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CURRENT OPINION

TQIP Mortality Reporting System Case Reports: Unanticipated Mortality due to Failures in Clinical Performance

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Summary

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 clinical performance, and presents strategies to mitigate these events locally with the hope of decreasing unanticipated mortality nationwide.

Key Words:

Quality Improvement;

Wounds and Injuries;

Cause of Death;

Medical Errors/prevention and control;

Trauma Centers

Unanticipated Mortality due to Failures of Clinical Performance

The American College of Surgeons Trauma Quality Improvement Program (ACS TQIP) 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. At least one error in clinical performance was felt to be a contributing factor in 100 (24%) of the cases. Errors in clinical performance included 212 (50%) omitted or inappropriate diagnostic or therapeutic procedures, and 83 (20%) correct procedures that did not occur in a timely fashion. This case review illustrates the contribution of failures of clinical performance to mortality in trauma patients, and provides evidence-based strategies to mitigate errors in clinical performance.

> *A 30-year-old male presented to the trauma bay after a high-speed motor vehicle collision in which he was an unrestrained driver. He was initially hypotensive and his blood pressure increased slightly with fluid resuscitation though his heart rate remained quite elevated. He had a positive FAST exam and was taken to the CT scanner for further work-up. The patient became progressively more hypotensive in radiology and had a cardiac arrest before he could be resuscitated. He was rushed to the operating room where he was found to have a bleeding liver and*

spleen injury. Despite hemostatic efforts and return of vital signs, he again had a cardiac arrest and could not be resuscitated.

A 58-year-old male with severe COPD and morbid obesity (BMI 43) was brought to the trauma bay by EMS directly from the field after a high-speed motor vehicle collision. Initial vitals were 133/84, heart rate 114, RR 26, and O2 sat of 91% on room air. GCS was 15. Whole body CT demonstrated a grade 5 splenic laceration with active extravasation. Upon return to the trauma bay after CT, his blood pressure dropped to 112/78 and his heart rate increased to 125. The trauma surgeon asked the team to request interventional radiology for angioembolization. The injury was reported to the interventionalist as a Grade 2 and the urgency of the procedure was not conveyed. The patient decompensated further and was taken emergently to the operating room for laparotomy and splenectomy. Postoperatively he failed to wean from the ventilator, and developed complications related to respiratory failure that led to his death.

The Golden hour was first described by R Adams Cowley in 1975, "the first hour after injury will largely determine a critically injured person's chances for survival." This concept has been studied in relation to pre-hospital time as well as emergency department resuscitation with variable results. It was expanded upon when Rotondo popularized the idea of damage control laparotomy (DCL) for penetrating trauma. Urgent resuscitation with correction of hypothermia, coagulopathy and acidosis has been shown to improve mortality in severely injured trauma patients in conjunction with hemorrhage control and DCL. Prompt recognition and treatment of bleeding is paramount to ensuring optimal outcomes in trauma patients and delays in treatment, including for diagnostic imaging, may be detrimental.

How do we determine which patients are stable enough to obtain diagnostic imaging outside the trauma bay? The decision to proceed with diagnostic imaging is made by the trauma team leader based on history, physical exam findings, and laboratory values. Multidisciplinary resuscitation of critically injured patients is a dynamic process with rapidly changing information and involves numerous providers with differing perspectives of the evolving situation. Team members with differing perspectives may recognize subtle (or frankly overt) findings that would preclude a trip to the diagnostic imaging department. An individual team member may hone in on an initial piece of data, and not adapt to the dynamic and changing physiologic status of the patient – otherwise referred to as anchoring bias. The perspective of additional team members may help to overcome this bias. “Double-checks” have been recommended as a strategy to decrease medical errors specifically for medication errors and transfusion reactions (1), and may be an option for the trauma team to prevent delay in operative intervention secondary to diagnostic imaging. In this context and for selected patients, a double-check would require two providers review the clinical picture and agree prior to sending the patient for additional imaging. Independent double-checks are recommended by the Institute for Healthcare Improvement to decrease medication errors for high-risk medications (2,3). Double-checks can be cumbersome and should be reserved for high-risk scenarios such as the decision to image or operate on severely injured patients. The trauma team composition varies for each center but often consists of surgical trainees, attending surgeons, Emergency Medicine physicians, and specially trained trauma nurses. If the independent double-check system was utilized to decide when a patient is stable enough for diagnostic imaging, the correct procedure could be done in a timely fashion, perhaps during the "Golden Hour."

Another patient safety initiative to keep unstable patients from traveling for diagnostic imaging is the "Stop the Line" culture. This concept was developed by Toyota to allow any worker on the assembly line to stop the line if a safety issue is identified. The issue is assessed and a solution is developed before the line can be re-started. Over time, safety and productivity improved as errors were avoided. "Stop the Line" has been applied to healthcare as part of the Lean curriculum to improve patient safety and is currently utilized in the VA system (4). Teaching "Stop the Line" to the trauma service line could improve patient safety by stopping unstable patients from traveling for imaging when they may be better treated in the operating room. It would allow for discussion about indications for imaging and treatment options to optimize patient outcomes before a catastrophic event occurs in the radiology suite.

These cases are examples of rule-based errors. Rule-based performance is defined as responding to a situation by recalling and using a rule that you learned either through education or experience. Rule-based errors can occur in three ways: using the wrong rule, misapplying a rule, or being non-compliant with a rule. These two scenarios presented in this report represent the second type of rule-based error: misapplying a rule. In the first case, the trauma surgeons know (we assume) that unstable patients with a positive FAST exam should go to the operating room but the surgeon chose to obtain advanced imaging instead. We can only assume that the surgeon interpreted clinical data and determined the patient was stable for imaging, and anchoring bias prevented the recognition of the dynamic picture of an unstable patient. Education alone will not address this error because the surgeon knew what to do, but did not recognize the instability of the patient, and therefore misapplied a rule to proceed with imaging. Prevention strategies should include thinking a second time about the rule and how to apply it in the current situation. Double checks and the "stop the line" culture would teach a structured way to prevent these rule-based errors. In the second case, the surgeon knew the splenic laceration would ideally be managed by interventional radiology, but the patient was taken to the operating room instead and later died of complications. The delay in performing any intervention ultimately led to the patient's death. Though the miscommunication delayed interventional radiology's response, the trauma team could have performed a splenectomy earlier which may have decreased the postoperative complications that ultimately occurred. Again, double checks and "stop the line" may have allowed for a second discussion about treatment options with percutaneous embolization or an emergent laparotomy minimizing the side effects of a large operation in this patient with risk factors for poor outcome.

Failures of clinical performance are often due to rule-based errors. Provider education alone is unlikely to impact these errors. The intentional implementation of systems- and team-based interventions such as double checks and "Stop the Line" culture in the trauma bay for unstable patients may provide a safety net for rule non-compliance.

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