



Database Research: Best Practices

Databases for surgical health services research: collaborative quality improvement programs



Healthcare data are expected to double in size every 2 months during the next decade. The sheer volume of information makes navigating the array of available databases both time-consuming and complicated for the busy clinician. Surgeons want to know how each source of data can be used effectively to answer their clinical and research-related questions. In this series, *Surgery* will explore examples of the most common databases used for surgical health services research—highlighting the strengths, limitations, and most effective uses of each. This *Invited Commentary* discusses data from Surgical Collaborative Quality Initiatives.

What are Collaborative Quality Initiatives?

Collaborative Quality Initiatives (CQIs) provide a cooperative approach to population-based surgical quality improvement. Under most current models, payers provide financial support and infrastructure to establish regional collaborations between hospitals and surgical practices to improve the quality of care for patients across a variety of procedures.^{1,2} Within programs, each hospital or site collects longitudinal, prospective clinical data on patient characteristics, clinical outcomes, and relevant perioperative processes of care, which are then submitted to a coordinating center. Data are obtained from the medical record at regular intervals by trained abstractors, using standardized definitions, or automatically from linkage with the electronic health record. Collected data are maintained in a large clinical registry. Registries are compiled to include detailed clinical and sociodemographic information, including risk factors, processes of care, and outcomes.

A core component of CQI participation is data transparency. Hospitals, surgeons, and other providers receive regular feedback regarding their performance. CQI participants often convene at scheduled intervals to review data and interpret areas of improvement, concern, or variation. This timely audit-and-feedback system permits tracking of changes in practices and outcomes longitudinally. It also gives providers and institutions normative feedback about their performance. Participating surgeons and institutions can identify problems in care, develop best practices, and analyze the effect of those changes in the clinical laboratory provided by the collaborative. Participation in the collaborative is voluntary, but compensation may be provided for those centers that maintain data and participation standards. Hospitals and physician groups are compensated for their participation and data collection efforts

regardless of their individual performance or how they rank compared with other hospitals.^{3,4}

Examples of regional surgical quality collaboratives and the research that can result from the collaborative platform are highlighted in [Table 1](#). In Michigan, the Michigan Surgical Quality Collaborative, which was established in 2005, now represents a partnership between 73 hospitals performing common general and vascular surgery procedures.⁹ This collaborative is funded by Blue Cross/Blue Shield of Michigan under a pay-for-participation model and has served as an example for the formation of other regional collaboratives across Michigan and other states.^{2,10} The scope of use of data from this CQI is discussed in more detail later in this commentary.

What Questions Can CQI Data Help Surgeons Answer?

In recent years, a shift has occurred toward greater scrutiny on practice patterns to monitor for changes in perioperative outcomes, both at the surgeon and hospital level. CQI data are an ideal source to organize and evaluate information of this nature ([Table 2](#)). Because the intent of the CQI is to facilitate research and quality improvement, the data are clinically relevant to surgeons and other physicians. This contrasts with administrative data, for example, which are collected primarily for billing purposes. Research questions concerning variation in care, improving patient selection for treatment, or identifying best performers and their practice patterns are well-addressed by CQI data.

For example, the Michigan Surgical Quality Collaborative surgeons designed an initiative to reduce infectious complications after elective colectomy. Using collaborative data, the CQI investigated processes of care associated with surgical site infection (SSI). From 2008 to 2011, a group of 24 hospitals and their surgeons agreed to examine colectomy cases in depth through oversampling of cases and the collection of colectomy-specific practice patterns and outcomes. After accounting for patient and hospital factors, 6 process measures were independently associated with SSI.^{11,12} These measures included specific preoperative antibiotic choices, oral antibiotics given with mechanical bowel preparation, maintenance of postoperative normoglycemia, peri- and postoperative normothermia, short operative duration, and use of a minimally invasive approach. Although many of these findings are intuitive, the point here is that

Table 1
Examples of work from regional surgical CQIs illustrating efforts to improve quality using shared data.

Authors	Description	Surgical CQI
Hakkarainen et al ⁵	A statewide cohort study found postoperative NSAIDs to be associated with increased risk of anastomotic leak after nonelective colorectal surgery.	Surgical Care and Outcomes Assessment Program (SCOAP), linked with administrative data from the State of Washington
Hensley et al ⁶	This retrospective cohort study examined readmission after colectomy and found several risk factors, including diabetes, smoking, and ileostomy formation.	Upstate New York Surgical Quality Initiative (UNYSQI)
Daley et al ⁷	For 35 procedures across 21 hospitals, long operative duration was correlated with higher risk of many complications including SSI, septic shock, DVT, prolonged intubation, and pneumonia.	Tennessee Surgical Quality Collaborative (TSQC)
Toltzis et al ⁸	An SSI bundle initiative in 8 pediatric hospitals for pediatric cardiac, orthopedic, and neurologic operations reduced SSI across Ohio.	Ohio Children's Hospitals Solutions for Patient Safety (OCHSPS)

NSAIDs, non-steroidal anti-inflammatory drugs; DVT, deep venous thrombosis.

Table 2
An overview of the strengths, limitations, and favorable uses for CQI data.

Strengths of CQI Data	Limitations of CQI Data
<ul style="list-style-type: none"> Clinical information is collected and validated by trained data abstractors. Dynamic data collection platform. Oversampling cases to address specific research questions. Rapid addition of new cases to registry. Hospitals and surgeons have access to data via online platforms. 	<ul style="list-style-type: none"> Representative case sample, not 100% capture. Regional sample of patients and hospitals. Selection bias for hospitals willing to participate in CQI. Requires buy-in from surgeons and hospitals to share data transparently. Requires funding.
Optimal Research Directions	Future Directions
<ul style="list-style-type: none"> Identify variation in practice patterns. Identify patient factors associated with complications. Examine the effects of clinical practice changes. Evaluate regional quality improvement initiatives. Launch multicenter research and implementation programs. 	<ul style="list-style-type: none"> Gather PRO data. Link with claims data. Deliver surgeon-specific reporting with improved risk adjustment. Reduce chart review data abstraction with direct links to the electronic medical record. Examine impact of technical assessment and coaching.

PRO, patient-reported outcome.

this information can be built into existing data collection methods to answer specific clinical questions.

These data allowed Michigan surgeons to implement a best-practice bundle initiative, based on process measures relevant to their practices, to reduce SSIs. The collaborative was also able to track adherence to best practices and evaluate outcomes longitudinally across hospitals and surgeons. From 2012 to 2016, SSI bundle implementation increased, and SSI rates decreased by 41%.

What are the Future Directions of CQI Data?

By design, CQIs are nimble and can quickly adjust their scope and focus to tackle important regional issues in surgical care. CQI data can be linked to other information, such as provider prescribing patterns or administrative claims to evaluate the relationship between clinically relevant surgical data and opioid use.¹³ Data linkages are also helpful to study costs or resource utilization for a variety of surgical and nonsurgical topics. Linkages between CQI data and the intraoperative anesthesia record offer unique opportunities to understand the relationship between intraoperative physiologic events and surgical outcomes.¹⁴

CQIs are also expanding their data collection platforms to include patient-reported outcome measures. A prominent feature of modern reimbursement and incentive programs, patient-reported outcomes are increasingly emphasized alongside traditional outcomes as another indicator of clinical quality. Because of the size of CQIs, data collection platforms are dynamic and can adapt to new trends in surgical health services research and can be customized to answer specific research questions given available funding and buy-in from participating hospitals.

Another emerging use of a CQI partnership includes mentorship and coaching opportunities to improve technical proficiency and patient outcomes.¹⁵ Assessing technical skill and applying a structured training curriculum is complex and requires a community of

willing physicians. CQIs are well suited for such programs, with one prominent example existing within the Illinois Surgical Quality Improvement Collaborative and their coaching program around laparoscopic colectomy.

Summary

CQIs represent a subset of databases where a collaborating network of hospitals share data. Although CQIs may be costly and labor intensive to build and maintain, one strength is that the data collected are intended for quality improvement and are of interest to surgeons and other clinicians. The data and the infrastructure of a CQI are useful to identify knowledge gaps in surgical practice, adopt practice changes, and analyze the effect of those changes.

Joceline V. Vu, MD, Michael J. Englesbe, MD,
 Kyle H. Sheetz, MD, MS
 Department of Surgery, University of Michigan Medical School, Ann Arbor, MI
 Michigan Surgical Quality Collaborative (MSQC), Ann Arbor, MI

E-mail address: vuj@med.umich.edu (J.V. Vu)

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