Editorial

Surgical-Site Infections and the NNIS SSI Risk Index: Room for Improvement

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Surveillance of surgical-site infections (SSI), with feedback of appropriate data to surgeons, has been shown to be an important component of strategies to reduce SSI risk.[1-3] For SSIs, the traditional wound classification system, which stratifies each wound into one of four categories (clean, clean-contaminated, contaminated, and dirty-infected), has been available since 1964.[2-4] Limitations of this system of risk stratification are well recognized. One of the major problems is its failure to account for the intrinsic patient risk of developing an SSI. A composite risk index that captures the joint influence of this and other risk factors is required before meaningful comparisons of SSI rates can be made among surgeons, among institutions, or across time.

A simple index was developed during the Study on the Efficacy of Nosocomial Infection Control Project.[5] Since 1991, a modification of this risk index has been used by National Nosocomial Infection Surveillance (NNIS) System hospitals.[6] The NNIS Basic SSI Risk Index is a significantly better predictor of SSI risk than is the traditional wound classification system and performs well across a broad range of operative procedures. Initially, it seemed most attractive to collect and analyze the same few data fields for risk adjustment in calculation of SSI rates, primarily to decrease the data-collection burden and add simplicity to the interpretation of the rates. In fact, it was surprising that the same few risk factors stratified better than wound class alone for so many diverse procedures. The NNIS Basic SSI Risk Index performed reasonably well for all but a handful of procedures. Ah, but this simplicity could not last. . . .

The last decade has witnessed changes to healthcare delivery with regard to surgical procedures. Considerable numbers of procedures are now performed on outpatients, and the surgical patients admitted to hospitals tend to have higher intrinsic risk and often are discharged earlier.[7-9] Roy and colleagues report in this issue of the Journal a simple matched case-control study of 201 cardiothoracic patients who developed an SSI and 398 controls who did not (two controls per case matched on age, gender, type of procedure, and date of procedure).[10] Two main results that the authors found were equally simple to describe and were totally consistent with previously published NNIS results, which were based on a cohort of patients many times larger and coming from many hospitals:

- For coronary artery bypass graft (CABG) procedures, the NNIS Basic SSI Risk Index is largely just a dichotomization of patients based on the cut point for duration of surgery, because almost all of these procedures are clean and done on patients with anesthesiology scores of 3 or 4.
- The SSI rate is significantly higher in patients with a risk index score ≥ 2 compared with patients having a risk index score <2. The authors found an odds ratio of 1.83 (P=.01), which is nearly identical to the odds ratio of 1.75 in NNIS-published data.[11]

Thus, the NNIS Basic SSI Risk Index *does* stratify patients undergoing CABG operations by their risk of SSIs, as evidenced by the authors' own data. A major point of the authors' manuscript, that for CABG, the elements of the NNIS Basic SSI Risk Index may not have equal weights, is valid but not new.[11] This criticism is inconsequential, though, compared with the issue at hand. The NNIS Basic SSI Risk Index could be improved for CABG and many other procedures as well. Efforts are needed to use available NNIS data at the Centers for Disease Control and Prevention to improve the NNIS Basic SSI Risk Index. Recent NNIS analyses from the 4th Decennial International Conference on Nosocomial Infections for cholecystectomy, gastric surgery,

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99-ED-192. Gaynes RP. Surgical-site infections and the NNIS SSI risk index: room for improvement. Infect Control Hosp Epidemiol *2000;21:184-185.*

colon surgery, and appendectomy showed the value of including the use of the laparoscope in the NNIS Basic SSI Risk Index.[12,13] For cesarean sections and various neurosurgical procedures, the NNIS Basic SSI Risk Index did not stratify SSI risk at all[6]; none of the elements of the index were risk factors for these procedures. Thus, cesarean section, craniotomies, spinal fusions, and ventricular shunt procedures were initially targeted for procedure-specific risk-factor data collection. These supplemental risk factors were collected after review of the literature and extensive discussion with experts in the field. Unfortunately, especially for the neurosurgical procedures, there were few studies that examined risk factors for SSIs. While there were more studies for cesarean sections and, as the authors point out, several for CABG, not all studies examined factors in a multivariate manner or followed rigorous design.[14-17] Certainly, an improved risk index that incorporates additional risk factors relevant to CABG is needed. The authors are now performing a study to delineate risk factors for CABG rather than merely document that the NNIS Basic SSI Risk Index could be improved.[18] However, one study will not be sufficient to delineate risk factors. The CABG procedure is one of the most commonly reported procedures to the NNIS System, and we have targeted that procedure for improvement, but at what price? CABG-specific risk factors need to be examined carefully and standardized for collection in the NNIS System by literally hundreds of data collectors. As we have seen for neurosurgical procedures and cesarean sections, not all purported risk factors are found to be risk factors in multivariate analysis, and the nature of the risk factors can be complex and surprising.[19-21] Added to this difficulty is the issue of postdischarge surveillance and its accuracy, which was not addressed by Roy et al.[10] This issue is of limited concern at a single institution, but may be responsible in part for variation in SSI rates when multiple institutions aggregate their CABG rates.[22] Limited resources and the uncertainty regarding postdischarge surveillance have hampered our ability to address all of these concerns. The next millennium will bring many changes to our lives. A better risk index will be one of them. The hospital epidemiology community can help by developing studies to delineate risk factors for CABG and other operative procedures of interest. Until then, the NNIS Basic SSI Risk Index may be the best available tool for comparing SSI rates.

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