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Source: *Infection Control and Hospital Epidemiology*, Vol. 22, No. 5 (May 2001), pp. 266-267
Published by: The University of Chicago Press on behalf of The Society for Healthcare Epidemiology of America
Stable URL: http://www.jstor.org/stable/10.1086/501897
Accessed: 02/03/2015 14:52

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Editorial

Surgical-Site Infections (SSI) and the NNIS Basic SSI Risk Index, Part II: Room for Improvement

Robert P. Gaynes, MD

Movie sequels usually need to review their previous story. So, to review (from part I)[1]:

Surveillance of surgical-site infections (SSIs) with feedback of appropriate data to surgeons has been shown to be an important component of strategies to reduce SSI risk.[2-4] 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.[3] Limitations of this system of risk stratification are well recognized. . . . A simple index was developed during the Study on the Efficacy of Nosocomial Infection Control (SENIC) Project.[5] Since 1991 a modification of this risk index has been used by National Nosocomial Infections 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. . . . The NNIS Basic SSI Risk Index performed reasonably well for all but a handful of procedures[7]. . . . [However,] 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 are often discharged earlier.[8-10]

In part I, a recent report had discussed the shortcomings of the NNIS Basic SSI Risk Index.[11] In the editorial that accompanied that report, my comments were directed at improving the use of a risk index for SSI rates.[1]

And so begins part II. In this issue of the Journal, Campos et al revisit the risk index and modify it to suit local interests.[12] The authors calculated their own "T" for the various procedures, then calculated their own NNIS-like index, and (of course) found it fit the data better (although the difference was marginal). However, unlike some previous authors, they recognize the limitations of this approach and present what appears to be a proposal for use of local versus "official" risk indices, as well as for further development. Their article is just one of several recent attempts to improve a risk index.[11-14]

However, the simplistic approach of risk indices is only a short-term solution. Using a risk index, local, official, or otherwise, suggests that there are a limited number of risk factors and that the risk factors have similar importance or weight. This is ultimately a doomed strategy. To truly account for SSI risk for each operative procedure, we must examine risk factors that are unique to that procedure, eg, duration of labor for SSIs after cesarean section (Is there another procedure where examining that risk factor even makes sense?). Also, the relative importance or weight of risk factors will vary depending upon the procedure. Rather than a risk index, using multivariate modeling would aid in accounting for SSI risk.

How do we proceed? Two major obstacles are evident:

- Procedure-specific risk factors based upon multivariate models are very difficult to find in the literature.
- Problems with case-finding due to postdischarge surveillance are becoming paramount to utilizing any of these data for comparative purposes.

A single institution's study usually is not sufficient to delineate risk factors. As we have seen for neurosurgical procedures and cesarean sections, not all purported risk factors are found to be predictive in multivariate analysis, and the nature of the risk factors can be complex and surprising.[15-17] To develop an aggregate database for comparative purposes, procedure-specific risk factors will need to be carefully examined and standardized for collection by literally hundreds of data collectors.

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00-ED-054. Gaynes RP. Surgical-site infections (SSI) and the NNIS Basic SSI risk index, part II: room for improvement. Infect Control Hosp Epidemiol *2001;22:266-267.*

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Factors in common from various multivariate models determined at multiple institutions will be the most important to consider for comparative purposes. Once the procedure-specific risk factors are determined, standardized, and collected, an aggregate multivariate model would be developed. The results of this aggregated model would serve as the benchmark, rather than the large table of risk-stratified rates currently shown in NNIS reports.[18]

A method for comparison would likely involve using the recently described Standardized Infection Ratio (SIR).[7,19] Using this method for comparison, one calculates how many infections would have been expected to occur among patients having an operative procedure. Summing the numbers of expected SSIs for a procedure from multiple hospitals and comparing the sum to the number of observed SSIs for the surgeon or hospital, we can obtain a ratio of the observed number of SSIs to the expected number, or the SIR.[7,19] The aggregate model comes into play when calculating the expected number of SSIs. Based upon a particular patient's risk factors and their relative weights from the aggregate model, the SSI risk for this patient undergoing the procedure can be determined. The sum of the SSI risks of all an institution's patients undergoing a certain procedure yields the expected number of SSIs. It seems complex, but computers would do nearly all the computation work.

Still, there is one other major difficulty: the issue of postdischarge surveillance and its accuracy. This issue may be, in large part, responsible for variation in SSI rates when multiple institutions aggregate their SSI rates.[20] The uncertainty about SSI rate accuracy due to limitations in postdischarge surveillance has hampered our ability to make comparisons of accurate SSI rates.[21]

Considerable resources will need to be directed toward improving both risk adjustment and postdischarge surveillance accuracy if credible, accurate information is going to be fed back to surgeons—one of the most important components of a quality improvement program.

The CDC's Division of Healthcare Quality Promotion is cooperating with other federal agencies to develop the National Healthcare Safety Network, which will include an SSI component to help determine, standardize, and collect procedure-specific SSI risk factors using the approach outlined here.

Research is needed to bypass the two major obstacles in our path. Directions to go beyond these barriers are clear: produce procedure-specific, multivariate risk factor analyses, and develop better, more efficient methods for finding the events, namely SSIs. While the directions may be clear, the answers are not.

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