardless of intubation/extubation status).

No literature to support the inclusion of these variables was found; however, local hospitals are including them on their RRTI "watch list" (A. Paulson, DNP, electronic communication, December 8, 2013). Including these variables provided an opportunity to test for statistical significance of this current practice and add to the body of nursing knowledge.

Methods of evaluation

Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to describe the sample. Comparisons were made using the χ^2 and t tests between groups for demographic characteristics, study hospital RRTI criteria, and clinical independent predictor variables. The confidence interval was set at $P \leq .05$.

RESULTS

Records from a total of 466 patients (RRTI: $n = 135$; control: $n = 331$) were reviewed. In the RRTI group, 58% ($n = 78$) were female, and 51% ($n = 170$) of controls were female.

For outcome of the RRTI, 36% ($n = 48$) of the patients remained on the same unit, 62%

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($n = 84$) were transferred to a higher level of care, and 2% ($n = 3$) progressed to Code Blue status.

Discharged to home was the outcome for 55% ($n = 74$) of the RRTI patients and 80% ($n = 266$) of the control. Twenty-eight percent ($n = 38$) of RRTI patients were discharged to a skilled nursing facility versus 17% ($n = 55$) of the control group. Expiration varied between the 2 groups: 16% ($n = 22$) of RRTI patients died compared with 1% ($n = 4$) of controls. Transfers to another acute care facility or left against medical advice (RRTI: $n = 1$; control: $n = 6$) accounted for the remainder of hospitalization outcomes.

Five statistically significant differences between the case and control groups were found. RRTI patients ($n = 135$; $M = 67.39$ years) were significantly older than patients in the control group ($n = 331$; $M = 62.11$ years; $P = .003$). RRTI patients were more likely to have a history of chronic cardiac disease ($P = .0395$; odds ratio = 1.67) or a history of psychiatric/mental illness ($P = .042$; odds ratio = 1.56). Regarding active medications on the

eMAR, RRTI patients had more steroids and inhalers for chronic respiratory conditions ($P < .001$; odds ratio = 2.70) and had more medications for psychiatric/mental illnesses (other than antianxiety medications) ($P = .003$; odds ratio = 2.01).

The criterion that triggered the need to call RRTI as per this hospital's RRTI policy was examined by reviewing the 4 hours prior to the RRTI call. There was a large variation in timeliness between time the RRTI criterion was documented (ie, heart rate >130) and when the actual call to the team was placed (Table). The Table includes a total sample of 137, as 2 patients had 2 RRTI criteria at the same time. For all other instances, the earliest documentation of any 1 RRTI criterion was the data point captured. Large standard deviations (27.6-87.73 minutes) were noted.

At the low end of the range, nurses called for RRTI assistance in 0 to 6 minutes, and at the high end of the range, the call for RRTI was delayed (80-238 minutes). The mean time from RRTI criteria documentation to RRTI call ranged from 17 to 99.9 minutes for the

Table. Criteria for RRTI and Minutes to Call

Variable	n	Minutes From Documented Criteria to RRTI Call, Mean (SD)	Min	Max
Heart rate <40	1	NA	6	NA
Heart rate >130	23	17.0 (27.60)	1	120
Systolic blood pressure <90	23	45.91 (67.83)	1	230
Respiratory rate <8	3	29.73 (43.75)	9	80
Respiratory rate >28	11	74.18 (82.20)	2	206
Temperature $<97^{\circ}\text{F}$	15	86.80 (71.29)	1	195
Temperature $>100.4^{\circ}\text{F}$	26	28.76 (52.02)	0	222
Oxygen saturation $<90\%$ with supplemental oxygen	20	37.20 (67.88)	1	238
Acute change in level of consciousness	15	99.93 (87.73)	3	222

Abbreviations: Max, maximum; Min, minimum; NA, not applicable; RRTI, Rapid Response Team Intervention; SD, standard deviation.

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different criteria. This suggests that, on average, patient data indicating clinical deterioration are not being acted on in a timely manner.

DISCUSSION

Our findings support those of previous studies that RRTIs are not effective in preventing transfer to a higher level of care or mortality.⁹ Findings regarding timeliness of the RRTI call suggest that RRTIs may have a greater impact on these patient outcomes if criteria were acted on immediately. The literature review revealed wide variation in RRTI use among hospitals.⁹ Perhaps, the reason RRTI has not been found to be successful in improving patient outcomes is because the known criteria are not being acted upon immediately.

The delay between documentation of RRTI criteria and actual RRTI activation suggests that our staff nurses were not consistently acting quickly when patients met RRTI criteria. This is congruent with a qualitative study presented at the 2013 American Nurses Credentialing Center Magnet Conference. That qualitative study found that nurses (N = 32) could be grouped into 2 categories in activating an RRTI: "Blink" were nurses who "had an immediate response," and "Think" were nurses who "expressed internal tension in deciding to call or not to call the RRT as they generally gathered more information."¹⁰ Our study did not include qualitative information from the primary nurses as to their thinking processes in the collection of assessment data and the subsequent decision to call for RRTI.

Information from this study about the significant time lag between documentation of RRTI criteria and time the RRTI call was placed can serve as the basis for a professional development in-service for both direct care nurses and RRT members. A quality improvement educational intervention for direct care RNs could be implemented quickly and cost-effectively. In a study of nurses and physicians about their knowledge and satisfaction with rapid response systems, more than 70% of nurses would rather call a treating physician first than activate an RRTI to allay the

nurses' fears of criticism.¹¹ Determining barriers to calling the RRTI should be included in the quality improvement process. RRTI members can use current EMR systems to scan for documentation of RRTI criteria.

Because earlier intervention based on documentation of RRTI criteria may improve patient outcomes, automating the notification process may improve response times as well as capture documented indicators of clinical deterioration, such as a lower temperature, that may have been overlooked previously. One method for improving timeliness would be to create a guideline and electronic configuration that automates the call for an RRTI using the EMR. Individual hospitals would need to collaborate with their EMR vendors to explore possibilities within an organization's infrastructure. Automation of the RRTI call would mitigate the barriers to RRTI described in the literature such as nurses' fears of being reprimanded or being thought of as incompetent.¹²

Findings of this study did not support the criteria selected for proactive rounding being used at local hospitals. Only 4% (n = 6) of the 135 patients met the ED admission criteria (n = 6), and none of the 135 RRTI patients met the CCU transfer/LOS criteria. This suggests that these may not be appropriate criteria to use for proactive rounding by the RRT for this hospital's population. This finding is congruent with literature regarding proactive rounding by RRT members on patients who had recently been transferred out of the ICU to non-ICUs at a large academic center.¹³ Butcher et al¹³ found no statistically significant improvement in patient outcomes after implementation of proactive rounding by a rapid response nurse on patients who had been transferred out of the ICU.

However, this study's findings about comorbid conditions and active medication profiles have implications for establishing a proactive rounding protocol. Patients with the comorbidities of diagnosed cardiac conditions and psychiatric/mental health issues could be included on the proactive rounding "watch list" for the RRT. Likewise, patients with

respiratory and psychiatric medications on their eMAR may benefit from the additional assessment proactive rounding by the RRT provides.

Future research

Replication of this study in different acute care settings is indicated. Research suggests that new graduate nurses may be less adept at recognizing changes in patient condition, thereby leading to delay in treatment.¹⁴ Future research could include the variable of years of experience of the nurse caring for the patient at the time of RRTI. Studies to compare the effectiveness of designated criteria for calling an RRTI versus MEWS or surveillance of patients on patient outcomes also are indicated. Exploring the relationship between timeliness of the RRTI call and patient outcome may provide evidence to support the value of RRTI.

Limitations

A limitation of the study was that it was conducted at 1 acute care nonprofit community hospital located in an ethnically diverse affluent area of the United States. This patient population is highly educated, well insured, and health care literate. Another limitation for the study is sample size. The descriptive variable of language other than English yielded $P = .054$. A larger sample may have reached

statistical significance. This finding suggests that patients who do not speak English may have a higher likelihood of RRTI. Patients may have met criteria for RRTI and did not have an RRTI called. There was no means to identify or include those patients in this study. As noted earlier, vital sign data were manually entered on 2 units; thus, the potential for transcription error existed.

CONCLUSIONS

Findings suggest that there is opportunity for quality improvement in timeliness of time to documentation of RRTI criteria to the time of RRTI call. Medical-surgical patients in this sample may have benefitted from timely assessment by an RRTI member soon after the first documentation of RRTI criteria was observed and recorded. An automated in-house RRTI notification system would yield a faster response due to the immediate availability of the RRT rather than waiting for a return call from a physician. Automation also makes the call for RRTI objective and databased, thus removing provider subjectivity and one barrier to calling the RRT. In addition, patients with chronic conditions such as cardiac or psychiatric/mental illnesses, and those who take medications for chronic respiratory illnesses and psychiatric illnesses, may benefit from a proactive rounding protocol.

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