

Table 1.

Table. Risk factors associated with hospital-onset MRSA.

Variables	crude R%	adjusted odds ratio (95% confidence interval)	Estimate	P value
Age (years)				
<= 25	35.20%	Reference	Reference	Reference
25-52	48.00%	1.446(1.239, 1.686)	0.3686	<.0001
52-63	55.30%	1.906(1.627, 2.232)	0.6448	<.0001
63-73	58.80%	2.167(1.854, 2.533)	0.7734	<.0001
> 73	65.20%	2.737(2.351, 3.186)	1.0068	<.0001
Percentage of beds in intensive care units				
<= 16.5	60.90%	Reference	Reference	Reference
>16.5	49.60%	0.886(0.81, 0.969)	-0.1212	0.0078
Teaching status				
major teaching	52.20%	Reference	Reference	Reference
non-major teaching or non-teaching	57.80%	1.131(1.037, 1.232)	0.1227	0.0051
Antimicrobial testing site				
outsourcing	60.50%	Reference	Reference	Reference
on site	52.40%	0.905(0.825, 0.993)	-0.0998	0.0343
Specimen source				
blood and cerebrospinal fluid	51.70%	Reference	Reference	Reference
lower respiratory tract	55.00%	1.209(1.101, 1.326)	0.1894	<.0001
urine	61.20%	1.354(1.182, 1.55)	0.3027	<.0001
Gender				
male	54.00%	Reference	Reference	Reference
female	56.10%	1.087(1.001, 1.181)	0.0839	0.047
Community onset MRSA proportion (%)				
<= 38.0	43.90%	Reference	Reference	Reference
38.0-45.3	51.40%	1.269(1.141, 1.41)	0.238	<.0001
45.3-50.7	59.30%	1.724(1.519, 1.956)	0.5445	<.0001
>50.7	68.40%	2.398(2.128, 2.702)	0.8745	<.0001

MRSA. Logistic regression showed that a higher proportion of HO-MRSA was significantly associated with older age, female, particular sources of specimen (urine and LRT), and selected hospital characteristics: hospitals not serving as major teaching hospitals, hospitals with a higher proportion of MRSA among community-onset SA isolates, hospitals with lower percentage of beds in intensive care units, and hospitals outsourcing AST service (Table 1). **Conclusions:** HO-MRSA is independently associated with community burden of MRSA, older and female patient populations, and hospital teaching status and AST practices, which highlights the importance of public health engagement and regional collaborations to prevent MRSA. To provide a standardized MRSA proportion for public health surveillance, taking some of these factors into account in MRSA proportion standardization should be considered.

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Risk Factors for Carbapenemase Producing-Carbapenem Resistant Enterobacteriaceae in Those With CRE Positive Cultures

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Background: Carbapenem-resistant Enterobacteriaceae (CRE) are gram-negative bacteria resistant to at least 1 carbapenem and are associated with high mortality (50%). Carbapenemase-producing CRE (CP-CRE) are particularly serious because they are more likely to transmit carbapenem resistance genes to other gram-negative bacteria and they are resistant to all carbapenem antibiotics. Few studies have evaluated risk factors associated with CP-CRE colonization. The goal of this study was to determine the risk factors associated with CP-CRE colonization in a cohort of US veterans. **Methods:** We conducted a retrospective cohort study of patients seen at VA medical centers between 2013 and 2018 who had positive cultures for CRE from any site, defined by resistance to at least 1 of the following carbapenems: imipenem, meropenem, doripenem, or ertapenem. CP-CRE was defined via antibiotic sensitivity data that coded the culture as being 'carbapenemase producing,' being 'Hodge test positive,' or 'KPC producing.' Only the first positive culture for CRE was included. Patient demographics (year of culture, age, sex, race, major comorbidities, infectious organism, culture site, inpatient status, and CP-CRE status) and facility demographics

(rurality, geographic region, and facility complexity) were collected. Bivariate analysis and multiple logistic regression were performed to determine variables associated with CP-CRE versus non-CP-CRE. **Results:** In total, 3,322 patients were identified with a positive CRE culture: 546 (16.4%) with CP-CRE and 2,776 (83.63%) with non-CP-CRE. Most patients were men (95%) and were older (mean age, 71; SD, 12.5) and were diagnosed at a high-complexity VA medical center (65%). Most of the cultures were urine (63%), followed by sputum (13%), and blood (7%). Most were from inpatients (46%), followed by outpatients (42%), and long-term care facilities (12%). Multivariable analysis showed the following variables to be associated with CP-CRE positive cultures: congestive heart failure ($P = .0136$), African American ($P = .0760$), *Klebsiella* spp ($P < .0001$), GI cancers ($P = .0087$), culture collected in 2017 ($P = .0004$), and culture collected in 2018 ($P < .0001$). There were also significant differences CP-CRE frequencies by geographic region ($P < .001$). **Discussion:** CP-CRE diagnoses are relatively rare; however, the serious complications associated make them important infections to investigate. In our analysis, we found that congestive heart failure and gastric cancer were comorbidities strongly associated with CP-CRE. In 2017, the VA formalized their CP-CRE definition, which led to more accurate reporting. **Conclusions:** After the guideline was implemented, CP-CRE detection dramatically increased in noncontinental US facilities. More work should be done in the future to determine the different risk factors between non-CP-CRE and CP-CRE infections.

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Risk Factors for Cesarean Section Surgical Site Infections: A Systematic Review

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Background: According to the CDC NHSN, surgical site infections (SSI) are wound infections that develop within 30 days postoperatively for nonimplanted surgeries such as cesarean sections. SSIs is shown to manifest in a continuum of a purulent discharge from surgical site to severe sepsis. It contributes to rising morbidity, mortality and prolonged length of stay. **Objective:** To describe risk factors to the development of SSI in cesarean section in descriptive studies. **Methods:** The Preferred Reporting Items for Systematic Reviews (PRISMA) reporting guidelines is used as method for this systematic review. A PubMed literature search was conducted, limited to published articles in English from 1998 to 2016 using the broad key terms “cesarean section,” “surgical site infection,” and “risk factor.” The following inclusion criteria were applied to all reviews: (1) peer-reviewed journal, (2) computed risk factor for SSI development, and (3) calculated SSI rate. Reviews of references of the include studies were conducted, and 7 studies were appraised, with only 1 accepted. Results: After extracting data from 52 article reviews, 23 were finally accepted based on the inclusion criteria. Most studies were multivariate studies ($n = 8$) followed by cohort studies ($n = 6$). Unique numerators and denominators for SSI reviews were mentioned in all 23 studies, of which 22 studies followed the CDC NHSN definitions for SSI. Within the 23 studies, most studies showed that obesity (11.46%) is a common maternal risk factor

for the development of postoperative cesarean section SSI. **Conclusions:** Identifying that obesity is a major contributor of surgical site infection in postoperative cesarean section women is a topic that warrants exploration. The relationship of cesarean section SSI to obesity should be investigated, specifically highlighting the level of obesity based on the WHO international body mass index (BMI) classification and the development of SSI. A correlation between increasing wound infection rates and increasing body mass index should be studied further. Published recommendations for preventing SSIs in this population should be reviewed.

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Risk Factors for Surgical Site Infection After Orthopedic Trauma Surgery: A Two-Year Prospective Multicenter Analysis

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Background: Trauma is defined by the NHSN as “blunt or penetrating traumatic injury.” Therefore, if the surgery was performed because of a recent fall, for example, then it is a trauma surgery. Here, we investigated which preoperative and operative parameters are associated with surgical site infection (SSI) after orthopedic trauma surgery. **Objective:** We aimed to answer 3 main questions: What is the risk of wound infection for patients undergoing trauma surgery? What are the main etiologic agents of SSI after trauma surgery? And what are the risk factors associated with SSI after trauma surgery? **Methods:** This prospective multicenter cohort study included 2,035 patients undergoing trauma surgery between July 2016 and June 2018 in 4 hospitals in Belo Horizonte, Brazil. Outcome variables were SSI, hospital mortality, and length of hospital stay. The following preoperative and operative parameters were evaluated: age, length of hospital stay before surgery, duration of surgery, number of professionals at surgery, number of hospital admissions, surgical wound classification, American Society of Anesthesiologists (ASA) preoperative assessment score, type of surgery (elective, emergency), general anesthesia (yes, no), trauma surgery (yes, no), and the 3-point prediction Nosocomial Infections Surveillance (NNIS) risk index. **Results:** The overall estimated SSI risk was 2.8% (95% CI, 2.0%–3.6%). Hospital mortality risk after trauma surgery was 3.4% (95% CI, 2.8%–4.4%). Hospital length of stay parameters in noninfected patients were as follows: mean, 8 days; median, 3 days; SD, 12 days. Hospital length of stay parameters in infected patients were mean, 30 days; median, 23 days; with SD, 31 days. The parameters for hospital stay in infected patients were mean, 10 days; median, 3 days, and SD, 15.9 ($P < .001$). Trauma orthopedic surgery lasting >2 hours was associated with approximately twice the risk (RR, 2.2) of developing an SSI compared to ≤ 2 hours of surgery: 27 of 739 (3.7%) versus 21 of 1,290 (1.6%), respectively, ($P = .005$) (Fig. 1). The NNIS risk index predicts the risk of SSI after trauma surgery ($P = .003$): 13 of 737 SSIs (1.8%) had an NNIS risk index of 0; 20 of 736 SSIs (2.7%) had an NNIS risk index of