The hierarchical location group levels consisted of room nested within floor, within model. A multi-level Bayesian logistic regression model was run in R version 3.5.1. through 2017 and for which complete information was reported were used for the VHA nationwide. Our goal was to understand when, where and why variations in potable water samples, for its 170 medical facilities (“stations”) distributed across the United States. We modeled the variability in Legionella positivity, as well as lower overall positivity for Legionella water sampling. The observed dominant station-level effects could be due to overarching influences such as a single water source and suggests approaches at this level can impact Legionella control. These results demonstrate a mechanism for understanding the distribution and probability of Legionella and can inform prevention practices and future policy.

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1231. Legionella Variability From Routine Environmental Testing Across All Veterans Health Administration (VHA) Medical Facilities

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Session: 146. HAI: Surgical Site Infections

Background. VHA Legionella prevention policy requires quarterly testing of potable water samples, for its 170 medical facilities (“stations”) distributed across the United States. We modeled the variability in Legionella positivity rates by location structure and by time to understand Legionella prevalence and distribution across VHA nationwide. Our goal was to understand when, where and why variations in Legionella positivity happens across VHA facilities.

Methods. Data from quarterly water samples from sinks and showers from 2015 through 2017 and for which complete information was reported were used for the model. A multi-level Bayesian logistic regression model was run in R version 3.5.1. The hierarchical location group levels consisted of room nested within floor, within building, within station, within region. The time group-level effects included quarter nested within year. Variabilities within groups were estimated as standard deviation (SD) on the log-odds scale.

Results. Among 138,553 samples, there was little seasonal effect (SD: 0.32) in Legionella positivity based on the quarter in which they were sampled. The largest variability in Legionella positivity occurred at the station level (SD: 2.38), with substantial variation at the building level also (SD: 1.85). The 5% of stations most likely to be positive for Legionella represented only 7.5% of total samples but accounted for 39.7% of all positive samples. The 5% of stations least likely to be positive for Legionella represented 10.4% of total samples, but only had 2 positive samples.

Conclusion. Buildings with the highest probability for Legionella positivity are clustered together within stations. We saw no major seasonal variations in Legionella positivity across facilities. We were able to better predict stations with higher positivity as well as lower overall positivity for Legionella water sampling. The observed dominant station-level effects could be due to overarching influences such as a single water source and suggests approaches at this level can impact Legionella control. These results demonstrate a mechanism for understanding the distribution and probability of Legionella and can inform prevention practices and future policy.

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1232. Potential Health and Cost Outcomes of Optimized Statistical Process Control Use for Surgical Site Infection Surveillance

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Session: 147. HAI: Surgical Site Infections

Background. Surgical site infections (SSIs) are common (160,000–300,000 per year in the United States) and costly ($6,000–$25,500 per event) healthcare-associated infections with potentially lethal outcomes (2.1%–6.7% mortality rate). A prior analysis by our group suggested that statistical process control (SPC) can detect SSI outbreaks earlier than traditional epidemiological surveillance methods. This study aimed to quantify the potential impact of SPC surveillance on patient outcomes (prevented SSIs and deaths) and healthcare costs.

Methods. We retrospectively analyzed 30 SSI outbreaks occurring over a period of 8 years in a network of 50 community hospitals from the Southeastern United States. We applied 24 control chart variations, including 2 optimized for SSI surveillance, 6 with expert-defined pre-outbreak baselines (used in our pilot study), 4 with lagged rolling baselines (used in our pilot study), and 12 common practice ones (using rolling baselines with no lag or fixed baselines). The charts used procedure-specific data from either the outbreak hospital or the entire network to compute baseline SSI rates. We calculated the average SSI rates during, before and after the outbreaks, and the months elapsed between SPC and traditional detection. We then used these values to estimate the number of SSIs that could have been prevented by SPC, and corresponding deaths avoided and cost savings (Figure 1).

Results. Optimized charts detected 96% of the outbreaks earlier than traditional surveillance, while pilot study and common practice charts did so only 65% (58%) of the time (Figure 2). Optimized charts could potentially prevent 15.2 SSIs, 0.64 deaths, and save $226,000 in excess care costs per outbreak. Overall, charts using network baselines performed better than those relying on local hospital data. Commonly used variations were the least effective, but were still able to improve on traditional surveillance (Figure 3).

Conclusion. SPC methods provide a great opportunity to prevent infections and deaths and generate cost savings, ultimately improving patient safety and care quality. While common practice SPC charts can also speed up outbreak detection, optimized SPC methods have a significantly higher potential to prevent SSIs and reduce healthcare costs.

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1233. Preoperative Optimization of Antimicrobial Stewardship Practices to Improve Outcomes of Children Undergoing Surgery

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Session: 106. Antimicrobial Stewardship and Infection Prevention, Durham, North Carolina

Background. Early optimization of antimicrobial stewardship practices has the potential to decrease healthcare associated infections and improve health outcomes. We present data from a multidisciplinary, preoperative optimization of antimicrobial stewardship practice using a network-based, preoperative SPC pilot study at Children’s National Hospital, a 276-bed academic children’s hospital in the District of Columbia.

Methods. We implemented a multidisciplinary, preoperative SPC pilot study to optimize antimicrobial stewardship practices. SPC charts were used to monitor and improve antimicrobial prescription practices. Our pilot study team included antimicrobial pharmacists, infection preventionists, pediatricians, nurse practitioners, and medical students.

Results. We implemented a multidisciplinary, preoperative SPC pilot study to optimize antimicrobial stewardship practices. SPC charts were used to monitor and improve antimicrobial prescription practices. Our pilot study team included antimicrobial pharmacists, infection preventionists, pediatricians, nurse practitioners, and medical students.

Conclusion. Preoperative optimization of antimicrobial stewardship practices has the potential to decrease healthcare associated infections and improve health outcomes. We present data from a multidisciplinary, preoperative optimization of antimicrobial stewardship practice using a network-based, preoperative SPC pilot study at Children’s National Hospital, a 276-bed academic children’s hospital in the District of Columbia.
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123. Surveillance Quality Correlates with SSI Rates in Prosthetic Hip and Knee Surgeries: A Call to Action to Adjust Reporting of SSI rates
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Session: 147. HAI: Surgical Site Infections
Friday, October 4, 2019: 12:15 PM

Background. Surgical site infections (SSIs) are rather infrequent following knee and hip surgery, but can have profound consequences for the patient. SSI data from a large network of Swiss hospitals has routinely been collected in a nationwide SSI surveillance system since 2009. The aim of the study was to investigate whether SSI rates are correlated with the quality of surveillance.

Methods. We calculated the weighted mean NNIS adjusted infection rates for knee and hip surgeries for the years in which audits occurred in each hospital. The 50-point score per audit is an amalgamation of quantitative and qualitative information from both structured interviews and a random selection of reviewed patient records, including (amongst others) an evaluation of completeness of medical documentation, follow-up, data quality, and training.

Results. The analysis included 30696 knee and hip surgeries from 92 hospitals (excluding those institutions with <50 procedures in the audit year), with median infection rate 1% (IQR [1–2%]) and median audit score 35 (IQR [32–39]). The Figure plots the NNIS adjusted infection rate against audit score along with the linear fit (solid red) and 95% confidence intervals (gray). There is large variability in rates and scores, with a noticeable increasing trend (P = 0.01). Using the median of both metrics to divide the plot into 4 quadrants, those hospitals in the lower left quadrant have both lower infection rates and audit scores (mostly public hospitals). Those in the upper right quadrant have both high infection rates and high-quality surveillance (mostly private hospitals). Those in the lower right quadrant represent the ideal situation with both low rates and high-quality surveillance.

Conclusion. In this national surveillance of nosocomial SSI hip and knee infections, there was a wide range of SSI rates and surveillance quality, with discernible clustering of hospital types. Those hospitals with low infection rates and low audit scores (predominantly private hospitals), whereas those in the upper right quadrant have both higher SSI rates and audit scores (mostly public hospitals). In this analysis, the audit scores were found to be correlated to the infection rates.

1234. Mental Models of Surgical Site Infection Prevention Among Surgical Technicians and Nurses
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Session: 147. HAI: Surgical Site Infections
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Background. Surgical site infections (SSI) are common and costly. Institutions have implemented complex prevention bundles to reduce SSI, but adherence remains challenging. Understanding clinicians’ mental models related to SSI prevention can help develop strategies to improve adherence.

Methods. We conducted focus groups with surgical technicians at a tertiary care center. We used constructs from behavior change theories to analyze responses and identify relevant themes for SSI prevention.

Results. We had 19 participants (10 nurses, 9 surgical technicians) in 4 focus groups. We found the following SSI prevention challenges: (1) emphasis on rapid patient turnover, which impairs ability to complete all required infection control tasks; (2) OR crowding and traffic, with increased risk to sterile technique breaks; (3) poor compliance with OR attire, including wearing scrubs outside of the hospital; (4) inadequate OR cleaning between cases; (5) lack of emphasis on post-discharge wound care instructions. The following beliefs were commonly expressed: (1) belief that some SSI are inevitable, due to increased complexity and number of surgical procedures in a referral center; (2) perceived lack of knowledge and training on OR sterile technique among medical and nursing students; (3) perceived incorrect techniques for applying skin prep among surgical residents, and, occasionally, attendings; (4) fear and hesitancy to bring up OR irregularities if individual involved is perceived as having a difficult personality; (5) feeling overwhelmed by too many requirements for SSI prevention, which frequently change; (6) belief that some policies originate from outside influences and are not relevant to frontline clinicians; (7) frustration receiving SSI performance feedback that is not individualized and lacks actionable items; (8) feeling “blamed” for having SSI without knowing “how to fix it”; (9) belief that training rigor and dedication to patient care have decreased over time, and are lax among younger generations. Representative quotes categorized according to behavior change theories are shown in Table 1.

Conclusion. Addressing clinicians’ perceptions of SSI prevention may help improve adherence to the process and reduce SSI incidence.

Table 1. Representative quotes depicting mental models of SSI prevention among surgical nurses and technicians, grouped by principal behavior change theory (Theoretical Domain Framework).

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