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Operationalizing quality improvement in a pediatric surgical practice

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ABSTRACT

Background/Purpose: Quality improvement (QI) is critical to enhancing patient care. It is necessary to prioritize which QI initiatives are relevant to one's institution and practice, as implementation is resource-intensive. We have developed and implemented a streamlined process to identify QI opportunities in our practice.
Methods: We designed a web-based Pediatric and Infant Case Log and Outcomes (PICaLO) instrument using Research Electronic Data Capture (REDCap™) to record all surgical procedures for our practice. At the time of operation, a surgeon completes a case report form. An administrative assistant enters the data in PICaLO within 5–7 days. Outcomes such as complications, deaths, and "occurrences" (readmissions, reoperations, transfers to ICU, ER visit, additional clinic visits) are recorded at the time of encounter, during M & M Conferences, and during follow-up clinic visits. Variables were chosen and defined based on national standards from the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP), and Patient Based Learning Log. Occurrences are queried for potential QI initiatives.
Results: In 2012, 3597 patients were entered, totaling 5177 procedures. There were 220 complications, 278 occurrences, and 16 deaths. Specific QI opportunities were identified and put into place.
Conclusion: Data on procedures and outcomes can be collected effectively in a pediatric surgery practice to delineate pertinent QI initiatives. PICaLO is recognized by the American Board of Surgery as a mechanism to meet Maintenance of Certification 4 criteria.

The rising costs of medical care parallel the demand for quality patient experience. The equation "Value = Quality/Cost" resonates with all aspects of the health care delivery system. In any surgical practice, a multitude of quality improvement (QI) initiatives can be adopted to improve patient care and decrease costs. However, selecting which measures to adopt is challenging, and it is often difficult to assess their impact in patient outcomes.

We present a method of operationalizing pediatric surgical quality improvement that integrates simple case tracking into the workflow of patient care and academic practice.

1. Methods

The Division of Pediatric Surgery at the Medical College of Wisconsin developed an instrument called Pediatric and Infant Case Log and Outcomes (PICaLO) using the Research Electronic Data Capture (REDCap™) [1] tools hosted at Children's Hospital of Wisconsin (CHW). REDCap™ is a secure, web-based application designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources. REDCap™ was developed at Vanderbilt University to address needs of academic biomedical researchers for electronic databases. REDCap™ is available at no charge to institutional partners, but requires internal information technology (IT) support staffing.

1.1. Database development

Initial database requirements were developed using input from the quality improvement physician champion and were based on national standards from groups including the American College of Surgeons (ACS) National Surgical Quality Improvement Program (NSQIP) and ACS Patient Based Learning Log/Surgeon Specific Registry. The requirements were designed to fulfill internal and external reporting mandates as well as to facilitate internal practice and quality improvement. After initial requirements were built, data entry and workflow were pilot tested. Two surgeons, one administrative assistant (AA) and the master coder (MC) participated in one month of pilot testing (28 cases) prior to implementation. During the pilot testing phase, all staff members were educated on the tool and reporting requirements and appropriate modifications were made to the database requirements and workflow. The finalized process involves nine surgeons, five physician assistants (PAs), six AAs, and three research staff.

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To streamline data entry and ensure back-end data integrity, the data entry tool underwent several revisions during the first quarter of implementation. These revisions included more detailed case staffing information, required fields, and branching logic for diagnosis and procedure codes. Comorbidities were added as discrete variables in an effort to establish congruence with established databases and to reduce free text entries.

Missing diagnosis and procedure codes are constantly updated during lockdown procedures.

PICaLO is divided into two components: (1) Case Log, for prospective collection of all pediatric surgical cases within the practice, and (2) Morbidity and Mortality, for tracking the complications associated with the operative procedures performed.

1.2. Case log entry

The prospective nature of the Case Log allows a surgeon to record data directly into the database immediately following case completion (similar to ACS Patient Based Learning Surgeon Specific Registry). However, the primary workflow involves a surgeon filling out a Case Report Form (CRF) which is later entered into the database by a fully trained AA. At the surgeon's discretion, completion of the CRF can be delegated to a responsible second party (e.g. fellow or PA). It takes a surgeon less than 2 min to complete the CRF. Hard copies of the CRF are archived for reference. Any instance where a patient has more than one procedure on the same date generates higher level investigation to ensure no cases are double-entered. Complex or unique cases may be verified with a billing officer during data entry. Within the Case Log, procedures and diagnoses are listed alphabetically and according to the nomenclature commonly used by pediatric surgeons. Pediatric specific ICD-9 codes and CPT codes are recorded concurrently within the log with allowances for up to eight unique diagnoses and 20 unique procedure codes per case. Comorbidities for patients are also collected, which are adapted from those identified in the Pediatric National Safety and Quality Improvement (Peds-NSQIP). CRFs are completed for all procedures, including those that are done at the bedside, and the information entered into the database. The surgeon or designee completes a case report form for each case which takes 1–2 min. These data are entered by the surgeon's administrative assistant. Each case takes 5–10 min to enter into the database depending on the complexity of the case and patient (about 2 h per week for a single full time clinical surgeon). Review of discharge dates and outstanding pathology takes approximately 1 h a week. In our practice, more than 4000 cases are entered in a year. Initial training of data entry personnel takes approximately 4–6 h over the course of several weeks. Monthly targeted training for data entry personnel to address variables with a low interrater reliability rate takes about 1.5 h. Quarterly reports take approximately 30–40 h to generate and include information on interrater reliability, morbidity and mortality, as well as patient and case data. Quarterly data cleaning by the administrative assistants takes approximately 4–8 h depending on quarterly case volume. Quarterly lockdown processes take approximately 30 h. At lockdown, diagnosis and procedure codes not entered in the database are added and all unverified cases are reviewed by the Master Coder. Other database maintenance involves approximately 1–2 h a month database build and maintenance, case entry and maintenance and M&M data entry and maintenance would require the equivalent of one full-time employee to be successful. Maintenance of data integrity is crucial and considerable time is spent ensuring that case data are complete and accurate.

1.3. Morbidity and mortality entries

The Morbidity and Mortality (M & M) portion of PICaLO is designed to systematically track complications associated with each surgical case. It utilizes the cases presented during M & M Conferences. All deaths and complications are discussed at M & M. Complications are collected through many avenues—through visits in the emergency room or urgent care, visits in the pediatrician's office as well as telephone calls through the office. Categories of complications are listed on Table 1A. When possible, cause of each complication is defined as technical, communication, systems-based, error in judgment or management, or other. In addition to complications, we also collect "occurrences" such as errors in diagnosis, unplanned transfer to higher level of care, unplanned readmission, unplanned return to the operating room, emergency room visits and/or post-operative clinic visits beyond the usual expected visits (Table 2). Occurrences give a general idea of how a patient may continue to require health care resources after an operation. Occurrences are identified as to whether they are related to the index surgical procedure. We should note that these occurrences may or may not be associated with complications. For instance, a patient may be readmitted for a viral gastroenteritis and dehydration after split thickness skin grafting for burns; this readmission would be classified as "not related to index procedure". Multiple complications and/or occurrences can be entered for each case. Each complication or occurrence is classified based on preventability (potentially preventable versus not preventable). A faculty lead is responsible for recording each complication/occurrence into the database during discussion at M & M Conference. Entry and review of morbidity and mortality data take about 1 h per week of the attending surgeon, and one to two days per quarter when reviewing the quality improvement initiatives.

During M&M Conference, clinicians in attendance determine if the complication/occurrence has the potential to become a QI project. If the group determines that something is immediately actionable, an attending staff is made responsible for the associated task. A report of all recorded M&M events is given back to the Surgery Group after a review is performed (every 6–9 months). This report tracks complication trends and summarizes M & M events in order to identify additional areas for improvement. If necessary, the attending in charge proposes change in practice by researching the literature and obtaining group consensus. As a matter of course, the group continues to monitor all complications. Every 6–12 months, the attending is responsible for a report on whether the incidence of the complication changes based on the change in practice.

All faculty and staff affiliated with PICaLO receive training on definitions of variables within the database in order to produce consistent data between providers.

Data entry staff is supervised by the Database Integrity Manager (DIM) to ensure accurate and timely recording of all surgical

Table 1A
Categories of complications.

Surgical site infection (SSI): superficial incisional, deep incisional, organ/space, wound dehiscence,
Other wound (e.g., hematoma)
Pneumonia
Unplanned intubation
Pulmonary embolism
Anastomotic leak
Other respiratory
Acute renal failure
Progressive renal insufficiency
Urinary tract infection
Other urinary tract
Cerebrovascular accident/stroke
Coma >48 h
Cardiac arrest, requiring chest compressions
Other cardiac
Sepsis/septic shock
Deep vein thrombosis/Thrombophlebitis
Other
Not reported

Complication list and definitions are derived from Peds NSQIP.