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DEFORMITY

Rates of Infection After Spine Surgery Based on 108,419 Procedures

A Report from the Scoliosis Research Society Morbidity and Mortality Committee

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Study Design: Retrospective review of a prospectively collected database.

Objective. Our objective was to assess the rates of postoperative wound infection associated with spine surgery.

Summary of Background Data. Although wound infection after spine surgery remains a common source of morbidity, estimates of its rates of occurrence remain relatively limited. The Scoliosis Research Society prospectively collects morbidity and mortality data from its members, including the occurrence of wound infection.

Methods. The Scoliosis Research Society morbidity and mortality database was queried for all reported spine surgery cases from 2004 to 2007. Cases were stratified based on factors including diagnosis, adult (≥21 years) *versus* pediatric (<21 years), primary *versus* revision, use of implants, and whether a minimally invasive approach was used. Superficial, deep, and total infection rates were calculated.

Results. In total, 108,419 cases were identified, with an overall total infection rate of 2.1% (superficial = 0.8%, deep = 1.3%). Based on primary diagnosis, total postoperative wound infection rate for adults ranged from 1.4% for degenerative disease to 4.2% for kyphosis. Postoperative wound infection rates for pediatric patients ranged from 0.9% for degenerative disease to 5.4% for kyphosis. Rate of infection was further stratified based on subtype of degenerative disease, type of scoliosis, and type of kyphosis for both adult and pediatric patients. Factors associated with increased rate of infection included revision surgery ($P < 0.001$), performance of spinal fusion ($P < 0.001$), and use of implants ($P < 0.001$). Compared with a traditional open approach, use of a minimally invasive approach was associated with a lower rate of infection for lumbar discectomy (0.4% *vs.* 1.1%; $P < 0.001$) and for transforaminal lumbar interbody fusion (1.3% *vs.* 2.9%; $P = 0.005$).

Conclusion. Our data suggest that postsurgical infection, even among skilled spine surgeons, is an inherent potential complication. These data provide general benchmarks of infection rates as a basis for ongoing efforts to improve safety of care.

Key words: spine surgery, complications, infection, instrumentation, pediatric, minimally invasive, deformity. **Spine 2011;36:556–563**

Despite substantial advancements in the surgical care of spine disease, postoperative wound infections remain a relatively common source of morbidity and increased costs.[1,2] Although several potential risk factors for the development of postoperative spinal wound infections have been suggested,[3–17] the etiology of the vast majority remains unclear.

The rate of wound infection after spine surgery is dependent on many factors, including the complexity of the procedure, health status of the patient, and potentially the experience and technique of the operating surgeon and facility related factors. This multifactorial nature of spinal wound infection complicates the ability to determine rates of wound infection that have generalizable, clinically meaningful applicability.

Documentation of the rates at which postoperative spine infections occur is important for several reasons, including preoperative patient counseling, quality improvement, and potentially medicolegal issues. The reported rate of postoperative spine infection ranges from 0.3% to 20%.[4–10,18–22] However, the

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majority of these reports are based on relatively small patient populations, single surgeon or single institution experiences, or include a heterogeneous collection of spine procedures.

The Scoliosis Research Society (SRS) is a group of predominantly fellowship-trained spine surgeons and pediatric orthopedists dedicated to the study of spinal deformity. As part of its mission, the SRS collects surgical case data from its members, including morbidity and mortality (M&M). The resulting database consists of a consecutively collected series of cases, representing a broad range of procedures, from simple lumbar discectomy to complex deformity correction. In addition, these cases are submitted by spine surgeons with a broad range of experience and were performed at multiple institutions spanning the country and world. We have previously provided validation of this database for the assessment of complications associated with spine surgery.[23]

Our objectives in the present study were twofold. First, we sought to assess the rates of postoperative wound infection associated with spine surgery based on primary diagnosis, using cases submitted to the SRS M&M database over four consecutive years. Second, we stratified cases based on multiple factors, including subdiagnosis, patient age, spinal level, primary *versus* revision surgery, and surgical approaches, to determine the corresponding rates of infection and to assess for potential factors associated with the occurrence of infection.

MATERIALS AND METHODS

Patient Population

Before application for active membership in the SRS, surgeons must complete 5 years of candidate membership. International membership status is also available for surgeons outside of the United States. Candidate members are required to collect and submit data on all spine cases performed, including all associated M&M. Reported complications do not influence whether a candidate is offered membership, since the SRS membership committee is only provided with indication as to whether each candidate member has completed the required case submission process, not the number or types of complications for each candidate. Active members are also encouraged to submit their cases. Deidentified data are collected using a questionnaire developed by the SRS M&M committee in the 1990s and updated to a secure Internet-based data entry form in 2001. The SRS has invested substantial resources in this database and emphasizes to its membership the importance of accurate and consistent reporting. In addition, data submission includes a process in which members formally attest that submitted data are true and complete.

The SRS M&M database was queried for all cases reported from the years 2004 through 2007. Extracted data included patient age, diagnosis, whether the surgery was primary *versus* revision, whether a spinal fusion was performed and if so the type of fusion, whether implants were used, whether a minimally invasive approach was used, and whether a superficial or deep infection occurred after surgery. Patients were stratified based on age as either pediatric (younger than 21 years) or adult (aged 21 years or older).

This project was submitted to the Hospital for Special Surgery (New York, NY) institutional review board and was determined to be exempt from institutional review board approval based on use of deidentified data (institutional review board #29045).

Statistical Analyses

Frequency distributions and summary statistics were calculated for all clinical and demographic data. For categorical variables, cross-tabulations were generated and Fisher exact tests were used to compare distributions. All statistical analyses were two sided. $P < 0.05$ was considered significant.

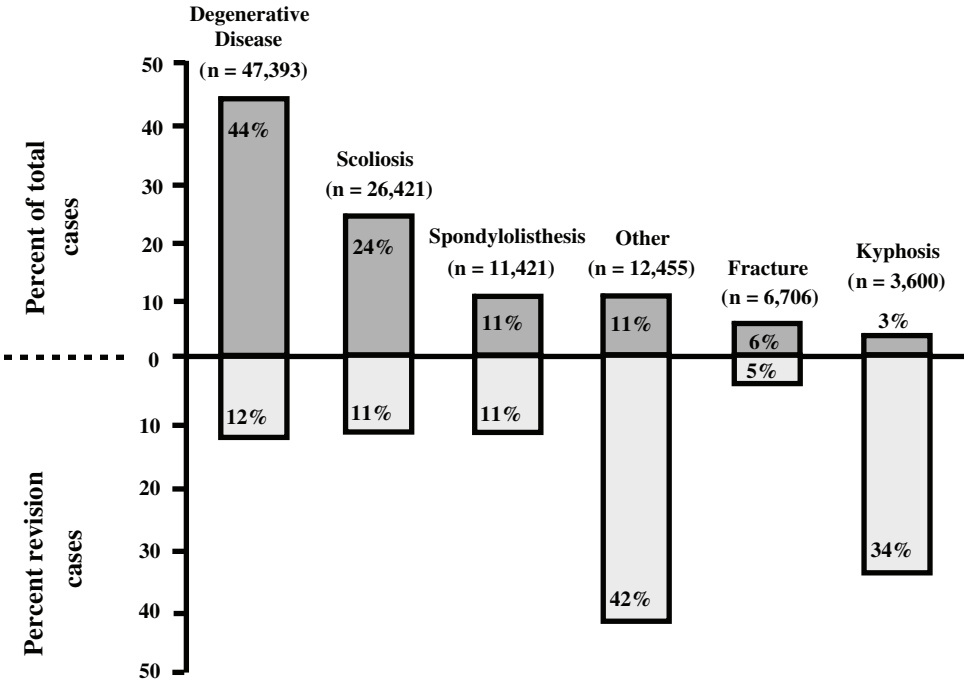

Figure 1. Distribution of cases based on primary diagnosis and percentage of revision cases. The top half of the plot shows the percentage of cases represented by each primary diagnosis, The 423 cases for which primary diagnosis was not reported are not included. The bottom half of the plot shows the percentage of cases within each primary diagnosis that were revison cases.

RESULTS

A total of 108,419 surgical cases were reported to the SRS M&M database from 2004 to 2007. The mean patient age was 47 years (median: 48, range: 1 month–97 years), with 76% of cases performed in adult and 24% in pediatric patients. The distribution of cases by primary diagnosis and the percentage of revision cases within each diagnosis are shown in Figure 1. Procedures using a minimally invasive approach comprised 13% of cases. Of the total cases, spinal fusion was performed in 67%. Active members contributed the majority of cases (71%), followed by candidate members (23%) and international members (6%).

The overall rates of superficial and deep infection were 0.8% and 1.3%, respectively. Superficial and deep infections occurred in 0.8% and 1.2% of adult patients (n = 82,082), respectively, and in 1.0% and 1.7% of pediatric patients (n = 25,432), respectively (Table 1). Based on primary diagnosis, the rate of infection ranged from 1.4% for degenerative disease to 4.2% for kyphosis among adults and ranged from 0.9% for degenerative disease to 5.4% for kyphosis among pediatric patients (Table 1). Cases reported as pediatric degenerative disease predominantly consisted of disc herniations, stenosis, or degenerative disc disease, with the vast majority involving the lumbar region. Notably, metastatic tumor and acute osteodiscitis, two subgroups within the "other" category for adults, each had infection rates of approximately 5%.

The overall rate of infection among adult patients with a primary diagnosis of degenerative disease varied based on spinal location, with the highest rate for thoracic procedures (2.1%), followed by lumbar (1.6%) and cervical (0.8%) procedures (Table 2). Within each spinal location, the rate of infection varied based on the diagnosis. For each spinal location, the rate of infection was lowest for disc herniations, ranging from 0.5% for cervical to 1.7% for thoracic herniations. The

TABLE 1. Rate of Infection Based on Patient Age and Primary Diagnosis*

Primary Diagnosis	No. Cases	Superficial Infection (%)	Deep Infection (%)	Total Infection (%)
Adult (≥21 yr)				
Degenerative disease	46,434	308 (0.7)	342 (0.7)	650 (1.4)
Scoliosis	5801	66 (1.1)	146 (2.5)	212 (3.7)
Spondylolisthesis	10,529	93 (0.9)	130 (1.2)	223 (2.1)
Fracture	6025	31 (0.5)	92 (1.5)	123 (2.0)
Kyphosis	2012	28 (1.4)	57 (2.8)	85 (4.2)
Other	11,089	113 (1.0)	237 (2.1)	350 (3.2)
Primary Tumor†	404	4 (1.0)	7 (1.7)	11 (2.7)
Metastatic Tumor†	726	9 (1.2)	27 (3.7)	36 (5.0)
Acute osteo/discitis†	866	12 (1.4)	32 (3.7)	44 (5.1)
Implant revision/removal†	1720	16 (0.9)	39 (2.3)	55 (3.2)
Not recorded	192	2 (1.0)	2 (1.0)	4 (2.1)
Total	82,082	641 (0.8)	1006 (1.2)	1647 (2.0)
Pediatric (<21 yr)				
Degenerative disease	654	5 (0.8)	1 (0.2)	6 (0.9)
Scoliosis	20,424	195 (1.0)	341 (1.7)	536 (2.6)
Spondylolisthesis	827	9 (1.1)	12 (1.5)	21 (2.5)
Fracture	623	5 (0.8)	9 (1.4)	14 (2.2)
Kyphosis	1555	35 (2.3)	49 (3.2)	84 (5.4)
Other	1273	11 (0.9)	23 (1.8)	34 (2.7)
Primary tumor†	152	0 (0.0)	5 (3.3)	5 (3.3)
Implant revision/removal†	308	1 (0.3)	6 (1.9)	7 (2.3)
Not recorded	76	1 (1.3)	1 (1.3)	2 (2.6)
Total	25,432	261 (1.0)	436 (1.7)	697 (2.7)

*Age not recorded for 905 patients. These patients are not included in this table.

†Selected subgroup within the "other" category. Note that numbers of cases for these subgroups are part of the total other cases indicated.

TABLE 2. Rate of infection among adult patients with a primary diagnosis of degenerative disease, stratified based on spinal location and subtype of disease

Spinal Region/Diagnosis	No. Cases	Superficial Infection (%)	Deep Infection (%)	Total Infection (%)
Cervical				
Postlaminectomy syndrome	35	1 (2.9)	1 (2.9)	2 (5.7)
Spinal stenosis	3466	13 (0.4)	27 (0.8)	40 (1.2)
Spondylotic radiculopathy	1859	9 (0.5)	5 (0.3)	14 (0.8)
Degenerative disc disease	1769	5 (0.3)	7 (0.4)	12 (0.7)
Disc herniation	4472	11 (0.2)	12 (0.3)	23 (0.5)
Not recorded	73	0 (0.0)	0 (0.0)	0 (0.0)
Total	11,674	39 (0.3)	52 (0.4)	91 (0.8)
Thoracic				
Degenerative disc disease	95	0 (0.0)	3 (3.2)	3 (3.2)
Spinal stenosis	161	2 (1.2)	2 (1.2)	4 (2.5)
Disc herniation	235	3 (1.3)	1 (0.4)	4 (1.7)
Spondylotic radiculopathy	17	0 (0.0)	0 (0.0)	0 (0.0)
Not recorded	16	0 (0.0)	0 (0.0)	0 (0.0)
Total	524	5 (1.0)	6 (1.1)	11 (2.1)
Lumbar				
Spondylotic radiculopathy	949	22 (2.3)	14 (1.5)	36 (3.8)
Spinal stenosis	12,270	116 (0.9)	153 (1.2)	269 (2.2)
Postlaminectomy syndrome	573	6 (1.0)	4 (0.7)	10 (1.7)
Degenerative disc disease	7213	55 (0.8)	58 (0.8)	113 (1.6)
Disc herniation	12,694	62 (0.5)	51 (0.4)	113 (0.9)
Not recorded	211	2 (0.9)	2 (0.9)	4 (1.9)
Total	33,910	263 (0.8)	282 (0.8)	545 (1.6)
Spinal location not recorded	326	1 (0.3)	2 (0.6)	3 (0.9)

highest rate of infection among cases performed for cervical degenerative disease was associated with a diagnosis of postlaminectomy syndrome (5.7%). However, this estimate should be interpreted with caution, since only 35 cases and two infections were reported for this category (Table 2).

Scoliosis cases were further stratified by subtype and age group (Table 3). The rate of infection was higher for scoliosis cases than degenerative disease cases, and the proportion of deep wound infections was considerably greater. Among adult patients, the rate of infection ranged from 2.8% for idiopathic to 8.9% for neuromuscular scoliosis. The most common subgroup, degenerative scoliosis, had an intermediate rate of infection of 4.1%. Among pediatric cases, the most common subtype, idiopathic scoliosis, had the lowest rate of infection (1.4%). Although cases of posttraumatic scoliosis had relatively high rates of infection for both adult and pediatric patients, the numbers of cases reported are limited.

Kyphosis cases were also stratified based on the etiology of the deformity (Table 4). Postlaminectomy kyphosis was associated with the highest rate of infection among adults (5.1%). A wide range of infection rates was observed for pediatric kyphosis, ranging from 1.5% for congenital to 14% for neuromuscular kyphosis (Table 4).

Multiple surgical factors were assessed for an association with the occurrence of infection (Table 5). Cases that included spinal fusion had a 33% higher rate of infection (2.4% *vs.* 1.8%, $P < 0.001$). Among cases with spinal fusion, the rate of infection varied based on the type of fusion. Compared with the overall rate of infection associated with fusion cases, the rate of infection for anterior-only cases (0.6%) was significantly lower ($P < 0.001$), and the rates of infection for combined anterior-posterior fusions (3.2%), posterolateral-only fusions (3.0%), and interlaminar/facet-only fusions (2.8%) were significantly higher ($P < 0.001$, $P < 0.001$, and $P = 0.003$, respectively) (Table 5). In addition, the overall infection rate for cases with implants was 28% higher than the rate for cases without implants (2.3% *vs.* 1.8%, $P < 0.001$).

TABLE 3. Rate of Infection Among Patients with a Primary Diagnosis of Scoliosis, Stratified Based on Patient Age and Subtype of Scoliosis

Age Group/Type of Scoliosis	No. of Cases	Superficial Infection (%)	Deep Infection (%)	Total Infection (%)
Adult (≥21 yr)				
Neuromuscular	292	8 (2.7)	18 (6.2)	26 (8.9)
Posttraumatic	30	0 (0.0)	2 (6.7)	2 (6.7)
Degenerative	2533	31 (1.2)	73 (2.9)	104 (4.1)
Congenital	137	1 (0.7)	4 (2.9)	5 (3.6)
Idiopathic	2488	23 (0.9)	46 (1.8)	69 (2.8)
Other	139	3 (2.2)	2 (1.4)	5 (3.6)
Not recorded	182	0 (0.0)	1 (0.5)	1 (0.5)
Total	5801	66 (1.1)	146 (2.5)	212 (3.7)
Pediatric (<21 yr)				
Posttraumatic	35	1 (2.9)	1 (2.9)	2 (5.7)
Neuromuscular	4855	83 (1.7)	184 (3.8)	267 (5.5)
Congenital	2045	27 (1.3)	18 (0.9)	45 (2.2)
Idiopathic	11,741	65 (0.6)	100 (0.9)	165 (1.4)
Other	1464	16 (1.1)	31 (2.1)	47 (3.2)
Not recorded	284	3 (1.1)	7 (2.5)	10 (3.5)
Total	20,424	195 (1.0)	341 (1.7)	536 (2.6)

TABLE 4. Rate of Infection Among Patients with a Primary Diagnosis of Kyphosis, Stratified Based on Patient Age and Subtype of Kyphosis

Age Group/Type of Kyphosis	No. Cases	Superficial Infection (%)	Deep Infection (%)	Total Infection (%)
Adult (≥21 yr)				
Postlaminectomy	198	5 (2.5)	5 (2.5)	10 (5.1)
Osteoporosis	104	3 (2.9)	2 (1.9)	5 (4.8)
Scheuermann	227	2 (0.9)	8 (3.5)	10 (4.4)
Posttraumatic	365	3 (0.8)	12 (3.3)	15 (4.1)
Fixed sagittal plane deformity	553	6 (1.1)	15 (2.7)	21 (3.8)
Neuromuscular	42	0 (0.0)	1 (2.4)	1 (2.4)
Congenital	48	0 (0.0)	1 (2.1)	1 (2.1)
Other	396	9 (2.3)	13 (3.3)	22 (5.6)
Not recorded	79	0 (0.0)	0 (0.0)	0 (0.0)
Total	2012	28 (1.4)	57 (2.8)	85 (4.2)
Pediatric (<21 yr)				
Neuromuscular	264	10 (3.8)	27 (10.2)	37 (14.0)
Fixed sagittal plane deformity	18	1 (5.6)	0 (0.0)	1 (5.6)
Postlaminectomy	64	3 (4.7)	0 (0.0)	3 (4.7)
Scheuermann	634	12 (1.9)	15 (2.4)	27 (4.3)
Posttraumatic	31	1 (3.2)	0 (0.0)	1 (3.2)
Congenital	329	3 (0.9)	2 (0.6)	5 (1.5)
Other	200	4 (2.0)	5 (2.5)	9 (4.5)
Not recorded	15	1 (6.7)	0 (0.0)	1 (6.7)
Total	1555	35 (2.3)	49 (3.2)	84 (5.4)

TABLE 5. Summary of Surgical Characteristics Assessed for Association with Infection

Parameter	No. Cases	Superficial Infection (%)	Deep Infection (%)	Total Infection (%)	*P**
Spinal fusion performed					
Yes	72,534	642 (0.9)	1072 (1.5)	1714 (2.4)	<0.001
No	35,877	267 (0.7)	377 (1.1)	644 (1.8)	
Not recorded	8	0 (0.0)	0 (0.0)	0 (0.0)	
Type of fusion					
Post-ant-post	271	2 (0.7)	7 (2.6)	9 (3.3)	
Anterior-posterior	7887	91 (1.2)	161 (2.0)	252 (3.2)	<0.001†
Posterolateral	19,710	221 (1.1)	379 (1.9)	600 (3.0)	<0.001†
Interlaminar/facet	16,192	167 (1.0)	281 (1.7)	448 (2.8)	0.003†
All fusion cases	72,534	642 (0.9)	1072 (1.5)	1714 (2.4)	
TLIF/PLIF	12,267	104 (0.8)	182 (1.5)	286 (2.3)	
Anterior only	15,336	46 (0.3)	48 (0.3)	94 (0.6)	<0.001†
Not recorded	871	10 (1.1)	14 (1.6)	24 (2.8)	
Implants					
Yes	74,114	647 (0.9)	1092 (1.5)	1739 (2.3)	<0.001
No	34,305	262 (0.8)	357 (1.0)	619 (1.8)	
Revision surgery					
Yes	16,503	183 (1.1)	359 (2.2)	542 (3.3)	<0.001
No	91,916	726 (0.8)	1090 (1.2)	1816 (2.0)	
Minimally invasive approach					
Yes	14,301	43 (0.3)	35 (0.2)	78 (0.5)	<0.001
No	94,115	866 (0.9)	1414 (1.5)	2280 (2.4)	
Not recorded	3	0 (0.0)	0 (0.0)	0 (0.0)	

*P-values are based on statistical comparisons of total infection rates.

†Anterior-posterior, posterolateral, and interlaminar/facet fusions had significantly higher and anterior only had significantly lower rates of infection compared with the overall rate of infection for all fusion patients (2.4%).

TLIF indicates transforaminal lumbar interbody fusion; PLIF, posterior lumbar interbody fusion.

Revision cases had a 65% higher overall rate of infection compared with primary cases (3.3% *vs.* 2.0%, $P < 0.001$) (Table 5). This difference was more evident for deep wound infections (2.2% *vs.* 1.2%) compared with superficial wound infections (1.1% *vs.* 0.8%).

The rate of wound infection, especially deep wound infection, was significantly lower for cases performed using a minimally invasive approach compared with those using more traditional open approaches (0.5% *vs.* 2.4%, $P < 0.001$) (Table 5). Two specific procedures that are frequently performed minimally invasively were further assessed. The overall rate of infection associated with minimally invasive transforaminal lumbar interbody fusion (TLIF) (n = 848) was significantly less than that of the traditional open approach (n = 6,241; 1.3% *vs.* 2.9%; $P = 0.005$; Figure 2). Notably, this difference was almost entirely accounted for by the marked differences in the rate of deep wound infection (0.4% *vs.* 1.9%,

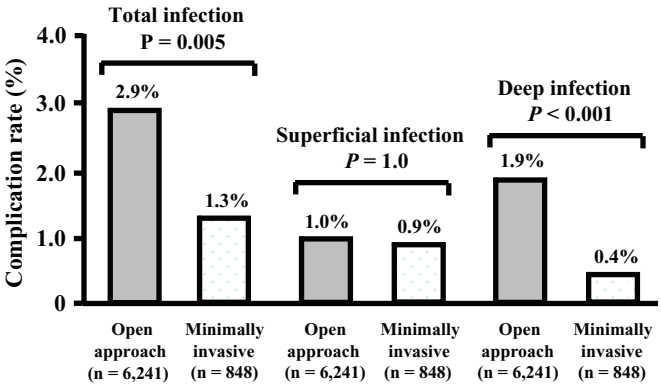

Figure 2. Rates of infection for transformaminal lumbar interbody fusions (TLIF) performed using a traditional open approach compared with a minimally invasive approach. The minimally invasive approach is associated with a significantly lower overall rate of infection and rate of deep wound infection.

$P < 0.001$; Figure 2). The overall rate of infection for lumbar discectomy was also significantly lower for cases performed minimally invasively compared with those performed using traditional open techniques (0.4% *vs.* 1.1%). This difference was also primarily due to the differences in the rate of deep wound infection (0.08% *vs.* 0.5%, $P < 0.001$).

DISCUSSION

This study provides the rates of postoperative wound infection after a broad range of spinal procedures, based on cases performed predominantly by fellowship-trained spine surgeons. The large number of cases enabled assessment of infection rates for relatively uncommon procedures, including those performed on pediatric patients. The SRS M&M database also enabled stratification of cases and assessment of corresponding infection rates based on operative factors, including primary *versus* revision status, use of implants, fusion approach, and whether minimally invasive techniques were used. In addition, the database distinguished between superficial and deep infections, allowing separate reporting of these complications.

The overall superficial and deep wound infection rates for the present series of 108,419 patients were 0.8% and 1.2%, respectively. The 2% total rate of infection in this series is comparable to previously reported series that include a diverse representation of spine procedures, in which the rate of infection ranges from 0.9% to 4.4%.[9,15,24–26] Prior reports have documented the rates of infection for select spinal procedures, and the rates in the present study are generally comparable to these prior reports. For example, the rate of postoperative infection for lumbar discectomy is 0.9% in the present series, which is comparable to recent prior reports in which the rate ranges from 0% to 1.6%.[27–31] As another example, the rate of wound infection after surgery for adolescent idiopathic scoliosis has been previously reported to range from 0.7% to 3%,[21,32] which is comparable to the present series in which the rate is 1.4%. As a third example, the rate of wound infection after surgery for degenerative scoliosis has been reported to be 4.3%,[33] which is comparable to the 4.1% rate in the present series.

Although for some of the more common procedures, the infection rates reported herein are comparable to those previously reported, for the vast majority of the other diagnoses and subdiagnoses presented, the literature provides very limited or no comparison. That some of the common procedures in the present series have comparable infection rates as in the literature, in our view, adds to the credibility of the rates of infection that are reported herein for many of the other diagnoses and subdiagnoses for which the literature fails to provide comparison.

Based on the SRS M&M database, the rates of postoperative wound infections are significantly higher for cases that included fusion or implants than those that did not. It is important to recognize that these data do not necessarily suggest a causation link between infection and performance of fusion or inclusion of implants, but rather likely reflect greater complexity and associated risk for cases that require fusion or the use of implants.

The overall infection rate for procedures performed using a minimally invasive approach was significantly less compared with those not doing so. Importantly, many of the procedures that are commonly performed using a minimally invasive approach, such as lumbar discectomy or TLIF, generally have relatively low infection rates, while more complex procedures that were typically only performed using a traditional open approach, such as degenerative scoliosis or neuromuscular kyphosis, generally have substantially higher infection rates. Specific assessment of the infection rates for lumbar discectomy and TLIF was possible however, and did demonstrate that these minimally invasive approaches were associated with significantly lower rates of postoperative wound infection, especially deep wound infection, compared with traditional open approaches. This putative benefit of the minimally invasive approach, although often suggested, has not been previously well demonstrated.

The present study has several strengths, most notably the large number of cases that includes representation of both low- and high-complexity procedures. The contributors, although predominantly fellowship-trained spine surgeons, represent a broad range of experience levels, which enhances the generalizability of the data. Cases were submitted from multiple institutions, which helps to mitigate the effects that specific institutional factors and patient populations may have on the occurrence of infection. In addition, the database enables separate assessment of superficial and deep infection rates and stratifies cases based on patient age and primary *versus* revision status, allowing separate assessment of infection rates based on these parameters.

The present study also has limitations. Although the data were collected prospectively, the study design and analysis were performed retrospectively. There are no methods to determine completeness of data submission, nor the accuracy of the reporting. It is dependent upon the efforts of the participants. The database does not provide documentation of several factors that may be related to the occurrence of wound infection, including whether prophylactic antibiotics were administered, length of operative time, estimated blood loss, number of surgeons involved in the procedure, length of hospitalization, or patient comorbidities. In addition, there is no documentation of causative organisms, how the infection was managed, or outcomes. It is also not possible to assess for the association of infection occurrence based on the specific surgeon or institution.

CONCLUSIONS

Based on 108,419 spine surgery cases from the SRS M&M database, the overall rates of postoperative superficial and deep wound infections are 0.8% and 1.3%, respectively. For both adult and pediatric patients, the rates of postoperative wound infection were lowest for procedures performed for degenerative spine disease and highest for procedures performed for spine deformity. Procedures with spinal fusion or implants had a significantly higher rate of postoperative wound infection, likely reflective of the greater complexity and associated risk of cases that require fusion or the use of implants. Compared with a traditional open approach, use of a minimally invasive approach was associated with a lower rate of infection for lumbar discectomy and for TLIF.

➢ Key Points

- ❑ Based on 108,419 spine surgery cases from the Scoliosis Research Society Morbidity and Mortality database, the overall rates of postoperative superficial and deep wound infections are 0.8% and 1.3%, respectively.
- ❑ For both adult and pediatric patients, the rates of postoperative wound infection were lowest for procedures performed for degenerative spine disease and highest for procedures performed for spinal deformity.
- ❑ Revision cases had a significantly higher rate of infection compared with primary cases (3.3% *vs.* 2.0%; $P < .001$).
- ❑ Procedures with spinal fusion or implants had a significantly higher rate of postoperative wound infection, likely reflective of the greater complexity and associated risk of cases that require fusion or the use of implants.
- ❑ Compared with a traditional open approach, use of a minimally invasive approach was associated with a lower rate of infection for lumbar discectomy (0.4% *vs.* 1.1%; $P < 0.001$) and for transforaminal lumbar interbody fusion (1.3% *vs.* 2.9%; $P = 0.005$).

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