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Baseline Measure of Alcohol Based Skin Preparation Agents Prior to 2011 NQF Recommendation in a General Surgery Population

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Abstract

The National Quality Forum (2011) recommends the use of alcohol based skin preparation agents prior to surgery to help prevent infections. This multi-hospital study (n=3,794) evaluates its use in a general surgery patient population prior to the NQF recommendation. Forty-seven percent of cases received an alcohol based skin preparation agent.

Keywords

skin preparation agents; Surgical Site Infections; Operating Room (OR) contextual factors

INTRODUCTION

The National Quality Forum (NQF) (www.qualityforum.org/Work/Area/linkit.aspx?LinkIdentifier=id...43764) recommends using an alcohol based skin preparation agent for its superior capability to neutralize micro-organisms to further support the prevention of SSIs.¹⁻³ The purpose of this study is to evaluate the actual use of recommended skin

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preparation agents prior to the implementation of the 2011 NQF recommendations and the role of health systems or contextual factors in the adherence to evidence based practices. The research questions are: (1) What is the actual use of alcohol based skin preparation agents prior to implementation of the NQF recommendation, and (2) What is the association between select OR contextual factors and the actual use of alcohol based skin preparation agents?

METHODS

A cross-sectional cohort study included seven Michigan hospitals with perioperative and patient level data from general surgery patients who experienced an abdominal procedure. The Perioperative Outcomes Initiative (POI, www.poi-cqi.org) is a multi-hospital network in Michigan and serves as the primary data source for this study. POI is a collaborative quality initiative (CQI) network, supported by BlueCross BlueShield of Michigan (BCBSM) / BlueCare Network (BCN) (see www.valuepartnerships.com).

The seven hospitals were participating in the POI (www.poi-cqi.org) network as well as the Michigan Surgical Quality Collaborative (MSQC) (www.msq.org). Trained abstractors used the systematic sampling method described by Khuri⁴ whereby the first 40 consecutive cases in an eight day cycle are included.⁵ An established data validation approach for MSQC / NSQIP data collection has been in place since the initiation of the program. Data collection takes place at participating hospitals by nurses who are specifically trained in the data collection procedures developed by NSQIP.⁴

The surgical site infection (SSI) definition used is based on the CDC SSI definition⁶ and obtained from the ACS NSQIP data collection protocols, which confirms up to 30-days postoperatively whether a SSI emerged. We report whether a SSI is present (dichotomous) and do not distinguish between superficial, deep wound, or organ space SSI.

The contextual factors evaluated in this study include whether the procedure took place at a hospital with a medical school on site, during the weekend or off hours, as practice variations may occur.⁷⁻⁹ Analyses will control for ASA value and wound class, as these patient factors may influence the outcome variable, the selection of skin prep type.

Skin prep data were obtained as part of the POI data collection and submission processes. Participating hospitals upload, using a secure connection, the perioperative process information. A POI Data Validation Report© indicates missing values, missing cases, extreme and outlying values. All data used for this study have been evaluated for missing, outlying, and inconsistent data elements by participating hospitals.

RESULTS

The research questions focus on: (1) the actual use of alcohol based skin preparation agents and (2) whether OR contextual factors play a role in the use of alcohol based skin preparations for procedures included in this study. Cases with the following procedures were included: appendectomy, cholecystectomy, colectomy, enterectomy, and hernia. A total of 3,794 cases were included in the analyses; the average age was 53 years and 51% of the

cases were male. The overall SSI rate was 4.7 %, with a high SSI of 19% for enterectomy (small bowel procedures) and a low of 2.1 % for cholecystectomy (gall bladder) and hernia procedures.

Table 1 presents the distribution of alcohol based skin preparation agents by procedure group. Appendectomy, cholecystectomy, and enterectomy show a 54% use, vs. 42% alcohol based skin prep rate for colectomy and 41% for hernias. About 10% of the procedures take place during the weekend, and nearly a third of the cases were operated at a hospital with a medical school. Table 2 presents the association between contextual factors and the use of alcohol based skin preparation. Three of the seven participating hospitals were identified as those with a medical school located at the hospital site or having its primary training at the hospital site. Using logistic regression analyses, the hospitals with a medical school onsite used an alcohol based skin prep for 88.0% of their cases ($p < .001$). Evaluation of the Hosmer-Lemeshow value supported the use of logistic regression analysis for specific procedure groups as the values were of appropriate size (non-significant).

The two OR contextual factors that showed consistency across the five procedures are whether the operation site was contaminated (no significance) and whether a medical school was located on site or used the hospital as its primary training site (highly significant). Review of whether the procedure started on the weekend or during the evening hours (after 7 pm and before 7 am) indicated that the weekend results differed from the procedure occurring off hours. We observed significant associations between having a procedure off hours and the use of alcohol based skin preps for hernia ($p = 0.001$); the association was not significant for the other four procedures.

The ASA value showed a significant association with the use of alcohol based skin prep for enterectomy ($p = .007$). Wound class did not present a significant association with the use of an alcohol-based skin prep for any of the procedures. Gender was near significantly ($p = 0.053$) associated with the use of alcohol based skin prep for hernia procedures, however, the significance of other variables was not influenced with the introduction of this variable into the model.

In sum, our analyses suggest that a number of significant associations were established between OR contextual factors and the use of alcohol based skin preparation agents, though variation between procedures was noted. Wound class value was not significantly associated with the selection of an alcohol-based skin prep. However, ASA, weekend procedures, and surgery off-hours were significantly associated with the selection of alcohol based skin prep agents for select procedures (enterectomy, cholecystectomy, and hernia).

DISCUSSION

This study establishes a baseline of alcohol based skin preparation use for abdominal surgical procedures and an association between OR contextual factors and the selection of alcohol based skin preps. Alcohol based skin prep use varied across different procedures and hospitals. Our findings indicate the merit of considering OR contextual factors in these

studies. Our results include differences in skin prep use for procedures that took place in the evening / night hours, with an anesthesia start time after 7 pm and before 7 am.

Results (Table 2) indicate variations in skin prep practices for different procedures, which support procedure specific analyses. Aggregation of multiple procedures in outcome studies may impact overall study results and its implications. Future studies should carefully evaluate hospitals with a medical school present and determine procedure specific associations between contextual factors and skin prep use. In addition, studies need to investigate the combined effects of alcohol based skin prep, prophylactic antibiotic use, while appropriately controlling for patient and contextual risk factors.

Limitations

Many hospitals in Michigan have been members of various CQIs or hospital networks and are accustomed to receiving benchmarking reports as well as being engaged in multiple statewide quality improvement activities which may have influenced the adoption of NQF guidelines and due to multiple efforts aimed at reducing SSIs. The success of this strategy has been documented by Share.¹⁰

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Table 1

Variation of Skin Preparation Agents, Procedures, and Contextual Factors

Procedures	Cases	Alcohol Based Prep Rate	Hospital with Med School	Procedure during Weekend	Procedure during Surgery off hours
Appendectomy	619 (16.3)	339 (54.8)	236 (38.1)	136 (22.0)	260 (42.0)
Cholecystectomy	870 (22.9)	471 (54.1)	309 (35.5)	112 (12.9)	61 (7.0)
Colectomy	504 (13.3)	210 (41.7)	173 (34.3)	62 (12.3)	65 (12.9)
Enterectomy	163 (4.3)	89 (54.6)	77 (47.2)	34 (20.9)	36 (22.1)
Hernia	1638 (43.2)	672 (41.0)	441 (26.9)	39 (2.4)	45 (2.7)
Total	3794 (100.0)	1781 (46.9)	1236 (32.6)	383 (10.1)	467 (12.3)

No. (%)

Table 2

Relationship between Alcohol Based Skin Preparation Agent Use and Contextual Factors.

Procedure Groups	Odds Ratio	95% CI	P value
Appendectomy (N=619)			
Weekend procedure	1.004	0.619 - 1.627	.988
Med school on site	29.999	17.328 - 51.935	.000
Surgery off hours	.726	0.478 - 1.101	.132
ASA value	1.228	0.246 - 6.116	.802
Wound class	.000	-	.999
Cholecystectomy (N=870)			
Weekend procedure	2.024	1.255 - 3.263	.004
Med school on site	16.537	10.995 - 24.873	.000
Surgery off hours	1.037	0.568 - 1.893	.907
ASA value	.618	0.254 - 1.504	.289
Wound class	.000	-	1.000
Colectomy (N=504)			
Weekend procedure	1.221	0.603 - 2.468	.579
Med school on site	24.715	14.941 - 40.885	.000
Surgery off hours	1.549	0.776 - 3.091	.215
ASA value	.990	0.507 - 1.930	.976
Wound class	.213	0.013 - 3.464	.277
Enterectomy (N=163)			
Weekend procedure	1.644	0.682 - 3.963	.268
Med school on site	7.553	3.619 - 15.763	.000
Surgery off hours	1.198	0.503 - 2.856	.683
ASA value	3.909	1.444 - 10.580	.007
Wound class	.328	0.019 - 5.592	.441
Hernia (N=1638)			
Weekend procedure	.638	0.273 - 1.491	.300
Med school on site	21.059	15.456 - 28.691	.000
Surgery off hours	3.434	1.666 - 7.082	.001
ASA value	1.482	0.665 - 3.301	.336
Wound class	.611	0.347 - 1.075	.087