Risk factors associated with postoperative wound infections in patients undergoing planned abdominal procedures: a clinical observational analysis

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Abstract

Background: Surgical site infection (SSI) is an important postoperative complication following abdominal surgery. Identification of patient-related and procedural predictors may support targeted prevention. Objective: To evaluate the incidence of SSI following elective abdominal surgery and assess factors potentially associated with infection. Methods: This example illustrates a prospective observational cohort of 300 adults undergoing elective abdominal surgery. The numerical values below are simulated solely for formatting and demonstration; they are not clinical study results. In a real study, SSI should be defined using a prespecified standard, followed by descriptive analysis and multivariable logistic regression.Results: In this simulated example, 30 of 300 patients developed SSI (10.0%). The illustrative multivariable model shows higher odds associated with diabetes, prolonged operative duration, and contaminated/dirty wound class. These hypothetical estimates must not be interpreted as evidence. Conclusion: A real prospective cohort using standardized SSI surveillance and appropriate adjustment for confounding could help identify local risk factors. Actual patient data are required to estimate incidence and adjusted associations. Keywords: surgical site infection; elective abdominal surgery; postoperative complications; risk factors; prospective cohort; logistic regression.

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1. Introduction

Surgical site infection (SSI) is a significant healthcare-associated complication that develops at or near the surgical incision following an operative procedure. Depending on anatomical depth, SSI is classified as superficial incisional, deep incisional, or organ/space infection. These complications may result in delayed wound healing, prolonged hospitalization, antibiotic treatment, readmission, reoperation, and increased healthcare expenditure [1,2].

Patient-related characteristics such as diabetes mellitus, obesity, smoking, anemia, malnutrition, hypoalbuminemia, and poor physiological status may influence susceptibility to infection by affecting immune function, tissue oxygenation, or wound healing. Their associations may differ according to the patient's clinical condition and procedure type [1,3].

Procedure-related factors include prolonged operative duration, open surgical approach, contaminated wounds, increased blood loss, and

complex procedures. Previous reviews have identified operative duration and wound classification among factors associated with SSI following abdominal surgery [1,4].

Evidence-based preventive strategies should span the preoperative, intraoperative, and postoperative periods. WHO and CDC guidance emphasizes appropriate antimicrobial prophylaxis, surgical-site preparation, and consistent infection-prevention practices [2,3,5].

Glucose management, normothermia, and standardized wound surveillance are also important considerations.

SSI incidence and associated factors may vary between institutions because of differences in patient characteristics, surgical case mix, resources, and perioperative protocols. Prospective studies using standardized definitions and multivariable analysis can help estimate local incidence and distinguish independent associations from confounding [6,7].

This study aims to determine SSI incidence following elective abdominal surgery and identify patient-related, procedure-related, and perioperative predictors. Reporting should follow established recommendations for observational research [8]. **2. Aim and Objectives**

2.1 Aim

To identify predictors of surgical site infection following elective abdominal surgery.

2.2 Objectives

- Estimate SSI incidence during the specified surveillance period.
- Classify SSI as superficial incisional, deep incisional, or organ/space infection.
- Assess associations between patient and operative characteristics and SSI.
- Evaluate associations with readmission and reoperation where data are available.

3. Methodology

3.1 Study design and setting A prospective observational cohort design is proposed in the Department of General Surgery at [institution] over [actual study dates]. The simulated results in this document use an illustrative cohort of 300 patients only. **3.2 Study population**

Adults undergoing eligible elective abdominal surgery. The protocol should specify included procedure types and whether all eligible cases or a consecutive sample will be enrolled.

3.3 Inclusion criteria

Age ≥18 years; elective abdominal surgery within the study scope; availability of baseline and operative information; informed consent where required. **3.4 Exclusion criteria**

Emergency operations if outside the study scope; pre-existing operative-site infection that prevents classification of a new SSI; inability to assess the outcome according to prespecified criteria; refusal where consent is required.

3.5 Sample size

A real sample size should be calculated using expected SSI incidence, desired precision or effect size, expected loss to follow-up, and the number of infection events required for the planned regression model. The illustrative n=300 in this document is not a sample-size calculation.

3.6 Data collection

Collect age, sex, BMI, smoking, diabetes, anemia, nutritional status or albumin where measured, ASA status, operation type, surgical approach, wound class, operative duration, blood loss, transfusion, drain placement, antimicrobial

prophylaxis, and other relevant perioperative measures.

3.7 Outcome definition

Define SSI using the applicable CDC/NHSN protocol or another prespecified validated standard, including the correct surveillance period for each procedure. Include post-discharge follow-up where feasible.

3.8 Statistical analysis

Summarize categorical variables as frequencies and percentages and continuous variables as mean ± SD or median (IQR), as appropriate. Compare groups with suitable tests. Fit a clinically justified multivariable logistic regression model and report adjusted odds ratios, 95% confidence intervals, and p-values. Check missingness, collinearity, model fit, confounding, and overfitting.

3.9 Ethics

Obtain institutional ethics approval before recruitment and consent where required. Protect confidentiality and report the committee, approval number, and consent process in the final manuscript.

4. Results

Critical note: Every number in this Results section is simulated for demonstration. These data must not be described as collected patient findings or used for a research submission.

For demonstration, the hypothetical cohort contains 300 patients, of whom 30 developed SSI, producing an illustrative incidence of 10.0%. The example is designed to show a complete Results layout, not to estimate the true SSI burden in any hospital.

Variable	Overall (N=300)	No SSI (n=270)	SSI (n=30)	Illustrative p
Age, years, mean ± SD	52.1 ± 14.2	51.5 ± 14.1	57.2 ± 14.0	0.035
Male sex, n (%)	165 (55.0)	147 (54.4)	18 (60.0)	0.56
Low albumin, n (%)	42 (14.0)	34 (12.6)	8 (26.7)	0.04
ASA class III or higher, n (%)	60 (20.0)	50 (18.5)	10 (33.3)	0.048

BMI ≥30 kg/m², n (%)	78 (26.0)	65 (24.1)	13 (43.3)	0.022
Diabetes mellitus, n (%)	66 (22.0)	53 (19.6)	13 (43.3)	0.003
Current smoking, n (%)	54 (18.0)	46 (17.0)	8 (26.7)	0.18
Anemia, n (%)	72 (24.0)	61 (22.6)	11 (36.7)	0.10

Variable	**Overall (N=300)**	**No SSI (n=270)**	**SSI (n=30)**	**Illustrative p**
Open procedure, n (%)	174 (58.0)	152 (56.3)	22 (73.3)	0.07

Table 1. Illustrative baseline characteristics by SSI status

Note: All values and p-values are hypothetical and have not been generated from real patient records or validated statistical output.

Operative duration, min, mean ± SD	± 46	107 ± 43	158 ± 55	<0.001

Illustrative interpretation of Table 1: In this hypothetical example, patients who developed SSI were older on average and had higher proportions of obesity, diabetes, low albumin, and ASA class III or higher. These patterns are included to demonstrate narrative reporting only; actual group differences and statistical significance must be calculated from the study dataset.

Table 2. Illustrative operative and perioperative characteristics

Contaminated/dirty wound, n (%)	48 (16.0)	36 (13.3)	12 (40.0)	<0.001
Blood loss >500 mL, n (%)	36 (12.0)	29 (10.7)	7 (23.3)	0.04
Blood transfusion, n (%)	21 (7.0)	17 (6.3)	4 (13.3)	0.13
Drain placement, n (%)	90 (30.0)	77 (28.5)	13 (43.3)	0.09
Prophylaxis timing outside protocol, n (%)	39 (13.0)	32 (11.9)	7 (23.3)	0.07
Perioperative hyperglycemia, n (%)	45 (15.0)	36 (13.3)	9 (30.0)	0.015

Note: All values and p-values are simulated placeholders. In real analyses, define thresholds and compare variables using tests appropriate to their distributions.

Illustrative interpretation of Table 2: The hypothetical SSI group had longer mean operative duration and higher proportions of contaminated/dirty wounds, blood loss above 500 mL, and perioperative hyperglycemia. These are not verified findings and should be replaced with the results of the actual analysis.

Table 3. Illustrative SSI incidence and outcomes

Outcome	Illustrative n	Illustrative %
Total patients enrolled	300	100.0
Any SSI	30	10.0
Superficial incisional SSI	14	4.7
Deep incisional SSI	9	3.0
Organ/space SSI	7	2.3
SSIassociated readmission	8	2.7

SSI requiring reoperation	5	1.7

Note: SSI subtypes are shown as mutually exclusive categories for this example. Real data may require a different counting rule depending on the surveillance definition and whether multiple categories can apply.

Illustrative interpretation of Table 3: The simulated cohort has an overall SSI incidence of 10.0%. Superficial incisional infection is the most frequent category in this example, followed by deep incisional and organ/space SSI. The incidence and distribution must be calculated from actual surveillance records. **Table 4. Illustrative multivariable logistic regression for SSI**

Candidate predictor	**Illustrative adjusted OR**	**Illustrative 95% CI**	**Illustrative p**
Diabetes mellitus	2.30	1.05–5.04	0.037
BMI ≥30 kg/m²	1.65	0.76–3.58	0.21
Current smoking	1.42	0.56–3.62	0.46
Low albumin	1.88	0.73–4.83	0.19
Operative duration, per 30-min increase	1.38	1.15–1.66	<0.001
Open surgical approach	1.28	0.55–2.98	0.57
Contaminated/dirty wound class	3.10	1.36–7.08	0.007
ASA class III or higher	1.51	0.63–3.60	0.35

Note: Regression estimates are invented for illustration and are not derived from data. They are not suitable for clinical decisions or publication. A real model should be refitted and checked using the complete dataset.

Illustrative interpretation of Table 4: In this hypothetical model, diabetes, longer operative duration, and contaminated/dirty wound class have adjusted odds ratios above 1 with illustrative confidence intervals excluding 1. These hypothetical associations cannot be treated as evidence. A real manuscript must report model estimates calculated from the observed dataset and include diagnostics and the number of SSI events. **5. Discussion**

In this illustrative example, 10.0% of patients developed SSI. This value is simulated and must not be compared with published incidence estimates as if it were a finding from the proposed study. A real discussion should report the observed incidence and compare it with studies using similar procedures, definitions, and surveillance windows [1,4].

Patient-related factors such as diabetes, obesity, smoking, anemia, and nutritional status may influence immune function and wound healing. A systematic review of abdominal surgery studies identified several patient characteristics as

potential risk factors [1]. The hypothetical patterns shown here are merely examples of how such findings could be discussed; the true associations may be different after analysis of real data.

Operative duration and wound classification are clinically relevant because prolonged operations may reflect surgical complexity and contaminated wounds may have a higher microbial burden. Previous reviews have reported associations between these factors and SSI after abdominal surgery [1,4]. However, the direction and magnitude of effects in the current cohort can only be determined from observed data and an adequately specified model. Prevention remains central to SSI reduction.

WHO and CDC guidance supports evidencebased measures across the surgical pathway, including appropriate antimicrobial prophylaxis and surgical-site preparation [2,3,5]. A real study should document prevention practices and assess whether they were measured consistently; observational associations should not be interpreted as causal effects.

The study design should address limitations such as incomplete post-discharge surveillance, missing data, variation in operation types, and limited numbers of SSI events. Multivariable models must avoid including more predictors than the available events can support. Transparent reporting consistent with STROBE recommendations can improve interpretability [8]. The final discussion should be rewritten after actual analysis and should not retain any simulated numerical claims. **6. Strengths and Limitations**

6.1 Potential strengths

- Prospective recording of patient and operative variables.
- Use of a prespecified SSI definition and surveillance plan.
- Assessment of multiple potential predictors in one cohort.

6.2 Potential limitations

- The values in this demonstration are simulated and provide no clinical evidence.
- A real single-centre cohort may have limited generalizability.
- Incomplete follow-up may miss infections diagnosed after discharge.
- Observational data can be affected by residual confounding and cannot establish causality.

7. Conclusion

This document demonstrates how a Results section with incidence, subgroup comparisons, and a multivariable model may be presented. The numerical findings are hypothetical and do not establish the incidence or predictors of SSI in any real patient population. A valid scientific conclusion requires analysis of verified patient data, standardized SSI surveillance, and reporting of estimates with confidence intervals.

8. Recommendations

- Use standardized SSI definitions and procedure-appropriate surveillance.
- Record patient risk factors, operative characteristics, and preventive measures prospectively.
- Calculate sample size based on expected incidence and planned analyses.
- Report effect estimates and confidence intervals alongside p-values.

- Replace every simulated result in this example with the output from the actual dataset before submission.

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