

Research Article

International Journal of Orthopaedics Research

Surgical Site Infection in Orthopedics: Epidemiological Profile, Risk Factors, And Underreporting at A Regional Hospital in The Federal District, Brazil

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Submitted: 2026, Aug 13; **Accepted:** 2026, Sep 17; **Published:** 2026, Oct 02

Citation: Morais, K. D. S., Oliveira, S. F. S., Lima, B. D. A. S. B., Almeida, F. T. D., Brigido, B. V., et al. (2026). Surgical Site Infection in Orthopedics: Epidemiological Profile, Risk Factors, And Underreporting at A Regional Hospital in The Federal District, Brazil. *Int J Ortho Res*, 9(3), 01-11.

Abstract

Objective: To investigate cases of surgical site infection (SSI) following orthopedic surgery at Hospital Regional de Sobradinho, Federal District, Brazil. Methods: A historical retrospective cohort study was conducted through review of 655 medical records of patients who underwent orthopedic surgical procedures between January and December 2024. After application of the eligibility criteria, 419 procedures classified as clean surgeries were included. The epidemiological profile was characterized by descriptive analysis, and SSI incidence was calculated. Incidence identified through medical record review was compared with epidemiological surveillance data recorded by the Hospital Infection Control Committee (HICC) of the same institution. Results: Forty-five SSIs were identified among 419 clean surgeries, corresponding to an incidence of 10.74%, compared with 5.25% recorded by the HICC. The presence of at least one comorbidity was significantly more frequent among patients with SSI (60.0% vs. 42.8%; $P = 0.042$). Sex, age, isolated systemic arterial hypertension, and type of fixation material were not significantly associated with SSI. Analyses of smoking, preoperative hospital stay, and operative time were limited by incomplete documentation. Conclusion: The findings indicate substantial underreporting of SSI by routine surveillance and support active, structured epidemiological surveillance with systematic post-discharge follow-up. Standardized and complete medical-record documentation is also necessary to improve risk assessment and the reliability of future studies.

Keywords: Surgical Wound Infection, Surgical Site Infection, Cross Infection, Orthopedic Procedures.

1. Introduction

Surgical site infections (SSIs) are among the most frequent complications in patients undergoing surgical procedures and represent the second leading cause of healthcare-associated infection. In addition to their substantial epidemiological impact, SSIs are associated with increased hospitalization costs, prolonged hospital stay, greater morbidity, worse prognosis, and unfavorable clinical outcomes [1,2]. A hospital-acquired or healthcare-associated infection is considered to be one that manifests within 30 days after a surgical procedure or, in the presence of implants, within up to one year after surgery, depending on the surveillance criteria adopted [3,4].

The occurrence of SSI is multifactorial and is associated with patient-related characteristics, surgical procedure characteristics, and the hospital environment. Major risk factors include patient preparation during the remote and immediate preoperative periods, duration of surgery, surgical technique and team experience, type of procedure, use of implants, operating-room environmental conditions, and the quality of postoperative surveillance. Intrinsic patient characteristics, including advanced age, comorbidities, smoking, inadequate nutritional status, and other clinical conditions, also influence the risk of SSI [5,6].

Studies show that in the United States, SSI incidence ranges from 2% to 5% and may double the duration of hospitalization.

In Brazil, SSI incidence ranges from 1.4% to 38.8%, depending on the type of surgery and surveillance method, demonstrating the substantial clinical and economic burden of this complication on the healthcare system. It is estimated that up to 60% of SSI cases may be preventable through evidence-based measures. Epidemiological studies are therefore fundamental for identifying risk factors and weaknesses in care processes and for supporting strategies aimed at preventing and reducing SSI rates [7,8].

In orthopedic and trauma surgery, SSI is particularly relevant because orthopedic implants are frequently used. Fixation materials and prostheses create an additional risk for infection, particularly through bacterial biofilm formation, which hinders eradication of the infectious agent. In this setting, SSIs are associated with prolonged hospitalization, reoperations, extended antibiotic therapy, and, in more severe cases, implant removal, with substantial effects on clinical and functional outcomes [3,4].

SSI rates may vary according to the epidemiological surveillance methodology. When follow-up is restricted to the hospitalization period, the incidence of SSI is more likely to be underestimated than when active post-discharge surveillance is incorporated. Studies have shown that post-discharge follow-up substantially increases case detection, indicating that the magnitude of this event may be underestimated depending on the surveillance method used [9].

Given the complexity and multiplicity of factors involved in SSI, these infections remain a major challenge for healthcare institutions, perioperative professionals, and health-service managers, especially regarding the implementation of effective prevention, surveillance, and control measures. Epidemiological studies support evidence-based decision-making, identify opportunities for improvement in care processes, and guide strategies to improve surgical safety, reduce costs, and improve patient outcomes.

The objective of this study was to investigate cases of SSI in orthopedic surgeries performed at Hospital Regional de Sobradinho, Federal District, Brazil, from January to December 2024. The specific objectives were to determine the epidemiological profile of patients undergoing clean surgery who developed SSI, including age, sex, previous comorbidities, and smoking; determine preoperative length of stay, the most frequently used fixation materials, operative time, and clinical outcomes; determine SSI incidence; compare the study findings with HICC data; and compare the findings with those described in the literature.

2. Methods

2.1. Study Design and Setting

This observational historical retrospective cohort study was conducted at Hospital Regional de Sobradinho, Federal District, Brazil. The study included patients who underwent orthopedic surgical procedures between January and December 2024. Medical records were reviewed longitudinally from admission to the Orthopedics and Traumatology Service through the last available postoperative documentation in the institutional electronic medical

record system (TrakCare®). A total of 655 medical records were initially assessed.

2.2. Study population and record screening

The medical-record review included the following sections of the TrakCare® system: Care, Care History, Medical Progress Notes, Nutrition Progress Notes, Anesthesia and Surgery, Surgery Data, Tests, and Test Results. Duplicate, inconsistent, or incomplete records were excluded, as were procedures previously performed at another hospital, closed manipulations, and closed reductions. After the initial screening, 610 orthopedic surgical procedures performed in 2024 remained eligible for further assessment.

2.3. Eligibility criteria and study groups

Procedures documented as exposed, contaminated, open, infected, or associated with a previous infection were excluded. Procedures performed in the presence of diabetic foot, osteomyelitis, removal of percutaneous fixation material, or previous use of external fixators were also excluded. After application of the eligibility criteria, 419 clean orthopedic surgeries constituted the final analytical sample. Patients were classified into two groups according to postoperative documentation: clean surgeries with surgical site infection (SSI) and clean surgeries without SSI.

2.4. Data sources and study variables

Demographic, clinical, and perioperative data were obtained from the longitudinal electronic medical record. The variables analyzed were age, sex, comorbidities, smoking status, surgical procedure, preoperative length of hospital stay, operative time, and type of implant or fixation material used. Preoperative length of hospital stay was defined as the number of days between hospital admission and the surgical procedure. The same variables were assessed in the SSI and no-SSI groups to allow descriptive characterization and between-group comparisons.

2.5. Definition and identification of surgical site infection

SSI was identified from postoperative follow-up documentation available in the electronic medical record. A case was considered to have evidence of SSI when the postoperative record documented inflammatory signs, wound drainage, abscess, purulent secretion, or a clinical course requiring readmission for initiation of antibiotic therapy and/or mechanical-surgical lavage. SSI incidence was calculated as the number of identified SSI cases divided by the 419 clean surgeries included in the analytical sample.

2.6. Clinical outcomes and follow-up

Among patients classified as having SSI, postoperative clinical outcomes were characterized using the available follow-up documentation. Outcomes assessed included readmission for SSI management, loss of fixation requiring early implant removal, loss of reduction requiring reoperation, surgical debridement, wound dehiscence, exposure of fixation material, additional intravenous or oral antibiotic therapy, and death related to septic shock associated with SSI. Mortality in the no-SSI group was also recorded when documented in the medical record.

2.7. Comparison with institutional epidemiological surveillance

The SSI incidence identified through longitudinal medical-record review was compared with epidemiological surveillance data recorded by the Hospital Infection Control Committee (HICC) of the same institution for the same study period. The HICC surveillance strategy consisted of active telephone contact with patients for up to 30 days after the surgical procedure, with the information recorded in specific surveillance spreadsheets. This comparison was performed to assess differences in case ascertainment between longitudinal review of clinical records and routine institutional surveillance.

2.8. Statistical analysis

The study population was characterized using descriptive statistics. Categorical variables were summarized as absolute frequencies and percentages. Continuous variables were summarized using means and standard deviations, with medians additionally reported for preoperative length of hospital stay. SSI incidence was calculated using the 419 clean surgeries as the denominator. Between-group comparisons were performed for sex, age, presence of comorbidities, systemic arterial hypertension, preoperative length of hospital stay, operative time, type of fixation material, and mortality; the corresponding P values are reported in the Results. Variables with incomplete documentation, particularly smoking status and operative time, were analyzed using the available recorded observations, and the extent of missing data was reported

explicitly.

2.9. Ethical considerations

The study was approved by the Research Ethics Committee (CEP), under Opinion No. 8.333.259 and CAAE No. 94776225.0.0000.5553, and was conducted in accordance with Brazilian National Health Council Resolution No. 466/2012 and the Brazilian General Data Protection Law (LGPD), Law No. 13,709/2018. Patient confidentiality, privacy, and data security were ensured throughout the study, with access restricted to the research team and all data analyzed and reported in an anonymized and aggregated form.

3. Results

From January to December 2024, 610 surgical procedures were performed by the Orthopedics and Traumatology Service of Hospital Regional de Sobradinho. Of these, 419 (68.7%) were classified as clean surgeries and constituted the final study population. Review of the medical records identified 45 cases of SSI, corresponding to 10.74% of the sample.

Figure 1 (Sex distribution in patients with and without SSI) summarizes the distribution by sex in the two study groups. Women accounted for 55.56% of patients with SSI, whereas men accounted for 54.01% of patients without SSI. Sex distribution did not differ significantly between groups ($P = 0.29$).

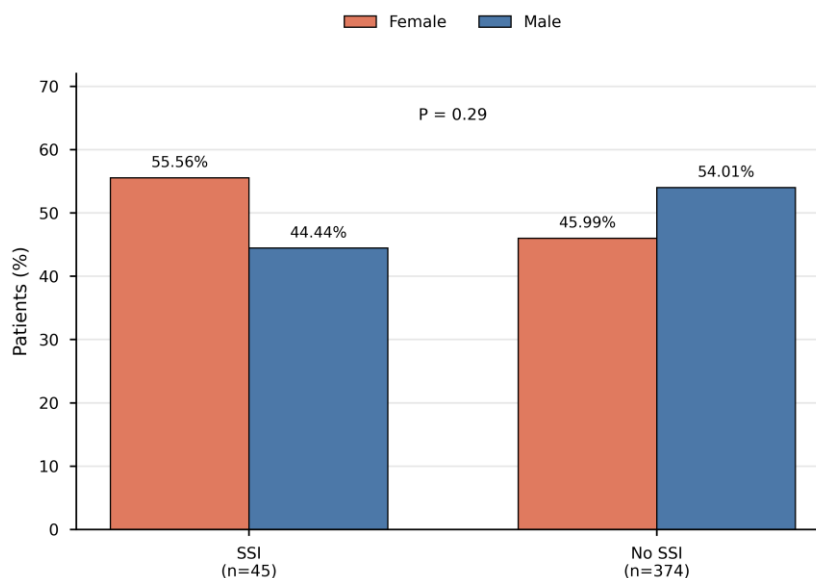


Figure 1: Sex distribution in patients with and without SSI. No statistically significant difference was observed between groups ($P = 0.29$).

Figure 2 (Mean age in patients with and without SSI) presents the age distribution of the study groups. Mean age was 46.6 ± 21.3 years in the SSI group ($n = 45$) and 41.4 ± 24.1 years in the no-SSI

group ($n = 374$), corresponding to a mean difference of 5.2 years. This difference was not statistically significant ($P = 0.133$).

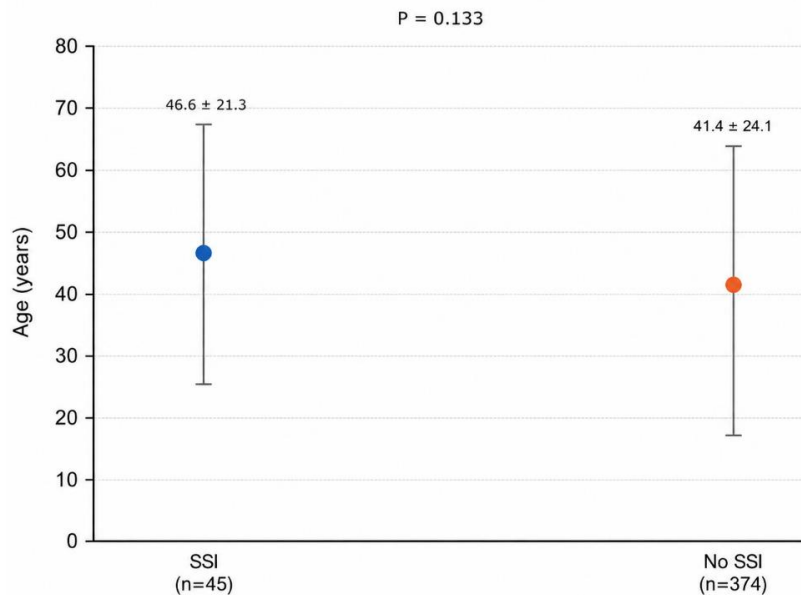


Figure 2: Mean age in patients with and without SSI. Values are mean $\pm$ SD; the between-group difference was not statistically significant ($P = 0.133$)

Figure 3 (Presence of at least one comorbidity in patients with and without SSI) shows the frequency of comorbidities in the two groups. At least one comorbidity was documented in 27 patients with SSI (60.0%) and in 160 patients without SSI (42.8%), demonstrating a significant association between comorbidity and

SSI ($P = 0.042$). Systemic arterial hypertension was the most prevalent comorbidity in both groups, occurring in 13 patients with SSI (28.9%) and 82 patients without SSI (21.9%), without a significant between-group difference ($P = 0.292$).

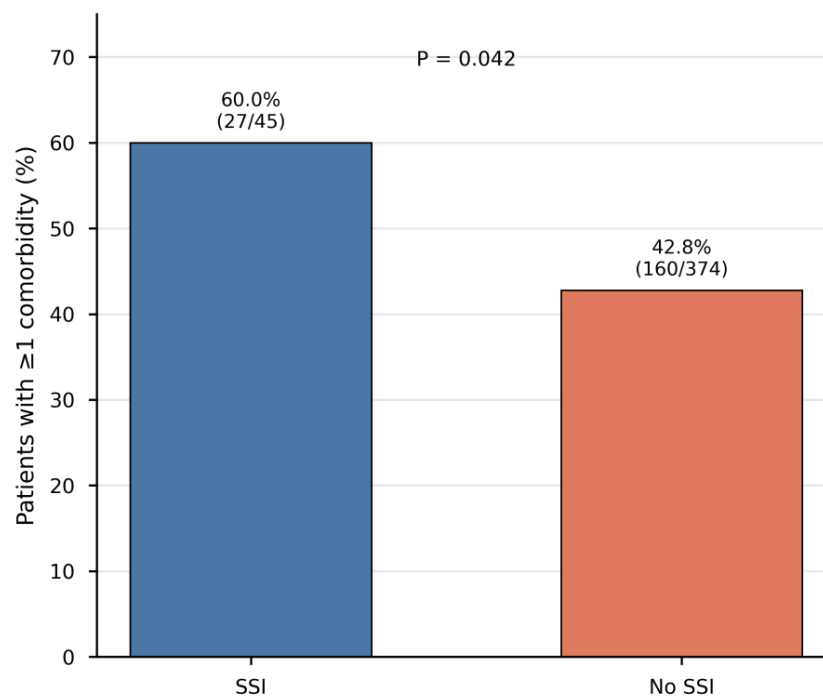


Figure 3: Presence of at least one comorbidity in patients with and without SSI. Comorbidities were significantly more frequent among patients with SSI ($P = 0.042$)

Smoking history was incompletely documented. Fifteen of 45 SSI records (33.3%) lacked this information. Among the 30 SSI patients with available data, 7 (23.3%) reported smoking and 23 (76.7%) denied smoking. In the no-SSI group, 292 of 374 records (78.1%) lacked smoking information; among the 82 patients with available data, 39 (47.6%) reported smoking. The extent of missing data precluded definitive interpretation of smoking as a risk factor in this sample.

Figure 4 (Preoperative hospital stay in patients with and without SSI) presents the duration of hospitalization before surgery in both groups. Preoperative hospital stays, defined as the number of days between hospital admission and surgery, averaged 14.13 ± 13.09 days in the SSI group (median, 10 days) and 10.68 ± 12.15 days in the no-SSI group (median, 8 days). The mean difference of 3.45 days did not reach statistical significance ($P = 0.097$).

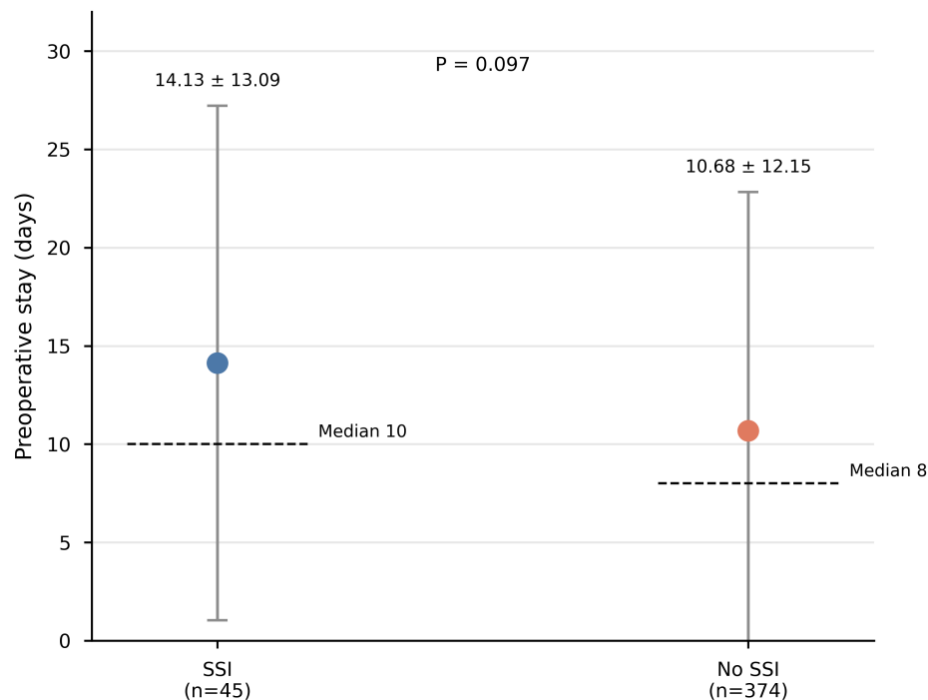


Figure 4: Preoperative hospital stays in patients with and without SSI. Values are mean $\pm$ SD; dashed markers indicate medians. The between-group difference was not statistically significant ($P = 0.097$)

Figure 5 (Operative time in patients with and without SSI) presents operative duration according to infection status. Operative time was recorded for 25 of 45 patients with SSI and 258 of 374 patients without SSI. Mean operative time was 116 ± 47.9 minutes in the SSI

group and 97 ± 45.6 minutes in the no-SSI group. The difference was not statistically significant ($P = 0.066$), and interpretation was limited by missing data in 44.4% of SSI records and 31.0% of no-SSI records.

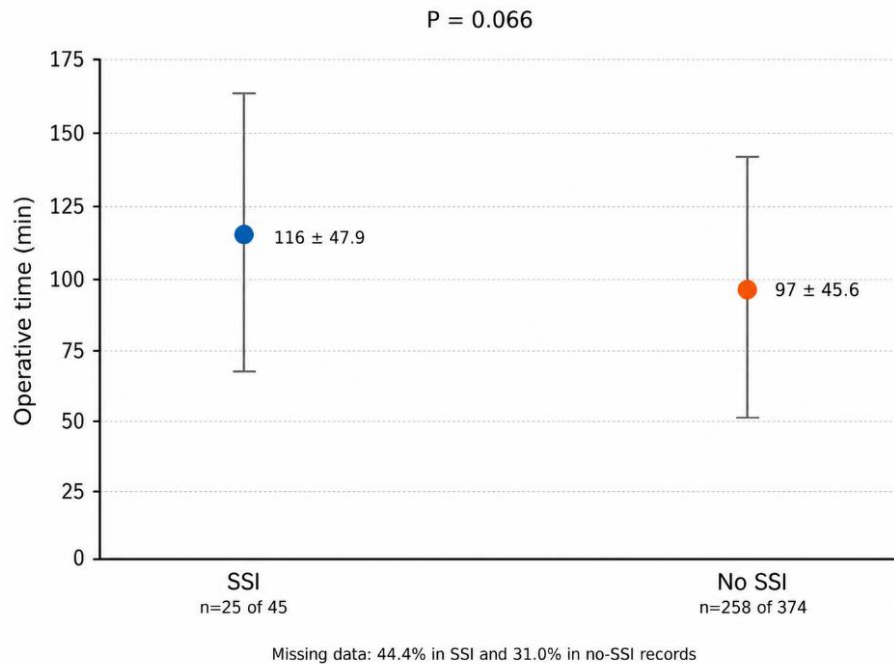


Figure 5: Operative time in patients with and without SSI. Values are mean $\pm$ SD. The comparison was limited by missing data and did not reach statistical significance ($P = 0.066$).

Figure 6 (Distribution of fixation-material categories in patients with and without SSI) summarizes the fixation materials used in each group. Internal metallic implants were the most frequently used fixation material in both groups. In the SSI group, internal metallic implants were used in 28 cases (62.2%), percutaneous metal in 14 (31.1%), and non-metallic materials in 3 (6.7%). In the no-SSI group, the corresponding numbers were 230 (61.5%), 99 (26.5%), and 45 (12.0%), respectively. No significant difference in fixation-material distribution was observed ($P = 0.554$).

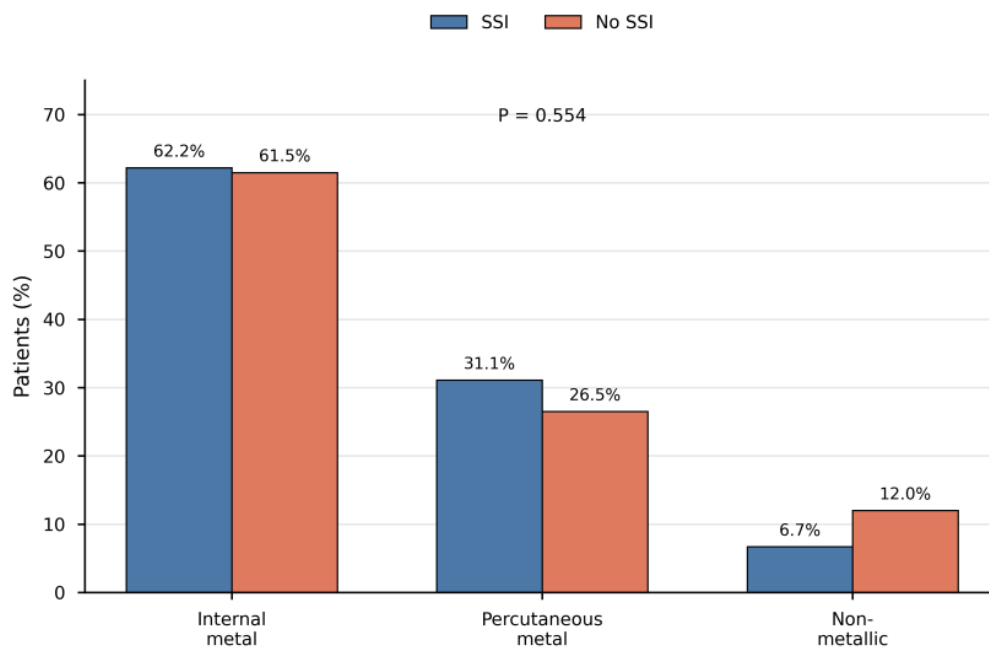


Figure 6: Distribution of fixation-material categories in patients with and without SSI. No statistically significant difference was observed ($P = 0.554$).

Figure 7 (Clinical outcomes among patients with SSI) summarizes the complications and subsequent interventions observed in the SSI group. Among patients with SSI, 7 (15.6%) required readmission for management of infection, 7 (15.6%) experienced loss of fixation requiring early implant removal, 4 (8.9%) experienced

loss of reduction and required reoperation, 3 (6.7%) underwent mechanical-surgical debridement, 3 (6.7%) developed wound dehiscence, and 2 (4.4%) had exposure of fixation material. All patients received new courses of intravenous or oral antibiotic therapy according to clinical status.

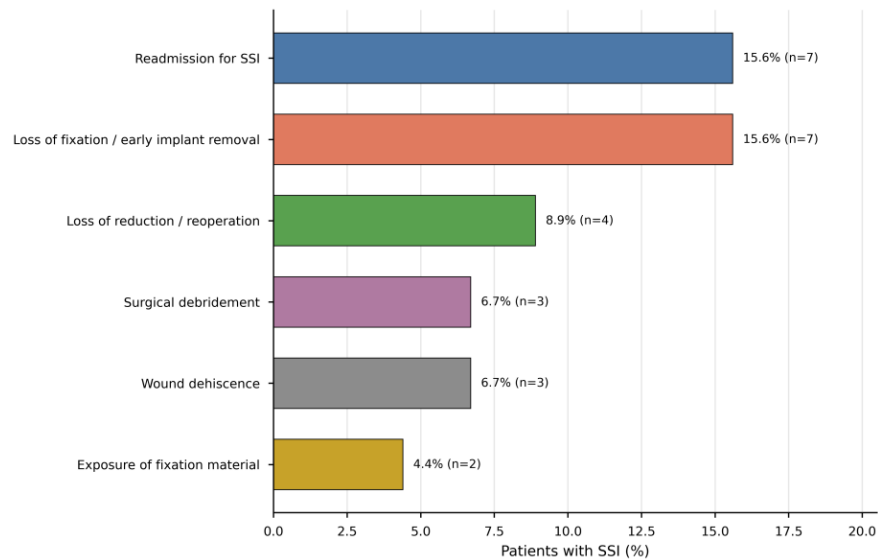


Figure 7: Clinical outcomes among patients with SSI (n = 45). Percentages use the total SSI group as denominator; categories were not necessarily mutually exclusive

Figure 8 (Mortality in patients with and without SSI) presents mortality according to infection status. Two of the 45 patients with SSI died from septic shock related to SSI, corresponding to a case-fatality rate of 4.4%. In the no-SSI group, 3 of 374 patients died from clinical causes unrelated to the initial orthopedic condition,

corresponding to 0.8%. The estimated relative risk of death was approximately 5.5, but the difference was not statistically significant ($P = 0.091$), with a wide 95% confidence interval (0.95-32.20).

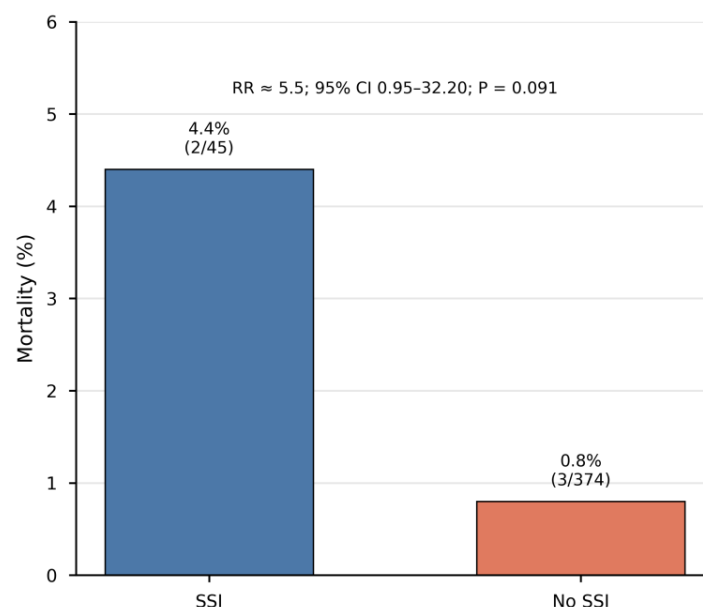


Figure 8: Mortality in patients with and without SSI. Estimated relative risk was approximately 5.5 (95% CI, 0.95-32.20; $P = 0.091$)

Figure 9 (SSI rates identified by medical record review and HICC surveillance) compares the infection rates obtained using the two surveillance approaches. Routine HICC surveillance recorded 22 SSI cases among the 419 clean surgeries, corresponding to 5.25%, compared with 45 cases (10.74%) identified by medical-record

review. The greatest discrepancy occurred in January 2024, when medical-record review identified an SSI rate of 21.62% and the HICC recorded 5.41%; the difference was statistically significant ($P = 0.003$).

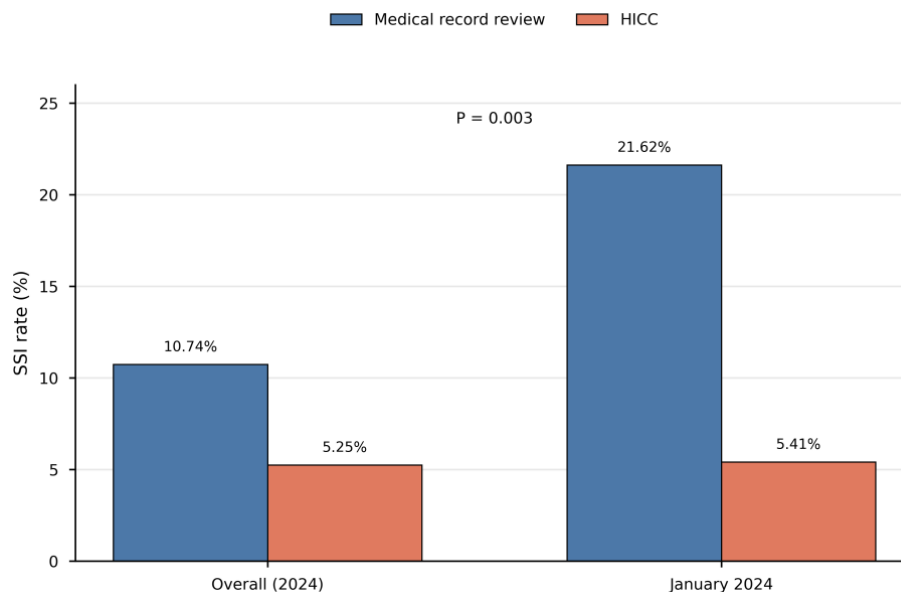


Figure 9: SSI rates identified by medical record review and HICC surveillance. The overall discrepancy was greatest in January 2024; the comparison was statistically significant ($P = 0.003$)

4. Discussion

The principal findings of this historical retrospective cohort are the high SSI incidence identified by medical record review (10.74%), the significant association between the presence of comorbidities and SSI, and the marked discrepancy between record-based case detection and HICC surveillance. Sex, age, isolated systemic arterial hypertension, and fixation-material category were not significantly associated with SSI in this sample. Preoperative hospital stay and operative time were numerically greater among patients with SSI, but neither difference reached statistical significance. Interpretation of smoking, operative time, and, to a lesser extent, other perioperative variables was constrained by incomplete documentation. Taken together, these findings indicate that both patient-related vulnerability and surveillance quality are central to interpretation of SSI rates in orthopedic practice.

The absence of a significant association between sex and SSI should be interpreted in the context of procedure-specific and population-specific variability. Aghdassi et al. demonstrated that sex-related differences in SSI risk are not uniform across surgical procedures and should not be interpreted as a universal independent effect [10]. A systematic review and meta-analysis of deep SSI after orthopedic trauma surgery likewise emphasized the multifactorial nature of infection risk and the importance of evaluating demographic characteristics together with clinical and procedural factors [11]. Therefore, the slight female predominance

in the present SSI group is descriptive and does not support sex as an independent determinant of infection in this cohort.

Age showed a similar pattern. Patients with SSI were, on average, 5.2 years older than those without SSI, but the wide standard deviations in both groups demonstrate substantial age heterogeneity. This is consistent with the clinical profile of a service that treats both younger trauma patients and older patients undergoing reconstructive procedures. Previous orthopedic studies have identified age as a relevant risk factor in specific populations [12-15]. Bischoff et al., using German surveillance data for hip and knee replacement, showed that the relationship between age and SSI depends on procedure and patient profile [13]. The present study therefore does not negate an age effect; rather, it indicates that the available sample and broad case mix did not demonstrate a statistically independent age difference. Future analyses stratified by procedure type and age category may better characterize this relationship.

The most consistent patient-related finding was the association between the presence of at least one comorbidity and SSI. Comorbidity burden has been associated with fracture-related infection and periprosthetic joint infection in large orthopedic datasets, while Fisichella et al. identified diabetes, smoking, and older age as clinically relevant risk factors in orthopedic surgery [16,15]. Yang et al. also reported that SSI risk in orthopedic patients

reflects the combined effect of patient and treatment characteristics rather than a single isolated variable [14]. In the present sample, systemic arterial hypertension was the most frequent comorbidity, but isolated hypertension was not significantly associated with SSI. This distinction is important: the observed association appears to reflect overall clinical complexity rather than hypertension alone.

Smoking could not be adequately evaluated because documentation was absent in 33.3% of SSI records and 78.1% of no-SSI records. This level of missingness creates a substantial risk of information bias and prevents a reliable comparison between groups. The limitation is clinically relevant because smoking has been associated with organ/space SSI in prospective orthopedic cohorts involving implants, and clean orthopedic surgery studies have also identified smoking among potentially relevant patient-related risk factors [17,18]. The present data should therefore not be interpreted as evidence against an effect of smoking. Instead, they demonstrate the importance of standardized recording of smoking status in admission and preoperative assessment fields.

Preoperative hospitalization was numerically longer among patients who developed SSI, with a mean of 14.13 days compared with 10.68 days in patients without infection. Although the difference did not reach statistical significance, the direction of the finding is consistent with evidence from clean surgery for femoral fractures, in which preoperative hospital stay has been evaluated as an infection-related exposure [19-27]. Ribeiro et al. also found total hospitalization time to be significantly associated with SSI in a prospective study of elective clean orthopedic surgery [28]. Prolonged hospitalization may increase exposure to healthcare-associated microbial flora and may also act as a marker of greater clinical complexity or delayed definitive treatment. In the present study, the broad dispersion of length-of-stay values and the relatively small number of SSI events likely reduced the precision of this comparison.

Operative time showed a parallel pattern. Mean duration was 116 minutes in patients with SSI and 97 minutes in those without SSI, with a P value of 0.066. This numerical difference is biologically and clinically plausible because longer procedures may reflect greater technical complexity, longer tissue exposure, and increased opportunity for contamination. Schmitt et al. reported an association between operative duration and SSI after total shoulder arthroplasty, and a systematic review and meta-analysis by Scigliano et al. found higher odds of SSI or periprosthetic joint infection with prolonged operative time in total joint arthroplasty [20,22]. However, 44.4% of SSI records and 31.0% of no-SSI records lacked operative-time data in the present study. Consequently, the observed trend cannot be considered a robust estimate. Reference 21, which was included in the original bibliography, was retracted in 2025 and is therefore retained in the reference list for fidelity to the source document but is not used here as confirmatory evidence [21].

The distribution of fixation materials did not differ significantly between groups. This result suggests that, within the categories analyzed, the selected material may be more closely related to

injury pattern and operative indication than to infection risk as an isolated variable. Evidence comparing open and percutaneous fixation strategies in specific orthopedic injuries has not consistently demonstrated a difference in SSI, as illustrated by Pearson et al. in spinopelvic dissociation [23]. At the same time, the biological interaction between implants, local tissue conditions, and infection remains clinically important; experimental and clinical observations have long emphasized susceptibility to local infection in the presence of internal fixation [24]. Thus, the present finding should not be interpreted as indicating that implants are irrelevant to SSI, but rather that the broad material categories used in this study did not distinguish infection risk.

The clinical consequences observed among patients with SSI demonstrate the severity of this complication. Readmission and early implant removal each occurred in 15.6% of infected patients, while reoperation for loss of reduction, surgical debridement, wound dehiscence, and hardware exposure were also documented. Such outcomes are compatible with the recognized burden of implant-associated infection, in which infection can compromise fixation, necessitate repeated procedures, and prolong antimicrobial treatment [7]. Studies of periprosthetic fracture and periprosthetic joint infection further demonstrate the association of infection with complex management, repeated surgery, and adverse outcomes [25,26]. The 4.4% case-fatality rate among patients with SSI in the present cohort, compared with 0.8% mortality in the no-SSI group, did not reach statistical significance because of the small number of events, but the estimated relative risk and wide confidence interval indicate clinically important uncertainty rather than absence of potential harm.

The incidence identified by medical record review deserves particular attention. The observed SSI rate of 10.74% is above the 1-5% reference range for clean procedures used in the original study framework based on CDC/ANVISA parameters [3,4]. However, SSI rates are highly dependent on case definition, procedure mix, and surveillance intensity. General reviews of SSI prevention and risk factors emphasize that surveillance methodology directly affects observed incidence [1,5-8]. Therefore, the rate identified here should not be interpreted solely as a direct measure of care quality. It should be interpreted together with the substantially greater case ascertainment achieved through review of longitudinal clinical records.

Comparison with Brazilian orthopedic studies support this interpretation. Franco et al. followed 222 patients undergoing orthopedic surgery with implants and reported an SSI rate of 12.6%, using post-discharge telephone follow-up for one year [27]. Ribeiro et al. prospectively evaluated 93 patients undergoing elective clean orthopedic surgery and identified SSI in 17.2% [28]. These studies demonstrate that higher SSI rates can be detected when surveillance extends beyond hospitalization and actively seeks postoperative events. Their findings provide an appropriate clinical context for the present 10.74% rate identified through medical-record review.

The discrepancy between medical record review and HICC surveillance is therefore one of the most relevant findings of this study. HICC identified 5.25% SSI overall, approximately half the rate found by chart review, and the difference was particularly pronounced in January 2024. Post-discharge surveillance is essential because a substantial proportion of orthopedic SSIs become evident only after discharge. Huotari and Lyytikäinen found that 56% of SSIs after selected orthopedic procedures were detected after discharge, demonstrating the direct effect of post-discharge surveillance on reported rates [9]. Perencevich et al. similarly documented the clinical and economic relevance of SSIs diagnosed after hospital discharge [2]. Telephone surveillance can increase detection, but its effectiveness depends on valid contact information, patient response, interviewer consistency, and the patient's ability to recognize wound abnormalities. The findings of the present study suggest that telephone follow-up alone may not be sufficient for complete case ascertainment in this service.

These observations have practical implications for infection surveillance. A more robust strategy would integrate standardized postoperative documentation, structured telephone follow-up, review of readmissions and emergency visits, and reconciliation of HICC records with the electronic medical record. The CDC surveillance framework provides standardized definitions and time windows that can support greater consistency in case classification [3], while orthopedic evidence indicates that the duration and method of follow-up materially influence SSI detection [4,9]. Such integration would improve the validity of institutional indicators and provide more reliable data for prevention programs, resource allocation, and quality-improvement initiatives.

This study has limitations inherent to its retrospective design. First, several clinically relevant variables were incompletely recorded, particularly smoking status and operative time. Second, the study evaluated a heterogeneous orthopedic population without stratification by specific procedure, anatomical site, or implant indication, which may have diluted associations that are procedure-specific. Third, SSI identification depended on documentation in the electronic record, including inflammatory signs, drainage, abscess, purulent secretion, readmission for antibiotics, or surgical lavage; although clinically meaningful, this approach depends on documentation quality. Fourth, the number of SSI events limited statistical precision for uncommon outcomes such as death and for subgroup comparisons. These limitations support cautious interpretation of nonsignificant findings and reinforce the need for standardized prospective data collection.

The study also has important strengths. It reviewed a large set of orthopedic records from an entire calendar year, applied explicit eligibility criteria to identify 419 clean surgeries, and directly compared case detection from clinical records with the institutional surveillance system. This design allowed identification of a substantial gap between routine surveillance and clinically documented SSI. By combining epidemiological characterization, risk-factor assessment, clinical outcomes, and surveillance performance, the study provides locally actionable

evidence for improving both patient follow-up and data quality. The central implication is not only that SSI prevention remains important, but also that the validity of SSI indicators depends on the completeness of the surveillance process itself.

5. Conclusion

In this cohort of clean orthopedic surgeries, medical record review identified an SSI incidence of 10.74%, compared with 5.25% recorded by routine HICC surveillance, demonstrating substantial underreporting. The presence of comorbidities was significantly associated with SSI, whereas sex, age, isolated systemic arterial hypertension, and fixation-material category were not. Preoperative hospital stay and operative time were numerically greater among patients with SSI but were limited by statistical imprecision and incomplete documentation. The findings support active, integrated epidemiological surveillance with structured post-discharge follow-up and standardized medical-record fields. Improving the completeness and consistency of clinical documentation is essential for reliable risk assessment, accurate institutional SSI indicators, and more robust future research.

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