The Effect of Universal Intranasal Povidone Iodine Antisepsis on Total Joint Replacement Surgical Site Infections

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ABSTRACT

Background/Objectives

Post operative infections are infrequent after total joint arthroplasty. When they do occur however, they result in significant morbidity. Colonization with *Staphylococcus aureus* (SA) increases the risk for surgical site infections (SSI). Previous studies have shown that Mupirocin reduces SA infections in those patients who are colonized. However, mupirocin resistant SA is increasingly being reported. Therefore preoperative intranasal povidone iodine (PI) was implemented in a busy orthopedic service as an alternative to mupirocin to asses the effect on infection rates from all pathogens.

Methods

All knee and hip arthroplasty patients were instructed to shower with chlorhexidine gluconate (CHG) preoperatively at home. Treatment with intranasal PI antisepsis on the day of surgery began in April 2012. We compared the rate of infection in the 34 months before this intervention (6/2009-3/2012) to the rate following implementation of the new process (5/2012-1/2014). A Fisher's exact 2 tailed test was performed to assess the impact of the intervention.

Results

The rate for hip infections fell from 1.17% (25/2130) to 0.50% (7/1387, P=0.045). The rate for knee arthroplasty infections decreased from 0.85% (19/2236) to 0.62% (8/1450, P=0.33). The overall infection rate for both hip and knee procedures declined from 1.01% to 0.53%, (P=0.03). When considering only infections caused by SA, the rate before intervention was 0.46% (20/4366) and dropped to 0.28% (8/2837, P=0.33).

Conclusions

A statistically significant decrease in SSI rates occurred following the intervention, and was statistically significant for all pathogens in the hip arthroplasty cases and the overall joint arthroplasty cases. Although the knee arthroplasty SSI rate decreased, a larger sample size is necessary to achieve statistical significance. The rate of SA infection compares favorably to published studies in which screening and mupirocin decolonization was done. The horizontal approach of using PI intranasal antisepsis deserves further investigation as a method to decrease arthroplasty infections.

BACKGROUND

Highland Hospital's orthopedic unit is a Center of Excellence for joint replacement being awarded the Gold Seal of Approval by the Joint Commission. There are over 1500 joint placements performed annually at this University Affiliated Community Teaching Hospital. A 20 bed orthopedic unit is dedicated to caring for these patients with expert surgeons and specially trained nurses, patient care technicians, physical therapists, and occupational therapists. As a Center for Excellence, Highland is dedicated to continual quality improvement, and a multidisciplinary team participated in the Institute for Healthcare Improvement's (IHI) Project JOINTS seeking to lower the SSI rate even further.

METHODS

Opportunity

IHI Project JOINTS recommended a bundle to decrease SSIs in joint arthroplasty patients. The following bundle was already in place:

- appropriate antibiotic use
- appropriate hair removal
- alcohol containing skin prep (CHG and alcohol)
- 3 days of preoperative CHG bathing (4% CHG shower in evening and 2% CHG cloth on day of surgery)

In addition to the above bundle, Project JOINTS also recommended *Staphylococcus aureus* screening and decolonization with mupirocin, which had not been implemented at Highland Hospital.

Barriers identified to implementation of this last piece of the bundle:

- Increased time required (need an additional preoperative appointment to get screening results and mupirocin treatment)
- Potential for mupirocin resistance
- Increased cost

Recognizing the above barriers, PI intranasal antisepsis was implemented using 3M™ Skin and Nasal Antiseptic, a 5% PI solution specially formulated for the nares, as an alternative approach to mupirocin.

Benefits of PI intranasal antisepsis approach:

- Universal/horizontal approach for all patients and all pathogens
- Does not contribute to antibiotic resistance
- Less costly
- Less time required (do not need an additional preoperative appointment)

Implementation

- PI added to the orthopedic order set as a medication order
- Recorded as a single dose on the medication administration record
- PI intranasal antisepsis performed by nurses on day of surgery in the pre-anesthesia area
- Nurses trained on proper PI intranasal antisepsis technique
- Educational posters in each pre-anesthesia room
- Nurses educated patients prior to administration
- Infection Prevention monitored PI antisepsis administration along with conducting routine surgical site infection surveillance
- All pathogen SSI rate calculated for pre and post intervention periods
- Fisher's Exact Two Tailed Test used for analysis

Surveillance for SSI:

Surveillance was performed on all units in a 261 bed University affiliated Community Teaching Hospital using the Center for Disease Control's National Healthcare Safety Network (NHSN) definitions to determine cases of surgical site infections (SSI). Case ascertainment was determined by reviewing microbiology, readmission, and reoperation data. All infections may not have been captured due to the lack of a comprehensive post discharge surveillance program during both the pre and post intervention periods. Superficial as well as deep and organ space SSIs were included in the rates.

Collection of procedure denominator data:

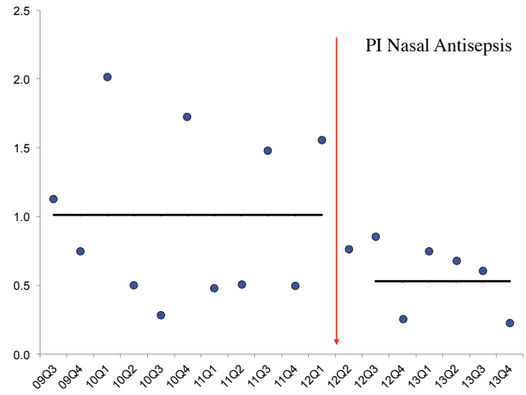
Procedures with codes meeting the NHSN definition for knee and hip arthroscopy procedures from patients discharged the previous month were collected for the denominator data.

Calculation of the SSI rates:

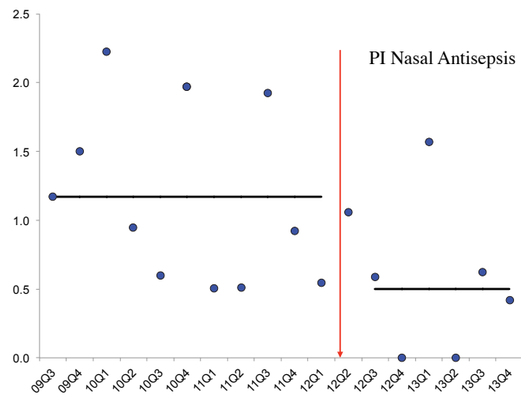
Number of Infections/Number of Procedures ×100=SSI Rate per 100 Cases

RESULTS

Arthroplasty SSI Rate (%), All Joints



Arthroplasty SSI Rate (%), Hips



All Pathogen Surgical Site Infection Reduction

- Hip SSI decreased from 1.17% to 0.50% (P=0.045)
- Knee SSI fell from 0.85% to 0.62% (P=0.33)
- Overall hip and knee declined from 1.01% to 0.53% (P=0.03)
- *Staphylococcus aureus* reduced from 0.46% to 0.28% (P=0.33)

Arthroplasty SSI (all pathogens)

Joint		Before	After	
Hip		6/2009 to 3/2012	5/2012 to 1/2014	
	Infections	25	7	
	Cases	2130	1378	
	Rate	1.17%	0.50%	P = 0.045
	(95% Confidence Interval)	(0.76 to 1.73)	(0.20 to 1.04)	
Knee				
	Infections	19	9	
	Cases	2236	1450	
	Rate	0.85%	0.62%	P = 0.33
	(95% Confidence Interval)	(0.51 to 1.32)	(0.28 to 1.18)	
Hips & Knees				
	Infections	44	15	
	Cases	4366	2837	
	Rate	1.01%	0.53%	P = 0.03
	(95% Confidence Interval)	(0.43 to 1.35)	(0.30 to 0.87)	

Arthroplasty SSI (*Staph aureus* only)

Joint		Before	After	
Hip		6/2009 to 3/2012	5/2012 to 1/2014	
	Infections	13	3	
	Cases	2130	1450	
	Rate	0.61%	0.22%	P= 0.12
	(95% Confidence Interval)	(0.33 to 1.04)	(0.04 to 0.63)	
Knee				
	Infections	6	5	
	Cases	2236	1450	
	Rate	0.27%	0.34%	P= 0.76
	(95% Confidence Interval)	(0.10 to 0.58)	(0.11 to 0.80)	
Hips & Knees				
	Infections	20	8	
	Cases	4366	2837	
	Rate	0.46%	0.28%	P= 0.33
	(95% Confidence Interval)	(0.26 to 0.68)	(0.12 to 0.55)	

CONCLUSIONS

- The overall rate of SSI decreased significantly following PI intranasal antisepsis
- A statistically significant reduction in hip arthroplasty SSI rate was achieved
- A larger sample size is necessary to reach a statistically significant reduction in the knee arthroplasty SSI rate
- This intervention warrants further investigation as a horizontal approach to decrease arthroplasty infections

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