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Avoiding surgical site infections

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For any patient about to undergo a surgical procedure, the possibility of developing a surgical site infection (SSI) is an ever-present risk. SSIs continue to represent the most common type of harm for the surgical population, estimated to occur in 2%-5% of all surgical procedures performed in the United States.[1-9] SSIs also represent 14% to 31% of all hospital-acquired infections and account for almost 77% of all deaths in patients with a hospital-acquired infection.[3,7, 10-12] The consequences of acquiring an SSI for the patient and family can be overwhelming, as an SSI significantly impacts the patient's morbidity and mortality.[1,4,5,7,9,11,13-19] As professional and regulatory agencies challenge and hold organizations accountable for a critical assessment of their prevention efforts, SSIs are a true public health concern and their elimination must be a priority for organizations to improve patient safety and the quality of care delivered.[8,20]

Background

Organizations can answer the challenge to improve patient safety and the quality of care by decreasing length of stay and readmissions, decreasing ICU admissions, and improving mortality for the surgical population, which includes decreasing or eliminating the incidence of SSIs. Patients who develop an SSI add, on average, 2 weeks to their hospital length of stay, are at increased risk to be admitted to an ICU by 60%, and are 2 to11 times more likely to die compared with patients who do not develop an SSI.[1,7,14,21,22] In addition, billions of dollars are spent annually to treat this undesirable surgical outcome.[3,15,23]

The focus of this study was to critically examine neurosurgical spinal SSIs and was initiated to answer the following questions in the literature:

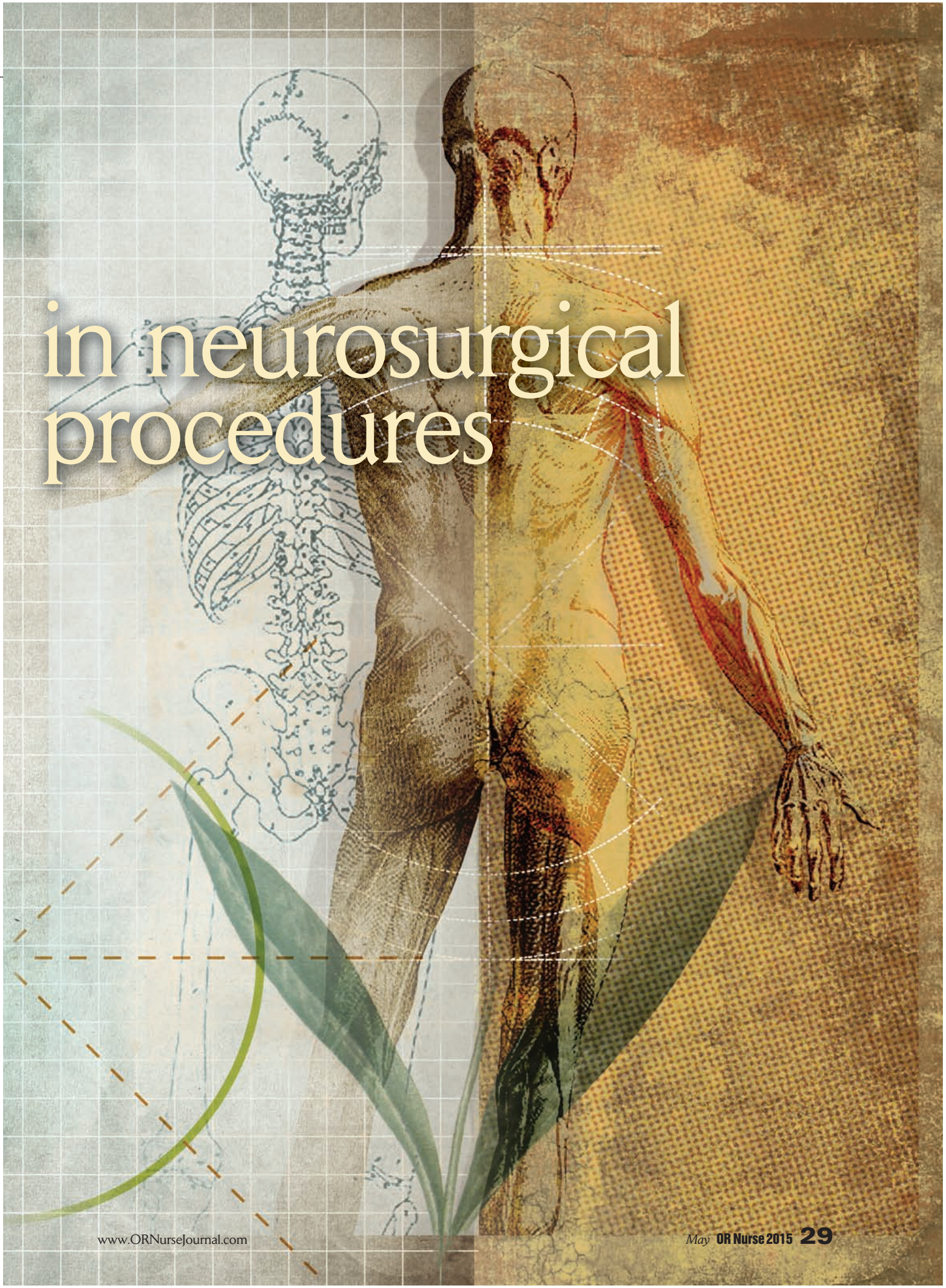
- What are the SSI risk factors for the neurosurgical spinal patient population?
- What evidence exists to describe SSIs in the neurosurgical spinal patient population?
- Is there a tool specifically designed for the neurosurgical spinal patient to assess SSI risk?

Literature review

Neurosurgical spinal procedure risk factors

The literature does identify additional risk factors contributing to an SSI that are unique to patients who will undergo a neurosurgical spinal procedure. These risk factors include: bowel and/or bladder incontinence; surgical approach (for example, posterior versus anterior); region of surgery (such as sacrum); history of previous spinal surgery; history of previous infection; intraoperative corticosteroid usage; utilization of fibrin glue or sealant, paste, or cement during surgery to repair a dural tear; instrumentation (such as implanting hardware); advanced age; blood loss during surgery; and fusions.[1,2,4,8,11,14,15,17,18, 24-29]

Although these risk factors specific to neurosurgical spinal surgery have been reported in the literature,



in neurosurgical procedures

there is not complete agreement due to relatively small sample sizes in the studies, small numbers of potential risk factors included in analyses, utilization of nonstandard definitions and variations in time frames for surveillance.[2,8,14,27,29,30] This lack of agreement adds complexity to accurately assessing the patient's true risk for an SSI in this population.

Assessing for risk

There are several SSI prediction tools available from organizations, such as the National Healthcare Safety Network (NHSN), formerly known as National Nosocomial Infections Surveillance (NNIS) risk index, the Surgical Invasiveness Index for spinal surgery,[28] and the American College of Surgeons' National Surgical Quality Improvement Program (NSQIP) web-based surgical risk calculator,[32] but these tools have limitations.

A tool typically utilized for SSI prediction is the NNIS risk index (currently known as NHSN), which stratifies patient risk for SSI utilizing the American Society of Anesthesiologists (ASA) Physical Status Classification System, surgical wound classification, and length of surgery.[6,14,19,31] Although the NNIS risk index has long been used for prediction, its limitations must be discussed and explored. Of particular interest for the patient having spinal surgery, limitations of the NNIS risk index include: the uncertainty of equally weighing all of the three elements of risk (such as a healthy and unhealthy patient are both assigned at the same level of risk for a wound class IV procedure), the inability to stratify risk based on a specific surgical procedure, the failure to account for inherent patient risk and intraoperative factors (other than wound classification) influencing SSI, and the final score limiting the discriminatory abilities since it reflects a small number.[6,14,19,31]

Cizik and colleagues examined the degree of surgical invasiveness in spinal surgery and compared to the risk of developing an SSI utilizing the Surgical Invasiveness Index.[28] This index takes into consideration the vertebral level, type of surgery (for example, arthrodesis or fusion), instrumentation, and approach (such as posterior or anterior) and points are assigned based on those factors. Cizik and colleagues found those patients with a higher Surgical Invasiveness Index score assigned, correlated with the strongest risk to develop an SSI, which differs from other studies found in the literature.[28] The index does not take into consideration the patient's comorbidities for developing an SSI, but rather focuses on the technical aspect of the surgery itself; whereas both are important in identifying those patients at highest risk for developing an SSI.

Also available to assess risk is the American College of Surgeons, NSQIP surgical risk calculator, a web-based tool.[32] This surgical risk calculator was developed utilizing data from 393 participating NSQIP hospitals.[32] The risk calculator takes into consideration 21 patient risk factors (such as age, ASA score, body mass index [BMI]) and the planned surgical procedure (for example, Current Procedural Terminology or CPT code) to assess the risk of not only SSI, but also eight other outcomes such as urinary tract infections, venous thromboembolism, and kidney failure.[32] Although this risk calculator is well developed, it does not include risk factors specific to a surgical population (for example, neurosurgical-specific risk factors) and cannot consider intraoperative risk factors that may influence the development of SSIs including: dural tear, use of glue or cement, drain placement, blood transfusion, and appropriate antibiotic redosing.[9]

Purpose

The ability to accurately assess and predict those patients at highest risk for an SSI and translate this information into prevention efforts would be a powerful tool for any organization. With the ability to correctly identify patients at highest risk for SSI prior to surgery, decisions regarding treatment and preventive strategies could be implemented with the ultimate goal to eliminate these devastating outcomes.[6,31]

The literature identifies risks specifically focused on patients undergoing spinal surgery, but does not demonstrate complete agreement regarding those risk factors. Nor is there a specific evidence-based practice (EBP) tool that can be utilized preoperatively and intraoperatively to assess a patient's risk of developing an SSI for patients having spinal surgery. Thus, the purpose of this study was twofold:

1. To identify the specific SSI risk factors for patients undergoing spinal surgery, and
2. To develop a risk assessment tool based on variables identified in the literature and results from this study that may contribute to prevention of an SSI.

Methods

Study setting

This project was conducted at an acute care hospital in the southeastern United States performing approximately 13,217 surgical cases per year with approximately 2,579 of those being neurosurgical spinal cases. This project was also approved by the appropriate institutional review board prior to data collection.

Study design

To examine specific SSI risk factors for the patient undergoing spinal surgery, a retrospective chart review was conducted utilizing similar methodology as discussed in previous studies focusing on neurosurgery spinal SSI.[1,2,14,17,24,25] A detailed drill down tool was created reflecting specific risk factors identified in the literature contributing to SSI in the neurosurgery spinal population.[1,2,14,17,24,25] This tool was completed for every patient identified as developing an SSI who underwent a neurosurgery spinal procedure (case patient) occurring in a 1-year time frame from June 2012 to June 2013.

For each case patient, the tool was also completed for three randomly selected noninfected patients (match control) who underwent a neurosurgery spinal procedure during the same time frame as the case patient (June 2012-June 2013) that were matched based on type of surgery and ASA score (for example, fusion, ASA 3). The number of case patient/match control patient ratio (1:3) for this project was determined by averaging the case patient/match control patient ratios described in previous studies examining neurosurgical risk factors for SSI.[1,2,14,17,24,25]

Inclusion criteria for both case patient and match control included 18 years of age or older and underwent a neurosurgery spinal procedure occurring during the time frame of June 2012 through June 2013. The CDC definition of an SSI was utilized in the identification of a confirmed SSI.[10]

Data collection

Information regarding patients who developed an SSI during the time frame of June 2012-June 2013 was provided by the organization's infection prevention department that had already established a program for tracking patients who developed an SSI for targeted surgical procedures, one of which was spinal cases.

The organization went live with a new electronic medical record (EMR) in November 2012. Data collection prior to the EMR was difficult and challenging, specifically surrounding the elements of illegible handwriting found in the documentation and the difficulty locating documents related to the nonspecific labeling of important documents as they were scanned into the patient's new EMR (for example, the operative record was not always labeled operative record). For this reason, the match control patients were pulled from procedures occurring from November 2012-June 2013, the time frame after EMR implementation.

To confirm reliability of data collection, 10% of the sample was randomly selected to assess for interrater reliability. The detailed audit tool was completed by another member of the team to demonstrate reliability in the data collection process.

Statistical analysis

Utilizing SPSS version 21, the first statistical analysis performed was computation of summary information for various variables. The main statistical procedure used was binary logistic regression, a common tool to model binary response variables that in this project is the incidence of SSI.

Logistic regression was utilized in two stages. In the first stage, only the individual predictors were analyzed to identify if any of the predictors would show a *p*-value of less than 0.15. In the final analysis, predictors were categorized as significant only with a *p*-value less than 0.05. Once this first stage or initial screening was completed, a short list of the predictors was identified. Using the short list of predictors, a binary logistic regression was again performed utilizing the forward selection option to account for mutual correlations/associations among various predictors.

Results

Between June 2012 through June 2013, 18 patients who underwent neurosurgical spinal surgery developed an SSI. The final sample size consisted of 73 patients; reflecting both patients who developed a SSI (n = 18), and patients who did not develop a SSI (n = 55). Most of the patients in this project's sample were White (81%) and female (60%) with a mean age of 58.9 (with a standard deviation of 14.05 years). (See *Examining neurosurgical SSI patient characteristics.*) From this sample, 58% (n = 42) of the patients were current

Examining neurosurgical SSI patient characteristics

Characteristics	n (%)	SSI (n = 18)	No SSI (n = 55)
Gender (n = 73)			
Male	29 (40%)	6 (33.3%)	23 (41.8%)
Female	44 (60%)	12 (67.7%)	32 (58.2%)
Race			
White	59 (81%)	16 (88.9%)	43 (78.2%)
Black	13 (18%)	2 (11.1%)	11 (20%)
Other	1 (1%)	0 (0%)	1 (1.8%)
Procedure			
Fusion	57 (78%)	15 (83.3%)	42 (76.4%)
Laminectomies	13 (18%)	3 (16.7%)	10 (18.2%)
Other	3 (4%)	0 (0%)	3 (5.5%)
Location			
Thoracic	2 (3%)	2 (11.1%)	0 (0%)
Lumbar	65 (89%)	15 (83.3%)	50 (90.9%)
Cervical	6 (8%)	1 (5.6%)	5 (9.1%)
History of diabetes			
Yes	16 (22%)	4 (22.2%)	12 (21.8%)
No	57 (78%)	14 (77.8%)	43 (78.2%)
Smoker			
Yes	42 (58%)	12 (66.7%)	30 (54.5%)
No	31 (42%)	6 (33.3%)	25 (45.5%)
Appropriate antibiotic administration			
Yes	62 (85%)	13 (72.2%)	49 (89%)
No	11 (15%)	5 (27.8%)	6 (11%)
CHG bath*			
Night before surgery	49 (67%)	11 (61.1%)	38 (69.1%)
Day of surgery	66 (90%)	16 (88.9%)	50 (90.9%)
Previous spinal surgery			
Yes	43 (59%)	13 (72.2%)	30 (54.5%)
No	30 (41%)	5 (27.8%)	25 (45.5%)
Pre-op PCR screening positive			
Staphylococcus aureus	15 (20%)	2 (11%)	13 (24%)
MRSA	4 (5%)	1 (5%)	3 (5%)

* Percentages do not add to 100%; includes patients who had CHG baths both the night before surgery and the day of surgery; and patients who had one CHG bath

Characteristic	Minimum	Maximum	Mean	Std. Deviation
Age**	20	86	58.90	14.052
SSI (n=18)	28	75	60.38	14.91
No SSI (n=55)	20	86	58.41	13.86
BMI	17.2	52.7	31.67	6.718
SSI (n=18)	17.2	35.40	29.06	4.67
No SSI (n=55)	22.20	52.70	32.53	7.09

(Continued)

Examining neurosurgical SSI patient characteristics (continued)

Characteristic	Minimum	Maximum	Mean	Std. Deviation
Blood glucose level prior to surgery (mg/dL)	68	252	110.45	32.11
SSI	77	180	107.47	23.88
No SSI	68	252.00	11.49	34.67
Procedure time (in minutes)	22	680	160.876	99.305
SSI	90	319	170.50	61.37
No SSI	22	680	157.72	109.18

**37% of patients over the age of 65

or past smokers, 22% (n = 16) had diabetes, 85% (n = 62) received appropriate antibiotic administration during the surgical procedure, 90% (n = 66) had at least one chlorhexidine gluconate (CHG) bath (either the night before surgery, day of surgery, or both), and had a mean BMI of 31.67 (with a standard deviation of 6.72). Three percent (n = 2) of the surgeries were thoracic procedures, with the majority of the surgical procedures, 89% (n = 65), occurring at the lumbar level, followed by 8% (n = 6) at the cervical level. For those patients who developed an SSI (n = 18), 39% (n = 7) were classified as organ space, 33% (n = 6) as deep, and 28% (n = 5) as superficial infections with the strongest percentage of causative organism being methicillin-sensitive *Staphylococcus aureus* (MSSA) or methicillin-resistant *Staphylococcus aureus* (MRSA) at 39%. (See *Type of SSI and specific organism.*)

Binary logistic regression was used to identify significant predictors of SSI. In Stage 1 screening utilizing binary logistic regression, the following variables had a *p*-value of less than 0.15: skin closure with suture and/or skin adhesive as compared to staples ($p = 0.006$; significant), type of intraoperative prepping agent used ($p = 0.002$; significant), placement of drains ($p = 0.002$; significant), a specific OR had a greater risk to develop a SSI as compared with the other OR rooms ($p = 0.038$; significant), BMI score ($p = 0.063$), patient age over 65 ($p = 0.065$), utilization of glue during the procedure to repair dural tears (or potential dural tears) ($p = 0.082$), person who performed the surgical prep (RN compared with surgeon) ($p = 0.103$), anesthesia administration of a preoperative corticosteroid prior to the incision ($p = 0.123$), and history of previous SSI ($p = 0.129$). Only the significant predictors (*p*-value less than 0.05) were reported in the binary logistic regression significant variables stage 1. (See *Binary logistic regression.*)

The next analysis included a collective assessment of all of these risk factors, including those where the *p*-value was between 0.05 and 0.15. Sometimes individual predictors may have significant correlation with SSIs; however, some of these predictors may be filtered out in a group analysis because their contribution to the development of SSI may be better explained by some other predictors. By utilizing this approach, one can account for cross-correlation among predictors. In this patient sample, the strongest predictors of SSI included the type of intraoperative prepping solution utilized and how skin closure was performed.

Patients who received iodine povacrylex in isopropyl alcohol as the intraoperative prepping agent as compared to povidone-iodine had a decreased risk of infection by 83% ($p = 0.009$ with an odds ratio of 0.17). Patients who had their skin closed with suture and/or skin adhesive as compared to staples had a decreased risk of infection by 92.4% ($p = 0.006$ with an odds ratio of 0.076). Based on chi-square test of association (Likelihood ratio test *p*-value = 0.026), the sample also demonstrated an association with decreasing risk for SSI with appropriate antibiotic administration,[4,7,9,29] which included: antibiotic administration prior to surgery, appropriate redosing as indicated by length of surgery, and presurgical antibiotic selection. (See *Appropriate antibiotic administration chi-square test of association.*)

Since the surgical team can control the intraoperative prepping agent and type of skin closure with standardization of practice, data was assessed in the absence of the intraoperative prepping agent used and skin closure for those variables demonstrating significance in the stage 1 analysis. The following risks related to SSI in the absence of skin prep and skin closure were identified: patients whose dural tears (or potential dural tears) were repaired with glue were 8.3 times more likely to develop an SSI as compared with patients whose tears were not repaired with glue ($p = 0.041$ with an odds ratio of 8.31). Patients who had drains placed were 7.7 times more likely to develop an SSI as compared with patients who did not ($p = 0.001$ with an odds ratio of 7.66).

No statistical significance was found with the following risk factors in this project's sample: gender, diabetes, blood glucose level prior to surgery, smoking, age, lowest patient temperature during surgery, polymerase chain reaction (PCR) positive for *Staphylococcus aureus* and/or MRSA, application of CHG baths prior to surgery, multilevel surgery, bladder and/or bowel incontinence, previous spinal surgery, or length of surgery.

Type of SSI and specific organism

SSI (n = 18)

Type of SSI	**n (%)**
Superficial	5 (28%)
Deep	6 (33%)
Organ	7 (39%)
Organism for SSI	**n (%)**
Staphylococcus aureus/MRSA	7 (38.8%) Note: 1 was MRSA
No growth (no organisms grew)	5 (27.7%)
Coagulase-negative *staphylococci*	2 (11.1%)
Enterobacter	1 (5.6%)
Streptococcus	1 (5.6%)
Not cultured	1 (5.6%)
Pseudomonas aeruginosa	1 (5.6%)

Discussion

The patient sample in this project demonstrated similar risk factors for developing an SSI as reported in some studies, but is not in agreement with all the risk factors previously reported in the literature. For this sample, intraoperative actions and interventions demonstrated the greatest link to SSI risk, rather than dependent variables of patient risk, such as diabetes, BMI, and history of smoking. Risk factors such as intraoperative prepping solution used, closing the skin with staples, the placement of drains, glue used to repair a dural tear (or potential dural tear), and timing of antibiotic administration demonstrated the greatest risks for SSI in this sample.

High BMI, smoking history, and diabetes are well known, widely accepted risk factors for the development of SSI. Similar to some recently published studies focusing on this same patient population, this project did not find a statistical link with these risk factors.[8,9,19,26,27] Recognizing that these risk factors do pose an increased risk for SSI, could this lack of significance found in this project, as well as other studies, be related to the positive impact of best practice bundles such as the surgical care improvement project (SCIP), PCR testing, and following established guidelines to mitigate those risks for developing an SSI?

Nursing implications

The results of this project support the development of an EBP risk assessment tool that accurately reflects not only preoperative risk factors, but also includes an assessment of intraoperative risk factors for SSI as well. The NNIS risk index assessment tool takes into account only limited data to assess the patient's true risk for developing an SSI (ASA score, wound classification, and length of surgery). Although the NSQIP risk assessment tool is more robust than the traditional NNIS risk index, it fails to account for specific risk factors occurring in a surgical patient population (for example, in neurosurgical patients, specific risk factors may include bladder and/or bowel incontinence or previous spinal surgery). In addition, the NSQIP risk assessment tool also fails to account

Binary logistic regression

Significant variables stage 1

	B	S.E.	Wald	df	Sig.	Exp (B)
Specific OR	2.420	1.165	4.313	1	0.038	11.250
Prep agent*	-1.872	0.614	9.295	1	0.002	0.154
Skin closure**	-1.851	0.674	7.547	1	0.006	0.157
Drains	1.885	0.598	9.611	1	0.002	6.389

Significant variables stage 2

	B	S.E.	Wald	df	Sig.	Exp (B)
Prep agent*	-1.774	0.675	6.910	1	0.009	0.170
Skin closure**	-2.582	0.938	7.582	1	0.006	0.076

* Prep agent (1 = Povidone-iodine scrub and paint; 2 = iodine povacrylex in isopropyl alcohol)
** Skin closure (0 = staples; 1 = suture and/or skin adhesive)

Significant variables stage 2 in the absence of prepping agent and type of skin closure

	B	S.E.	Wald	df	Sig.	Exp (B)
Drain	2.036	0.633	10.354	1	0.001	7.659
Utilization of glue	2.118	1.038	4.166	1	0.041	8.312

B = Regression Coefficients, S.E. = Standard Error, Wald = Wald Statistic used to test the true value of the parameter based on the sample estimate, df = degrees of freedom, Sig. = p-value, Exp (B) = odds ratio

Appropriate antibiotic administration chi-square test of association

Chi-square test

	Value	df	Asymp. Sig (2-sided)
Pearson chi-square	5.507[a]	2	0.064
Likelihood ratio	7.337	2	0.026
Linear-by-linear association	0.740	1	0.390
N of valid cases	73		

[a]. 2 cells (33%) have expected count less than 5. The minimum expected count is 2.22, df = degrees of freedom, Asymp. Sig (2-sided) = p-value using chi-square test of association

for risk introduced during the intraoperative phase of patient care that may be unknown prior to the incision (such as intraoperative prepping agent, appropriate antibiotic redosing, dural tear, glue used to repair an actual or potential dural tear, drain placement, and blood transfusion). The Surgical Invasiveness Index does not take into consideration the patient's comorbidities

for developing an SSI, but rather focuses on the technical aspect of the surgery itself; whereas both are important in identifying those patients at highest risk for developing an SSI. Thorough and accurate assessment of a patient's risk for developing an SSI should consider and include both intraoperative risk factors as well as preoperative risk factors.

This study did have limitations. Although this project was conducted utilizing similar methodology as discussed in previous studies focusing on neurosurgery spinal SSI, the sample size was relatively small, potentially compromising the results due to the lack of statistical power. With that said, the results of this study strongly support the development of a risk assessment tool for SSI prediction that specifically includes intraoperative risk factors and warrants a larger well-designed study to fully explore this phenomenon. In addition, this project also only looked at neurosurgical spinal patients. Future projects should assess the patient population with orthopedic spinal surgery.

A second limitation was the timing of the project, which occurred during implementation of a newly integrated EMR. Finding information in the old "paper" chart was very challenging related to illegible handwriting and nonspecific labeling of important scanned documents (for example, the operative record was not always labeled "operative record"). In addition, the new EMR posed unique challenges of its own. With the new EMR system, it was challenging finding all the different areas (such as screens) where data for this project could be documented, and not all areas of documentation automatically communicated and transferred

Risk assessment tool for neurosurgical spinal cases

This assessment tool was developed utilizing risk factors for spinal cases described in the literature and results from this study, in an effort to identify patients at a higher risk to develop an SSI.[1,2,4,8,11,14,15,17,18,24-27,29] The next step is to validate the tool through research. Patients are scored utilizing the criteria as defined below in each box. Each box is scored independent of the other. If a patient is scored as high risk in either one of the boxes, the patient is considered high risk to develop an SSI (For example, the patient does not have to score as high risk in both boxes, just one of the boxes utilizing the criteria defined below to be considered high risk for an SSI). The next step is to validate this tool through research.

The patient has an increased potential to develop an SSI if the patient has one or more of the following risk factors:

- Existing clinical infection
- Wound classification of 3/4 (contaminated and/or dirty/infected)
- Antibiotic redosing missed intraoperatively for surgeries greater than 4 hours
- Glue utilized during surgery to repair a dural (or potential dural) tear
- Drains placed

The patient has an increased potential to develop an SSI if the patient has four or more of the following risk factors:

- BMI greater than 30
- Diabetes
- History of previous SSI
- History of previous spinal surgery
- Smoker (current or past history)
- Bowel or bladder incontinence
- Posterior approach with multiple-levels
- ASA Physical Status Classification System score 3 or greater
- Blood transfusion during surgery
- Blood loss greater than 300 mL

Tool developed by Jennifer L. Fencl, DNP, RN, CNS-BC, CNOR; Felecia G. Wood, PhD, RN, CNL; Sat Gupta, PhD; Vangela Swofford, BSN, RN, ASQ-CSSBB, CPHQ; Melissa Morgan, BSN, RN, CIC; Debbie Green, DNP, RN, CENP.

information. For example, CHG baths preoperatively could be located in three different areas, two of which automatically communicated with each other and transferred information, but one of the areas stood alone. This is a common problem with efforts to make improvements in this rapidly changing healthcare environment, and one that many organizations will likely experience as they attempt to strengthen the quality of their care.

An important implication of this study is for the departments of nursing, medicine, and infection prevention to collaboratively develop an EBP SSI risk assessment tool to identify patients at highest risk for SSI during the preoperative and intraoperative phases of patient care. An assessment tool was developed utilizing risk factors for spinal cases described in the literature and results from this study, in an effort to identify patients at a higher risk to develop an SSI.[1,2,4,8,11,14,15,17,18,24-27,29] (See *Risk assessment tool for neurosurgical spinal cases.*) The next step will be to validate this tool through additional research.

Moving forward

By developing and validating a tool to help identify patients at risk for SSI, organizations could standardize practices based on published evidence such as the healthcare provider who preps patients, prepping agent, and wound closure. In addition, treatments such as irrigation of the wound with povidone-iodine or another solution prior to wound closure,[5,8,27] application of specialty dressings (such as silver impregnated dressing) could also be implemented in an effort to prevent an SSI. This same methodology could be utilized to further explore and expand on SSI risk factors for other specific surgical populations (for example, colon surgery) and create EBP SSI risk assessment tools based on that information.

Being able to proactively identify patients at highest risk for a neurosurgical (or any) SSI is powerful information for an organization to help drive quality and safe patient care. Healthcare organizations must take measures to identify their patients at highest risk for poor outcomes and thoughtfully implement strategies that ultimately improve care and eliminate the occurrence of these potentially devastating infections. This forward thinking supplements best practices for SSI prevention already established in the literature that include: continued vigilance regarding proper dress attire, strict adherence to sterile technique, appropriate skin prep, thorough cleaning of the OR in-between procedures and terminal cleaning, minimizing/eliminating immediate use steam sterilization (also known as flash sterilization),[4,8,12] and continued assessment of best practice bundles such as the SCIP, CHG preoperative baths, and decolonizing patients prior to surgery.[5,20] **OR**

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