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Surveying the Surveillance: Surgical Site Infections Excluded by the January 2013 Updated Surveillance Definitions

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Abstract

The updated 2013 Centers for Disease Control and Prevention/ National Healthcare Safety Network definitions for surgical site infections (SSIs) reduced the duration of prolonged surveillance from 1 year to 90 days and defined which procedure types require prolonged surveillance. Applying the updated 2013 SSI definitions to cases analyzed using the pre-2013 surveillance definitions excluded 10% of previously identified SSIs.

Hospitals and ambulatory surgery centers perform surveillance for surgical site infections (SSIs) to identify trends in infection rates, improve infection prevention practices, and decrease the incidence and burden of these costly and common infections.[1,2] Ideally, infection surveillance definitions are relevant, objective, easy to employ, and reproducible with minimal variation. The Centers for Disease Control and Prevention's (CDC's) SSI definitions undergo revisions every few years to improve the definitions' utility and relevance to changing practice.[3–5]

The CDC updated the National Healthcare Safety Network (NHSN) surveillance definitions for SSIs in January 2013. Before 2013, postoperative surveillance for an SSI continued for a year if prosthetic material such as a joint or hip pros-thesis was implanted.[6] In the new 2013 SSI definitions, surveillance for an SSI continues for 30 days for some procedures and for 90 days for others.[7] The duration of postoperative surveillance is now wholly dependent on the type of surgical procedure rather than the presence of implants or prosthetic material. Our primary objective was to assess how these changes impact SSI detection and reporting when applied to a historical cohort.

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METHODS

We performed a retrospective analysis of prospectively collected SSI surveillance data from hospitals participating in the Duke Infection Control Outreach Network (DICON). DICON is a network of 43 community hospitals in 5 states throughout the southeastern United States that has been described previously.[8] Trained infection preventionists at each hospital collect surveillance data using a standardized database employing NHSN definitions. DICON liaison infection preventionists validate a subset of surveillance data each month.

Complete surveillance data on SSIs following 39 categories of surgical procedures performed from January 1, 2010, through December 31, 2011, were available from 35 acute care hospitals and 2 ambulatory surgical centers in DICON. Surveillance was conducted for 1 year following surgical procedures, according to the pre-2013 definitions. Researchers applied the updated NHSN surveillance definitions to previously collected data by shortening the follow-up times to 30 or 90 days according to procedure type, on the basis of documented dates of infection. Procedure-specific SSI rates (ie, the number of SSIs detected per 100 procedures) were calculated for all 39 procedure categories using the old and new definitions.

RESULTS

The study included a total of 235,571 surgical procedures during the 2-year period. Surveillance SSI definitions in use prior to 2013 detected 2,420 SSIs (rate, 1.03 SSIs per 100 procedures); the 2013 SSI definitions detected 2,187 SSIs (rate, 0.93 SSIs per 100 procedures). Approximately 1 in 10 (n = 233 [9.6%]) SSIs detected by the pre-2013 definitions were not detected by the 2013 definitions. Seventy-one (30%) of these 233 SSIs occurred in patients undergoing procedures that previously required surveillance for 12 months but that now require surveillance for 30 days; 162 (70%) of the 233 excluded SSIs occurred in patients undergoing surgical procedures that previously required surveillance for 12 months but that now require surveillance for 90 days.

The proportion of SSIs that were detected by the pre-2013 definitions but excluded by the 2013 definitions varied depending on procedure type (Table 1). The change in SSI rate in procedures designated for SSI surveillance for 30 days postoperative was minimal, with the exceptions of laminectomies (13 [13%] of 97 SSIs excluded) and joint arthroplasties other than knee and hip (9 [60%] of 15 SSIs excluded). Among procedures designated for SSI surveillance for 90 days postoperative, the 2013 definitions failed to capture a substantial number of SSIs occurring after knee replacement surgeries (51 [25%] of 203 SSIs excluded) and open fracture repairs (32 [21%] of 149 SSIs excluded) that had been detected by the pre-2013 definitions.

Among SSIs excluded using the new definition, *Staphylococcus aureus* (n = 72 [44%]), gram-negative rod bacteria (n = 22 [14%]), and coagulase-negative staphylococci (n = 19 [12%]) were the primary pathogens isolated for SSIs (Table 2). The proportions of excluded SSIs were similar when stratified by hospital procedure volume and by hospital year (data not shown).

DISCUSSION

Application of the 2013 SSI surveillance definitions to our historical surveillance data led to omission of almost 10% of previously identified SSIs. The number of omitted SSIs varied by procedure type. In particular, the 2013 SSI definitions excluded more than 20% of SSIs previously detected by the pre-2013 SSI definitions occurring after joint and bone procedures, including knee arthroplasties, arthroplasties other than knees and hips, and open reduction with internal fixation. Thus, one important effect of the 2013 SSI surveillance definitions will be a decrease in SSI rates that is not due to a change in clinical practice. Interpretation of time-trended SSI rates before and after January 2013 must take this surveillance effect into account.

The pathogens that caused the majority of late-onset SSIs excluded by the 2013 definitions in procedures now undergoing 90-day surveillance are notable. *S. aureus* and gram-negative rod bacteria are virulent pathogens typically responsible for SSIs occurring early after a procedure.[5,9] Detection of these virulent pathogens in SSIs occurring more than 90 days after a procedure goes against traditional teaching about early- versus late-onset SSI. Some of these infections may be due to hematogenous seeding rather than procedural contamination events, but we are unable to differentiate primary SSI versus secondary seeding in this retrospective assessment.

The NHSN updated the SSI surveillance definitions in an attempt to simplify and improve the surveillance process. Surveillance is limited to a maximum of 90 days, and infection preventionists no longer search for whether procedures used implanted materials. Theoretically, SSI surveillance should now be more straightforward, require fewer resources, and generate results that are more precise because surveillance is performed over a shorter period of time. However, experience with the 2013 definitions is needed to determine whether this is true.

This retrospective analysis has limitations. First, our results derive from surveillance data in community hospitals and may not be generalizable to other practice settings. However, we believe our cohort of hospitals to be representative of the typical hospital in the United States. Second, because SSIs are low-frequency events occurring on average 1% of the time, even a 10% or 20% relative reduction in SSI rate amounts to a small absolute reduction in SSI occurrence for a single surgery program. The clinical and infection prevention implications of the SSI definition changes are uncertain.

In summary, use of the 2013 SSI surveillance definitions will lead to omission of almost 10% of previously identified SSIs. Furthermore, rates of SSI following certain procedure types, such as knee prosthesis procedures and open fracture repairs, appear to be more impacted than others by the definition change. Rates of SSI using the 2013 definitions for procedures involving implanted material are not comparable to rates derived using the pre-2013 surveillance definitions.

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TABLE 1

Comparison of Surgical Site Infections (SSIs) by Pre-2013 and 2013 Definitions for Procedures Undergoing 30-Day Surveillance and 90-Day Surveillance

Procedure	Total surgeries	SSIs by old definition	SSIs by new definition	SSIs excluded, no. (%)	Old SSI rate[a]	New SSI rate[a]	SSI rate change[a] (new − old)
SSI data for 30- and 90-day surveillance procedures combined							
Total	235,571	2,420	2,187	233 (9.6)	1.03	0.93	−0.10
Procedures designated for 30-day surveillance for SSIs							
Total	123,734	1,250	1,179	71 (5.9)	1.01	0.95	−0.06
Abdominal aortic aneurysm	451	4	3	1 (25.0)	0.89	0.67	−0.22
Abdominal hysterectomy	10,713	123	117	6 (4.9)	1.15	1.09	−0.06
Abdominal procedures[b]	3,366	181	166	15 (8.3)	5.38	4.93	−0.45
Abdominal transplants[c]	476	27	27	0 (0)	5.67	5.67	0
Appendix surgery	9,119	74	73	1 (1.4)	0.81	0.80	−0.01
Carotid endarterectomy	2,522	10	9	1 (10.0)	0.40	0.36	−0.04
Cesarean section	16,488	141	141	0 (0)	0.86	0.86	0
Colon surgery	7,739	248	234	14 (5.7)	3.20	3.02	−0.18
Exploratory laparotomy	5,011	84	78	6 (7.1)	1.68	1.56	−0.12
Gallbladder surgery	27,715	81	81	0 (0)	0.29	0.29	0
Gastric surgery	7,015	59	56	3 (5.1)	0.84	0.80	−0.04
Kidney surgery	1,206	10	10	0 (0)	0.83	0.83	0
Laminectomy	9,374	97	84	13 (13.4)	1.03	0.90	−0.13
Limb amputation	4,973	46	44	2 (4.4)	0.92	0.88	−0.04
Other (other prosthesis)	2,214	15	6	9 (60.0)	0.68	0.27	−0.41
Prostate surgery	1,780	1	1	0 (0)	0.06	0.06	0
Thoracic surgery	2,624	11	11	0 (0)	0.42	0.42	0
Thyroid and/or parathyroid surgery	4,513	4	4	0 (0)	0.09	0.09	0
Vaginal hysterectomy	6,435	34	34	0 (0)	0.53	0.53	0
Procedures designated for 90-day surveillance for SSIs							
Total	111,837	1,170	1,008	162 (13.9)	1.05	0.90	−0.15
Breast	17,468	142	127	15 (10.6)	0.81	0.73	−0.08

Procedure	Total surgeries	SSIs by old definition	SSIs by new definition	SSIs excluded, no. (%)	Old SSI rate[a]	New SSI rate[a]	SSI rate change[a] (new − old)
Cardiac surgery	1,062	11	7	4 (36.4)	1.04	0.66	−0.38
Coronary artery bypass grafting	5,065	68	60	8 (11.8)	1.34	1.18	−0.16
Craniotomy	1,487	17	17	0 (0)	1.14	1.14	0
Herniorrhaphy	21,947	169	153	16 (9.5)	0.77	0.70	−0.07
Hip prosthesis	12,200	181	165	16 (8.8)	1.48	1.35	−0.13
Knee prosthesis	20,767	203	152	51 (25.1)	0.98	0.73	−0.25
Open reduction internal fixation	14,361	149	117	32 (21.5)	1.04	0.81	−0.23
Pacemaker	1,679	1	1	0 (0)	0.06	0.06	0
Peripheral vascular bypass	1,811	69	62	7 (10.1)	3.81	3.42	−0.39
Spinal fusion	13,721	158	147	11 (7.0)	1.15	1.07	−0.08
Ventricular shunt	269	2	0	2 (100)	0.74	0	−0.74

[a]Cases per 100 procedures.

[b]Bile duct, liver, pancreatic, spleen, small bowel.

[c]Kidney, liver.

TABLE 2

Primary Pathogens Isolated from Surgical Site Infections (SSIs) Occurring Greater Than 90 Days Postoperatively That Were Excluded by the 2013 SSI Definitions for 90-Day Surveillance Procedures

Primary pathogen	SSI diagnosis at 91–180 days	SSI diagnosis at >180 days	Total
Staphylococcus aureus	51	21	72
Gram-negative rod bacteria	14	8	22
Coagulase-negative staphylococci	5	14	19
No pathogen identified	9	8	17
Streptococci	8	4	12
Other	5	5	10
Enterococci	3	4	7
Yeast	2	1	3
Total no. of SSIs	97	65	162

NOTE. Ninety-day surveillance procedures include breast surgery, cardiac surgery, coronary artery bypass grafting, craniotomy, herniorrhaphy, hip prosthesis, knee prosthesis, open reduction internal fixation, pacemaker, peripheral vascular bypass, spinal fusion, and ventricular shunt.