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Erin Waggoner
Fort Hays State University, elwaggoner@fhsu.edu

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Goal-Directed Hemodynamics in Rapid Response Teams

Erin Waggoner, RN, BSN, CCRN
Fort Hays State University School of Nursing

Abstract

Rapid Response Teams became a hospital standard in 2004 after a campaign by the Institute of Healthcare Improvement. The intention was to reduce hospital morbidity and mortality by bringing the resources to the bedside that match the patient's needs in a timely fashion. Rapid Response Teams, or RRTs, are now integral to most hospital operations. However, a wide variety of practices surround RRTs within a healthcare system, including team composition, the scope of interventions, team training, and administrative support. RRTs have not been shown to correlate strongly with reducing morbidity and mortality. Although RRTs may not reduce morbidity & mortality significantly, they do bring critical care expertise to the bedside of the deteriorating patient. One of the leading reasons for RRTs in a community hospital is hypotension. However, interventions to treat hypotension are limited. Evidence recommends goal-directed fluid management reduces renal and respiratory failure while improving patient outcomes in select patient populations (Douglas et al., 2020). Should RRTs utilize tools to treat patient by goal-directed fluid management?

Introduction

The 100,000 Lives campaign, launched by the Institutes of Health in 2004, set forth the standard that hospitals utilize Rapid Response Teams when a patient begins to decline. This recommendation left hospitals with little clear guidance regarding the details of how to implement these teams effectively.

Since the 100,000 Lives campaign, a host of research has been done to sort out the details of what makes an effective Rapid Response Team, or RRT. RRTs are inherently challenging to study because each institution has implemented them in various ways. This much is clear, RRTs offer a great benefit to both patients and hospital staff.

One key question that arises when evaluating RRTs is, what therapies are they privileges to provide to the deteriorating patient? Research and logic tells us that RRTs should have the ability to treat the leading reasons for calls, time-critical diagnosis and life-threatening conditions (Dukes et al., 2019)

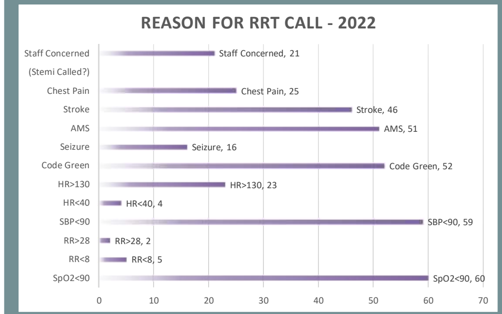
Methodology

Background

Firstly, we evaluated the top reasons for RRT calls in our setting, a community hospital. In 2022, there were 432 calls, or roughly 1.2 calls per day. The top reason for calls was hypoxia as defined by an SpO2 <90%. The inordinate circumstances created by the Covid-19 pandemic must be taken into consideration. In the year 2022, we had a larger than average population of respiratory ill patients in the hospital. Additionally, patients were cared for in non-critical care areas that would normally be treated within critical care. Thus, we consider the hypoxia metric to be an outlier.

The next most common reason for calls is hypotension, defined as a systolic blood pressure less than 90 mmHg. Hypotension has a high risk of mortality, especially in patients with associated tachycardia, shock or recurrent hypotension (Amnuaypattanapon & Khansompop, 2018).

This gives rise to our research question, what interventions might be appropriate for a RRT to provide to a hypotensive patient?



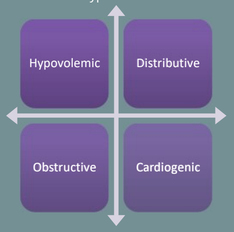
Current State

Currently, the RRT at the community hospital of interest any Registered Nurse may administer 250mL of 9% normal saline to the hypotensive patient. There are no unique interventions beyond 250mL of normal saline for the RRT. This is in contrast with the recommendation by Mitchell et al., 2019 that RRT members should include providers able to treat the most common reasons for calls. The RRT at this community hospital is comprised of a critical care nurse, respiratory therapist and nursing house supervisor.

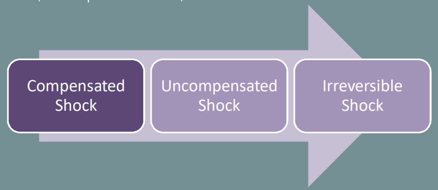
Thus, the current state of RRTs at this community hospital is out of step with evidence-based practice.

Recommendations

There are four different kinds of shock. Identifying the type of shock is essential to treat the cause. The types of shock are:



Shock occurs in stages. Cannon, 2018 defines these stages as compensated shock, uncompensated shock, and irreversible shock.



Intervention is indicated at the earliest recognized stages of shock. The current state of RRT at the hospital of interest is that an RRT is not called until hypotension already occurs, or when the patient transitions to uncompensated shock. Unless compensatory mechanisms are significant enough to be recognized and reach threshold for activation.

Crystalloid intravenous fluids are almost always beneficial to the hypovolemic shock patient. The same can be said of the distributive shock patient. Obstructive and cardiogenic shock may or may not benefit from fluid resuscitation. At the same time, the care team must be cautious not to administer more volume than the patient needs.

Non-invasive hemodynamic monitoring, or NIHM is an emerging technology to evaluate fluid status in a patient. Douglas et al., 2020 found that utilizing NIHM to determine if fluids are indicated resulted in lower overall fluid balance, thus reduced complications such as mechanical ventilation. There is no one-size-fits-all solution for fluid resuscitation, it must be tailored to the individual patient.

A fluid challenge assessment is conducted with minimal discomfort to the patient. Sensors are placed, a baseline is established over the course of a few minutes, then the legs are raise 45 degrees into the air to simulate a fluid bolus. The patients stroke volume is monitored for a few minutes more. If the stroke volume improves by 10% or greater, the patient is considered fluid responsive and would benefit from an additional fluid bolus.

Results & Discussion

Given the complex nature of shock and it's various types, as well as the patient-dependent treatments indicated, a systematic approach to shock patient evaluation is warranted. Utilizing NIHM for shock patients will provide the RRT nurse clear, evidence based direction as to if the patient would benefit from fluid resuscitation. Challenges in leveraging this technology include obtaining privileges for the RRT to administer larger volumes of crystalloid from provider teams. Another challenge lies in the cost of the non-invasive sensors, which will increase in use if the RRT begins to use NIHM.

Conclusion

Given the high frequency of shock-related RRT activations and evidence to support NIHM for evaluation and treatment, it is clear that RRTs may benefit from leveraging NIHM during calls. This validation tool will also assuage concerns from providers regarding expanding fluid administration privileges to the RRT. Lastly and most importantly, shock patients will benefit by superior care utilizing this goal-directed therapy.

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