Profiles in Patient Safety: Organizational Barriers to Patient Safety

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CASE SCENARIO

A 46-year-old woman presented to the trauma unit with a history of being trapped in a house fire. The trauma team, composed of a trauma surgery (TS) attending, an emergency medicine (EM) attending, four EM and surgery residents, and two trauma nurses, met the patient at arrival.

The patient had a Glasgow Coma Scale (GCS) score of 15 and complained of shortness of breath, severe eye pain, and hoarseness. There were no burns to her skin. Past medical history was significant for coronary artery disease with multivessel bypass six years prior. Physical examination supported the history of heavy smoke and thermal inhalation. Advanced Trauma Life Support (ATLS) protocols were instituted. An arterial blood gas (ABG) upon arrival demonstrated a carbon monoxide (CO) level of 28%. Both attendings agreed that urgent intubation was indicated. The procedure changed from an urgent to an emergent procedure when the nurse administered the paralytic agent first and prior to the setup of intubation materials. Although finally successful, the procedure was further complicated by gross edema of the epiglottis from thermal injury causing obstruction of the airway and a disagreement between the EM and trauma attendings about whether to perform a cricothyroidotomy on this patient after several failed attempts at intubation.

Following stabilization, the TS attending asked the EM attending whether patients with isolated airway injury were accepted at the nearest burn center, located about 100 miles away. The EM attending was unsure and stated that a more pressing concern was the patient's elevated CO level and toxic chemical exposure that required hyperbaric therapy prior to any transfer. The TS attending paged one of his colleagues, who stated that the burn center did accept such patients and recommended that this patient be transferred. The TS attending informed the trauma team that the patient would be transferred to the burn center, stating that the patient ''could not go into a chamber anyway because she was on a ventilator.'' The EM attending reiterated the importance of hyperbaric treatment for this patient's CO poisoning prior to transfer and that there was a chamber approximately 8 miles away that could accommodate a ventilated patient. The TS attending insisted on transferring the patient to the burn center and proceeded to facilitate transfer by ground transportation as inclement weather prevented helicopter transport. The EM attending expressed his concerns a third time, suggesting a toxicology consult at minimum before transport. The trauma attending was steadfast that the patient would be transferred immediately without hyperbaric oxygen (HBO) treatment.

The patient became bradycardic halfway to her destination and was returned to the hospital of origin in cardiac arrest with cardiopulmonary resuscitation (CPR) in progress. ACLS protocols were instituted upon arrival with a return of pulses. The TS attending called for a cardiology consult for management of an acute myocardial infarction that he believed had been the cause of the arrest since the patient had a history of coronary artery disease. He was skeptical of any role of CO poisoning in this patient's arrest despite cardiology's assessment that the patient was not having a myocardial infarction. The patient died 24 hours later.

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Received April 21, 2002; accepted April 22, 2002.
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Supported in part by a grant from AHRQ # P20H511592-02.
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DISCUSSION

One of the fundamental precepts of safety in complex systems is that adverse events result from of numerous small errors and missteps that are variably linked and lead collectively to undesirable outcomes.[1,2] This case illustrates problems in communication and situation awareness between team members, i.e., rapid-sequence intubation (RSI) medications given before the team is ready to perform intubation, as well as skill- and knowledge-based errors ranging from an incorrect sequence for administration of RSI medications to uncertainty about the criteria for transfer of a burn patient. The combination of these components leads to the undermining of patient safety. Our discussion, however, will focus on a more subtle issue—the organizational structure of medicine and its incongruence with other high-risk, high-reliability organizations.

Health care by the nature of its activities is a ''high-hazard'' industry,[3] and this especially applies to EM. The study of industries, such as naval aviation and nuclear power, has identified specific organizational characteristics that allow them to maintain uncommonly high levels of safety in the presence of risk from unexpected and potentially disastrous events. High-reliability organizations (HROs)[4,5] maintain safety by organizing themselves in such a way ''that they are better able to notice the unexpected in the making and halt its development.''[6] This characteristic is called *mindfulness*.

There are five hallmarks of HROs that support this state of mindfulness. They are 1) *preoccupation with failure* both large and small; 2) *reluctance to simplify interpretations*, an awareness of the complexity and unpredictability of the world within which they function; 3) *sensitivity to operations*, a hypervigilance for the presence of latent problems and loopholes that may develop into unsafe events; 4) *commitment to resilience*, the ability of the organization to persevere should dysfunction occur; and 5) *deference to expertise*, a practice of allowing critical decisions within a situation to migrate to the individual with the most expertise, and not necessarily with the highest rank or most experience.[7] We will focus on the last characteristic in this discussion.

Deference to expertise is achieved within HROs through a hybridization of hierarchy and specialization.[6] Organizational hierarchies exist within HROs; however, in certain situations, *expertise and experience outweigh rank*. The HROs (many of them military) fluidly switch the decision-making authority in an emergency to the individual or group with the most expertise for the situation at hand. The organization subsequently switches back to a hierarchical structure for decision making once normal operations are resumed. For example, when unsafe conditions are detected on aircraft carriers, there is a shift of important decision making from the standard hierarchy to the personnel most knowledgeable in the specific context of the problem. The most appropriate decision maker within HROs is based on accountability, responsibility, uniqueness of the problem, and environmental characteristics.[7] The entire crew is mindful of this and all members, no matter their rank, have the authority and responsibility to suspend flight operations without verifying through chain of command.

In this case, the hierarchy of the trauma unit did not recognize the specialization and expertise of a team member in the management of difficult airways and CO poisoning. The decision about HBO therapy was resolved by referring it to the highest ranking in the area when another person might have been more appropriate and knowledgeable in that context. This particular institution has a large emergency department with separate areas for trauma and emergency care that are headed by independent groups, so in a sense, ''geography is destiny.''

The ''command and control'' culture of health care, while effective (and necessary) during routine operations, can be an obstacle to maintaining or reestablishing safety. Danger is increased by the omnipresent belief that the physician's area of interest is the central and only relevant source of information.[8] In this case, the TS attending trusted the information provided him by one of his colleagues to be more reliable than that of the EM attending or other members of the trauma team. Credence is preferentially given to information that is self-generated or from those most like the decision maker in mindset, frame of reference, or hierarchy. This is the ''fallacy of centrality,''[8] where information not within the normal sphere of expectation for the decision maker is presumed not to exist. Research in this area has shown that experts tend to think they have the answer already, thereby affecting information flow. This behavior is not limited to the specialties presented here but occurs time after time across all areas of clinical practice and is one of the challenges to constructing an HRO within health care.

The contribution of organizational structure to the occurrence of adverse events has repeatedly been demonstrated in other industries.[1,9,10] Within health care, its influence upon the establishment and maintenance of safety has been overlooked. Efforts within health care to improve patient safety

must also consider organizational structure as another contributor to adverse events, whose influence is likely as strong as that of human fallibility.

PROPOSED SYSTEM CHANGES AND EDUCATIONAL RECOMMENDATIONS

1. Review of research about and education of organizational theory from other domains such as business and sociology.
2. Research into the human dynamics of health care organizations and its role in medical error.
3. Greater attention during investigations of adverse events to the contribution of organizational culture and structure to the development of unsafe conditions.

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