Assuring survival of safety-net surgical patients

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Background. *Survival of surgical inpatients is a key quality metric. Patient, surgeon, and system factors all contribute to inpatient mortality, and sophisticated risk adjustment is required to assess outcomes. When the mortality of general surgery patients was determined to be high at a safety-net hospital, a comprehensive approach was undertaken to improve patient survival.*

Methods. *General surgical service line mortality was measured in the database of the University HealthSystem Consortium from January 2013 through June 2015. Ten best practices were implemented sequentially to decrease observed and/or increase expected mortality. University HealthSystem Consortium mortality rank, observed, expected, and observed/expected index as well as early deaths were compared with control charts for 30 months.*

Results. *University HealthSystem Consortium general surgery mortality improved from the bottom decile to the top quartile, while Case Mix Index increased from 2.48 to 2.82 ($P < .05$). Observed mortality decreased from 3.39 to 2.35%. Expected mortality increased from 1.40 to 2.73% ($P < .05$). The observed/expected mortality index decreased from 2.43 to 0.86 ($P < .05$). Early deaths decreased from 0.52 to 0% ($P < .05$).*

Conclusion. *Risk-adjusted mortality and early deaths decreased significantly over 30 months in general surgery patients. Systematic implementation of quality best practices was associated with improved survival of general surgery patients at a safety-net medical center. (Surgery 2016;■:■-■.)*

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At the turn of the 21st Century, the Institute of Medicine (IOM) published 2 landmark reports related to hospital quality.[1,2] In *To Err is Human*, the IOM documented that patients in American hospitals suffer complications due to errors by health care providers and systems. In the second report, *Crossing the Quality Chasm*, the IOM outlined a framework for measuring hospital quality. As a result, patient mortality and safety have become key quality metrics for hospitals and health systems. Importantly, however, accurate assessment of these outcomes requires proper risk adjustment.

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In response, the University HealthSystem Consortium (UHC) in 2005 developed a Quality and Accountability (Q&A) study, which includes patient mortality as 1 of 6 quality and cost domains. Over the ensuing decade, the UHC has incorporated sophisticated, risk-adjustment into these analyses, and almost all Academic Medical Centers (AMCs) participate in this national effort of quality improvement.

Patient, surgeon, and system factors all contribute to inpatient mortality. Advanced age, multiple comorbidities, diminished functional status, poor nutritional state, and frailty all are patient factors known to increase the risk of surgery.[3-6] Emergency operations also are associated with increased postoperative mortality.[7] When these urgent operations are contemplated near the end of life, patient selection is particularly difficult.[8] In addition, some operations are associated with a long learning curve for surgeons, and outcomes for these procedures may be improved at high-volume centers with experienced surgical teams.[9,10] Controversy also exists regarding surgical outcomes at safety-net hospitals.[11,12] Some authors have reported that surgical mortality may

be greater at "safety-net hospitals",[11] but proper risk-adjustment for patients with chronic illness who present with advanced disease may mitigate this observation.[12]

When mortality of general surgery patients was determined to be high at our medical center with a high safety-net burden, a comprehensive approach was undertaken to improve patient survival. The aim of this analysis was to test the hypothesis that risk-adjusted mortality can be improved at an essential hospital through implementation of multiple best practices.

Table I. Quality improvement strategies and best practices

Recruitment of general surgery faculty
Participation in ACS-NSQIP
Expansion of Surviving Sepsis Campaign
Optimization of palliative care (V) coding
Improved documentation of patient comorbidities
Increased utilization of palliative care consultations
Initiation of 100% mortality review
Implementation of an Early Warning System
Development of an aspiration prevention program
Improvement of patient selection for procedures

METHODS

University HealthSystem Consortium. In 2005, UHC developed a Q&A scorecard fashioned after the IOM's STEEEP (safe, timely, effective, equitable, efficient, and patient-centered) design.[2] Over the ensuing decade, the UHC goal to improve patient outcomes has been achieved, because hospital quality scores on the Q&A scorecard have increased steadily.

Hospital mortality is 1 of 6 domains outlined by the IOM and incorporated by UHC in the Q&A scorecard. During the study period from January 2013 through June 2015, general surgery was 1 of 8 major service lines included in the Q&A scorecard. During this time, the UHC database incorporated approximately 130 US AMCs, and slightly >100 centers entered enough quality and cost data to be ranked.

For this analysis, Case Mix Index (CMI), the observed (O), expected (E), O/E mortality index, and early deaths were measured in each 3-month period. CMI is a financial metric that correlates with patient-related disease severity and the effect of technology employed in patient care. Observed mortality reflects all deaths that occur during inpatient admissions. Expected mortality is calculated by using multivariable logistic regression of a large number of variables for each of approximately 1,000 Diagnostic Related Groups (DRGs). Early deaths were defined as those that occurred within the first 2 days of admission. A relative rank in mortality among participating AMCs was reported by the UHC for each time period. This system is employed by UHC to rank participating institutions annually in their Q&A scorecard.[13]

Temple University Hospital. Temple University Hospital (TUH), a 722-bed AMC in north Philadelphia, is located in a federally designated, medically underserved area and is designated as a safety-net hospital for the City of Philadelphia by the Commonwealth of Pennsylvania. A third of the local population residing near TUH lives below the federal poverty level, and the disease burden of this population is the greatest in Pennsylvania.[14] During the study period, the percentage of patients at TUH covered by Medicaid and Medical Assistance was approximately 45%. TUH has a busy Emergency Department as well as a Level I Trauma Center. Like most AMCs, TUH provides many high-technology services, has multiple Intensive Care Units including a Burn Center, and provides labor and delivery services as well as a Level III neonatal care unit.

Patients. During the 2.5 years study period, neither the age, sex, race, nor insurance status of general surgery patients changed. Approximately one-fourth of the patients were >65 years of age. Approximately 40% of patients had Medicare insurance with an additional 8–9% being dually eligible for Medicare and Medicaid. The patient population was diverse with 56% African-American, 22% Latino/Hispanic, 16% Caucasian, and 6% other ethnicities. Fourteen percent of patients were non-native English speaking and required interpreters.

General surgery patients included those managed by acute care, bariatric, colorectal, endocrine, hepato-pancreato-biliary, and minimally invasive surgical subspecialties. In UHC burn, cardiac, gynecologic, neurosurgery, orthopedic, otolaryngology, ophthalmology, surgical oncology, transplant, trauma, thoracic, urology, and vascular surgery all are separate service lines. Service lines are categorized by DRGs in UHC and not by individual physicians. For this analysis, patients undergoing both elective and emergency/urgent operations were included in the general surgery service line.

Quality improvement. In 2012, new health system leadership began to implement a series of strategies and best practices (Table I). Ten additional acute care/surgical critical care, bariatric, colorectal, minimally invasive, and surgical