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Emergency vs Elective Abdominal Surgery in Terms of Surgical Site Infection

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Abstract

Background: Evidently, surgical site infections, poorly, emerge as a considerable issue in the course of abdominal operations, which confers increased enfeeblement, prolonged hospital stays, and escalated medical expenditures. Understanding the discrepancies in the SSI rates when it comes to the group of procedures, which are unexpected abdominal and those that may be scheduled, is crucial for any handy counteraction.

Aim: This inquiry also sought to compare the event and chance aspects of SSIs in the early, unexpected versus later, scheduled abdominal operations – of which the detangle acknowledges particular influencing factors that might bring about higher SSI rates in early methods.

Method: Thus, an observational cohort analysis was performed that included patients who had an unexpected or planned abdominal surgical intervention. The subjects without previous infection exposures or subpar resiliency were not included. The data were gathered from the medical records, operation records, and contagion administration reports with focus on demographics, type of operation, length of operation, antibiotic coverage, type of injury, and concomitant conditions. Data analysis was made using the SPSS program; comparisons of categorical data with chi-square test, comparison of means of the normally distributed variables with independent samples' t-test, and multivariable analysis was done by logistic regression.

Results: The examination included 1200 patients, of which 600 patients who had been operated on emergently, and 600 patients who had planned surgeries. Altogether, the incidence of SSIs was significantly higher in the cases of operations which were not planned in advance (18%) in comparison with those which were planned in advance (10%). Surgical site infections displayed increased SSI rates with regard to the utilization of unexpected methods, such as greater lengths of medical procedures, contaminated injuries and no preoperative optimization. The factors that were used to identify the risk of SSIs included the patient's age, his or her health complications, duration of surgery and injury type. Analysis of data from the subgroups showed that patients over 60 years of age and those with several illnesses are more susceptible to SSIs.

Conclusion: Emergency abdominal surgery is associated with approximately threefold greater SSI risk in comparison with elective surgery. The discoveries enhance the relevance of the preoperative preparation in planned surgical operations and suggest evaluating measures including the well-timed antibacterial therapy and refinement of operative procedures in

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emergent operations to reduce SSIs. Further research should focus on research about ideas and approaches that have not been implemented and therefore, possible, large interventional studies to come up with evidence-based approaches of reducing the SSIs and consequently increasing the surgical outcomes.
Keywords: For the terms, the following are proposed: SSIs, abdominal surgery, unintended surgery, elective surgery, source control, risk factors, preoperative preparation.

Introduction

Surgical procedures for the abdominal region include several approaches devised with the intention of diagnosing as well as managing diseases localized to the abdominal cavity. These medical procedures may solve issues related to stomach, liver, gallbladder, pancreas, intangible organs and appendix. Most common indications for stomach operations include situations such as gallstones that might call for cholecystectomy, hernias that demand the repair, intestinal blockage, appendicitis, as well as more complicated surgery involving colectomy for colon cancer or bariatric surgery for weight loss. These medical procedures are goals focus on the elimination of some symptoms, the eradication of abnormal tissue, and betterment of the patient's conditions and ways of living. Nevertheless, a significant and worrying cluster of postoperative complexity of medical procedure in the stomach region is the development of operative site infections (SSIs). An SSIs are those that develop at or close to the operative site within thirty days of the method (or within one year if an implant is involved) and can range about Milia layer infection, which is an infection of the skin to deep infection involving the other layer of the body or internal organs and tissues as well as the implants if there are any. SSIs are associated with higher morbidity, longer healthcare facility stay, increased healthcare cost and in severe cases with increased mortality [1].

Emergency abdominal operations can be defined as operations that are done urgently mainly in cases that are critical. For example, appendicitis, in which the appendix becomes dangerously inflamed and could burst; intestinal obstruction in which there are barriers to passage of digestive materials through the intestines which might lead to death of tissues; and perforated ulcers that may lead to peritonitis, [2] a serious infection of the abdominal cavity. Such operations are unique in that they are not planned in advance and since they require urgent medication to avert further deterioration of the situation or in extreme cases death. The very concept of emergency increases varied factors that may potentially act as a stimulus of the frequency of surgical site infections. Other risk factors include compromised direct physiological status resulting from the acute diseases, lack of preoperative optimization, and possible infection from leakage of body cavities or enzymes from burst organs or inflamed tissues [3]. However, emergency operations may occur during off working hours, maybe affecting availability of experienced surgical team, and ideal working environ [4].

On the other hand, emergent abdominal surgery entails procedures that are planned to be done on a patient before further examination or assessment that could be done in the process of preparation for the surgery. Hernia surgeries that reinforce areas of the abdominal wall which have become strained; removal of the gall bladder due to the formation of gallstones; some bariatric surgeries such as the Roux-en-Y gastric bypass or sleeve gastrectomy are examples of elective operations. Knowledge is power – patients can do health 'checks,' including optimisation such as controlling conditions that enhance surgical risks like diabetes or hypertension. Moreover, planning permits stringent assessment concerning methods to be employed, anaesthesia, besides

the subsequent management after the surgery. This deliberate process is often associated with reduced complication chances such as surgical site infection as against emergencies that by their nature are invariably devoid of any preparation. It is necessary to compare the rates of SSI in emergency and elective absolute operations because it is the complications that significantly affect the overall health care situation and cause billions of dollars in losses. Surgical site infections have been categorized as some of the most prevalent HAI parties which leads to the widening of patient's suffering, longer stay at the hospital, and additional treatments for instance antibiotics besides other surgery. The economical loss is also appreciable as SSIs enhance the duration of hospital stay along with additional diagnostic procedures and therapies. Knowledge of the various differences in the SSI frequencies and risk factors between both emergency and elective surgeries is useful to tailor strategies that will reduce these infections enhancing the surgery results. For instance, identifying critical situations that require improvement in the process of emergency operations may result in better infection control measures, while enhancing the precise preparation for elective operations may also help to reduce the risks [7].

Therefore, it can be stated that contemporary surgery includes a variety of operations of abdominal surgery aimed at treating a vast number of pathologies involving the structures of the abdominal-pelvic cavity [8]. Even though these operations create survival or an improved quality of life, they are susceptible to SSIs that prolong the patients' healing process and increase healthcare expenditure. Surgical procedures done in emergency circumstances/not elective procedures specifically targeting acute life-threatening conditions are often associated with a higher risk of SSIs due to issues like, deterioration of the patient's status and no time for preoperative preparation. On the other hand, elective surgeries benefit from preoperative preparation, which is often not the case for emergency surgeries and generally leads to a reduced level of SSI. The reason for the comparison of SSIs between these two groups lies in the possibility to enhance the outcomes of surgery and to reduce the expenses of healthcare, owing to the usage of targeted measures regarding the specifics of the associated risks for the given type of intervention. Thus, it is possible to decrease the general incidence of SSIs, which in turn will have positive outcomes to the patient's health as well as effective utilization of the health care system resources [9].

Methodology

The current study was conducted cross-sectionally and aimed at determining the effect of E&A and elective AS on the percentage of SSI. This design enabled collecting patient data and identifying relationships between the level of surgical emergency and postoperative infections outcome in the five years prior to the study. Thus, studying records of previous surgeries, we intended for identifying tendencies and unsafe clauses related to the SSI in emergencies and planned operations. Patients with a history of primary or secondary peritoneal or vehicles wash of the Belgium We have included all the patients who underwent a belly operation at our tertiary treatment centre in that half-decade. Any individual 18 years and above who required either an emergency or planned abdominal medical work was a candidate to be captured. These widely catching net included appendicitis, gallbladder operations, herniorrhaphy, intestinal resection, and bariatric surgery. To enhance the stability of conclusions, we used bar excluding those with pre-surgery diseases immunodeficient persons for example, HIV/AIDS carriers under chemotherapy or long-term immunosuppressive treatment and the patients with incomplete medical records. The

interpretation of these types of traits had to be stripped down to filter out these confounding elements in order that other aspects were not usurping the specter of infections [10].

In the demographic information, the patient's age and sex and any other significant health complications, such as diabetes, obesity, hypertension, or heart diseases, are captured. Monitoring these aspects was crucial for modifying certain assessments and identifying possible distortions in the process of determining the prevalence of surgical site infections after the surgery. Dependent variables such as comorbid states were documented according to patients' history and diagnoses at the time of surgery [11]. Data collection included the important working time, characterized by the amassment of innumerable preoperative, intraoperative, and postoperative details. The pre-op profiles consisted of demography data, comorbid diseases, laboratory data, and antibiotic prophylaxis. During the operation, referring to specifics, patients were asked about surgery class and number of operations, wound rank as clean, soiled, contaminated or tainted and complications. In the postoperative period, intel was focused on the SSI indication, the time of its expression, the degree of its severity, and the need for its treatment [12].

Electronic health records and logs were used in addition to archives that documented demographics, surgery details, and outcomes in regard to infections. Records offered comprehensive information that furnished; logs gave a confirmation of the operation type and its duration; files offered definitive SSI information and antibiotics. Mainly studied was SSI rate, which, according to CDC classification, can be divided into superficial, deep, and organ/ space. Secondarily analysed parameters included emergency vs elective procedures, operating time control, antibiotic prophylaxis, wound classification, and patient's co-morbidity. Variables were identified because of their potential effect on SSI risks based on existing or assumed knowledge. Assessments used founded on SPSS and R software, resources for storing and dissemination of information. Cohorts were first described for their general characteristics based on age, sex, co-morbidities, and the proportions of emergency/elective patients. For Groups, frequency of SSI was determined, and contrasts used chi-square for categories and t-tests for continuums such as the operation time [13].

First of all, a logistic regression analysis and subsequent subgroup examinations were carried out to determine risk factors for SSIs. In this multivariate analysis, it became possible to control for possibly discriminant variables and identify stand-alone risk factors for SSIs. General surgery characteristics, including emergency or elective surgery, patient age and sex, the presence of comorbid conditions, operation duration, wound classification according to refine WSES mainly type A, type B or type C, and antibiotic prophylaxis, were included into multiple regression analysis [14]. The results for the final logistic regression models were expressed as odds ratios with their respective 95% confidence intervals to show the nature and magnitude of association of the independent variables with SSIs risk. Moreover, additional analyses investigated whether the association of surgery type and SSIs varied by certain patient variables, including age and gender. Each of these definitive tests were useful in identifying whether particular groups of patients were at higher risk and needed targeted treatment. Additional sensitivity analyses were also conducted to narrow down the results to validity tests. Contained in these examinations was the practice of selectively leaving outpatients with high-risk characteristics or redefining borderline SSIs cases to assess whether the important outcomes were valid under different conditions. The feasibility of the intended study was good, and the methodology was devised to properly and comprehensively compare the effect of emergency as opposed to

elective abdominal surgery on SSIs. Retrospective analysis of 'natural encounters' data using retrospective cohort design proved useful while the costs of 'natural experiments and time for data collection was comprise [less intense for retrospective as compared to prospective design]. It is apparent that criteria for inclusion and exclusion of patients, the specific methods of data collection, and rigorous statistical analyses intended to obtain accurate and valid results that may be applicable to practical work and inform the further research direction to decrease the IMDs rate in the patients who undergo abdominal surgery [15].

Results

In the case of included patients, the study cohort consisted of twelve hundred patients who agreed to be operated on for abdominal surgery; out of the number, six hundred patients were in the emergency surgery cluster while six hundred others were in the elective surgery cluster. Since this is a descriptive design, descriptive statistics were used to summarize the patients' characteristics. Patients were eighteen years old to eighty-five years old and fifty two years was the mode of the age. The gender distribution of the cohort showed that there were slightly more males in the cohort; fifty-five percent while females were forty-five percent. There were comorbidities; hypertension was at forty percent, diabetes thirty percent, obesity twenty-five percent, and cardiovascular disease at fifteen percent. The cases of the emergency and elective surgeries demonstrated that patients mostly underwent appendectomy, bowel resection, and emergency operations for perforated peptic ulcer; whereas, patients mostly underwent hernia repair, cholecystectomy, and bariatric surgery as elective surgeries. Eighteen percent of the overall sample of patients in the emergency surgery cluster and ten percent in the elective surgery cluster had SSIs. This finding remained statistically significant ($p < 0.05$) and revealed a higher risk of SSIs pertaining to emergency procedures. Within the emergency group, the incidence of SSIs varied by type of surgery: Essentially, the SSI rate of appendectomy was fifteen percent, bowel resections twenty-two percent, and performed peptic ulcer surgeries twenty-eight percent. Specifically in the elective group SSI was noted in seven percent of the hernia repair operations, nine percent in cholecystectomy, and twelve percent in bariatric surgeries. This division shows that different surgeries contain the dissimilar danger level, but for surgeries in urgent cases, the SSI rate remains rather high [16].

Risk factor analysis revealed numerous factors before, during, and after surgery to be significantly related to the development of SSIs. Patient characteristics, which were age, gender, predisposing factors including diabetes and obesity were results of the study. SSI rates concerned were also higher among the elderly and the corona virus diseased comorbidity. Intra operating factors included the duration of the surgery, type of surgery done i.e., clean, clean-contaminated, contaminated, or dirty, and the administration of preventative antibiotics. These sub-operations had longer cycle times as well as being noted as having a tainted or dirty-infected status which attributed to much higher SSI rates. Relating preventative antibiotics as agreed with a decreased incidence of SSIs particularly in elective procedures. These factors included time to mobilisation and postoperative care processes with a long time to mobilise and suboptimal postoperative care indicated by a delay to mobilisation translating into a higher SSI infection rate. Relative analysis revealed a drastic difference in SSI incidences between emergency and elective surgical procedures. The ER operations, usually carried out in less-than-ideal environments, had a higher rate of contaminated operations combined with longer operation times, which have been calculated to increase the risk of

developing SSIs. Instead, objectives focused on higher preoperative standardization, which included a decrease in concurrent disease activity and a deliberately earlier initiation of preventive antibiotics before elective surgical interventions, resulting in a lower SSI rate. The effect of some of the variables such as length of surgery was much felt in emergencies for instance the lengthy surgery was strongly associated with SSI. The other significant factor was the wound classification too played a decisive part in such cases of emergency surgeries whereby it was estimated that cases of tainted or dirty-infected surgeries were more dominant than elective surgeries, which were presumably clean or clean-contaminated surgeries only [17].

Furthermore, the analyses of SSIs by subgroups identified the variation in the effects of SSIs related to patients' characteristics. This increase affected elderly patients much more, especially when they are over 65 years old, and is detected within both emergency and elective groups. Such an age-connected increase in SSI danger also requires improved antecedent intercessions in old sufferers who undergo abdominal surgery. The differences based on the gender were found to be moderate, and the male patients were noted to have a higher SSI rate compared to female patients, which may be due to the fact that the male patients have comorbidities at higher percentage than the female patients. Diabetes and obesity had the strongest associations with SSIs; patients with diabetes had a 25% emergency SSI rate, and 15% elective, while non-diabetic patients had 10% emergency and 5% elective SSI rates. Overweight sufferers had an SSI price of 20% in emergency surgeries and 12% in elective surgeries a lot higher than the non-overweight sufferers; 12% and 8% respectively. The understanding and subsequent evaluation of the problematic facets connected with the high-risk teams became a vital aspect of eradicating SSIs. Patients with colorectal disease, in particular, those who had a bowel resection or abdominal operation for a perforated peptic ulcer have been identified to be at a specifically high risk; SSI rates had been better of higher than 20% in each emergent and electromechanical category. This discovering underlines the need for enhanced an infection management procedure in the highlighted varieties of extreme-threat surgeries. Equally, the victims with different background co-morbidity or these who may require longer hours on the operating theatre had been also acknowledged as high-risk populace, demanding closer pre and post surgical supervision and monitoring.

In this study, there is shown very significant difference in the outcomes of the surgical site infection related to the emergency and elective abdominal surgeries. The analysis of rates of SSI showed the constantly increased values of the rate for emergency procedures in comparison with elective ones. It also provided a complex analysis of different factors that affect the rate of infections. The relationship between SSI results and patient and operation specifics as well as the aspects of care coordination are intricate. The conclusions drawn out highlighted the significance of the preoperative improvement in the patients especially for elective procedures. They also stressed the preservation of specific strategies to contain infections in various emergent cases. Additional studies of subgroups allowed for better definition of the patient population at highest risk for complications. This offered a premise from which fashioning of targeted approaches intended to improve the existing surgical performance and to control SSIs. The implications and applications of the findings are significant for clinical practices as indicated in the paper. More precisely, an enhanced emphasis on the overall infection and precise pre-and postoperative care can considerably decrease the SSIs' incidence among patients who underwent an abdominal procedure.

Factor	Description	Details
Study Cohort	1200 patients underwent abdominal surgery	600 emergency, 600 elective
Age Range	Patients aged 18-85 years, median age 52 years	Distribution of patient ages
Gender Distribution	55% males, 45% females	Gender ratio of study participants
Preexisting Conditions	40% hypertension, 30% diabetes, 25% obesity, 15% cardiovascular disease	Prevalence of comorbidities among patients
Common Surgeries (Emergency)	Appendectomies, bowel resections, perforated peptic ulcers	Types of emergency surgeries
Common Surgeries (Emergency)	Hernia repairs, cholecystectomies, bariatric surgeries	Types of elective surgeries
SSI Incidence (Emergency)	18% overall SSI rate	Appendectomies: 15%, bowel resections: 22%, perforated peptic ulcers: 28%
SSI Incidence (Elective)	10% overall SSI rate	Hernia repairs: 7%, cholecystectomies: 9%, bariatric surgeries: 12%
Risk Factors	Predisposing: age, gender, diabetes, obesity	Higher SSI rates in older individuals and those with comorbidities
Intraoperative Factors	Length of procedure, wound category, use of preventative antibiotics	Longer operations and tainted wounds saw higher SSIs; preventative antibiotics reduced SSIs in elective surgeries
Postoperative Factors	Time to mobilization, postoperative care standards	Delays in mobilization and inadequate care increased SSIs
Comparative Analysis	Emergency surgeries had higher contamination and longer durations	Elective surgeries benefited from preoperative optimization
Subgroup Analysis	Higher SSI rates in elderly (65+), males had slightly higher SSI prevalence	Diabetic and obese patients had higher SSI rates; bowel resections and surgeries for perforated ulcers were high-risk
Clinical Implications	Enhanced infection control, preoperative and postoperative management	Targeted interventions needed to reduce SSIs in high-risk surgeries and populations

Discussion

The findings of this study shed the light on the substantial difference between emergency and elective abdominal procedures in relation to SSI, besides confirming the evidence on the factors that affect these disparities. The SSI

rates identified in emergency operations were considerably higher than that of elective surgeries and impacted with previous research studies. It is illustrated by the fact that the risks associated with the performances of the procedures are often amplified by the coincidence of several circumstances, including the time constraints and the occasionally less-than-ideal conditions under which such operations are performed. On the other hand, elective surgical procedures require preoperative planning and patient preparation, thus decreasing the risk of SSIs remarkably. The coefficients of relationship between surgical classification and SSIs are moderate yet significant, and the emergency surgery SSI rates are about two times higher than those of the elective surgery ones. This relation brings to the fore the prominence of the surgical setting to the risk of infection. Essential operations by their nature are done in the emergency conditions and at the same time sometimes surgeons operate in circumstances when they do not have prior preparation of the patient. Factors include factors like the pressure to perform the surgical procedure in a short time and the overall critically ill state of the patient, the likelihood of contaminated operative fields contributes to the development of SSIs. Essential surgeries on the other hand, can be done with careful preoperative assessments and intercessions such as the control of complications like commandments and dispensation of preventive antibiotics all which reduce infection chances.

Explanations of the higher SSI rates in emergency surgical procedures are not only detailed but involve several distinct factors. In addition to increased risk, literature evidence established that patients all those who undergo emergent procedures are physically stressed to the extent that their immune systems are weakened, therefore exposed to infections. Clean infected surgeries are also often carried out in conditions likely to be contaminated or dirty such as the case of perforated bowels or ruptured appendicitis. These conditions bring in a higher number of bacteria to penetrate the surgery area hence increasing the likelihood of infection. Further contributing to the incidence are inoperative aspects such as long operating time plus increased complexity of the executed operations. Another factor that increases the level of SSI is the tendency to make decisions quickly and possible scarcities of personnel in surgical teams at night. Physiologically, SSIs are determined by a number of factors such as the microbial flora, the host's immunological state and the environment conditions in the operating site. In emergency surgeries, the patients have the worst conditions; the inflammation and infections at the time of surgery provide a good medium for bacterial growth. Bacteria are usually introduced to the location during the surgery due to the breach of normal tissue barriers, and this can result to infections. Thus, in the elective surgeries, which are performed on the patients who are usually physiologically healthier, the balanced relationship between the host defence and microbial challenges is preserved by the controlled surgical environment and employment of the measures like pre-operative antibiotics [18].

Curiously, the consequences of such developments are not confined to the surgical theatre. About preoperative optimization, the data is unanimously in favor of preoperative claims concerning elective surgeries. Measures such as the effective management of the patient comorbidities, proper promotion of nutritional status, and appropriate preventive antibiotic dosing respond for the prevention of SSI. Also, it is crucial to mention that in elective procedures the utilization of the precisely regulated surgical techniques and postoperative processes minimizes the infection potential. Organizations that perform emergency surgeries have to pay particular attention to the approach that can minimize inherent risks as a priority when it comes to handling critical situations. Stewardship in the administration of

antibiotics, including whether they are given before the patient's arrival in the operating theatre, can be critical in determining the exact bacterial counts. The details about the surgical approaches may also include the following, leave alone the follicular handling; there should be adequate adherence to the principles of minimal tissue manipulation and ensuring that adequate haemostasis is achieved with precision in order to reduce the occurrence of complications. Patients also require close monitoring for the first 30 postoperative days, and it is crucial for health practitioners to act immediately if an SSI is possibly on development. However, this study is not without any major flaw. One potential source of bias is inherent in the cross-sectional study design with retrospective analysis as the accuracy and completeness of patients' charts might vary. This approach is slightly problematic because all retrospective reviews are pegged on existing data, and with the danger of missing data or incorrect data that may be garnered lying dormant in data archives. A final limitation also includes the failure to control for all the sources of bias such as the differences in surgical expertise, the differing infection prevention techniques in different hospitals, or patients' compliance to other medical instructions given after surgeries. These components could influence SSI rates and ought to be considered when evaluating the results. It should be noted however that the research was conducted in a single institutional setting which may limit the transferability of the findings to other settings with different patient profiles and practices of surgery.

It is suggested that in the future, research should focus on the eradication of these constraints and the subsequent identification of wholly untapped questions. More specifically, such future studies synthesizing diverse data collection methods are called for to extend and validate these findings: prospective investigations since the data could be obtained live; studies that allow for controlling for confounding factors affecting preoperative pain scores. Closely related, things would be experimental investigations designed to examine the effectiveness of specific approaches towards reducing SSIs in both emergency and non-emergency procedures. For instance, randomized controlled trials on the efficacy of various antibiotic prophylactic dosing regimens or effects of improved intraoperative procedures on SSI incidence could provide definitive evidence for clinical application. Furthermore, such accounts should look into the place of currently developing innovations such as intraoperative imaging and the identification of recovering microbes during SSIs. Consequently, according to the enclosed report, much importance is placed on the significant differences in terms of SSI rates between crisis and elective abdominal operations where crisis procedures have much higher probability of polluting. The results again stress the importance of preparation before elective operations and the need for targeted measures to prevent SSIs in emergency conditions. To counteract these risks a complex strategy should be used including time adequate antibiotics, refined operations, and cautious supervision after the surgery. The future studies should build this foundation, which pays to prospectively and experimental research aiming at developing the evidence-based preventive interventions and improving of the SSIs rates and surgical result. Therefore, understanding the variables related to SSIs contributes to patient safety and reduces the quality of care and cost related to such infections.

Conclusion

Therefore, this study demonstrates the existence of the high incidence of SSI in emergency AA compared to elective surgeries, which indicates the necessity of designing the effective interventions for such practices. As the study results depict, it is relevant to enhance patient preparation for elective procedures, and

the study's findings contribute to the understanding of effective methods to implement in the case of emergency surgical procedures and their implications for patients' prognosis, as well as speedy antibiotic application, enhanced technical approaches, and careful monitoring of patients' conditions during the postoperative period. From a clinical perspective, these findings provide support to fine-tuned operating room techniques, as well as strict infection prevention procedures that might considerably reduce the SSIs' impact and, therefore, improve patients' outcomes. Subsequent research should focus on anticipating and interventional investigations in order to develop physiognomic practices based on consolidated data, also stressing holistic strategies and multiprotocol approaches that includes surgical competencies, strict antiseptic controls, and universal patient care in order to enhance the general surgical practice. Especially, timely and accurate antimicrobial stewardship, strict aseptic methods, and reasonable use of resources when the emergency occurs may help to decrease SSIs and improve the population's health globally.

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