Organizational Approaches to Improving Resuscitation Effectiveness

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KEYWORDS

• Cardiac arrest • Resuscitation • Simulation • Quality improvement • Patient safety • Hospital systems

KEY POINTS

- Improved resuscitation outcomes require not just advances in the understanding of bedside physiology but also advances in the organization of resuscitation care.
- Organizational targets for improving in-hospital resuscitation include three main domains: (1) monitoring and alerts, (2) resuscitation teams, and (3) quality improvement.
- Organizational approaches for monitoring include improved electronic health records that incorporate novel prediction models for recognizing physiologic deterioration and telemedicine for improving alert interpretation.
- Organizational approaches for resuscitation teams include formal rapid response/medical emergency teams based on managerial principals that emphasize leadership, team work, and organizational effectiveness.
- Organizational approaches for quality improvement include real-time data management strategies that feedback process and outcome data to the resuscitation team, enabling implementation of evidence-based approaches to correct specific quality deficits.
- Future research should be directed at developing novel predictive models for physiologic deterioration, improving interactions between physiology-based alarms and bedside providers, identification of the ideal components of an effective resuscitation team, and developing novel quality improvement strategies through information technology and organizational science.

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INTRODUCTION

Hemodynamic resuscitation is a central component of the care of patients with critical illness. The most common causes of critical illness world wide, including severe sepsis, trauma, acute myocardial infarction, and gastrointestinal hemorrhage, all share the common pathway of hemodynamic instability as a prelude to end organ dysfunction and death.[1] Consequently, efforts to reduce mortality and improve functional status after critical illness, regardless of cause, rest on effective resuscitation based on sound physiologic principals and evidenced-based management of shock. Indeed, many of the seminal advances in critical illness and injury in the last few decades are based on early, effective resuscitation[2,3] rather than new drugs and devices.[4]

Yet despite these advances mortality in sepsis and other forms of circulatory collapse remains depressingly high. In part, this failure is caused by the larger of failures of the health system to efficiently translate new therapies into consistent clinical care at the beside, so-called "T2" translation.[5] In severe sepsis, for example, despite strong evidence that early adequate resuscitation improves survival, only a minority of patients actually receive this therapy.[6] To address this problem, health care delivery experts are increasingly looking to the organization and management of critical care as a strategy to speed knowledge translation.[7] Under a classic model of health care quality, optimal health care structures (ie, the way health care is organized and management) are the primary determinant of the process of care, which in turn influence outcomes.[8]

Under this model, improving resuscitation outcomes requires not only a greater understand of shock physiology but also a greater understanding of the systems in which care is delivered.[9] This article describes a model for resuscitation based on modern organizational principals, describes the evidence-base for organizational approaches that might improve resuscitation outcomes, and outlines a research agenda that supports future organizational innovations in resuscitation care. Although the focus is on resuscitation in the intensive care unit (ICU), the principles described apply to resuscitation in other areas, such as the hospital ward, the emergency department, and the out-of-hospital setting.

A CONCEPTUAL MODEL FOR EFFECTIVE RESUSCITATION

Effective hospital-based resuscitation requires three primary components: (1) an afferent limb (ie, a mechanism to recognize impending physiologic deterioration), (2) an efferent limb (ie, a mechanism to delivery emergent medical care to patients with physiologic deterioration), and (3) a feedback limb (ie, a mechanism to measure and improve the quality of the afferent and efferent limbs). Each of these components has an organizational analog, depicted in **Fig. 1**. This system is similar to the neural networks by which sensory inputs are detected and elicit motor responses, which are ultimately refined by outcome-based adjustments.[10] Key principles of this model include the following: (1) in-hospital shock and death is predicated by a time period of physiologic deterioration that could be recognized by appropriate monitoring[11]: (2) rapid response teams (RRTs) and code teams can initiate treatments that improve patient outcomes, either by early response, effective resuscitation practices, or both[12]; and (3) interdisciplinary, multicomponent quality improvement based on feedback and education can improve the performance of monitoring systems and resuscitation teams.[13]

Under this model there are three domains of resuscitation effectiveness related to the organization of care: (1) monitoring and alerts (ie, the afferent limb), (2) rapid response and code teams (ie, the efferent limb), and (3) quality improvement (ie, the feedback limb) (**Table 1**). Effective resuscitation requires high-quality performance in each domain. Early warning systems and remote monitoring may help identify