

Enhancing Registered Nurse Preparedness for Rapid Response Interventions

by

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Dedication and Acknowledgements

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Abstract

Hospitalized patients can and do experience sudden physiologic deterioration. Early recognition, action, and communication are critical to mitigate worsening deterioration. Rapid response teams (RRTs) are composed of specialized healthcare providers (physicians, nurses, respiratory therapists, others) urgently called to the bedside most often by the registered nurse (RN). RRTs enhance patient outcomes by providing prompt and effective critical care interventions. The RRT initiative encompasses two distinct limbs: 1) the ‘afferent limb’ known as the detection of deteriorating patients and the prompt notification of the RRT; and 2) the ‘efferent limb’ or the interventions started once the team has arrived. The bedside RN is optimally positioned, due to familiarity and literal proximity with their patients, for recognizing acute changes in health status, and subsequently summoning a ‘rapid response team intervention’. Failure of the RN to recognize, react, and relay critical information can result in care delays leading to poor patient outcomes.

A literature review was conducted by searching the Cumulative Index to Nursing and Allied Health (CINAHL) and PubMed (MEDLINE) databases to investigate bedside care delays in the context of RRT initiatives. A single center, retrospective observational study conducted by Gupta et al. (2017) reported that a delay of 15 minutes or more of calling the RRT is commonplace and is associated with increased in-hospital mortality and increased length of hospital admission. Ludikhuize et al. (2012) identified weaknesses in identification of deteriorating patients on medical or surgical units. The study results showed that 80% of patients admitted to an intensive care unit from a medical surgical floor or that experienced cardiopulmonary arrest had signs of deterioration in the preceding 24-hours that were not acted on due to lack of knowledge and skills, inability to appreciate clinical urgency and failure to seek

advice. Davies et al. (2014) found that 24 – 35% of physicians and nurses studied were unfamiliar with the rapid response activation criteria.

An extensive review of literature indicates that a gap in knowledge of the bedside RN exists specific to early warning signs of patient physiologic deterioration, as well as knowing what common interventions are appropriate while simultaneously initiating the RRT. The majority if not all these interventions are within the professional RN scope of practice. The goal of this scholarly project is to offer a continuing education program addressing this knowledge gap. By working in cooperation with the Michigan Nurse Association (MNA), a continuing educational (CE) training module was made available to MNA members (and non-members). Successful completion of the module awarded participants 1.5 credit hours. A required survey was included within the training to evaluate the teaching content. Forty-four participant surveys were initially collected and analyzed. All survey respondents indicated at minimum that the professional development activity enhanced their knowledge on the rapid response system. Additionally, 97% of respondents indicated they feel more confident in initiating a rapid response call, and 95% feel more confident in actively participating during a rapid response. The favorable responses suggest the curriculum was well-received and sufficiently addressed the existing knowledge gap.

Background and Significance

Hospitalized patients can and do experience sudden physiologic deterioration; the reasons are multifactorial and dependent upon current diagnosis and overall health condition. When acute physiologic deterioration occurs, it is extremely frightening for the patient. The care provided by the medical/surgical bedside Registered Nurse (RN) becomes more complex and challenging. Acute changes in a health condition, without prompt identification and appropriate immediate interventions, can lead to worsening of health i.e., progression of deterioration, unexpected intensive care unit (ICU) admission, and untimely mortality. Early recognition and prompt intervention can serve to reverse physiologic deterioration in many instances. The bedside RN is optimally positioned, due to familiarity and literal proximity with their patients, for recognizing acute changes in health status, and subsequently summoning a 'rapid response team intervention'.

Rapid response teams (RRTs) are composed of specialized healthcare providers (physicians, nurses, respiratory therapists, others) urgently called to the bedside most often by the RN. There is an immediate need for assessment and treatment of the patient to ultimately avoid transfer to an ICU. RRTs are present in most healthcare institutions in large part due to the Institute for Healthcare Improvement's "100,000 Lives Campaign" established in 2005 (Patient Safety Network, 2019). Evidence is conclusive- RRTs facilitate favorable patient outcomes by providing prompt and effective critical care interventions. Even with the ability of the RRTs to assess and provide immediate care, overall effectiveness is weakened if there is a delay in recognizing acute changes in the patient's health condition and therefore a delay in summoning the RRT.

The RRT initiative encompasses two distinct limbs: 1) the ‘afferent limb’ known as the detection of deteriorating patients and the prompt notification of the RRT; and 2) the ‘efferent limb’ or the interventions started once the team has arrived. Delays in either limb at critical juncture points result in poor patient outcomes (Gupta et al, 2017).

When there is a delay in recognition by the RN, it becomes obvious there is a delay in paging the RRT to the bedside. In addition, there is a delay in bedside nursing interventions that serve to alleviate the associated physiologic stress, and a delay in preparing the environment for RRT arrival. For example, research conducted by van Galen et al. (2016) discovered that almost half of unplanned ICU admissions were healthcare worker related, and therefore preventable. Failure to apply knowledge to a new clinical situation, lack of task coordination within the healthcare team, failure to monitor patient progress or condition, failure to correctly check and assess the situation before performing interventions, an inappropriately trained individual performing the clinical task, and failure in performance of highly developed skills are reasons for the unplanned ICU admissions. There is an abundance of information in the current literature that a gap in knowledge of the bedside RN exists specific to early warning signs of patient physiologic deterioration, as well as knowing what common interventions are appropriate while simultaneously initiating the RRT. The majority if not are within the professional RN scope of practice.

This DNP project is principally a new continuing education program developed for the MNA members, but also incorporates components of a quality improvement initiative, as well as an opportunity to improve practice patterns based on the current evidence. The central aim is to inform the bedside medical surgical professional nurse about: The overarching RRT initiative and its respective two distinct limbs; identifying the most common causes of acute patient

physiologic deterioration; and the initiation of bedside nursing interventions within the scope of nursing practice while simultaneously initiating an expeditious rapid response team intervention.

Therefore, to achieve the central aim of the project, a continuing education program was offered to both members (and non-members) of the Michigan Nurses Association (MNA) in the form of a video webinar (aka a seminar conducted over the internet) that included all detail of the aforementioned.

Upon viewing the educational webinar, the RN completed a continuing education program posttest to obtain continuing education contact hours developed by the MNA continuing education personnel. In addition, participants evaluated the webinar and indicated if the learning objectives were met (Appendix B).

Review of the Literature

Search Methods

A literature review was conducted by searching relevant online databases during the months of September 2020 and again in October 2021. Two databases were searched: Cumulative Index to Nursing and Allied Health (CINAHL) and PubMed (MEDLINE). CINAHL is an online database provided by EBSCO publishing and is largely used by nursing researchers for nursing related inquiries. PubMed is a publicly available search engine utilizing the MEDLINE database of medical literature and is maintained by the United States National Library of Medicine at the National Institute of Health. In addition, the Agency for Healthcare Research and Quality, an official website of the Department of Health and Human Services, was accessed. The purpose was to identify peer reviewed publications that closely address the clinical problem. Studies were included that examined nursing barriers to early recognition of deteriorating patients on inpatient hospital wards, and subsequent interventions; published within

the past ten years; and, written in the English language. In addition, studies were selected that were aimed specifically toward nurse empowerment programs that advanced patient care and the culture of safety. Search terms combinations used included “early recognition”, “delayed recognition”, “patient deterioration”, “rapid response team/system”, “nursing care delay”, “outcomes”, “medical emergency teams”, “inpatient”, “quality improvement” and “nursing education”. Studies that did not address nursing or caregiver teams as a factor pertaining to delay of patient care were excluded. Of the 34 publications that met the search criteria, 15 were selected. Reasons for exclusion (n=19) were date of publication (too old), not addressing the overarching purpose of this project, and duplications. This literature review has several subsections including: research related to identification (or lack thereof) of patient deterioration within the hospital setting, research related to delayed activation of RRTs, the utility of a Modified Early Warning System (MEWS), failure to rescue, and the culture of patient safety.

Identification of Patient Deterioration

Initiating a rapid response team intervention is dependent on the bedside RN to alert the appropriate provider or RRT expeditiously that a patient is in distress and requires immediate attention. The following studies are specifically related to the identification, or lack thereof, of patient deterioration and its impact on patient outcomes.

Gupta et al. (2017) conducted a single center retrospective study investigating the impact of delayed activation of the RRT (15 minutes or greater) on hospital mortality. The researchers discovered that a delay of 15 minutes or more in contacting the RRT was commonplace, associated with increased in-hospital mortality, and increased hospital length of stay. Approximately 25% of 826 calls were considered ‘delayed’ for contacting the RRT. Additionally, the most common triggers for RRT activation were low blood oxygen saturation,

altered level of consciousness, and hypotension. Afferent limb failure was attributed to inadequate education regarding detection of clinical deterioration, inadequate knowledge regarding the rapid response system (RRS), inadequate documentation of physiologic observations, belief that deterioration can be or has been managed by clinical staff on the unit, concern about activating a false alarm, and/or poor interdisciplinary communication.

A retrospective review of 49 medical records of patients transferred from a general medical/surgical unit to the intensive care unit (ICU) identified 156 ‘root causes’ of unplanned ICU admissions (van Galen et al, 2016). Root causes are realized by conducting a root cause analysis (RCA). An RCA “is a structured method used to analyze serious adverse events” in healthcare; the goal of an RCA is to identify any underlying problems in processes that increase the likelihood of an error with a non-punitive approach (Patient Safety Network, 2019). Analysis of the ‘root causes’ revealed that 46% of unplanned ICU admissions were related to lack of patient monitoring that caused a delay in identifying acute physiologic deterioration, and therefore delayed immediate interventions. Examples of human-related monitoring failure included an omission of obtaining vital signs after a treatment, and an omission of any action (including obtaining vital signs) after the caregiver reported patient deterioration. Only 40% of the records in the analysis had vital parameters monitored and/or documented per protocol or physician order.

Ludikhuizen et al. (2012) analyzed the records of medical and surgical patients who experienced a severe adverse event, including but not limited to, cardiopulmonary arrest, non-cardiac arrest physiologic deterioration, subsequent unplanned ICU admission, the need for emergency surgery, and unexpected death. Results of this retrospective medical record review revealed that 80% of patients admitted to an ICU from a medical-surgical unit, and those who

experienced cardiopulmonary arrest, had signs of acute deterioration in the preceding 24-hours that were not acted on due to lack of knowledge and skills, inability to appreciate clinical urgency, and failure to seek advice. Insufficient measurement and documentation of patient vital signs and observation were also identified; for example, respiratory rate was documented only 23% of the time, and urine production and level of consciousness were seldom recorded compared to pulse rate and blood pressure measurements (recorded most often).

Interestingly, there is no single set of RRT activation criteria for RNs to utilize for clinical guidance; RRT activation does appear to be institution specific and can vary based on individual or system interpretations. A lack of objective universal standards pertaining to RRT activation criteria can result in inconsistencies across studies making it difficult to determine of root causes of care failure. A good example of defined objective RRT activation criteria is found in a study conducted by Chalwin et al. (2019). The researchers described the RRT activation criteria from a single tertiary metropolitan hospital located in South Australia. The RRT was activated for multiple objective criteria including cardiac and/or respiratory arrest. Additional objective criteria of physiologic deterioration included threatened or obstructed airway, heart rate greater or equal to 140 beats per minute or less than 40 beats per minute, systolic blood pressure greater or equal to 200 mmHg or less than 90 mmHg, respiratory rate greater than 30 breaths per minute or less than eight breaths per minute, pulse oximetry less than 90%, level of conscious described as responding only to physical or painful stimulus, and prolonged seizures. The RRT could also be activated for simply feeling “worried” or having concerns over an unresolved clinical condition. This study described how repeat RRT activations for individual patients surprisingly increased mortality. Using objective RRT criteria, repeat calling could be due to chronic conditions such as mild hypoxemia or airway disease yet the data suggest mortality

could not be explained by physiological or other risk factors. Therefore, despite clear and adequate calling criteria, efferent limb failure was suspected indicating inexperienced clinicians were not attending to the patient or failure to resolve calling criteria prior to completing the actual RRT response.

Delayed Activation of Rapid Response Team

Delayed activation of rapid response teams is often attributed to a delay in identification of need, and not knowing when to activate. The following studies address barriers to RRT activation.

An analysis of 593 RRT events at a tertiary care center discovered, via narrative responses and survey data from hospital medical-surgical nurses, that “uncertainty regarding activation criteria” and feeling and being told “...that they were bypassing the attending physician by calling the RRT” were barriers to activation (Braaten et al. 2015).

Difonzo (2019) conducted a systematic review aimed to evaluate the factors that influence the performance of the afferent limb in deteriorating hospital patients, and the effects on patient outcomes. The researchers delineated the three stages that affect efficiency of the afferent limb of the Rapid Response System (RRS): monitoring, recognizing, and escalating care. Therefore, publications were included in the systematic review if they influenced the caregiver’s ability (or met barriers) to monitor, recognize, and escalate care, related to patient deterioration. A total of 31 articles were included in the review - 27 quantitative, two qualitative, and two mixed- methods. The results exposed several factors that enabled, or inhibited, the ability of ward staff to monitor and record physiologic parameters, recognize physiological deterioration, and escalate care to unexpectedly deteriorating patients.

Extreme variability was noted across settings and the lack of monitoring was implied by the lack of recording and documenting physiologic measurements (from monitors) by the caregivers. If patients were not monitored appropriately matching their comorbid state, there was an absence of recognition. Five studies demonstrated evidence of poor recognition because of poor compliance with Early Warning Score (EWS) protocols. The EWS is a scoring system that derives a single score from abnormal deviations of multiple clinical parameters compared to normal parameters. The parameters are weighted and converted into a single score with higher scores indicating higher clinical risk. Regrettably, signs of worsening disease states were missed, and early warning scores that should have been recognized, were lowest on weekends. As a result, patient mortality was high. Additionally, there was minimal agreement between hospital staff regarding how often patients should be assessed for early warning signs of deterioration.

Several limitations to this review were noted by Difonzo (2019). For example, since the review included physicians and nurses from different hospitals in 11 different countries, it was impossible to compare the clinical performance of the afferent limb because of differences in warning tools, activation thresholds, team composition, and physician or nurse team leaders.

Davies et al. (2014) conducted descriptive research for the purpose of identifying barriers to rapid response system (RRS) activation. RRS incorporates both the afferent and efferent limbs of a rapid response initiative, whereas RRT is referring to the efferent limb or the team that arrives once summoned. This study was conducted in a Harlem Hospital Center in Manhattan, New York. A total of 84 staff members (81% physicians and 19% nurses) that provide direct patient care participated and completed a questionnaire regarding adherence to 6 RRS triggering criteria as part of the hospital RRS criteria. The rapid response criteria included heart rate less

than 45 or greater than 125 beats per minute, mean arterial blood pressure less than 70 mmHg or greater than 139 mmHg, respiratory rate less than 10 breaths per minute or greater than 30 breaths per minute, patient “not looking right”, and change in mental status. The results revealed 24 – 35% of physician and nurse respondents were unfamiliar with the hospital’s RRS activation criteria and 65% indicated they felt inadequately trained regarding the activation of the RRS. It was concluded that as familiarity with, agreement with, and perceived benefit of activating the RRS increases, so does the self-reported adherence rate. Familiarity with criteria was found to be more important (66%) than agreeing with (33%) or believing in the benefit of the criteria (33%). The authors determined that staff education is needed to overcome barriers and that current educational methods such as lectures, orientation sessions, and posters, are not effective. Training stimulation sessions and a continuous noninvasive respiratory and pulse rate monitoring system to detect abnormal vital signs in hospitalized patients was also suggested.

The Medical Early Response Intervention Therapy (MERIT) study investigated the impact of introducing an RRT into a clinical setting and compared it to a conventional cardiac arrest team (CPR team) on early response intervention and treatment. The goal was to evaluate if a newly created RRT versus a CPR team influenced patient care outcomes (Chen et al. 2015). The ‘timing of calls’ to either the RRT or CPR team was analyzed to for impact on mortality, unplanned ICU admissions, and cardiac arrests. Over 3,154 of combined emergency calls were made in four different Australian hospitals over a specific unit of time. One-third of all calls were considered ‘delayed’ (greater than 15 minutes) when acute deterioration had occurred. Delays were associated with increased risk of hospital mortality ($p < 0.001$) and unplanned ICU admissions ($p < 0.001$). There was no significant difference in the proportion of delayed calls

between either group ($p = 0.961$). The findings suggest the importance of the afferent limb ‘delay’ as a strong predictor of patient outcomes.

Braaten et al. (2015) tested the effect of a group of interventions on RRT activation and cardiac arrest rates, to identify strategies for improvement in RRT utilization. These quality improvement interventions included education tools, collaborative initiatives such as partnering with physicians, protocol development, post-rapid response team support services, and evaluation of survey responses from staff that activated RRTs. The results of the quality improvement interventions had a significant impact on increasing the RRT rate of activation and many increased RRT activation. The authors emphasized significantly increased RRT activations after simulation education and physical badge cards with calling criteria were developed. The results also identified several barriers to nurse activation of RRT: fear of criticism, reliance on traditional, non-structured systems of calling the attending physician, lack of support systems, lack of confidence and knowledge, particular history with RRT members, and lack of staff and administrative support.

Utility of an Early Warning Score (EWS) and Modified Early Warning Score (MEWS)

The purpose of Early Warning Score Systems (EWS) is to identify acute deterioration of the patient. Williams et al. (2016) describes EWS as a weighted composite score based on the severity of derangement of physiological variables, including systolic blood pressure, heart rate, respiratory rate, and oxygen saturation. Variations of the scoring system include laboratory findings and therapeutic measures, for example supplemental oxygen use. The composite score is compared to an established score; it indicates if escalation of care is necessary. The Modified Early Warning Score (MEWS) is similar to the EWS and the parameters include systolic blood

pressure, heart rate, respiratory rate, temperature, and AVPU which is similar to the Glasgow Coma Scale (GCS): alert, reaction to voice, pain, or unresponsive.

Alam et al. (2014) conducted a systematic review to evaluate the impact Early Warning Scores (EWS) have on patient outcomes, “including in-hospital mortality, patterns of intensive care unit admission and usage, length of hospital stay, cardiac arrests, and other serious adverse events of adult patients on general wards and in medical admission units.” Seven studies were included in the systemic review; they all assessed patient outcomes before and after the implementation of an EWS. Because of heterogeneity, the authors did a narrative analysis, and the results were mixed. For example, improved patient outcomes were noted after introducing the EWS chart process to hospital staff. Six of the seven studies used mortality as an endpoint; two found no significant difference of in-hospital mortality rate, and two did not. There did however appear to be a ‘trend’ towards improved patient survival when the EWS was in place. Intensive care unit mortality also trended downward as did serious adverse events.

A retrospective descriptive study, conducted by Ludikhuizen et al. (2012) at the Academic Medical Center in Amsterdam, the Netherlands, explored practice patterns for the measurement and documentation of vital signs when using the modified early warning score (MEWS). Adverse events (AE) experienced by patients were defined as 1) cardiopulmonary arrest, 2) unplanned ICU admission, 3) unexpected death, or 4) emergency surgery. Vital sign data was extracted from the medical record for those experiencing an adverse event, and MEWS were calculated when one or more vital signs was documented. Any missing vital signs or parameters were considered “normal”. Per hospital policy, an attending physician should be notified when a MEWS of three or more is calculated based on documentation by the caregiver. Two hundred and four patients had a combined total of 2,688 measurements in the 48 hours preceding the AE.

Data from 29 patient charts were excluded from analysis because one of the required medical or nursing charts was absent. Documentation of vital signs was reviewed for those with MEWS $\geq$ 3. The researchers discovered that pulse rate and systolic blood pressure were not documented for 72% and 73% of cases respectively. In patients with MEWS $\geq$ 3, these increased to 91%, reflecting that more complete sets of vital signs were recorded in cases with an MEWS $\geq$ 3. In addition, respiratory rate was not documented in 23% of the cases, state of consciousness in 6.5%; urine production in 16.6%; temperature in 48.5%, and peripheral oxygen saturation in 43.7%. These results indicate a lack of vital sign monitoring 48 hours prior to an AE and ultimately leading to failure of the afferent limb of the rapid response system.

Failure to Rescue

In 2007 the U.S. Agency for Healthcare Research and Quality (AHRQ) established failure to rescue (FTR) as a patient safety indicator. They define failure to rescue as a “failure or delay in recognizing and responding to hospitalized patients experiencing complications from a disease process or medical intervention (Hall et al., 2020).”

Burke, J., Downey, C., & Almoudaris, A., (2020) published their research titled: Failure to rescue deteriorating patients: A systematic review of root causes and improvement strategies. The purpose was to summarize the findings of all relevant individual studies specific to failure to rescue in the adult population. Fifty-two articles met the inclusion criteria and were grouped into 3 strategic arms: recognizing, relaying, and reacting, and each incorporated 6 areas of interventions: 1) staffing levels & education, 2) detection, early warning score systems, and checklists, 3) surveillance communication & electronic monitoring, 4) medical emergency & rapid response teams, 5) relaying information, and 6) reaction and response to deteriorating patients.

Failure to recognize was a key factor for imminent mortality. For example, unrecognized changes in vital signs lead to failure to rescue. This is evidenced by the fact that extreme deviations in vital signs typically occur within 48 hours prior to admission to the ICU. If not recognized in a timely manner, results are catastrophic. The ability to recognize and subsequently rescue is directly related to nurse staffing and staffing ratios. When staffing increases by 10%, independent of the quality of the nurse's working environment, rescue opportunities rose. Interestingly, it was noted that the addition of one extra patient to a nurse's assignment translated to a 7% increase in likelihood of death within 30 days of hospital admission.

A link between FTR and nursing education was also identified. Hospitals that employed more baccalaureate degree registered nurses had decreased rates of FTR. One study included in the systematic review cited a 5% risk reduction of FTR when 10% of nurses held a bachelor's degree in nursing or higher.

Simulation was also recognized as a useful learning tool for staff specific to FTR. Emphasis was placed on 'crew resource management', used in the aviation industry, to develop clinical leadership and team training, teaching, and investment in simulation curriculum in both medical and nursing schools.

Failure to react is a significant component of failure to rescue. Publications included in this review identified that barriers to care- and failure to react - can be minimized by healthcare team educational processes, including team rounds and consistent engagement, teaching, and learning. Team improvement strategies have been shown to better the safety climate attitude of associated institutions.

Patient Safety Culture

According to The Joint Commission (2018), patient safety culture is defined as the “product of individual and group beliefs, values, attitudes, perceptions, competencies, and patterns of behavior that determine the organization’s commitment to quality and patient safety.” Several studies have examined interventions and approaches that create a culture of safety such as educational tools, communication initiatives, and nurse empowerment opportunities.

A strong patient safety culture is associated with lower rates of complications and adverse events, as reported by Amiri et al., 2018. These researchers tested a program of nurse empowerment that involved a two-day workshop, learning from informative posters and pamphlets specific to patient safety concepts modeled after the Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS). TeamSTEPPS was developed by the Agency for Healthcare Research and Quality (AHRQ) and is an evidence-based set of teamwork tools centered around optimizing patient outcomes by improving communication and teamwork skills among health care professionals. Participants took a pretest, participated in the multifaceted education program, and took a posttest to assess learning patient safety culture. The pre- and post-tests were developed from the Persian version of the Hospital Survey on Patient Safety Culture (HSOPSC), developed by the Agency for Healthcare Research and Quality (AHRQ). A total of 60 nurses and 20 nurse supervisors participated in the study. The participants were randomly assigned into an experimental and control group. Those in the experimental group received the empowerment educational program whereas those in the control group did not. The experimental group had significantly higher post-test scores compared to the control group ($p < 0.001$). Outcomes of the research noted improvement of post-test scores following the educational interventions.

Radeschi et al. (2015) conducted survey research aimed at identifying factors affecting attitudes and barriers to the RRS. Over 2,200 staffers were identified and 92% deemed eligible to participate. A total of 1,812 (79.6%) participants completed the survey (1,278 nurses and 534 medical doctors). Survey results indicated that staff 'attitude' toward a RRT was improved if they had previously participated in a rapid response educational program or had previous experience with rapid response interventions. Medical unit staff were more likely to call the covering physician rather than activate the RRS, compared with surgical unit staff who were more compliant with RRS activation processes.

Integrated educational programs and empowering the bedside RN enhances confidence both in clinical practice as well as embraces a culture of safety. If the RN is confident in their knowledge, recognizes deterioration promptly, provides timely and safe interventions, and escalates care to the RRT, patient outcomes are favorable.

Problem Statement

Following an extensive review of the literature, informal dialogue with members of an RRT at a large Michigan healthcare system, and discussions with the Associate Executive Director of Nursing and Government Affairs and ANCC Accredited Provider Program Director for the Michigan Nurses Association (MNA), there is a need for a continuing education program for the RN practicing at the bedside:

- 1) to understand the general purpose of a RRT and their structure, role, implementation, and actions,
- 2) to recognize early signs, symptoms, and underlying pathophysiology of the most common causes of acute physiologic deterioration in the acute care patient,

- 3) to acknowledge high priority nursing interventions for the at-risk or deteriorating acute care patient prior to and during an RRT event.

Objectives

The overarching goal of this DNP project was to offer a continuing education program to both members and non-members of the Michigan Nurses Association, through the MNA continuing education website. Learner objectives were established for the professional nurse who engages in the education program that is authored by this DNP project team and offered by the Michigan Nurse Association (MNA). The learner objectives are as follows:

1. The nurse will recognize early signs, symptoms, and underlying pathophysiology of the most common causes of acute physiologic deterioration of the acute care patient.
2. The nurse will be able to summarize the Rapid Response Team (RRT) general purpose, structure, roles, implementation, and actions.
3. The nurse will be able to prioritize nursing interventions for the at-risk or deteriorating acute care patient prior to and during an RRT response.

Framework

The Plan-Do-Study-Act (PDSA) model for evidence- based practice developed by Deming and Shewhart is the foundation of this continuing education program. The project consists of a novel curriculum format developed to enhance the knowledge of Registered Nurses in Michigan (the Plan), followed by nurse participation in the continuing education webinar offered by the MNA (the Do), evaluation of nurse understanding of the content (passing a posttest by 80% or better (the study) and assessing one's own individual confidence level when

caring for acutely decompensating patients and acknowledge the importance of consistent review of the content (the Act).

The theoretical framework for this project is based on David A Kolb's experiential learning theory (ELT). ELT explains how work experiences coupled with traditional education allows for personal development through continual learning (Kolb, 2015). According to Kolb (2015), ELT "offers a system of competencies for describing job demands and corresponding education objectives, and it emphasizes the critical linkages that can be developed between the classroom and the 'real world' with experiential learning methods" (p. 4). ELT utilized the workplace as a learning environment, where bedside experiences draw critical connections that can enhance or revitalize formal education allowing for continual professional development to one's full potential (Kolb, 2015). This theory is suited for bedside nurses who have little or no experience in a rapid response situation. Experiential learning is the process that links formal education, work, and personal development (Appendix A).

1. Education – webinar developers provide education to professional Registered Nurses about the most commonly physiologic signs of patient deterioration and the necessary tools for immediate interventions
2. Work – webinar developers provide guided video instruction that simulates the hospital work environment allowing the learner to make connections between what is learned and real-life work experiences
3. Personal development - By establishing connections between formal education and work experiences, the learner will gain knowledge specific to professional practice, enhance opportunities to increase competence and skills in care delivery on a continuum.

Project Methodology

Project Design

This DNP project embraced components of an evidence- based intervention, program development, and quality improvement initiative. A continuing education webinar with embedded videos was developed with content matching the goals of the project and learning objectives for nurses that participate in the webinar. The webinar was advertised and offered by MNA to members and non-members of the association, and available on the MNA website per the MNA continuing education established processes. After engaging in the CE program and passing a posttest requiring a grade of 80%, the MNA education department awarded 1.5 continuing education credits to be used for professional Michigan nursing license renewal.

The participants who completed the program were also asked to complete an evaluation of the program by completing a 12 – question Likert Scale evaluation. The purpose of the evaluation was for the authors to evaluate the efficacy of their teaching and to review the learners’ responses regarding achieving the learner objectives. (See Appendix B)

The first step in the development of the project was to engage in informal discussions with members of RRTs and Certified Registered Nurse Anesthetists who are also members of RRTs and/or summonsed by the RRT, to discuss obvious knowledge gaps by professional RNs providing care on medical surgical nursing units.

Following identification of knowledge gaps, several meetings took place with the DNP project chairperson to map out an outline of an intervention that was achievable in the time frame allotted to solve the problem.

Once a planned intervention was decided upon (a formal webinar with embedded vignettes within a curricular presentation), the Associate Executive Director of Nursing and

Government Affairs and ANCC Accredited Provider Program Director for the MNA was contacted first by email, and queried about opportunities available to offer the program to members/nonmembers of the MNA for continuing education credit, aka contact hours.

An extensive literature review was conducted to validate the importance of the CE webinar and to identify and prioritize curricular content that aligned with the goals and the learner objectives. The established outline of the CE program was confirmed and included:

1. An introduction to the CE program
 - a. the authors
 - b. the purpose
 - c. the learner objectives
2. A succinct description, including common signs and symptoms, of the most frequent causes of acute patient physiologic deterioration in the non -ICU hospital setting
 - a. Acute respiratory distress
 - i. Common causes
 1. Upper airway disease and/or obstruction
 2. Pulmonary disease
 3. Cardiac disease
 4. Neurological disease
 5. Toxic and metabolic derangements
 6. Miscellaneous causes
 - ii. Signs and symptoms
 1. Clinical warning signs
 - iii. Treatments

1. Oxygen delivery modalities
 2. Airway support
 - b. Acute cardiac disturbances
 - i. Common causes
 1. Hypertension exacerbation
 2. Arrhythmias
 3. Acute coronary syndrome
 4. Pulmonary embolism
 - c. Acute neurologic disturbances
 - i. Common causes
 1. Sedation
 2. Seizure
 3. Hypoglycemia
 4. Stroke
 - ii. Signs and symptoms
 - iii. Interventions/ treatment
3. An introduction to RRTs, the importance of monitoring, prompt recognition of the signs and symptoms, and prompt signaling of the RRT
4. The importance escalating care, summoning providers to the bedside, and delegating appropriate nursing interventions
 - a. i.e., oxygen administration, frequent vital signs, placement of an intravenous catheter, proximity of emergency equipment, gathering pertinent patient information from the medical record (for communication purposes)

The developed continuing educational webinar is 75-minutes in length, formatted using PowerPoint slides and narrated by the DNP students. A videographer was hired to record the clips of essential curricular content and facilitated embedding the video clips within the slides at the appropriate places (Appendix F).

The MNA provided the authors of this project with an accredited provider planning template to facilitate MNA continuing education requirements and project objectives (Appendix D). Upon completion of the PowerPoint presentation, it was submitted to the MNA for a comprehensive review. When it was fully approved, the MNA continuing education department advertised the program on their website (minurses.org) and it remains available by members and non-members of the MNA through March 2024.

As aforementioned, nurses who engaged in the program were required to complete a posttest of the presentation and pass the posttest with a minimum grade of 80% to obtain 1.5 continuing education credits.

The posttest questions were developed by the MNA education committee, and the posttest results were not made available to the authors. The program evaluation questions were developed by the authors of the project in collaboration with the MNA continuing education leadership. Upon completion of the program, the evaluations were submitted to the MNA, responses de-identified, and emailed to the project authors (Appendix B). Submitted evaluations were collected by the investigators and analyzed to assess the efficacy of teaching as well as if participants met the learning objectives.

Project Setting

The project is a formal continuing education webinar available on the MNA website from March 2022 through March 2024.

Key Personnel

The key personnel included DNP Project developers Bethany Grupido RN and Ryan Korodan RN, both DNP Nurse Anesthesia students enrolled in the Oakland University Beaumont Graduate Program of Nurse Anesthesia, Mary Golinski PhD, CRNA, FAANA and DNP Project Chair; Kristen Munyan DNP, RN, Project Committee Member; and Larissa Miller PhD, MSN, RN, CNE, CNS, MNA Associate Executive Director of Nursing and Government Affairs, and ANCC Accredited Provider Program Director; as well as Hope Mwemba MSN-ed, RN MNA Continuing Education Nurse Planner. Additionally, Julian Enghauser, an Oakland University student of film productions was enlisted for audiovisual support for the embedded video content.

Participants/ Population and Recruitment Strategy

Participants included members and nonmembers of the MNA who viewed the *Review of Rapid Response Team Activation and Interventions* curriculum for continuing education credit. Participation is fully voluntary. Recruitment for participation was implemented by the MNA through advertisement on their website prior to publishing the program.

Data Collection

The developers of the program were not privy to who participated in the program, who took the posttest and achieved a passing grade, or who completed the evaluation. The only data received was the de-identified participant evaluation of the program (Appendix E). The project authors then examined participant evaluation responses. Evaluation responses are continually being collected by the MNA, however only responses from the first cohort, those completed between March 5th and April 15th, 2022, were reviewed.

Potential Barriers

Potential barriers for participation included lack of interest from RNs of the program titled: *Review of Rapid Response Team Activation and Interventions*.

Ethical Considerations/Protection of Human Subjects

After extensive consultation with the Oakland University IRB and reviewing policy and processes on the Oakland University Research Website (Oakland.edu/research/), it was explained to the chair that the project did not qualify as Human Subjects Research.

The MNA reviewed and approved the content of the program. Program objectives and learner objectives were agreed upon between the developers and the MNA. The MNA continuing education department is directly responsible for posting the program and following their accreditation guidelines for offering CE credits. The developers did not receive any identifiable data of the participants. The content of the program was based upon the extensive literature review and reviewed by the MNA and the project chair for accuracy.

Potential Benefits & Outcomes

Evidence is conclusive that expeditious recognition and prompt intervention of the physiologic deteriorating patient in the hospital setting can and does reduce morbidity and prevent unplanned ICU admissions. An educational program and curriculum that emphasizes the duty and responsibilities of the RRT, early recognition of the most common causes of acute decompensation, and prompt escalation of care ultimately improves patient outcomes. In addition, promoting a culture of safety, as determined by the Hospital Survey on Patient Safety Culture (HSOPSC) developed by the Agency for Healthcare Research and Quality (AHRQ), is a priority for all healthcare settings.

Timeline

The entire timeline of the DNP Project is depicted in Appendix C.

Cost-Benefit Analysis/Budget

Resources for the project include DNP student time, creation of webinar content (the PowerPoint and embedded videos), and the cost of the audiovisual (AV) support person who filmed the video slips. There is no cost for the collaboration with the MNA. Constraints to the implementation included availability and flexibility of the DNP student developers, scheduling times for the audiovisual support, and coordination of personnel. To overcome these barriers, the project developers paid out of pocket for the AV-support and worked closely with the project faculty chairperson to ensure availability for filming the educational content.

Discussion and Implications for Practice

Overall, the evaluation of the webinar by the participants was positive (Appendix E); most participants responding favorably (either “Agree” or “Strongly Agree”). Only two evaluators gave a “neutral” response, and no evaluators responded with “Disagree” or “Strongly Disagree”. The evaluation responses suggest that the curriculum was well-received and sufficiently addressed the existing knowledge gap. Of the 44 evaluators, 100% indicated at minimum that the professional development activity enhanced their knowledge on the rapid response system. Furthermore, after completing this professional development activity, 97% of respondents indicated they feel more confident in initiating a rapid response call for a clinically deteriorating patient, and 95% of respondents feel more confident in actively participating during a rapid response. Our project’s results are consistent with those found by Radeschi et al. (2015) which stated that 74% of survey respondents “... agreed or strongly agreed that specific training was necessary to interact appropriately with the MET [medical emergency team] during hospital emergencies”, and “...54% of responders agreed that the MET *al* course significantly improved their skills in managing unstable patients in the ward.”

Limitations

There were a few limitations related to this project. Due to changes in personnel at the MNA, there was a delay in getting the curriculum approved, which led to a delay in presentation creation and subsequent steps through delivery of the final product. This unfortunately led to a shorter time interval for evaluations of the program by the participants. Another limitation of the project was RN interest. With the MNA offering several independent continuing education modules and having various timelines for license renewal, our project was competing against other subjects that may have interested the RN seeking credit hours for other topics. Additionally, we would have liked to have had the ability to film in an actual in-patient hospital setting with all the necessary equipment to provide a more realistic vignette. Due to administrative regulations, we were unable to do so.

Contribution of the Project to Achieving DNP Essentials

This project has met AACN Essentials for DNP Education - I, II, III, IV, VI, and VIII. Through interprofessional collaboration, this quality improvement project began by addressing scientific underpinnings for practice by explanation of pathophysiology as it relates to acute physiologic problems. Evolution of nursing care and science was addressed by curricular content of RRT role and responsibility, and additionally explaining the expanding responsibilities of the professional nurse as it relates to enhancing the culture of safety. The literature review, RRT, and healthcare provider conversation highlighted a gap in nursing practice knowledge that the creators of the project were able to address at an organizational level through a low-cost, yet far-reaching educational intervention. After critical appraisal of existing literature, the technology-based webinar was designed and implemented to promote safe, timely, and effective patient-centered care. Willingness of leadership from the MNA to collaborate with

the DNP student project leaders was momentous for the success of the project. The guidance provided throughout creation and dissemination of the professional quality improvement project led to a well-developed, current, user-friendly educational tool for Registered Nurses.

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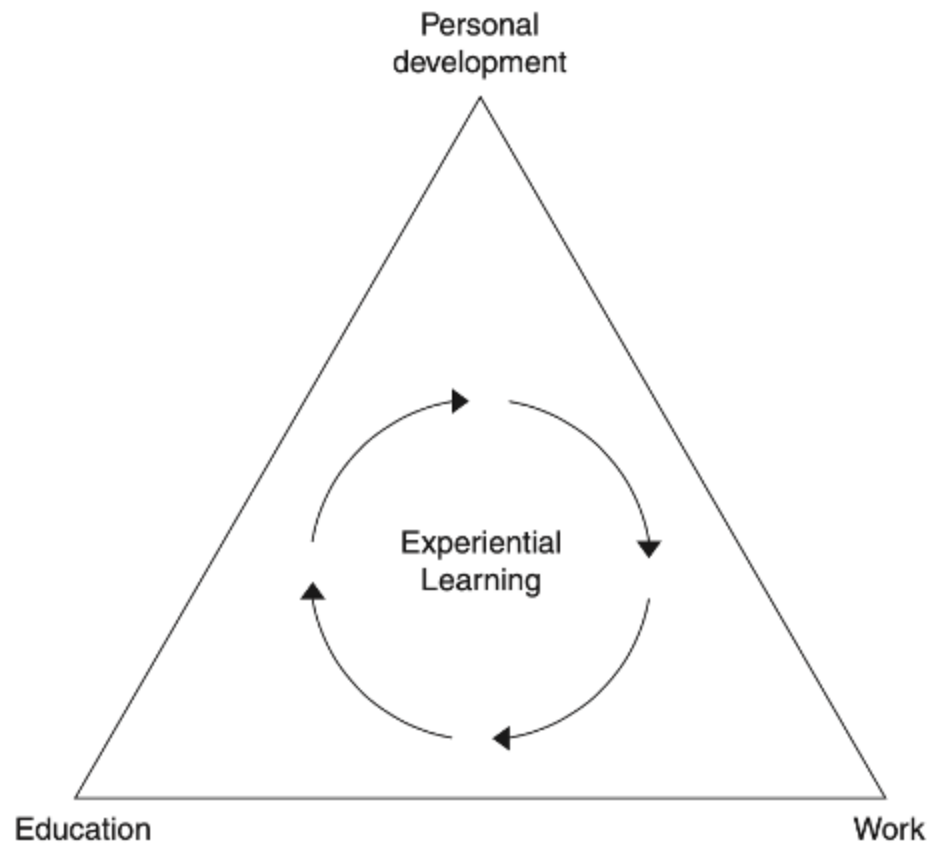
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Appendix A



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Appendix B

Rate your answers on a scale of 1 to 5 where:

1 - strongly disagree 2- disagree 3- neutral 4-agree 5-strongly agree

1. I feel that the professional development activity enhanced my knowledge on the rapid response system.
1 2 3 4 5
2. I feel that the format of this professional development activity was effective.
1 2 3 4 5
3. I feel that the presenters were effective in their delivery of content.
1 2 3 4 5
4. I feel that I can summarize the Rapid Response Team (RRT) general purpose, structure, roles, implementation and actions.
1 2 3 4 5
5. I was able to enhance my knowledge and ability to recognize early signs, symptoms and underlying pathophysiology of the most common causes of acute physiologic deterioration in the acute care patient.
1 2 3 4 5
6. I am better prepared to prioritize nursing interventions for the at-risk or deteriorating acute care patient prior to and during an RRT event.
1 2 3 4 5
7. This presentation included information on one or more topics that was helpful for me to review.
1 2 3 4 5
8. I learned at least one piece of information that will be helpful in my practice as a Registered Nurse.
1 2 3 4 5
9. After completing this professional development activity, I feel more confident in initiating a rapid response call for my patient who is clinically deteriorating.
1 2 3 4 5
10. After completing this professional development activity, I feel more confident in actively participating during a rapid response.
1 2 3 4 5

Appendix C

Table 1: Project Timeline

Task	JAN 2021	FEB 2021	MAR 2021	APR 2021	MAY 2021	JUN 2021	JLY 2021	AUG 2021	SEP 2021	OCT 2021	NOV 2021	DEC 2021
project research & development	X	X	X	X	X	X	X	X	X	X		
completion of education curriculum											X	
filming of content video												
Educational intervention & post-assessment												
Data analysis & interpretation												
Dissemination												

Task	JAN 2022	FEB 2022	MAR 2022	APR 2022	MAY 2022	JUN 2022	JLY 2022	AUG 2022
project research & development								
completion of educational curriculum								
filming of content video	X							
Educational intervention & post-assessment			X	X				
Data analysis & interpretation					X	X		
Dissemination						X		

Appendix D

OPTION 2
MICHIGAN NURSES ASSOCIATION ACCREDITED PROVIDER PLANNING TEMPLATE

Title of Activity:

Date Form Completed: [Click here to enter a date.](#)

Activity Type:

- ☐ Provider-directed, provider-paced: Live (in person or webinar)
 - Date of live activity:
- ☐ Provider-directed, learner-paced: Enduring material
 - Start date of enduring material:
 - Expiration/end date of enduring material:
- ☐ Blended activity
 - Date(s) of enduring materials (e.g. prework): [Click here to enter a date.](#)
 - Date of live portion of activity: [Click here to enter a date.](#)

Nurse Planner contact information for this activity.

Name and credentials:

Email Address:

The **Nurse Planner** must be a registered nurse who holds a current, unencumbered nursing license (or international equivalent) **AND** hold a baccalaureate degree or higher in nursing (or international equivalent) **AND** be actively involved in planning, implementing and evaluating this continuing education activity.

MICHIGAN NURSES ASSOCIATION ACCREDITED PROVIDER PLANNING TEMPLATE

- A. Description of the professional practice gap** (e.g. change in practice, problem in practice, opportunity for improvement)

Describe the current state:

Describe the desired state:

Identified gap:

- B. Evidence to validate the professional practice gap (check all methods/types of data that apply)**

- ☐ Survey data from stakeholders, target audience members, subject matter experts or similar
- ☐ Input from stakeholders such as learners, managers, or subject matter experts:
- ☐ Evidence from quality studies and/or performance improvement activities to identify opportunities for improvement
- ☐ Evaluation data from previous education activities:
- ☐ Trends in literature, law and health care:
- ☐ Direct observation
- ☐ Other—Describe:

Please provide a brief summary of data gathered that validates the need for this activity:

- C. Educational need that underlies the professional practice gap (e.g. knowledge, skill and/or practices)**

- D. Description of the target audience. (You can select more than one target audience).**

- E. Desired learning outcome(s) (What will the outcome be as a result of participation in this activity?)**

Area of impact (check all that apply):

- ☐ Nursing Professional Development
- ☐ Patient Outcome
- ☐ Other- Describe: _____

- F. Outcome Measure(s) (A quantitative statement as to how the outcome will be measured): learning outcome** (3 components: learning behaviors, assessment method, specific performance criteria)

- G. Content of activity: A description of the content with supporting references or resources**

- ☐ See Educational Planning Table OR
- ☐ Describe content and include time calculation for content: [Click here to enter text.](#)

Content for this educational activity was chosen from:

- ☐ Information available from the following organization/web site:
- ☐ Information available through peer-reviewed journal/resource (reference should be within past 5 – 7 years):
- ☐ Clinical guidelines (example - www.guidelines.gov): _____
- ☐ Expert resource (individual, organization, educational institution) (book, article, web site):

MICHIGAN NURSES ASSOCIATION
ACCREDITED PROVIDER PLANNING TEMPLATE

- ☐ Textbook reference: _____
- ☐ Other: _____

H. Learner engagement strategies

- ☐ See Educational Planning Table OR
- ☐ Integrating opportunities for dialogue or question/answer
- ☐ Including time for self-check or reflection
- ☐ Analyzing case studies
- ☐ Providing opportunities for problem-based learning
- ☐ Other: _____

I. Criteria for Awarding Contact Hours

Criteria for awarding contact hours for live and enduring material activities include:

(Check all that apply)

- ☐ Attendance for a specified period of time (e.g., 100% of activity, or miss no more than 10 minutes of activity)
- ☐ Credit awarded commensurate with participation
- ☐ Attendance at 1 or more sessions
- ☐ Completion/submission of evaluation form
- ☐ Successful completion of a post-test (e.g., attendee must score _____% or higher)
- ☐ Successful completion of a return demonstration
- ☐ Other - Describe: _____

Description of evaluation method: Evidence that change in knowledge, skills and/or practices of target audience was assessed

Short-term evaluation options:

- ☐ Intent to change practice
- ☐ Active participation in learning activity
- ☐ Post-test
- ☐ Return demonstration
- ☐ Case study analysis
- ☐ Role-play
- ☐ Other – Describe: _____

Long-term evaluation options:

- ☐ Self-reported change in practice
- ☐ Change in quality outcome measure
- ☐ Return on Investment (ROI)
- ☐ Observation of performance
- ☐ Other – Describe: _____

OPTION 2

MICHIGAN NURSES ASSOCIATION
ACCREDITED PROVIDER PLANNING TEMPLATE

Attachment 1

Individuals in a Position to Control Content

Complete the table below for each person in a position to control content of the educational activity and include name, credentials, educational degree(s), role on the planning committee, and expertise that substantiates their role. There must be one Nurse Planner and one other planner to plan each educational activity. The Nurse Planner is knowledgeable of the CNE process and is responsible for adherence to the ANCC criteria. One planner needs to have appropriate subject matter expertise for the educational activity being offered (Content Expert). **The individuals who fill the roles of Nurse Planner and Content Expert must be identified.**

Names and credentials of all individuals in a position to control content (must identify the individuals who fill the roles of Nurse Planner and content expert(s)).

Name of individual and credentials	Individual's role in activity	Planning committee member? (Yes/No)	Name of commercial interest	Nature of relationship

MICHIGAN NURSES ASSOCIATION
ACCREDITED PROVIDER PLANNING TEMPLATE

ATTACHMENTS

Please provide evidence of the following:

Attachment 1	Names and credentials of all individuals in a position to control content (must identify the individuals who fill the roles of Nurse Planner and content expert(s)). (See example on previous page.)
Attachment 2	Conflict of interest documentation from all individuals in a position to control content (e.g. planners, presenters, faculty, authors, and/or content reviewers) and resolution if applicable
Attachment 3	Number of contact hours awarded for activity, including method of calculation (Provider must keep a record of the number of contact hours earned by each participant.) If the activity is longer than 3 hours, attach the agenda for the entire activity.
Attachment 4	Documentation of completion and/or certificate.
Attachment 5	Commercial Support Agreement with signature and date (if applicable)
Attachment 6	Evidence of required information provided to learners: 1. Accreditation statement of provider awarding contact hours 2. Criteria for awarding contact hours 3. Presence or absence of conflicts of interest for all individuals in a position to control content (e.g. the Planning Committee, presenters, faculty, authors, and content reviewers) 4. Commercial support (if applicable) 5. Expiration date (enduring materials only) 6. Joint Providership (if applicable) (Materials associated with the activity (marketing materials, advertising, agendas, and certificates of completion) must clearly indicate the Provider awarding contact hours and responsible for adherence to ANCC criteria)
Attachment 7	Summative evaluation

Completed by:

Date:

Appendix E

Table 1

A Review of Rapid Response Team Activation & Interventions: Continuing Education Evaluation Survey Results (n = 44)

	SD	D	N	A	SA
I feel that the professional development activity enhanced my knowledge on the rapid response system	0	0	0	18	26
I feel that the format of this professional development activity was effective.	0	0	1	19	24
I feel that the presenters were effective in their delivery of content	0	0	1	18	25
I feel that I can summarize the Rapid Response Team (RRT) general purpose, structure, roles, implementation, and actions	0	0	0	19	25
I was able to enhance my knowledge and ability to recognize early signs, symptoms, and underlying pathophysiology of the most common causes of acute physiologic deterioration in the acute care patient	0	0	0	19	25
I am better prepared to prioritize nursing interventions for the at-risk or deteriorating acute care patient prior to and during an RRT event	0	0	1	19	24
This presentation included information on one or more topics that was helpful for me to review	0	0	2	19	23
I learned at least one piece of information that will be helpful in my practice as a Registered Nurse	0	0	1	19	24
After completing this professional development activity, I feel more confident in initiating a rapid response call for my patient who is clinically deteriorating	0	0	1	18	25
After completing this professional development activity, I feel more confident in actively participating during a rapid response	0	0	2	17	25

Note. SD = strongly disagree, D = disagree, N = neutral, A = agree, SA = strongly agree

Appendix F

Patient Safety: Review of Rapid Response Team Activation & Interventions

Bethany Grupido BSN

Ryan Korodan BSN

Oakland University - Beaumont Graduate Program of Nurse Anesthesia, Class of 2022

Introduction

Learning Objectives

By the end of this presentation the learner should be able to:

- Summarize the Rapid Response Team (RRT) general purpose, structure, roles, implementation and actions
- Recognize early signs, symptoms and underlying pathophysiology of the most common causes of acute physiologic deterioration in the acute care patient
- Prioritize nursing interventions for the at-risk or deteriorating acute care patient prior to and during an RRT event



Rapid Response System (RRS)

Institutional process designed to improve patient outcomes through rapid assessment & intervention of a non-intensive care unit (ICU) patient who is clinically deteriorating



2 main functions¹:

- Recognize urgent and unmet patient needs & activate the rapid response team (RRT)
- Initiate an RRT response for assessment, intervention, & triage





- RRTs are typically a multi-disciplinary team that includes a critical care RN, respiratory therapist, physician or advanced practice Registered Nurse, nursing house supervisor or administrator
 - *Composition varies based on institution*
- RRTs improve patient outcomes by providing prompt and effective critical care interventions
- RRT intervention decreases the incidence of cardiopulmonary arrest outside of the ICU & hospital mortality

Design and Rationale for the Rapid Response Team (RRT)

You are the patients' first and last line of defense

"The trained nurse has become one of the great blessings of humanity, taking a place beside the physician and the priest."

—Dr. William Osler, Canadian physician and founder of Johns Hopkins University

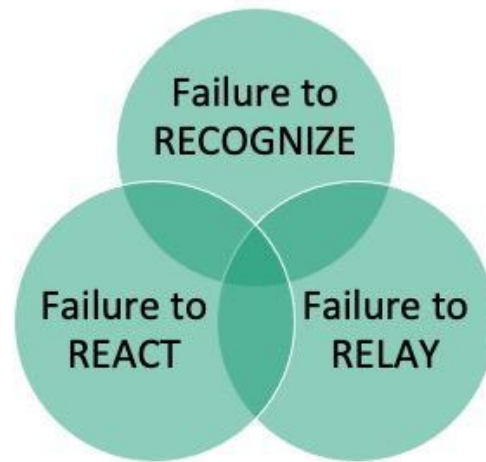
"Constant attention by a good nurse may be just as important as a major operation by a surgeon."

—Dag Hammarskjöld, Swedish economist and diplomat



Reason for RRTs: Failure to Rescue

*"Failure to prevent inpatient deterioration and death as a result of complication(s) related to medical care or underlying illness."*²



Failure to Recognize

- Variation in vital signs is seen up to 48 hours prior to ICU admission
- Incomplete documentation & measurement of vital signs is a common theme across the literature



Failure to Relay

- A delay of 15+ minutes between recognizing deterioration & initiating RRT intervention is associated with increased hospital mortality & length of stay³
- Barriers to the nurse activating the RRS⁵:
 - fear of criticism
 - reliance on outmoded systems of notifying the attending physician
 - lack of support system
 - lack of confidence and knowledge
 - particular history with RRT members
 - lack of staff and administrative support



Failure to React



Reaction to complications must be timely and based on correct evidenced-based management.



Common triggers for RRT activation are low blood oxygen saturation, altered level of consciousness, and hypotension³



Barriers to initiation of the RRS include³:

inadequate education regarding detection of clinical deterioration
 inadequate knowledge regarding the RRS
 inadequate documentation of physiologic observations
 belief that the deterioration can be or has been managed by clinical staff on the unit
 concern about activating a false alarm
 poor interdisciplinary communication

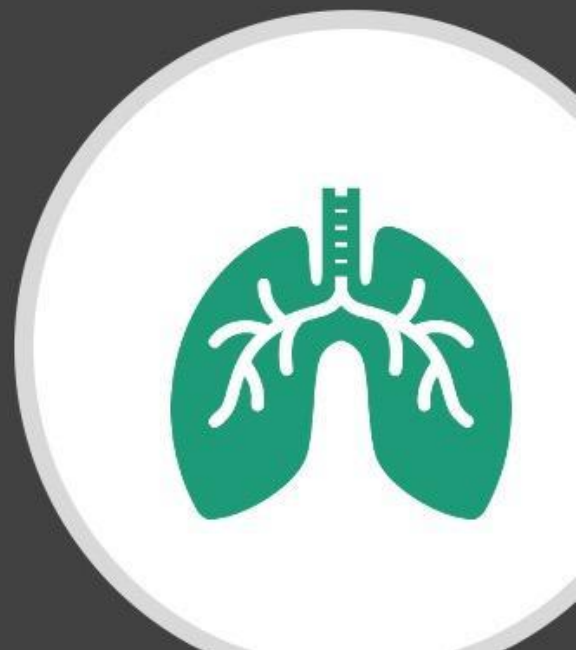


Common Causes of Acute Physiologic Deterioration in the Non-ICU Patient



What is Acute Respiratory Distress?

- Subjective
 - Dyspnea
- Objective
 - RR > 25
 - SpO₂ < 93%
 - Accessory muscle use
 - Cyanosis/dusky skin
 - Anxiety



Common Causes of Acute Respiratory Distress¹²



Upper Airway Obstructions

Pulmonary Disease

Cardiac Disease

Neurological Disease

Toxic and Metabolic Causes

Miscellaneous Causes

How to Assess For Respiratory Distress



Early warning signs

- Dyspnea
- RR > 22
- SpO₂ < 93%

Clinical danger signs

- Depressed mental status
- Inability to maintain respiratory effort
- Cyanosis

Supportive signs

- Most will appear anxious attempts to compensate by sitting upright in the tripod position
- Retractions and use of accessory muscles
- Brief, fragmented speech
- Inability to lie supine
- Profound diaphoresis
- Dusky skin
- Agitation or altered mental status

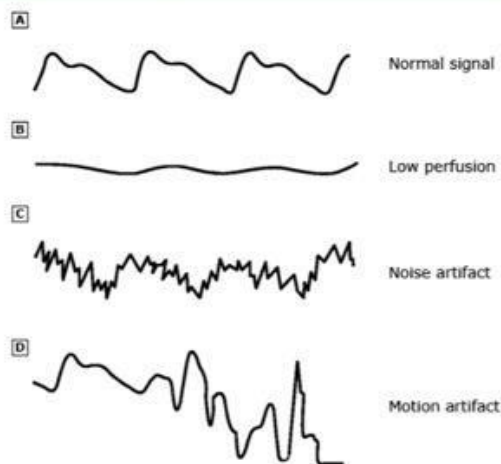
How to Assess For Respiratory Distress¹²

- **Pulse Oximetry**

- Measures arterial oxygenation saturation to hemoglobin
- Not accurate in all situations

Must Understand
How to Interpret
SpO₂ Data

Pulse oximeter waveform



Troubleshooting Pulse Oximeter Readings¹³



Waveform is considered inaccurate when dicrotic notch is lost or low in amplitude or erratic.

Improper probe placement

- Area of hypoperfusion (BP cuff)
- Emitter and receiver not aligned

Motion or noise artifact

Hypoperfusion – hemodynamic instability

Hypothermia – vasoconstriction

Breath Sound Auscultation



Stridor

- upper airway obstruction

Wheezing

- Lower airway obstruction

Crackles

- Interstitial fluid

Diminished Breath Sounds

- Any condition preventing air from entering a given region of the lung

How to Treat Respiratory Distress

- Initial Interventions ☑ call for help, placement of cardiac & pulse oximetry monitoring
- Provide Oxygen
 - 100% NRB (Priority if patient is able to breathe on own)
 - Bag mask valve (Priority if not breathing on own)
 - Venturi mask
 - CPAP/BiPAP
- Support airway
 - Suction!
 - Sit patient up if hemodynamically stable
- Ensure peripheral IV is established

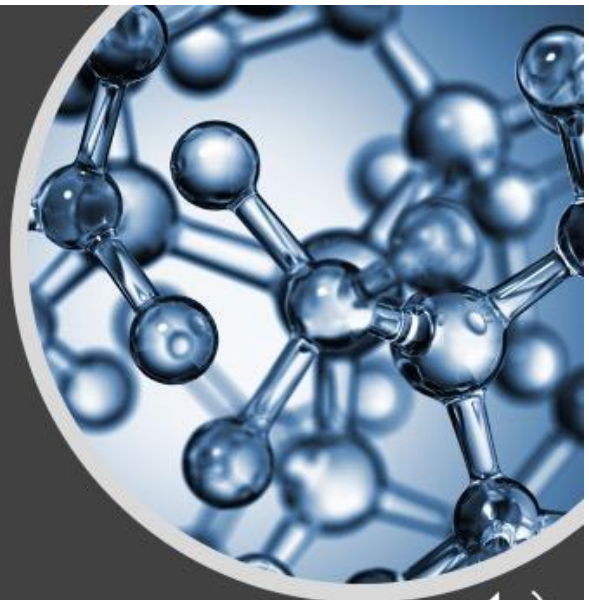


Respiratory Educational Video

What are Cardiac Disturbances?

Cardiac disturbances occur when the heart's ability to function as a pump has failed to adequately provide blood to the body and its organs.

If left untreated severe morbidity, cardiac arrest and death can occur.



Common Causes of Acute Cardiac Decompensation

Hypertension Exacerbation

Arrhythmias

Acute Coronary Syndrome

Pulmonary Embolism



Hypertension Exacerbation^{14,15}

- What is a hypertensive emergency?
 - systolic pressure ≥ 180 mmHg and/or diastolic pressure ≥ 120 mmHg
 - Can be asymptomatic with no acute end-organ damage
 - *Symptomatic* patients require immediate treatment

BLOOD PRESSURE CATEGORY	SYSTOLIC mm Hg (upper number)	and/or	DIASTOLIC mm Hg (lower number)
NORMAL	LESS THAN 120	and	LESS THAN 80
ELEVATED	120 – 129	and	LESS THAN 80
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 1	130 – 139	or	80 – 89
HIGH BLOOD PRESSURE (HYPERTENSION) STAGE 2	140 OR HIGHER	or	90 OR HIGHER
HYPERTENSIVE CRISIS (consult your doctor immediately)	HIGHER THAN 180	and/or	HIGHER THAN 120



Complications of Uncontrolled Hypertension¹⁴



Myocardial
infarction

Cerebral
infarction

Heart failure

Acute kidney
injury or
failure

Vision loss

Angina or
shortness of
breath

Types of Arrhythmias



- Atrial fibrillation
- Bradycardia
- Heart block
- Tachycardia
- Ventricular fibrillation
- Ventricular Tachycardia

Acute Coronary Syndrome Presentation



Risk factors

- Tobacco abuse
- Dyslipidemias
- Hypertension
- Diabetes mellitus
- Family history of CAD

When to suspect?

- Angina in retrosternal area at rest or with minimal exertions
- Signs and symptoms of heart failure
- Acute rhythm changes
- Hemodynamic instability

Pulmonary Embolism (PE)¹⁷



- PE results from partial obstruction of pulmonary vasculature resulting in decreased perfusion to alveoli
- Causes of PE
 - Deep vein thrombosis (DVT) or venous thromboembolism (VTE) (most common)
 - Septic emboli
 - Venous air embolism
 - Tumor emboli
 - Fat emboli (trauma, surgery)

Pulmonary Embolism Presentation (PE)



- **Risk factors**
 - Prior history of VTE
 - Thrombophilia
 - Surgery
 - Cancer
 - Pregnancy
 - Immobilization
 - Trauma
 - Obesity
 - Central venous access
- **When to suspect?**
 - Dyspnea
 - Tachypnea
 - Tachycardia
 - Pleuritic chest pain
 - Cough
 - Low grade fever
 - Hemodynamic instability (Hypotension)
 - Oxyhemoglobin desaturation

Assessment of the Cardiac Patient

- Suspect cardiac compromise when patients are experiencing acute hemodynamic instability while experiencing chest pain and/or shortness of breath, anxiety/distress, and diaphoresis.
- First ensure patient is hemodynamically stable before performing a physical exam



Cardiac Assessment – Subjective Data

• Chest Pain

- Angina occurs when blood supply to the heart cannot satisfy myocardial oxygen demand.
- Assessment
 - Onset
 - Location
 - Characteristics
 - Triggers
 - Alleviating factors

• Dyspnea

- Dyspnea is the sensation of shortness of breath or difficulty breathing.
- Determine when exactly the patient becomes dyspneic. Ask about dyspnea on exertion and quantify level of activity that results in symptoms.
- Assessment
 - Onset
 - Duration
 - Positioning
 - Triggers
 - Alleviating factors



Cardiac Assessment – Subjective Data

Orthopnea

- Orthopnea is characterized by improvement of breathing when assuming a more upright position.
- Ask patients how many pillows they require to sleep comfortably at night
- “How many pillows do you use when lying down to sleep?”

Cough

- Cough is often seen with a variety of cardiopulmonary pathophysiology
- Example: Pinkish, frothy sputum can be a sign of pulmonary edema.
- Duration
- Frequency
- Type
- Productivity



Cardiac Assessment General Findings



Fatigue

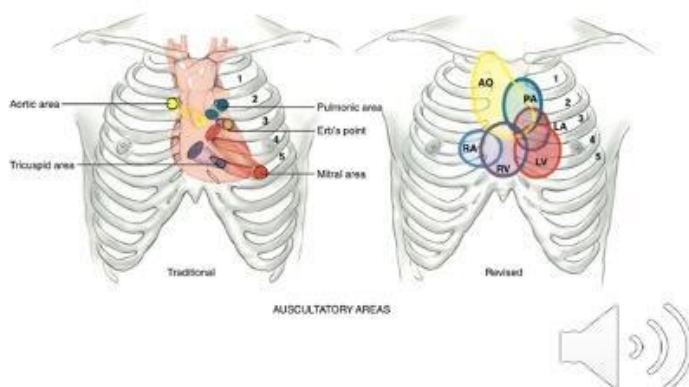
Cyanosis or Pallor

Edema

Past Cardiac History

Cardiac Assessment – Objective Data

- Vital Signs
- Jugular venous distension
- Auscultation
- Valve areas
- Identify S_1 and S_2



What to do if you suspect the patient is decompensating?

• Initial Actions

- Assess the patient
- Identify a crisis
- Call for help, activate RRT
- Stay with the patient



Does the Patient Have a Pulse?

If not, follow BLS protocol until RRT team arrives



Summary of High-Quality CPR Components for BLS Providers



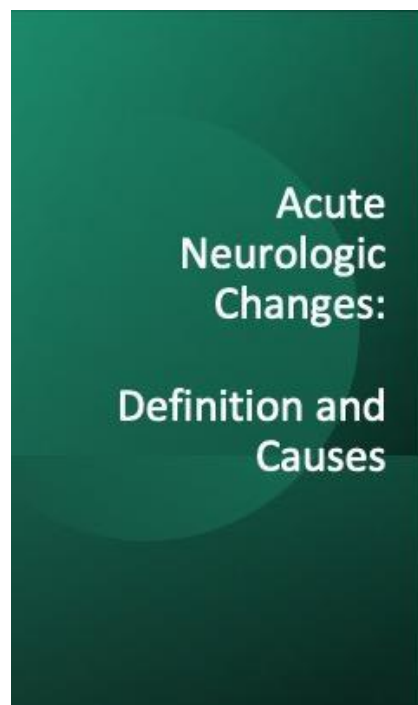
Component	Adults and adolescents	Children age 1 year to puberty†	Infants age less than 1 year, excluding newborns
Verifying scene safety	Make sure the environment is safe for rescuers and victim.		
Recognizing cardiac arrest	Check for responsiveness. No breathing or only gasping (ie, no normal breathing). No definite pulse felt within 10 seconds. (Breathing and pulse check can be performed simultaneously in less than 10 seconds)		
Activating emergency response system	If a mobile device is available, phone emergency services (9-1-1). If you are alone with no mobile phone, leave the victim to activate the emergency response system and get the AED before beginning CPR. Otherwise, send someone to get the AED and begin CPR. Immediately use the AED as soon as it is available.		
Compression-ventilation ratio without advanced airway	1 for 2 rescuers 30:2	1 rescuer 30:2 2 or more rescuers 15:2	1 rescuer 30:2 2 or more rescuers 15:2
Compression-ventilation ratio with advanced airway	Continuous compressions at a rate of 100-120/min. Give 1 breath every 8 seconds (10 breaths/min).	Continuous compressions at a rate of 100-120/min. Give 1 breath every 2-3 seconds (20-30 breaths/min).	Continuous compressions at a rate of 100-120/min. Give 1 breath every 2-3 seconds (20-30 breaths/min).
Compression rate	100-120/min		
Compression depth	At least 2 inches (5 cm)*	At least one-third AP diameter of chest. Approximately 2 inches (5 cm)	At least one-third AP diameter of chest. Approximately 1½ inches (4 cm)
Hand placement	2 hands on the lower half of the breastbone (sternum).	2 hands or 1 hand (optional for very small child) on the lower half of the breastbone (sternum).	For rescuer: 2 fingers or 2 thumbs in the center of the chest, just below the nipple line. 2 or more rescuers: 2 thumb-encircling hands in the center of the chest, just below the nipple line. If the rescuer is unable to achieve the recommended depth, it may be reasonable to use the heel of one hand.
Chest recoil	Allow complete recoil of chest after each compression. Do not lean on the chest after each compression.		
Minimizing interruptions	Limit interruptions in chest compressions to less than 10 seconds with a CCF goal of 90%.		

*Compression depth should be no more than 2.4 inches (6 cm).

Abbreviations: AED, automated external defibrillator; AP, anteroposterior; CCF, chest compression fraction; CPR, cardiopulmonary resuscitation.

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Cardiac Review Video



What is neurological deterioration⁶?

- Decrease of 2+ points on Glasgow Coma Scale (GCS)
- Regression from Full alertness > some impairment > complete unawareness > unconsciousness
- < 8 = medical emergency

Common causes include: sedation, stroke, seizure, hypoglycemia, & sepsis



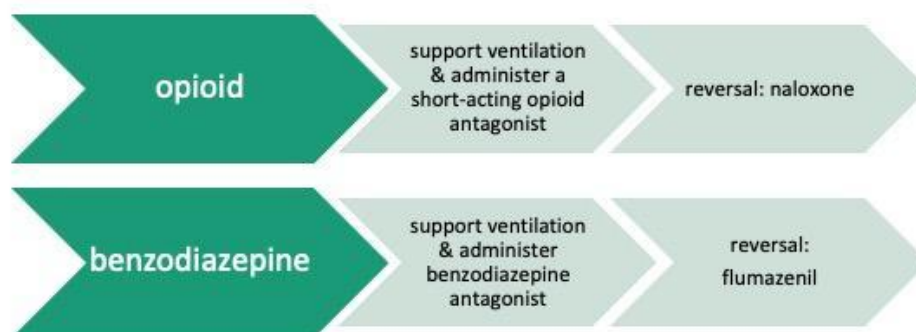
Glasgow Coma Scale (GCS)

	Score
Eye opening	
Spontaneous	4
Response to verbal command	3
Response to pain	2
No eye opening	1
Best verbal response	
Oriented	5
Confused	4
Inappropriate words	3
Incomprehensible sounds	2
No verbal response	1
Best motor response	
Obeys commands	6
Localizing response to pain	5
Withdrawal response to pain	4
Flexion to pain	3
Extension to pain	2
No motor response	1
Total	



Sedation...Is there a reversible cause?

- Symptoms:*
- pinpoint pupils
 - respiratory decline
 - apnea
 - decreased level of consciousness
 - hypoxia



Stroke Symptoms

Symptoms?

- FAST: facial droop, arm weakness, speech difficulty, time to call 911
- Sudden onset numbness or weakness (especially 1-sided), confusion, vision abnormalities, difficulty walking, severe headache without known cause

Hyper/hypoglycemia & drug toxicity can mimic acute stroke

Medical emergency

- Last known well-time: <4.5 hours for IV thrombolysis, <24 hours for mechanical thrombectomy



Pathophysiology of Stroke



Hemorrhagic 20%

too much blood within closed cranial cavity

caused by:
intracerebral hemorrhage -
bleeding directly into brain tissue
subarachnoid hemorrhage -
bleeding into CSF that surrounds
brain & spinal cord

Symptoms increase gradually
over minutes to hours

Ischemic 80%

too little blood to supply an
adequate amount of oxygen &
nutrients to a part of the brain

caused by:
thrombosis, embolism, or
systemic hypoperfusion

Symptoms: begin abruptly & are
maximal at onset



If you suspect stroke...

- Call RRT/ stroke team alert
- obtain point-of-care blood glucose
- place patient on pulse oximeter
- Place patient on cardiac monitor – chronic or intermittent arrhythmias can predispose patient to embolic events & systemic sympathetic response to stroke can cause demand ischemia



National Institutes of Health Stroke Scale (NIHSS)

0-42 points total

- <5 mild
- 5-9 moderate
- ≥ 10 severe

3 most predictive exam findings:
facial paresis, arm drift/weakness,
abnormal speech

Table 1 National Institutes of Health stroke scale score	
1a. Level of consciousness	0 = Alert; keenly responsive 1 = Not alert, but arousable by minor stimulation 2 = Not alert; requires repeated stimulation 3 = Unresponsive or responds only with reflex
1b. Level of consciousness questions	0 = Both answers correct 1 = Answers 1 question correctly 2 = Answers 2 questions correctly
1c. Level of consciousness commands	0 = Performs both tasks correctly 1 = Performs 1 task correctly 2 = Performs neither task correctly
2. Arm drift	0 = Normal 1 = Partial arm drift 2 = No arm drift
3. Visual	0 = No visual loss 1 = Partial hemianopia 2 = Complete hemianopia 3 = Bilateral hemianopia
4. Facial palsy	0 = Normal symmetric movements 1 = Minor palsy 2 = Partial palsy 3 = Complete paralysis of 1 or both sides
5. Motor arm	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity; limb falls 4 = No movement
6. Motor leg	0 = No drift 1 = Drift 2 = Some effort against gravity 3 = No effort against gravity 4 = No movement
7. Limb ataxia	0 = Absent 1 = Present in 1 limb 2 = Present in 2 limbs
8. Sensory	0 = Normal; no sensory loss 1 = Mild to moderate sensory loss 2 = Severe to total sensory loss
9. Oral language	0 = No aphasia; normal 1 = Mild to moderate aphasia 2 = Severe aphasia 3 = Mutism; global aphasia
10. Dysarthria	0 = Normal 1 = Mild to moderate dysarthria 2 = Severe dysarthria
11. Consciousness and inattention	0 = No abnormality 1 = Visual, verbal, auditory, spatial, or personal inattention 2 = Profound level of inattention or obtundation
Total score = 0-42	



Types of Seizures

Focal seizure with retained awareness (simple partial)⁹

Looks like: flashing lights, rhythmic jerking movement of body part, sudden speech impairment

- Postictal – patient may return to baseline or have a period of worsened neurologic function
 - i.e., simple motor seizure involving left arm, postictal weakness for minutes to hours, postictal weakness or aphasia may be more pronounced than actual seizure (differential diagnosis of TIA or stroke)

Focal seizure with impaired awareness (complex partial)⁹

Looks like: staring into space, remaining still, automatisms (grimace, chewing, lip smacking) may become hostile/aggressive if physically restrained

- Altered awareness at onset or as seizure progresses
- Patient appears to be awake, but is not interacting with anyone around them & does not respond normally to instructions/ questions



Types of Seizure, continued

generalized seizure (grand mal, major motor, convulsion)⁹

Looks like:

- abrupt change in level of consciousness – patient may scream or appear to be choking initially
- muscles of arms, legs, chest & back become stiff
- may become cyanotic
- after 1 minute start to jerk & twitch for 1-2 minutes
- tongue may be bitten



What do I do when my patient has a seizure?

Management⁹:

- place patient on their side if you can, have suction available, pad bedrails, administer oxygen
- make sure you have patent IV incase seizure recurs or is prolonged
- check a blood sugar

Next steps⁹:

- place patient on cardiac monitor
- obtain 12-lead ECG



Hypoglycemia Presentation

Can look like focal neurological deficits that can mimic stroke, diaphoresis, tachycardia, hypotension, anxiety or confusion¹⁰

Severe hypoglycemia can injure neurons¹⁰

POCT glucose & correct low serum glucose (<60 mg/dL) ASAP¹⁰



Sepsis

A life-threatening organ dysfunction due to a dysregulated host response to infection, usually presents as¹¹:

- Hypotension, tachycardia, tachypnea, warm & flushed or cool & clammy skin, altered mental status, restlessness

Is there a potential source?

- Pneumonia
- recent surgery
- abdominal pain

What to do

- sepsis alert or RRT notification
- Patent IV
- If hypotensive - IVF bolus as appropriate

What to Expect

- blood draw (basic labs, lactic acid, blood cultures)
- urine & sputum cultures
- antibiotic therapy
- fluid resuscitation
- radiology



Case Report

The patient:

- 63-year-old male
- Past Medical History: hypertension, 2nd degree heart block with associated bradycardia, type 2 diabetes, hypothyroidism, and a remote 40-pack-years smoking history
- Recently resected stage 3-C colon cancer & malignant neoplasm of the hepatic flexure currently admitted to your oncology unit to receive a 46-hour infusion of IV chemotherapy



Neurologic Assessment Review Video

Case Report...What happened?

The NIHSS you performed matched that of the stroke team.

Blood drawn for basic metabolic panel, complete blood count, and ammonia level
*all resulted within normal limits

The patient was taken for a stat CT scan of his head which was unremarkable.

The team administers TPA and transfers the patient to the ICU.

By the 3rd day, the patient continued to complain of a headache, but his speech and orientation had returned to normal.



“Human error is inevitable. We can never eliminate it. We can eliminate problems in the system that make it more likely to happen.”
— Liam Donaldson, WHO World Health Alliance for Patient Safety



THANK YOU



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