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Comparing surgical infections in National Surgical Quality Improvement Project and an Institutional Database

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ABSTRACT

Background: Surgical quality improvement requires accurate tracking and benchmarking of postoperative adverse events. We track surgical site infections (SSIs) with two systems; our in-house surgical secondary events (SSE) database and the National Surgical Quality Improvement Project (NSQIP). The SSE database, a modification of the Clavien–Dindo classification, categorizes SSIs by their anatomic site, whereas NSQIP categorizes by their level. Our aim was to directly compare these different definitions.

Materials and methods: NSQIP and the SSE database entries for all surgeries performed in 2011 and 2012 were compared. To match NSQIP definitions, and while blinded to NSQIP results, entries in the SSE database were categorized as either incisional (superficial or deep) or organ space infections. These categorizations were compared with NSQIP records; agreement was assessed with Cohen kappa.

Results: The 5028 patients in our cohort had a 6.5% SSI in the SSE database and a 4% rate in NSQIP, with an overall agreement of 95% (kappa = 0.48, $P < 0.0001$). The rates of categorized infections were similarly well matched; incisional rates of 4.1% and 2.7% for the SSE database and NSQIP and organ space rates of 2.6% and 1.5%. Overall agreements were 96% (kappa = 0.36, $P < 0.0001$) and 98% (kappa = 0.55, $P < 0.0001$), respectively. Over 80% of cases recorded by the SSE database but not NSQIP did not meet NSQIP criteria.

Conclusions: The SSE database is an accurate, real-time record of postoperative SSIs. Institutional databases that capture all surgical cases can be used in conjunction with NSQIP with excellent concordance.

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1. Introduction

Reducing health care-associated infections is a priority goal of the US Department of Health and Human Services [1]. Surgical site infections (SSIs) are the most common cause of health care-associated infection and affect approximately 500,000 patients in the United States every year [2–4]. Patients with SSIs have longer length of stay, higher hospital charges, and return to work later than patients without SSIs [2].

In 2001, our institution developed a department-wide institutional surgical secondary events (SSE) database to track deviations from the expected postoperative course that occur within the first 30 postoperative days [5]. The SSE database defines specific secondary events by body system and grades them on a 1–5 scale according to a modification of the Clavien–Dindo classification (Table 1), with increasing grade indicating increasing severity of the event as defined by the level of intervention required to treat the event or the sequelae of the event. Grade 1 and 2 events, those requiring bedside care and either oral (grade 1) or IV (grade 2) medicine, are defined as minor events. Grades 3–5, which require either invasive intervention (grade 3), result in chronic organ disability (grade 4), or death (Grade 5), and are defined as major events. There are no subgrades in grades 3 or 4. This database has been validated [5] and is used throughout our Department in quality improvement and research projects [6–11].

In 2011, our Department joined the American College of Surgeons National Surgical Quality Improvement Project (NSQIP). NSQIP [12,13] uses standardized nationwide definitions, has been widely adopted, provides benchmarking of events between hospitals, and has been shown to decrease the incidence of SSEs at participating hospitals [14]. NSQIP was never intended to capture 100% of operations at participating institutions, and full risk-adjusted results are not available for all variables in real-time.

Both the SSE database and NSQIP are independently known to identify more than 90% of captured SSEs, but the two systems have never been directly compared. Our institution tracks the incidence of SSIs department wide using both our SSE database and NSQIP. However, the two systems, which have different capture methodology, different definitions (Tables 2 and 3), and different timelines for reporting, have never been compared head to head. The aim of our study was to compare these two systems head to head. Our hypothesis was that we would find significant, but not perfect, concordance. To assess the overall concordance between the SSE database and NSQIP, and to assess whether the SSE database can serve as a proxy for NSQIP results in between NSQIP semiannual reports, we performed a blinded audit of all surgeries performed in 2011 and 2012 to compare the rates of categorized postoperative infections.

Table 1 – Severity-based grading of the Memorial Sloan Kettering Cancer Center SSE database.

Grade	SSE requiring or resulting in
1	Bedside care or oral medications
2	Intravenous medications or transfusion
3	Radiologic, endoscopic, or operative intervention required
4	Chronic disability or organ resection
5	Death

The SSE database classifies all deviations from the expected postoperative course with a modification of the Clavien–Dindo classification that does not include subgrades for grade 3 or 4.

2. Methods

Data capture methodology for both the SSE database [5] and NSQIP [12,13,15] have been previously described. The SSE database captures postoperative events on all operations performed at our institution. Events and their corresponding grades are recorded prospectively by house staff, research assistants, and attending surgeons at the point of care, on chart review, during morbidity and mortality conferences, and at patient follow-up visits. We presently capture over 220 specific adverse events; the full list is available for public download at www.mskcc.org/sse. NSQIP records postoperative events on a sample of operations performed at each participating hospital [12,13,15]; at our institution, NSQIP captures roughly a 10% sample of all operations. These selected cases are thoroughly reviewed by specifically trained surgical case reviewers who undergo yearly training on changes to NSQIP variables.

After obtaining institutional review board approval, the prospectively maintained SSE database was queried for all patients in our 2011 and 2012 NSQIP cohorts. Although blinded NSQIP records, all entries in the SSE database possibly representing SSIs were categorized as either superficial incisional infections, deep incisional infections, or organ space infections (OSIs). For the purposes of this analysis, we combined NSQIP superficial incisional infections and deep incisional infections into a single composite outcome, incisional infection. We created this composite outcome because entries in our database were not designed to discriminate between superficial and deep incisional infections. SSE entries of wound infection, cellulitis, wound breakdown, and fascial dehiscence or evisceration were categorized as incisional infections. Entries of intra-abdominal abscess, anastomotic leak (either biliary, intestinal, esophageal, pancreatic, or rectal), noninfected intra-abdominal or intrathoracic fluid collection, and fistula (either biliary, intestinal, esophageal, pancreatic, or urinary) were classified organ space infections (Table 2). Table 3 lists the NSQIP definitions for superficial incisional infections, deep incisional infections, and organ space infections. As the aim of our study was to compare SSE database entries to NSQIP-defined wound infections, we did not compare SSE entries to NSQIP-defined wound disruption.

After the blinded categorization of SSE entries, concordance was assessed with Cohen kappa. Cases where discordance existed between the SSE categorization and NSQIP were reviewed by a blinded reviewer and classified both according to NSQIP (as either a superficial incisional infection, deep incisional infection, organ space infection, or no event