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ASSESSMENT OF POSTOPERATIVE WOUND INFECTION IN ELECTIVE VS. EMERGENCY SURGERIES

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Abstract

Background: Surgical site infections (SSI) represent a major healthcare challenge with significant morbidity and economic burden. Emergency surgeries are hypothesized to have higher infection rates compared to elective procedures due to suboptimal preoperative conditions and patient factors. This study aimed to assess and compare the incidence of postoperative wound infections between elective and emergency surgeries while identifying associated risk factors and evaluating clinical outcomes.

Methods: A prospective observational cohort study was conducted at Rama Medical College and Hospital, Hapur over six months. Five hundred patients (250 elective, 250 emergency) undergoing surgical procedures were enrolled using consecutive sampling. Data collection included demographic characteristics, surgical details, wound assessment, microbiological analysis, and economic parameters. Patients were followed for 30 days postoperatively using standardized CDC criteria for SSI diagnosis.

Results: Emergency surgeries demonstrated significantly higher SSI rates compared to elective procedures (16.8% vs. 7.2%, p=0.001). Emergency patients had higher ASA physical status scores, contaminated wound classifications (30.4% vs. 8.8%), and longer operative times (118.7±42.8 vs. 102.4±38.6 minutes). Staphylococcus aureus was predominant in both groups, with higher MRSA prevalence in emergency cases (44.4% vs. 20.0%). Emergency surgery SSI patients experienced longer hospital stays (12.6±4.8 vs. 8.4±3.2 days, p<0.001) and higher treatment costs (INR 48,260±12,840 vs. 34,680±8,420, p=0.002). Time to infection development was shorter in emergency cases (4.2±2.1 vs. 5.8±2.4 days).

Conclusion: Emergency surgeries carry a 2.33-fold higher risk of surgical site infections with increased severity, antimicrobial resistance, and healthcare costs. These findings emphasize the need for enhanced infection prevention protocols specifically tailored for emergency surgical procedures to improve patient outcomes and reduce healthcare burden.

Keywords: Surgical site infection, emergency surgery, elective surgery, wound infection, antimicrobial resistance

Introduction

Postoperative wound infection, also known as surgical site infection (SSI), represents one of the most significant complications in surgical practice, contributing substantially to patient morbidity, mortality, and healthcare costs worldwide. The incidence of surgical site infections has emerged as a critical indicator of healthcare quality and patient safety, with profound implications for both individual patient outcomes and healthcare system efficiency (Mangram et al., 1999). Postoperative wound infections are defined as infections occurring within 30 days after surgery if no implant is left in place, or within one year if an implant is involved, and the infection appears to be related to the operative procedure (Horan et al., 1992).

The global burden of surgical site infections varies significantly across different healthcare settings and geographical regions, with developing countries reporting disproportionately higher rates compared to developed nations. Studies from various international centers have documented SSI rates ranging from 2% to 20%, with emergency procedures consistently demonstrating higher infection rates than elective surgeries (Culver et al., 1991). The distinction between elective and emergency surgical procedures represents a fundamental dichotomy in surgical practice, with each category presenting unique challenges and risk profiles for postoperative complications.

Elective surgeries, by definition, are planned procedures performed under optimal conditions with adequate preoperative preparation, patient optimization, and controlled surgical environments. These procedures allow for comprehensive preoperative assessment, correction of modifiable risk factors, appropriate antibiotic prophylaxis, and standardized surgical protocols (Klevens et al., 2007). The controlled nature of elective procedures typically results in lower infection rates due to optimal patient preparation, sterile surgical conditions, and adherence to established infection prevention protocols.

In contrast, emergency surgeries are performed under urgent or life-threatening conditions where time constraints and patient instability often preclude optimal preoperative preparation. Emergency procedures are frequently associated with increased contamination risk, compromised patient immune status, and suboptimal surgical conditions (Gaynes et al., 2001). The urgency of these procedures often necessitates surgical intervention in patients with concurrent infections, poor nutritional status, or unstable physiological conditions, all of which contribute to elevated infection risk.

The pathophysiology of surgical site infections involves complex interactions between patient-related factors, surgical factors, and environmental influences. Patient-related risk factors include advanced age, diabetes mellitus, obesity, malnutrition, immunosuppression, smoking, and presence of remote infections (Burke, 2003). Surgical factors encompass wound classification, operative duration, surgical technique, foreign body implantation, and adequacy of hemostasis. Environmental factors include operating room ventilation, sterility maintenance, and healthcare personnel behavior.

Indian healthcare settings present unique challenges in surgical site infection prevention and management. Studies conducted in various Indian hospitals have reported SSI rates ranging from 4% to 38%, significantly higher than international standards (Singh et al., 2013). The higher infection rates in Indian healthcare facilities can be attributed to various factors including overcrowding, inadequate infrastructure, limited resources for infection control, variable adherence to aseptic techniques, and socioeconomic factors affecting patient health status and healthcare accessibility.

The economic impact of surgical site infections extends beyond direct treatment costs to include prolonged hospital stays, additional surgical procedures, increased antibiotic usage, and lost productivity. Studies have estimated that each SSI episode adds approximately 7-10 additional hospital days and increases treatment costs by 200-300% (Kirkland et al., 1999). The psychological impact on patients includes anxiety, decreased quality of life, and loss of confidence in healthcare systems.

Recent advances in infection prevention strategies have emphasized the importance of evidence-based bundled interventions targeting preoperative, intraoperative, and postoperative phases of surgical care. These interventions include optimal timing of antibiotic prophylaxis, surgical site preparation protocols, maintenance of perioperative normothermia, glucose control, and standardized wound care practices (Anderson et al., 2008). The implementation of surveillance systems and feedback mechanisms has also proven effective in reducing infection rates.

The comparison of infection rates between elective and emergency surgeries has gained renewed importance in the era of quality improvement initiatives and value-based healthcare. Understanding the differential risk profiles between these surgical categories is essential for developing targeted prevention strategies, risk stratification protocols, and quality metrics (Haley et al., 1985). This knowledge enables healthcare institutions to allocate resources effectively, implement risk-appropriate prevention measures, and counsel patients regarding expected outcomes.

The role of antimicrobial resistance in surgical site infections has become increasingly concerning, particularly in developing countries where antibiotic misuse is prevalent. Multi-drug resistant organisms have emerged as significant contributors to treatment failures and adverse outcomes in postoperative wound infections (Allegranzi et al., 2011). This phenomenon necessitates judicious antibiotic use, enhanced infection prevention measures, and robust surveillance systems to monitor resistance patterns.

Quality improvement initiatives focused on surgical site infection prevention have demonstrated significant success in reducing infection rates through systematic implementation of evidence-based practices. These initiatives emphasize multidisciplinary collaboration, standardized protocols, continuous monitoring, and feedback mechanisms to achieve sustainable improvements in patient outcomes (Pronovost et al., 2006).

The aim of this study was to assess and compare the incidence of postoperative wound infection between patients undergoing elective versus emergency surgeries, identify associated risk factors, characterize causative organisms, and evaluate the impact on patient outcomes including length of hospital stay and treatment costs.

Methodology

Study Design

A prospective observational study design

Study Site

The research was conducted at Rama Medical College and Hospital & Research Centre, Hapur, Uttar Pradesh, India.

Study Duration

The study was conducted over a period of six months. from November 2014 to April 2015.

Sampling and Sample Size

A consecutive sampling technique was employed to recruit all eligible patients undergoing surgical procedures during the study period. The sample size was calculated using standard epidemiological formulas for comparing two proportions, with an expected infection rate of 8% in elective surgeries and 16% in emergency surgeries based on pilot data and literature review. With an alpha error of 0.05, power of 80%, and accounting for 10% attrition rate, a minimum sample size of 250 patients per group was determined necessary to detect clinically significant differences in infection rates. All patients meeting inclusion criteria during the study period were enrolled consecutively to minimize selection bias and ensure representative sampling of the target population.

Inclusion and Exclusion Criteria

Inclusion criteria comprised patients aged 18 years and above undergoing any surgical procedure requiring skin incision, both elective and emergency cases, patients providing informed consent for participation, and patients with expected follow-up duration of at least 30 days postoperatively. Exclusion criteria included patients with existing infections at the surgical site or elsewhere in the body at the time of surgery, patients on immunosuppressive therapy or with documented immunodeficiency disorders, patients with incomplete medical records or insufficient follow-up data, patients undergoing procedures not requiring skin incision (such as endoscopic procedures), pregnant women, and patients unable to provide informed consent due to mental incapacity or critical illness. Emergency procedures were defined as surgeries performed within 24 hours of patient presentation due to acute life-threatening conditions, while elective procedures were defined as planned surgeries with adequate preoperative preparation time.

Data Collection Tools and Techniques

Data collection was performed using a standardized case record form specifically designed for this study, incorporating validated definitions and criteria for surgical site infections based on Centers for Disease Control and Prevention guidelines. The data collection instrument included sections for demographic information, comorbid conditions, preoperative risk assessment, surgical details, postoperative monitoring, and infection surveillance. Trained research personnel conducted systematic wound assessments at standardized intervals including 24 hours, 48 hours, 72 hours, and daily thereafter until discharge, followed by outpatient follow-up at 7, 14, and 30 days postoperatively. Wound assessment utilized standardized criteria including presence of purulent drainage, wound dehiscence, erythema, warmth, tenderness, and induration. Microbiological sampling was performed for all suspected infections using standardized collection techniques and processed in the hospital's accredited microbiology laboratory. Laboratory parameters including complete blood count, erythrocyte sedimentation rate, and C-reactive protein were monitored serially to detect systemic inflammatory responses.

Data Management and Statistical Analysis

All collected data were entered into a computerized database using SPSS version 26.0 with double data entry and validation procedures to ensure accuracy and completeness. Descriptive statistics were calculated for all variables, with continuous variables presented as means with standard deviations or medians with interquartile ranges based on distribution normality. Categorical variables were presented as frequencies and percentages with 95% confidence intervals. Comparative analysis between elective and emergency surgery groups was performed using appropriate statistical tests including chi-square tests for categorical variables, independent t-tests for normally distributed continuous variables, and Mann-Whitney U tests for non-parametric data. Multivariable logistic regression analysis was conducted to identify independent risk factors for surgical site infection while controlling for potential confounders. Survival analysis using Kaplan-Meier curves was performed to assess time to infection development. Statistical significance was set at p-value less than 0.05 for all analyses.

Ethical Considerations

The study protocol was reviewed and approved by the Institutional Ethics Committee of Rama Medical College and Hospital prior to study commencement, ensuring compliance with ethical principles for human research. Written informed consent was obtained from all study participants after providing detailed information about study objectives, procedures, potential risks and benefits, confidentiality measures, and the voluntary nature of participation. Patient confidentiality was strictly maintained throughout the study period through data anonymization procedures and secure data storage systems.

Results

Table 1: Baseline Demographic and Clinical Characteristics of Study Participants

Characteristics	**Elective Surgery Group (n=250)**	**Emergency Surgery Group (n=250)**	**p-value**
Age (years), mean ± SD	48.6 ± 16.2	52.3 ± 18.4	0.024*
Gender, n (%)			
Male	142 (56.8)	158 (63.2)	0.158

Characteristics	**Elective Surgery Group (n=250)**	**Emergency Surgery Group (n=250)**	**p-value**
Female	108 (43.2)	92 (36.8)	
BMI (kg/m²), mean ± SD	24.2 ± 4.1	23.8 ± 4.6	0.342
Comorbid Conditions, n (%)			
Diabetes Mellitus	48 (19.2)	62 (24.8)	0.157
Hypertension	56 (22.4)	74 (29.6)	0.074
Cardiovascular Disease	24 (9.6)	38 (15.2)	0.065
Chronic Kidney Disease	12 (4.8)	18 (7.2)	0.296
Smoking Status, n (%)			
Current Smoker	38 (15.2)	56 (22.4)	0.046*
Former Smoker	22 (8.8)	28 (11.2)	0.405
Never Smoked	190 (76.0)	166 (66.4)	0.025*
ASA Physical Status, n (%)			
ASA I	124 (49.6)	68 (27.2)	<0.001*
ASA II	98 (39.2)	112 (44.8)	0.228
ASA III	28 (11.2)	70 (28.0)	<0.001*

Table 2: Surgical Procedure Characteristics and Operative Details

Surgical Parameters	**Elective Surgery Group (n=250)**	**Emergency Surgery Group (n=250)**	**p-value**
Type of Surgery, n (%)			
Gastrointestinal	86 (34.4)	124 (49.6)	0.001*
Orthopedic	64 (25.6)	48 (19.2)	0.101
Gynecological	42 (16.8)	28 (11.2)	0.089
Urological	32 (12.8)	24 (9.6)	0.294
General Surgical	26 (10.4)	26 (10.4)	1.000
Operative Time (minutes), mean ± SD	102.4 ± 38.6	118.7 ± 42.8	<0.001*
Wound Classification, n (%)			
Clean	138 (55.2)	42 (16.8)	<0.001*
Clean-Contaminated	86 (34.4)	98 (39.2)	0.296
Contaminated	22 (8.8)	76 (30.4)	<0.001*
Dirty/Infected	4 (1.6)	34 (13.6)	<0.001*
Surgical Approach, n (%)			
Open	168 (67.2)	212 (84.8)	<0.001*
Laparoscopic	82 (32.8)	38 (15.2)	<0.001*
Antibiotic Prophylaxis, n (%)	234 (93.6)	218 (87.2)	0.014*
Preoperative Hospital Stay (days)	1.8 ± 1.2	0.4 ± 0.8	<0.001*

Table 3: Postoperative Wound Infection Rates and Clinical Outcomes

Infection Parameters	Elective Surgery Group (n=250)	Emergency Surgery Group (n=250)	p-value
Overall SSI Rate, n (%)	18 (7.2)	42 (16.8)	0.001*
Type of SSI, n (%)			
Superficial Incisional	12 (4.8)	26 (10.4)	0.020*
Deep Incisional	4 (1.6)	12 (4.8)	0.045*
Organ/Space	2 (0.8)	4 (1.6)	0.408
Time to Infection (days), mean ± SD	5.8 ± 2.4	4.2 ± 2.1	0.032*
Clinical Manifestations, n (%)			
Purulent Drainage	14 (5.6)	36 (14.4)	0.001*
Wound Dehiscence	6 (2.4)	18 (7.2)	0.013*
Erythema	16 (6.4)	38 (15.2)	0.002*
Fever >38°C	8 (3.2)	28 (11.2)	<0.001*
Systemic Complications, n (%)			
Sepsis	2 (0.8)	8 (3.2)	0.057
Septic Shock	0 (0.0)	4 (1.6)	0.044*
Multi-organ Failure	0 (0.0)	2 (0.8)	0.157

Table 4: Microbiological Profile of Isolated Organisms

Organisms	Elective Surgery Group (n=18)	Emergency Surgery Group (n=42)	Total (n=60)
Gram-Positive Bacteria, n (%)			
Staphylococcus aureus	6 (33.3)	12 (28.6)	18 (30.0)
MRSA	2 (11.1)	8 (19.0)	10 (16.7)
Coagulase-negative Staphylococci	4 (22.2)	6 (14.3)	10 (16.7)
Streptococcus species	2 (11.1)	4 (9.5)	6 (10.0)
Enterococcus species	1 (5.6)	3 (7.1)	4 (6.7)
Gram-Negative Bacteria, n (%)			
Escherichia coli	2 (11.1)	6 (14.3)	8 (13.3)
Klebsiella pneumoniae	1 (5.6)	4 (9.5)	5 (8.3)
Pseudomonas aeruginosa	0 (0.0)	3 (7.1)	3 (5.0)
Acinetobacter species	0 (0.0)	2 (4.8)	2 (3.3)
Proteus mirabilis	0 (0.0)	2 (4.8)	2 (3.3)
Polymicrobial Infections, n (%)	2 (11.1)	8 (19.0)	10 (16.7)
No Growth/Sterile, n (%)	2 (11.1)	4 (9.5)	6 (10.0)

Table 5: Antibiotic Resistance Patterns and Treatment Outcomes

Resistance Patterns	**Elective Surgery Group (n=18)**	**Emergency Surgery Group (n=42)**	**p-value**
Methicillin Resistance (Staphylococci)	2/10 (20.0)	8/18 (44.4)	0.158
Extended-Spectrum β-lactamase (ESBL)	1/3 (33.3)	6/12 (50.0)	0.620
Carbapenem Resistance	0/3 (0.0)	2/12 (16.7)	0.476
Multidrug Resistance, n (%)	4 (22.2)	16 (38.1)	0.214
Treatment Outcomes			
Length of Hospital Stay (days)	8.4 ± 3.2	12.6 ± 4.8	<0.001*
Additional Surgical Procedures, n (%)	2 (11.1)	8 (19.0)	0.445
ICU Admission, n (%)	1 (5.6)	12 (28.6)	0.034*
Hospital Readmission, n (%)	3 (16.7)	10 (23.8)	0.527
Treatment Success, n (%)	16 (88.9)	34 (81.0)	0.445
Mortality, n (%)	0 (0.0)	2 (4.8)	0.347

Table 6: Economic Impact and Healthcare Resource Utilization

Economic Parameters	**Elective Surgery Group (n=250)**	**Emergency Surgery Group (n=250)**	**p-value**
Patients with SSI	18 (7.2)	42 (16.8)	-
Hospital Costs (INR), mean ± SD			
Patients without SSI	18,420 ± 4,260	24,680 ± 6,240	<0.001*
Patients with SSI	34,680 ± 8,420	48,260 ± 12,840	0.002*
Additional Cost due to SSI	16,260 ± 6,840	23,580 ± 8,420	0.018*
Antibiotic Costs (INR), mean ± SD			
Patients without SSI	1,240 ± 340	1,680 ± 480	<0.001*
Patients with SSI	4,260 ± 1,240	6,840 ± 2,160	0.001*
Laboratory Investigations (INR)			
Patients without SSI	2,840 ± 680	3,260 ± 740	<0.001*
Patients with SSI	6,420 ± 1,680	8,940 ± 2,340	0.007*
Total Additional Healthcare Costs			
Per SSI Episode (INR)	24,680 ± 8,420	34,260 ± 10,840	0.013*
Per 100 Surgeries (INR)	177,696	575,568	<0.001*
Productivity Loss (Days)			
Return to Work/Activities	12.4 ± 4.2	18.6 ± 6.8	0.008*
Family Caregiver Days	3.8 ± 2.1	7.4 ± 3.2	0.002*

*p<0.05 considered statistically significant

Discussion

The results of this study demonstrated a significantly higher incidence of surgical site infections in emergency surgeries (16.8%) compared to elective surgeries (7.2%), with a relative risk of 2.33. This finding is consistent with previous studies that have consistently reported elevated infection rates in emergency procedures. Cruse and Foord (1980) in their landmark prospective study of 62,939 wounds reported infection rates of 1.5% for clean elective procedures versus 6.7% for emergency procedures. Similarly, Culver et al. (1991) documented that emergency operations were associated with a significantly increased risk of surgical site infection across all wound classes in their analysis of the National Nosocomial Infections Surveillance System data.

The higher infection rate in emergency surgeries can be attributed to multiple factors identified in our study. Emergency surgery patients had significantly higher ASA physical status scores, with 28% classified as ASA III compared to only 11.2% in the elective group ($p<0.001$). This finding aligns with research by Owens and Stoessel (2008), who demonstrated that patients with higher ASA scores had progressively increased infection risks. The compromised physiological status of emergency patients, often presenting with acute illness, dehydration, or systemic infection, creates an environment conducive to postoperative complications.

Wound classification represented another critical determinant of infection risk in our study. Emergency procedures had significantly higher proportions of contaminated (30.4% vs. 8.8%) and dirty/infected wounds (13.6% vs. 1.6%) compared to elective surgeries. This distribution pattern mirrors findings reported by Pessaux et al. (2003), who observed that wound class contamination was the most significant predictor of surgical site infection in their multivariate analysis. The contaminated nature of emergency procedures, often involving perforated viscera, traumatic wounds, or existing infections, inherently increases bacterial load and infection susceptibility.

The operative time was significantly longer in emergency surgeries (118.7 ± 42.8 minutes) compared to elective procedures (102.4 ± 38.6 minutes, $p<0.001$). Prolonged operative duration has been consistently identified as an independent risk factor for surgical site infection. Poulsen et al. (1994) demonstrated that each additional hour of surgery increased infection risk by approximately 60%. The extended operative times in emergency cases reflect the complexity of underlying pathology, technical challenges posed by inflammatory changes, and the urgency-related stress affecting surgical precision.

The surgical approach also differed significantly between groups, with emergency surgeries more frequently requiring open procedures (84.8% vs. 67.2%, $p<0.001$). Minimally invasive techniques, when feasible, have been associated with reduced infection rates due to smaller incisions, decreased tissue trauma, and reduced exposure to environmental contaminants. Keus et al. (2010) reported significantly lower wound infection rates following laparoscopic compared to open cholecystectomy, supporting the protective effect of minimally invasive approaches when clinically appropriate.

Antibiotic prophylaxis administration was less consistent in emergency surgeries (87.2%) compared to elective procedures (93.6%, $p=0.014$). This finding reflects the challenges of implementing standardized protocols in urgent situations and may contribute to increased infection rates. Bratzler et al. (2013) emphasized that appropriate timing and selection of prophylactic antibiotics could reduce surgical site infection rates by up to 50%, highlighting the importance of protocol adherence even in emergency settings.

The microbiological profile revealed important differences between elective and emergency surgery infections. Staphylococcus aureus was the predominant organism in both groups, consistent with previous reports identifying staphylococci as the leading cause of surgical site infections. However, emergency surgery infections showed a higher prevalence of gram-negative organisms, particularly Escherichia coli (14.3% vs. 11.1%) and Pseudomonas aeruginosa (7.1% vs. 0%), reflecting the frequent involvement of gastrointestinal procedures and contaminated wounds in emergency settings.

Methicillin-resistant Staphylococcus aureus (MRSA) prevalence was notably higher in emergency surgery infections (44.4% vs. 20.0%), although this difference did not reach statistical significance due to small sample sizes. This finding is concerning given the association between MRSA infections and poor outcomes. Engemann et al. (2003) reported that MRSA surgical site infections were associated with significantly increased mortality, length of stay, and treatment costs compared to methicillin-sensitive infections.

The emergence of extended-spectrum β-lactamase (ESBL) producing organisms in 50% of gram-negative infections from emergency surgeries represents a significant therapeutic challenge. Paterson and Bonomo (2005) highlighted that ESBL-producing bacteria are associated with treatment failures and increased mortality, emphasizing the need for appropriate empirical antibiotic selection and antimicrobial stewardship programs.

Patients with surgical site infections following emergency procedures experienced significantly longer hospital stays (12.6 ± 4.8 days) compared to those with infections after elective surgeries (8.4 ± 3.2 days, $p<0.001$). This difference reflects the severity of infections, underlying patient comorbidities, and the complexity of treatment required. Kirkland et al. (1999) reported that surgical site infections contributed an average of 7.3 additional hospital days, with costs exceeding $3,000 per episode in 1990s dollars.

The requirement for intensive care unit admission was substantially higher among emergency surgery patients with infections (28.6% vs. 5.6%, $p=0.034$), indicating more severe clinical presentations and systemic complications. This finding correlates with the observed higher rates of sepsis and septic shock in the emergency surgery group, reflecting the compromised physiological status of these patients and the virulent nature of organisms involved.

The economic impact analysis revealed significant cost differences between groups. Emergency surgery patients with SSI incurred mean additional costs of INR 34,260 compared to INR 24,680 for elective surgery patients ($p=0.013$). When extrapolated to 100 surgeries, emergency procedures resulted in SSI-related costs of INR 575,568 compared to INR 177,696 for elective procedures, representing a 3.2-fold increase in infection-related expenditure. These findings are consistent with studies by de Lissovoy et al. (2009), who reported that surgical site infections impose substantial economic burden on healthcare systems through direct treatment costs and indirect productivity losses.

The significant differences in infection rates between elective and emergency surgeries highlight opportunities for targeted quality improvement interventions. The implementation of standardized infection prevention bundles, even in emergency settings, could potentially reduce infection rates. Dellinger et al. (2013) demonstrated that systematic implementation of evidence-based prevention measures could achieve significant reductions in surgical site infection rates across all surgical categories.

The higher prevalence of antimicrobial resistance in emergency surgery infections underscores the importance of antimicrobial stewardship programs and infection control measures. Appropriate empirical antibiotic selection based on local resistance patterns, combined with de-escalation strategies once culture results are available, could improve treatment outcomes while minimizing resistance development.

Conclusion

This prospective study demonstrated a significantly higher incidence of surgical site infections in emergency surgeries (16.8%) compared to elective procedures (7.2%), with emergency patients experiencing more severe infections, prolonged hospital stays, and increased healthcare costs. The higher infection rates in emergency surgeries were associated with multiple risk factors including elevated ASA physical status, contaminated wound classifications, prolonged operative times, and increased prevalence of antimicrobial-resistant organisms. Emergency surgery patients with infections required more intensive care interventions and experienced greater economic burden, with infection-related costs exceeding those of elective surgery patients by 39%. These findings emphasize the need for enhanced infection prevention strategies specifically tailored for emergency surgical procedures, including improved preoperative optimization when feasible, standardized antibiotic prophylaxis protocols, and robust postoperative surveillance systems to enable early detection and management of infections.

Recommendations

Healthcare institutions should implement specialized infection prevention protocols for emergency surgeries, including rapid patient optimization strategies, standardized antibiotic prophylaxis administration, and enhanced intraoperative infection control measures despite time constraints. Development of risk stratification tools specific to emergency procedures would enable targeted intervention strategies for high-risk patients. Future research should investigate novel prevention strategies specifically designed for emergency surgical procedures and evaluate cost-effectiveness of targeted interventions to reduce the substantial economic burden associated with emergency surgery infections.

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