TQIP mortality reporting system case reports: Unanticipated mortality due to communication and handoff failures

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ABSTRACT: The TQIP Mortality Reporting System is an online anonymous case reporting system designed to share experiences from rare events that may have contributed to unanticipated mortality at contributing trauma centers. The TQIP Mortality Reporting System Working group monitors submitted cases and organizes them into emblematic themes. This report summarizes unanticipated mortality from two cases of failure of communication and handoff, and presents strategies to mitigate these events locally with the hope of decreasing unanticipated mortality nationwide. (*J Trauma Acute Care Surg.* 2023;94: 739–742. Copyright © 2023 Wolters Kluwer Health, Inc. All rights reserved.)

KEY WORDS: Quality improvement; wounds and injuries; cause of death; medical errors/prevention and control; trauma centers.

The American College of Surgeons Trauma Quality Improvement Program Mortality Reporting System collects anonymous self-reported cases from participating trauma centers in a structured format. The purpose of this system is to collect and describe cases with opportunities for improvement that may not be widely recognized due to the rare nature of these events, and to disseminate evidence-based strategies to improve care nationally. A total of 395 reports have been submitted to the TQIP Mortality Reporting System with 133 (34%) considered unanticipated mortalities after review through trauma centers' performance improvement programs. An error in communication was felt to be a contributing factor in 173 (44%) of the cases with 86 (22%) related to inadequate or absent handoff. This series of case reviews illustrates the impact of communication failures on mortality in trauma patients and presents evidence-based strategies to mitigate these communication failures.

CASE REPORTS FROM THE MORTALITY REPORTING SYSTEM

Case 1

A 45-year-old woman presented with severe femur fracture from a fall. She was admitted to the trauma service with plans for syncopal work-up and orthopedic fixation. Overnight, she developed tachycardia, elevated potassium and creatinine and was placed on telemetry, which she later removed. The overnight events were not communicated to the oncoming team, who identified worsening renal failure on early morning laboratory tests. An electrocardiogram showed ST changes with peaked T waves prompting the oncoming team to order stat laboratory tests and an ultrasound. She was taken to radiology prior to laboratory results returning where she had a cardiac arrest, which was fatal.

Case 2

A 64-year-old female was brought to a trauma center after a high-speed motor vehicle collision. She presented with a Glasgow Coma Scale of 14, heart rate of 110 bpm, and blood pressure of 122/74 mm Hg. Her emergency department course was brief and she was admitted to the intensive care unit (ICU) for monitoring of a small subdural hematoma, a Grade 4 splenic laceration with extravasation, and a pelvic fracture. The surgeon intended to order serial laboratory tests with the ICU admission orders, but the box was not checked. The standard order set called for a MAP goal of >60, which the patient maintained despite systolic blood pressures in the 90s. As the systolic pressures trended downward, the nurse followed the ordered MAP goals and did not notify the provider. The patient had a cardiac arrest and code blue was called. On further review of the case, it was noted that serial laboratory tests were not ordered. Serial laboratory tests could have revealed ongoing hemorrhage earlier, which may have resulted in an intervention prior to the cardiac arrest.

CASE DISCUSSION AND MITIGATION STRATEGIES

Preventable deaths due to medical errors comprise up to 10% of deaths in a Level I trauma center.[1] This error rate in the trauma population is two to four times higher than that for general medical patients based on the Institute of Medicine report, *To Err is human*. Many of these errors are patient management errors, with 43% related to questionable management of initial resuscitation in the emergency department or in the operating room. While only 4% of errors were attributed to communication failures, when these communication errors did occur, they mostly occurred during the initial assessment/resuscitation (39%) or during the ICU phase of care (32%). The majority of preventable deaths reported were due to human errors (74/76)—particularly human errors related to communication. In modern health care systems that require 24/7 coverage of increasingly complex patients with increased fragmentation due to specialization, team-based medicine that is reliant on handoffs has become standard practice. While team-based medicine has become common, the handoff process during transitions in care has not been standardized. Communication errors during the handover process for critically injured patients are alarmingly common, with clinical information lost during one in three patients requiring change in care after information rescue. Overall, there have been numerous studies examining interventions to improve handoffs with variable populations, interventions, and outcomes reported.[2]

While several studies have examined checklists to improve handoff in general medical populations, one study has focused specifically on trauma patients.[3] The checklist used included 11 items to be reviewed with space for action items and completion (Fig. 1). When utilizing the checklist, omissions over 24 hours significantly decreased from 61 (20.1%) to 14 (3.6%). Critical laboratory values and test results were the most commonly omitted items, with omission occurring at a significantly lower frequency (36% vs. 5%, $p < 0.01$) after checklist

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TABLE A1. Patient Handoff of Care Checklist

PATIENT MANAGEMENT PLAN CHECKLIST for _____BED_____

Diagnosis/Operation _____ Primary Team_____ Date/Time_____

Follow-Up Items	Action to be Taken	√Done
Critical laboratory order/pending	Check	Time
	Treat	
Critical tests order/pending	Check	Time
	Treat	
Antibiotics/cultures/fever	Check	Time
	Treat	
Central/arterial lines	D/C	Time
	Wire	
	New	
Communication	Contact	Time
Consults/team	Check	
	Order	
Medications/orders	New	Time
	Change	
TPN/nutrition	Order	Time
	Change	
IVs/fluids/electrolytes	New	Time
	Change	
AGB/vent/respiratory	Order	Time
Treatments	Change	
	Stop	
Other		Time

Figure 1. Proposed checklist for use during handoff of critically injured trauma patients. From Stahl K, Palilea A, Schulman CI, Wilson K, Augenstain J, Kiffin C, McKenney M, et al. Patient Safety in the Trauma/Surgical Intensive Care Unit. J Trauma 2009;67:430–435. Used by permission.

implementation. The second most common item omitted during handoff was the insertion or removal of lines and tubes (26%), which decreased significantly with utilization of the checklist (6%, $p < 0.02$). These data illustrate that checklists can be used to improve communication during critical patient handoffs and decrease medical errors specifically in the trauma population.

These checklists can be effective initially, but may be hard to implement and sustain and may require frequent reinforcement with care teams to incorporate as routine and standard work. Using a more simplified checklist may aid in preventing provider "checklist fatigue." To simplify checklist utilization, other groups have incorporated mnemonics into handoff which include both written and oral components. The illness severity, patient summary, action list, situation awareness and contingency plan, and synthesis by receiver (I-PASS) tool was developed at Boston Children's Hospital and has been implemented at several academic centers with a decrease in the medical-error rate of 23% and a 30% decrease in the rate of preventable adverse events after implementation.[4] Implementation of I-PASS has been standardized with the complete curriculum available online. Implementing a standard handoff or checklist prevents lost information that can lead to preventable death, as in the example cases.

While itemized checklists may prevent the omission of specific details about critical tests and values to follow-up on, they may fall short in identifying unanticipated changes. The concept of a shared mental model is when all members of a team have the same mental image about a situation or patient across disciplines and training levels. When managing complex trauma patients, a shared mental model ensures all individuals involved in the handoff have the same understanding of the patient situation and action items following the handoff. TeamSTEPPS is a program provided by the Agency for Healthcare Research and Quality that provides training on teamwork and effective communication emphasizing the role of a shared mental model in patient safety and quality outcomes.[5] It has been studied specifically with trauma resuscitation teams, and has been shown to improve leadership, situation monitoring, mutual support, communication, and overall teamwork scores. When teams had worked with a shared mental model, the time from patient arrival to computed tomography scan, endotracheal intubation, and operating room were all shorter. Extending the shared mental model to handoffs can ensure the receiving team recognizes the anticipated course of the critical patient and can react to unanticipated changes. In the second scenario, if the surgeon and the nurse had a shared mental model for hemorrhagic shock, the early signs might have been recognized regardless of the laboratory results, or the nurse may have noticed the surgeon's error in not ordering them. Alternatively, a well-established guideline for nonoperative management of solid organ injuries which includes when laboratory results should be drawn and immediate notification when hypotension occurs could have led to earlier recognition.

Centering the handoff of a critically injured patient around a checklist—ideally at the patient's bedside—can reduce medical errors. TeamSTEPPS can be utilized as a framework for multidisciplinary handoff and communication to improve the shared mental model when managing complex trauma patients. We

recommend the routine incorporation of both of these techniques into handoffs to decrease preventable deaths in the trauma population.

AUTHORSHIP

D.M.H., A.R.J., B.P. participated in the case curation and selection. All authors participated in the critical discussion and analysis of error mitigation strategies. R.F.W., S.P.M. participated in the article drafting. All authors participated in the critical revision and approval of the final article.

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