

Abstract:

Patient safety is the foundation of high-quality health care. Simulation has been integrated with patient safety activities in pediatric emergency medicine to improve knowledge, skills, and attitudes; teamwork and communication; systems and processes; and identification and mitigation of threats to safety. Simulation efforts, coordinated with those of key stakeholders, can be a powerful agent of change at the individual provider, team, and system levels. It is imperative that simulation activities be integrated within the systems infrastructure for maximal impact and dissemination of learnings.

Keywords:

medical simulation; pediatric emergency medicine; patient safety; quality improvement; systems integration

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Simulation to Improve Patient Safety in Pediatric Emergency Medicine

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A 2-year old girl status post cardiac surgery returns to the pediatric emergency department (PED) with respiratory distress: she is in extremis with cardiac tamponade. A pericardiocentesis reveals frank blood, and ongoing bleeding ensues. Blood products are needed emergently. As the team begins the resuscitation, several team members place orders in the hospital's electronic ordering system requesting blood products with different attributes. Other team members call

the blood bank and verbally order products. A nearby blood refrigerator contains 4 units of O negative blood: a team member grabs 1 unit of O negative irradiated blood, leaving behind 3 units of nonirradiated blood, reporting back that the O negative blood is gone. Meanwhile, the limited blood bank personnel try to clarify disparate blood orders, prioritize product preparation, and respond to phone calls, all while preparing the products. The patient experiences a significant delay in receiving the necessary blood products. Fortunately, she survives.

A root cause analysis (RCA) identified several important factors at the individual provider, team, and systems levels that contributed to the delay (Table 1). Following the RCA, the blood bank director, charged with many of the RCA action items, partnered with the simulation program to address many of the safety issues.



Simulation has been integral to patient safety in many health care organizations. Its unique characteristics and experiential aspects allow simulation to fulfill a number of roles within organizational safety infrastructure: technical and nontechnical training; testing and

evaluation of teams, systems, and processes; identification of latent threats; and incorporation in root cause and failure mode effects analyses. We will review the role of simulation at the individual, team, and systems level in pediatric emergency medicine (PEM), starting with a review of patient safety terminology. We will discuss the role of simulation as an agent of change and the importance of evaluating its impact. We will conclude with future directions for patient safety and simulation. Throughout this article, we will return to our opening case to describe how simulation was used at the individual, team, and system level to address this patient safety example.

PATIENT SAFETY PRIMER

For simulation to be fully integrated into the quality improvement and patient safety infrastructure of an organization, it is crucial that a common terminology exists between those conducting simulation and those responsible for patient safety.

Quality Improvement and Patient Safety

Quality and patient safety are often confused and sometimes equated with one another. A simple way to differentiate them is by describing patient safety as the floor (the minimum conditions for care), whereas quality is the ceiling (Figure 1).¹ High-quality care has been identified as efficient, effective, timely, patient centered, equitable, and safe.² High-quality care and safe patient care may occur simultaneously, but safe care is not necessarily high quality.

TABLE 1. Root cause analysis findings of factors contributing to delay in patient receiving necessary blood products.

Individual-Level Factors	Team-Level Factors	Systems-Level Factors
<ul style="list-style-type: none"> • Lack of familiarity with O negative refrigerator • Limited experience with rapid administration of blood for small children • Knowledge gaps about how to prioritize blood products during a bleeding emergency 	<ul style="list-style-type: none"> • Lack of roles and responsibilities for ordering and communicating with blood bank • Lack of standard language among team and blood bank to communicate needs and priorities 	<ul style="list-style-type: none"> • Absence of an emergency bleeding protocol to guide the process and prioritization of ordering and administering blood products rapidly during an emergency

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