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Beyond 30 Days: Does Limiting the Duration of Surgical Site Infection Follow-up Limit Detection?

Concern over consistency and completeness of surgical site infection (SSI) surveillance has increased due to public reporting of hospital SSI rates and imminent nonpayment rules for hospitals that do not meet national benchmarks.¹ Already, hospitals no longer receive additional payment from the Centers for Medicare and Medicaid Services (CMS) for certain infections following coronary artery bypass graft (CABG) surgery, orthopedic procedures, and bariatric surgery.²

One major concern is incomplete and differential post-discharge surveillance. At present, substantial variation exists in how and whether hospitals identify SSI events after the hospitalization in which the surgery occurred. Parameters used for SSI surveillance such as the duration of the window of time that surveillance takes place following the surgical procedure can impact the completeness of surveillance data. Determination of the optimal surveillance time period involves balancing the potential increased case ascertainment associated with a longer follow-up period with the increased resources that would be required. Currently, the time window for identifying potentially preventable SSIs related to events at the time of surgery is not fully standardized. The Centers for Disease Control and Prevention National Healthcare Surveillance Network requires a 365-day postoperative surveillance period for procedures involving implants and a 30-day period for nonimplant procedures.³ In contrast, the National Surgical Quality Improvement Program and the Society of Thoracic Surgeons systems employ 30-day postoperative surveillance regardless of implant. As consensus builds toward

national quality measures for hospital-specific SSI rates, it will be important to assess the frequency of events beyond the 30-day postsurgical window that may quantify the value of various durations of surveillance and ultimately inform the choice of specific outcome measures.

We evaluated the fraction of deep and organ/space SSIs detected beyond 30 days following CABG, orthopedic procedures, and mastectomy with implant surgical procedures to inform whether a longer SSI surveillance time period identifies sufficient additional SSI cases to warrant additional surveillance resources.

SSIs were identified as part of retrospective cohort studies at 5 hospitals following total hip replacements (THRs) and total knee replacements (TKRs) performed from January 1, 2007, to December 31, 2007.⁴ SSIs with onset of infection within 365 days of surgery were identified by (a) routine surveillance by hospital infection prevention programs, which was not standardized and commonly involved a combination of review of microbiology records and evaluation of readmissions or reoperations that came to attention, and (b) cases flagged by a previously validated algorithm involving antibiotic data, administrative diagnostic codes, and readmission criteria.⁵

Previously identified post-CABG SSIs were identified from a 2005 retrospective cohort study of Medicare beneficiaries undergoing CABG in US hospitals ranked in the top and bottom deciles based on case mix-adjusted probabilities of an SSI-related claim code within 60 days of surgery. The Romano score was used for case mix adjustment and was demonstrated as a significant predictor of SSI.⁶ Randomly selected medical records were reviewed for SSI.

Last, we evaluated previously identified SSI cases following mastectomy procedures involving implantation of prosthetic

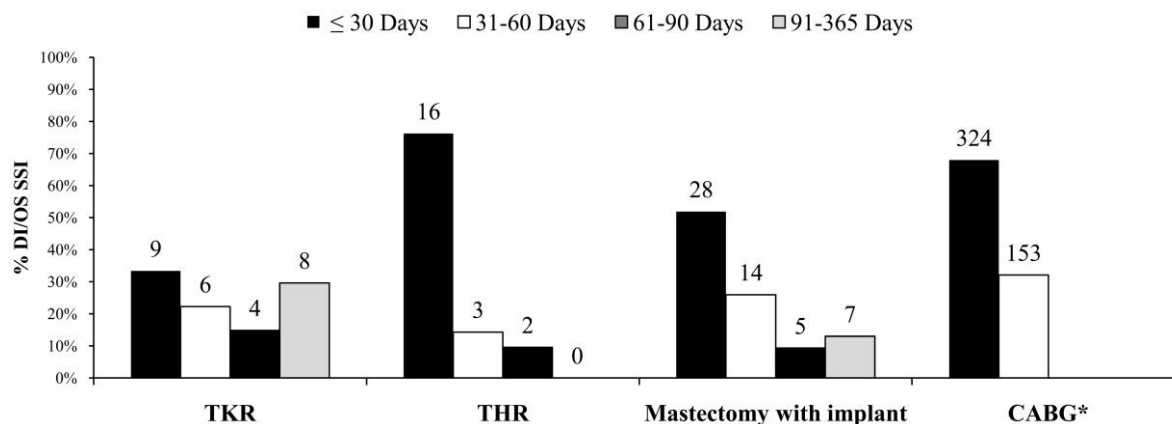


FIGURE 1. Distribution of time to onset of deep-incisional (DI) and organ space (OS) surgical site infections (SSIs) following total knee replacement (TKR), total hip replacement (THR), mastectomy with implant reconstruction, and coronary artery bypass grafting (CABG) surgeries. Duration of postprocedure follow-up for DI/OS SSI was 365 days for TKR, THR, and mastectomy with implant and 60 days for CABG. An asterisk indicates that the surveillance window was limited to 60 days for CABG.

material from an academic medical center (August 2005–December 2007). Data were collected from the surgical admission, readmissions, and clinic visits within 1 year of surgery.⁷

All SSIs were limited to those involving deep-incisional (DI) or organ/space (OS) infections. Time from surgery to SSI onset was calculated for all SSIs and grouped into less than or equal to 30 days and 31–60 days for CABG, while TKR, THR, and mastectomy procedures included additional groupings of 61–90 and 91–365 days.

We identified 27 SSIs following 1,666 TKRs, 21 SSIs following 1,691 THRs, 477 SSIs following 23,376 CABGs, and 54 SSIs following 327 mastectomies with implants (Figure 1). Based on these identified SSIs, TKR required 60 days to identify the majority of cases.⁸ By 90 days after procedure, 100% of known DI/OS SSIs were identified for THR, 70% of DI/OS SSIs for TKR, and 87% of DI/OS SSIs for mastectomy with implants. Limiting postoperative SSI surveillance to 30 days would lead to underreporting of approximately one-quarter to two-thirds of DI/OS SSIs across the 4 procedures surveyed. Confining postoperative SSI surveillance to 60 days, as was done for all CABG procedures, results in detection of the vast majority of DI/OS SSIs following THR and mastectomy-plus-implant procedures but only half of DI/OS SSIs following TKR. In contrast, a 90-day window detected most DI/OS SSIs across these 3 procedures. A limitation of all SSI estimates across THR, TKR, and mastectomy-plus-implant procedures was that follow-up was confined to the hospital where the index procedure was performed. Therefore, results represent minimum estimates of infection because postdischarge outpatient events and SSIs identified at other hospitals were not captured. In contrast, the use of insurer claims to identify CABG SSIs regardless of the location of medical care would allow for more confidence that all medically attended DI/OS infections were captured.⁶

Impending CMS SSI surveillance measures for mandatory reporting should consider including DI/OS SSI surveillance periods for TKR, THR, CABG, and mastectomy-plus-implant procedures beyond 30 days. Nevertheless, additional research is needed to assess whether resources to extend surveillance to 365 days after procedures is prudent, given limited resources, the fact that most DI/OS SSIs are captured within 90 days, and the uncertainty whether SSIs occurring that long after surgery are in fact due to preventable issues at the time of the operation.

Regardless of which duration of postdischarge surveillance is selected, assurance that hospitals are conducting postdischarge surveillance using standardized methods is necessary for interhospital comparison. Training and validation to ensure similarly comprehensive SSI capture across hospitals is critical for valid public reporting used to determine Medicare payment. In addition, comparison and improvement of existing case mix adjusters should be performed to properly account for different patient population risks for SSI. Early successful explorations into the use of large networks of

claims-based databases appear promising in this regard since both case mix adjustment and claims-based algorithms to trigger chart review have been shown to be superior to routine surveillance performed by hospital infection prevention programs for SSI detection and can be used to standardize postdischarge SSI surveillance.^{6,9,10}

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Latent Tuberculosis Infection in Nurses Exposed to Tuberculous Patients Cared for in Rooms without Negative Pressure after the 2011 Great East Japan Earthquake

In the aftermath of the Great East Japan Earthquake on March 11, 2011, Miyagi Cardiovascular and Respiratory Center, a designated tuberculosis (TB) center, was unable to provide negative pressure rooms as a result of lack of electricity and damage to our generator. In our TB ward, infection control measures are performed as follows: the use of N95 respirators by healthcare personnel (HCP), independent ventilation systems with rooms maintained at negative pressure with respect to the corridor and direct out exhausted air, and respiratory isolation of TB patients.

Despite evidence demonstrating the association between ventilation and the transmission of TB,¹ there are no data assessing the importance of negative pressure rooms in the airborne transmission of TB following a natural disaster. In addition, HCP are at risk for TB exposure and infection when they care for patients in healthcare settings.² In this study, we investigated the prevalence of latent tuberculosis infection (LTBI) in nurses who were exposed to patients with smear-positive TB in rooms that could not be maintained under negative pressure after the earthquake.

All negative pressure rooms in the TB ward were unavailable on March 11–15 (5 days) and April 7 (1 day) because

of seismic damage to the ventilation system. The ventilation system was not designed to be supplied by the backup power generation system. It was not possible to open room windows for ventilation because our hospital was located in a very cold area.

All study participants completed self-administered questionnaires about working time in the TB unit while negative pressure rooms were not available, exposure time to smear-positive TB patients, exposure to aerosol-generating procedures such as tracheal aspiration, and personal risk factors for TB infection. The whole-blood interferon- γ release assay (IGRA) was performed to identify LTBI by using QuantiFERON-TB Gold In-Tube (Cellestis) on May 19 or May 26, 2011 (10–11 weeks after the earthquake), because all nurses were already tuberculin skin test (TST) positive at baseline and had a previous history of bacillus Calmette-Guérin (BCG) vaccination. We could not obtain IGRA results at baseline because of difficulties with processing the blood test just after the earthquake.

Fortunately, we had stocked sufficient N95 respirators, but compliance of some nurses was poor. The nursing station in the TB ward was connected via a corridor to patient rooms, and most HCP did not wear masks while working at the station. At the time during which there was inadequate ventilation, there were 23 smear-negative TB patients and 2 smear-positive TB patients: 1 was graded 3+ in sputum smear with a TB strain resistant to isoniazid; the other was graded 1+ according to the World Health Organization scale.³ Fifteen nurses, including 6 in team X, 7 in team Y, and 2 other nurses, were recruited into this study. Team Y mainly provided care for patients with smear-positive TB.

The questionnaire demonstrated that no participants had a history of TB and none had a risk factor for TB infection, including human immunodeficiency virus infection, immunodeficiency, use of high-dose steroids or immunosuppressive drugs, diabetes mellitus, or malignancy. Overall, 3 (20%) of 15 nurses were IGRA positive (Table 1). Menzies et al⁴ reported that the prevalence of LTBI among HCP was 63% in low- and middle-income countries and 24% in high-income countries. It is estimated that a prevalence of LTBI among Japanese HCP is approximately 10%.⁵ Two IGRA-positive nurses were derived from team Y, whereas all nurses in team X were IGRA negative. Two (50%) of the 4 nurses who were exposed to smear-positive TB for more than 9 hours were IGRA positive, whereas 1 (9.1%) of the 11 nurses who were exposed to smear-positive TB for less than 5 hours was IGRA positive. Although airline passengers who are seated for more than 8 hours in the same or adjoining rows are more likely to be infected than other passengers, the optimal cutoff duration of exposure is undetermined in evaluating the likelihood of TB infection at close contact in the healthcare setting.⁶

TST has very limited value for screening LTBI among HCP in Japan according to the possibility of false-positive results in people who have received BCG vaccination, while