Trends in Knee Arthroplasty (KPRO) Surgical Site Infections (SSI) Reporting in Illinois Acute Care Hospitals, 2011 - 2016

Surgical Site Infections (SSI) Overview

Illinois hospitals have been reporting surgical site infection (SSI) data to the Illinois Department of Public Health (IDPH) using the CDC's National Healthcare Safety Network (NHSN) surveillance system since April, 2010. SSIs are infections that occur in the wound created by an invasive surgical procedure and are one of the most important causes of healthcare-associated infections (HAI). The surgeries monitored for SSI in Illinois include coronary artery bypass surgery (CABG) procedures, and knee replacement (KPRO) surgery. This report focuses on trends in NHSN SSI aggregate data from acute care hospitals that perform KPRO from 2011 – 2016.

The CDC describes three types of surgical site infections:
- **Superficial incisional SSI.** This infection occurs just in the area of the skin where the surgical incision was made.
- **Deep incisional SSI.** This infection occurs beneath the incision area in muscle tissue and in fascia, the tissue surrounding the muscles.
- **Organ or space SSI.** This type of infection can be in any area of the body other than skin, muscle, and fascia that was involved in the surgery, such as a body organ or a space between organs.

IDPH monitors and reports inpatient KPRO and CABG Deep Incisional Primary and Organ/Space SSIs that were identified during admission or readmission to Illinois facilities as defined in the NHSN Manual.

Standardized Infection Ratio (SIR)

The SIR is a measure that compares a facility's burden of KPRO SSI events to a predicted number based on a national referent population. It is a risk-adjusted summary statistic used to measure the relative difference in healthcare-associated infections (HAI) during a given reporting period compared to that of a national referent population. The SIR adjusts for risk factors found to be significant predictors of KPRO SSI incidence in a facility.

The SIR is the ratio of the actual number of HAIs reported to what would be predicted, given the standard population.
- If the SIR value is greater than 1.0, there are more infections than predicted.
- If the SIR value is less than 1.0, then fewer infections occurred than predicted.
- If the facility SIR is 1.0, then the number of observed infections is the same as or similar to the predicted number.

The three categories summarizing how a hospital compares to the national infection data are highlighted below:
- Statistically fewer (Lower) infections than predicted based on national infection data;

- Statistically similar (Similar) infections as predicted based on the national infection data; or
- Statistically more (Higher) infections than predicted based on national infection data.

NHSN 2015 Baseline

Prior to 2015, the SIR was calculated using a single statistical model for all facility types (acute care and critical access) and national data collected during 2006-2008. In 2015, the CDC modified the risk adjustment factors that are used to calculate the predicted number of infections in the SIR and updated the national referent population (see SSI Risk Adjustment Factors below). Under the 2015 baseline, NHSN started using four separate statistical models based on facility type: acute care hospital, critical access hospital, inpatient rehabilitation facility, and long-term acute care hospital. In addition to the change to risk adjustment factors, SIRs under the new 2015 baseline are calculated using the national data collected during 2015.

Due to the difference in baseline data and risk adjustment factors, SIRs from 2011 – 2014 are not directly comparable to those from 2015 and beyond. The 2011-2014 SIRs under the previous baseline are included and displayed in this report for contextual purpose only and as an indicator of past progress. Starting with 2015 data, SIRs under the new baseline will be used in the current and future trend report updates. Historical trend reports may be found on the Illinois Hospital Report Card website (State Reports of Current Interest):
http://www.healthcarereportcard.illinois.gov/contents/view/State_Reports_of_Current_Interest

SSI Risk Adjustment factors

The predicted number of infections is calculated based on 2015 national HAI aggregate data and patient risk at each health facility type. The logistic regression models are used to calculate the number of predicted SSI events under the 2015 baseline. For acute care hospitals, the number of predicted events calculated under the 2015 baseline for SSI is risk adjusted based on the following factors found to be statistically significant predictors of KPRO SSI incidence: gender, trauma, anesthesia, ASA, wound class, medical school affiliation, facility bed size, age, duration, BMI, and procedure type.

Additional information regarding these SSI risk models and SIR calculations can be found at: https://www.cdc.gov/nhsn/pdfs/ps-analysis-resources/nhsn-sir-guide.pdf

Summary Tables and Results

Table 1 is a summary of Knee Arthroplasty SSI in Illinois hospitals from 2011 to 2016. Reporting years 2011-2014 are based on the 2006-2008 national experience, whereas 2015 and 2016 are based on the 2015 national experience. From 2011-2014, the numbers of observed SSI compared to the number of predicted SSI have been significantly lower than the national referent period with all the SIR values being less than 1.0.

In 2016, there were 107 KPRO surgical site infections reported compared to 113 predicted, for an SIR of 0.94 (95% CI: 0.776, 1.134). This translates to 6% less KPRO surgical site infections compared to the national referent population, however, this decrease is not statistically significant. The trend of SIRs over time is graphically displayed in Figure 1. Because SIRs calculated under the old baseline are not comparable to those under the new baseline, a vertical line in the figure denotes a break between when the old versus new baselines were used.
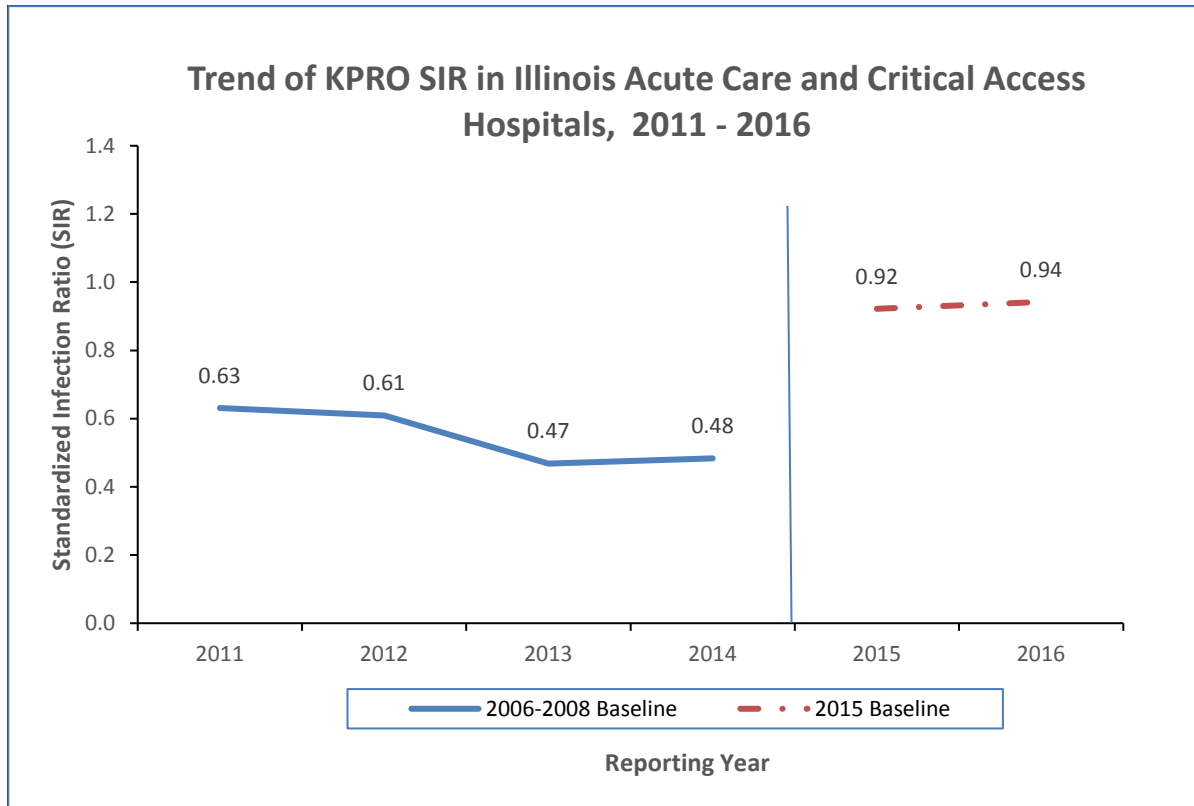
Table 1. SSI-KPRO in Illinois hospitals from 2011 to 2016

| Reporting Year | Number of Facilities Reporting | Total Number of KPRO Performed | Number of Infections (SSI) | | Standardized Infection Ratio (SIR) | 95% Confidence Interval (SIR) | | Statistical Interpretation |
			Observed	Predicted		Lower Limit	Upper Limit	
2011 †	134	26646	108	171.29	0.63	0.520	0.758	Lower
2012 †	137	27620	109	178.89	0.61	0.503	0.732	Lower
2013 †	141	28275	84	179.52	0.47	0.376	0.576	Lower
2014 †	140	29208	90	186.42	0.48	0.390	0.591	Lower
2015 *	137	30307	100	108.41	0.92	0.754	1.117	Similar
2016 *	137	31242	107	113.59	0.94	0.776	1.134	Similar

† NHSN SSI data compared to 2006 – 2008 baseline.

∗ NHSN SSI data compared to 2015 baseline.

Figure 1. Trend of KPRO SSI SIR in Illinois Hospitals from 2011 – 2016

Illinois Surgical Site Infection (SSI) Trend Report, Illinois Department of Public Health

November, 2017

Summary

The trends of KPRO-SSI SIRs of Illinois acute care hospitals from 2011-2014 and 2015-2016 are shown in Figure 1. SIRs from reporting years 2011-2014 are based on the 2006-2008 national experience, whereas 2015 and 2016 are based on the 2015 national experience. From 2011-2014, the numbers of observed SSI compared to the number of predicted SSI have been significantly lower than the national referent period. Based on the new 2015 baseline, comparative analysis of KPRO-SSI SIRs between 2015 and 2016 shows an increase of 2% which is not statistically different (CI: 0.777, 1.343 and p-value = 0.88).

In 2016, there were 107 KPRO surgical site infections reported compared to 113 predicted, for an SIR of 0.94 (95% CI: 0.776, 1.134). This translates to 6% less KPRO surgical site infections compared to the national referent population, however, the decrease is not statistically significant.

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