Failure Events in Transition of Care for Surgical Patients

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BACKGROUND: Unexpected clinical deterioration (failure events) in surgical patients on standard nursing units (WARDs) could have a significant impact on eventual survival. We sought to investigate failure events requiring intensive care (surgical ICU [SICU]) transfer of surgical patients on WARDs in a single-center academic setting.

STUDY DESIGN: Surgical patients admitted to WARDs over a 12-month period, who developed failure events, were retrospectively reviewed. Time to deterioration since WARD arrival, clinical factors, notification chain, and outcomes were identified. A physician review panel determined the preventability of failure events.

RESULTS: Ninety-eight patients experienced 111 failure events requiring SICU transfer. Most patients (85%) were emergency admissions. Of 111 events, 90% had been previously discharged from an SICU or a postanesthesia care unit (PACU). Recognition of failure was by nursing (54%) and on routine physician rounds (34%). Rapid response or code blue alone was less common (12%). A second physician notification was needed in 29%, with delays due to failure to identify severity of illness. Most commonly, respiratory events prompted notification (77 of 111, 69%). Overall mortality was 26 of 98 (27%). Median time to failure was 2 days and was associated with early transfer from the SICU or PACU. Rapid response or code blue activation was associated with higher mortality than physician notification.

CONCLUSIONS: Patients most at risk for WARD failures were those with acute surgical emergencies or recently discharged from the SICU or PACU. Respiratory complications were the most common cause of WARD failure events. Many early failures may have been due to premature transfer from the SICU or PACU. Failure events on WARDs can have lethal consequences. Awareness, monitoring, and communication are important components of preventative measures. (J Am Coll Surg 2014;218:723–733. © 2014 by the American College of Surgeons)

Mortality in surgical patients has declined over the past decades. This has largely been due not so much to a decrease in complications but rather to improvements in "failure to rescue" or effective recognition and treatment of complications.[1] However, failures in processes of care still occur and can have an impact on patient mortality, length of stay, and cost of care.[2] A recent systematic review demonstrated that adverse events, defined as unintended injuries or complications caused by health care (mis)management, perhaps as a consequence of process failures, occurred in 14.4% of surgical patients, and more than one-third of these events were preventable.[3] Some of these process failures had to do with recording and interpreting vital signs and communicating patient information between shifts of health care workers (so-called hand-offs) during periods of transition of care.[4] In fact, some have determined that more than 60% of in-hospital cardiac arrests, as the extreme result of process failure, were preventable and that virtually all received inadequate previous care.[5] Although intensive care units are capable of close monitoring and immediate intervention, hospital wards may have variable staffing and resources available to handle unanticipated clinical deterioration that could lead to adverse events. And they are often saddled with higher acuity patients than

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Abbreviations and Acronyms

HR = heart rate
PACU = postanesthesia care unit
SBP = systolic blood pressure
SICU = surgical intensive care unit
SpO_2 = oxygen saturation by pulse oximetry
WARD = standard nursing unit

in the past, particularly those recently transferred from intensive care locations. The key, then, to reversing adverse occurrences in these ward patients would seem to be identification of those at risk, timely recognition, and prompt response and intervention. There is some indication that such safety efforts can, indeed, reduce further complications and mortality in surgical patients.[6] This requires the carefully orchestrated interaction of all levels of health care providers, with timely communication during transitions of care at the heart of the matter.

In keeping with the risk – recognition – response – rescue paradigm, we have sought to identify patients on medical or surgical hospital wards (WARDs) who might be susceptible to unanticipated clinical deterioration, what we have termed *failure events*, who require a higher level of care, or "rescue," and any potential warning signs that might alert health care providers of impending trouble. Failure events can represent the first manifestation of complications and as such, should be swiftly recognized and addressed. For that reason, we also were interested in the response of health care providers to failure events and whether there were any preventable issues in patient recognition, diagnosis, or management that might have forestalled further deterioration. Our hypothesis was that failure events were more likely to occur in high risk individuals, and therefore were predictable and probably preventable situations.

METHODS

This was a retrospective observational study in which all surgical WARD patients who experienced unexpected clinical deterioration (failure events) and required admission to the surgical intensive care unit (SICU) or who died during a 12-month period, were reviewed for potentially preventable errors in recognition, communication, or management using the institutional electronic medical record (EPIC). The following parameters were examined: age, sex, admitting service, the Charlson Comorbidity Index with age adjustment,[7] the Acute Physiology and Chronic Health Evaluation (APACHE) 2, the American Society of Anesthesiologists Physical Status Classification System (ASA) scores as a measure of acuity of illness and risk, the communication chain and notification pathways, medications given before the failure event, thromboprophylaxis, and WARD vital signs and clinical appearance before the failure event. Vital signs and clinical appearance were assessed as follows: heart rate (HR), systolic blood pressure (SBP), respiratory rate, fever, bedside pulse oximetry (SpO_2), chest pain, dyspnea, focal neurologic signs, urine output, bleeding, aspiration, and mental status changes. In particular, vital signs immediately before the failure event were examined and recorded as sentinel vital signs. Hypnotic, antipsychotic, and analgesic medications administered within 4 hours of the failure event were examined and recorded.

The medical record was queried for nursing and physician progress notes and the chronologic unfolding of events. This led to determination of how the failure event was recognized and subsequent communication chains for treatment intervention. Recognition of failure events was grouped into the following communication chains: nurse to resident; resident on rounds; attending surgeon on rounds; activation of an emergency response team activation, termed *rapid response*, initiated by nurse or physician; or activation of a "code blue" team for cardiopulmonary arrest. Required fields included preoperative diagnosis, postoperative diagnosis, indications for operation, attending surgeon, resident surgeon, assistants, anesthesia provider, operation performed, operative findings, operative description, estimated blood loss, specimens obtained, complications, antibiotics, patient tolerance, and postoperative plan. The level of residency of the responding resident was tracked by postgraduate year (PGY). Delays in response were assessed by the need for multiple calls from nurse to physician. Outcomes measures consisted of patient outcome (lived, died), reason for failure, timing of the failure event, and whether the failure was preventable, possibly preventable, or nonpreventable, as judged by a panel of 3 physician reviewers (TSH, LCM, MEM), who independently reviewed the medical record. Preventability focused on delays in recognition, errors in diagnosis, and errors or delays in management. Some cases were discussed in group for consensus.

Clinical variables at the first call such as heart rate, temperature, systolic blood pressure, and SpO_2 were summarized as mean, standard deviation, median, interquartile range, and range. We constructed histograms and boxplots to visualize distributions of these variables. Outliers yielded from boxplots were individually examined to validate data or determine possible exclusion. Patient population was further dichotomized based on the clinically important cut points for these variables. Proportions of patients having critical conditions were tabulated and depicted in bar graphs. Pearson chi-square, unpaired Student's *t*-test for continuous variables, and Fisher's exact tests for dichotomous variables were used where appropriate.