Surveillance of the Surgical Wound

Ronald Lee Nichols, MD

Postoperative wound infections remain a major source of morbidity and, less frequently, a source of mortality in the surgical patient.[1] Their occurrence nationally is estimated to be more than 500,000 per year, or about 2.8 per 100 operations performed.[2] This incidence varies from surgeon to surgeon, from hospital to hospital, from surgical procedure to surgical procedure and, most importantly, from patient to patient. The increased cost attributable to these wound infections depends primarily on whether prolonged hospitalization or rehospitalization is necessary.[3] Major complications, such as deep sternal wound infections, have a grave impact, increasing the duration of hospitalization as much as 20-fold and the cost of hospitalization five-fold.[4]

Traditional surveillance of the surgical wound, practiced widely in the 1970s, depended primarily on infection control personnel searching for positive cultures from the microbiology laboratory. Finding a positive culture of wound drainage or exudate triggered a review of the patient's chart and of the patient, if still hospitalized. Errors in this approach were caused by inadequate and widely varying definitions of surgical wound infection, in addition to missing clinical infections when cultures were not done or were falsely negative.

Using a representative sample of U.S. general hospitals (Study of the Efficacy of Nosocomial Infection Control [SENIC] Project), the efficacy of infection surveillance and control in preventing nosocomial infections was established by the Centers for Disease Control (CDC) in 1985.[5] A 32% reduction in nosocomial infections was noted from 1970 through 1976 in the participating hospitals where the essential components of the intensive infection surveillance and control programs were practiced. These effective programs included conducting organized concurrent surveillance and control activities, having a trained, effective infection control physician, having one infection control nurse per 250 beds, and using a system for reporting infection rates to practicing surgeons. It was estimated that because only a few hospitals had these programs, only 6% of the nation's approximately 2 million nosocomial infections were being prevented by the mid-1970s, leaving another 26% to be prevented by universal adoption of these programs. Among hospitals without effective programs, the overall infection rate increased by 18% from 1970 to 1976. An update of the SENIC project[6] from a random sample of U.S. hospitals collected in 1983 reported that the intensity of infection surveillance and control activities had increased greatly from 1976. The number of hospitals with an infection control nurse per 250 beds increased from 22% to 57%, while the number with a physician trained in infection control remained low (15%). Although there was an increase in hospitals with effective programs in preventing urinary tract infections, bacteremias and pneumonias, this was not the case for surgical wound infections. The update showed that the percentage of hospitals doing surgical wound infection surveillance had decreased (from 90% to 79%), and those reporting surgeon-specific infection rates to surgeons had decreased (from 19% to 13%). At this point, approximately 9% of the nosocomial infections were being prevented, whereas 32% could be prevented if all hospitals adopted the most effective programs.

The first comprehensive, one-hospital, ten-year prospective study of wound infection surveillance was reported in 1981.[7] In this study, a total of 62,939 wounds were inspected by one surgical nurse. Definitions of wound infections were standardized, and surveillance was continued by telephone up to 28 days when a final report on each wound was made. Using this approach, 2,960

From the Department of Surgery, the Tulane University School of Medicine, New Orleans, Louisiana.

Address reprint requests to Ronald Lee Nichols, MD, Department of Surgery, 1430 Tulane Ave., New Orleans, LA 70112.

Nichols RL. Surveillance of the surgical wound. Infect Control Hosp Epidemiol. *1990;11:513-514.*

wound infections were identified, for an overall rate of 4.7%. Each surgeon received an annual report showing their individual rate of infection in clean wounds as well as the average clean-wound infection rate of the other surgeons' patients in corresponding surgical divisions. A monthly computer report of the infection rates, especially stressing the clean wound, was discussed at meetings of the division of surgery as well as with the infection control committee. The bottom line of this report was a reduction of almost 50% in the overall wound infection rate, as well as the clean-wound infection rate, within six months after institution of this surveillance program.

Most recently, the results of a similar ten-year wound infection surveillance program have been published.[8] In this study, procedure-specific, rather than surgeon-specific, rates were calculated annually. The results of this study showed a significant reduction of wound infection rates in the last nine years of surveillance in every class of surgical wound when compared to the index year rates. Estimated savings in hospital room costs alone reached $3 million during the ten years.

The improvement in wound infection rates in all of these studies was the direct result of periodic clinical interventions based on the surveillance data.

Shorter lengths of hospitalization and the increasing numbers of outpatient operations have heightened our awareness of the importance of post-hospital surveillance in order to accurately document the presence of surgical wound infection. Follow-up of at least 30 days after operation is generally required to rule out the presence of a superficial wound infection. In this issue of *Infection Control and Hospital Epidemiology,* Manian and Meyer describe their active wound surveillance system that encompassed both inpatient and outpatient surgery.[9] They used a monthly surgeon-specific computer-generated questionnaire in outpatients (and after discharge in inpatients) in order to improve the surveillance of surgical wound infections. This approach was responsible for identifying 20% of the infected wounds that would have gone undetected by their conventional surveillance methods during the one-year study. The infected wounds identified by this technique were largely in outpatient surgical cases, and the average time spent by the infection control department in conducting the survey was approximately two hours per week. Other studies have shown that about 50% of all wound infections can be identified after hospital discharge if adequate surveillance is carried out.[10,11]

The use of computer surveillance to improve the use of antibiotic administration in both the prevention and treatment of nosocomial infections, including wound infections, has also recently been stressed.[12,13] Many different computer-based programs have been developed to monitor surgical wound infections and identify risk factors for the development of infection.[14,15]

Most studies concerning the collection and confidential distribution of surgeon-specific wound infection rates, especially in clean surgical procedures, have shown a reduction of surgical wound infections following the use of this approach. However, a recent editorial stressed that in order to prove the validity of surgeon-specific wound infection rates, an adjustment for surgical procedure as well as the severity of patient illness was required.[16]

A standardized effective surveillance program to detect and control surgical wound infection has been proven to be of benefit in reducing the incidence of the infections. Direct wound observation by qualified infection control personnel, when possible, is an important part.[17] It is urged that all hospitals implement these programs.

REFERENCES

1. Nichols RL. Postoperative wound infection. N *Engl J Med.* 1982;307:1701-1702.
2. Haley RW, Culver DH, White JW, Morgan WM, Emori TG. The nationwide nosocomial infection rate: a new need for vital statistics. *Am J Epidemiol.* 1985;121:159-168.
3. Green JW, Wenzel RP. Postoperative wound infection: a controlled study of the increased duration of hospital stay and direct cost of hospitalization. *Ann Surg.* 1977;185:264-168.
4. Taylor GJ, Mikell FL, Moses HW, et al. Determinants of hospital charges for coronary artery bypass surgery: the economic consequences of postoperative complications. *Am J Cardiol.* 1990;65:309-313.
5. Haley RW, Culver DH, White JW, et al. The efficacy of infection surveillance and control programs in preventing nosocomial infections in US hospitals. *Am J Epidemiol.* 1985;121:182-205.
6. Haley RW, Morgan WM, Culver DH, et al. Update from the SENIC project: hospital infection control: recent progress and opportunities under prospective payment. *Am J Infect Control.* 1985;13:97-108.
7. Cruse P. Wound infection surveillance. *Rev Infect Dis.* 1981;3:734-737.
8. Olsen MM. Lee JT Jr. Continuous, 10-year wound infection surveillance: results, advantages, and unanswered questions. *Arch Surg.* 1990;125:794-803.
9. Manian FA, Meyer L. Comprehensive surveillance of surgical wound infections in outpatient and inpatient surgery. Infect Control *Hosp Epidemiol.* 1990;11:515-520.
10. Brown RB. Bradley S. Opitz E, Cipriani D. Pieczrka R. Sands M. Surgical wound infections documented after hospital discharge. Am *J Infect Control.* 1987;15:54-58.
11. Krukowski ZH, Matheson NA. lbn-year computerized audit of infection after abdominal surgery. *Br J Surg.* 1988;75:857-861.
12. Evans RS, Larsen RA, Burke JP, et al. Computer surveillance of hospital-acquired infections and antibiotic use. *JAMA.* 1986;256:1007-1011.
13. Larsen RA, Evans RS, Burke JP, Pestotnik SL, Gardner RM, Classen DC. Improved perioperative antibiotic use and reduced surgical wound infection through use of computer decision analysis. Infect *Control Hosp Epidemiol.* 1989;10:316-320.
14. Bremmelgaard A, Raahave D, Beier-Holgersen R, Pedersen JV, Andersen S, Sorensen A. Computer-aided surveillance of surgical infections and identification of risk factors. *J Hosp Infect.* 1989;13:1-18.
15. Kjaeldgaard P, Cordtz T, Sejberg D, et al. The DANOP-DATA system: a low cost personal computer based program for monitoring of wound infections in surgical wards. *J Hosp Infect.* 1989;13:273-279.
16. Scheckler WE. Surgeon-specific wound infection rates-a potentially dangerous and misleading strategy. *Infect Control Hosp Epidemiol.* 1988;9:145-146.
17. Condon RE, Schulte WJ, Malangoni MA, Anderson-Teschendor TMJ. Effectiveness of *a* surgical wound surveillance program. *Arch Surg.* 1983;118:303-307.