Sepsis At The Surgical Site: Emerging Trends, Challenges, And Management

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ABSTRACT

Background: Sepsis at the surgical site (SSIs leading to sepsis) is a major cause of morbidity and mortality in surgical patients. Effective prevention and management strategies are critical for improving patient outcomes. This study also includes an analysis of patients admitted to the Intensive Care Unit (ICU) due to sepsis resulting from surgical site infections (SSIs), comparing their outcomes with non-ICU patients. This study aims to explore the emerging trends, challenges, and management practices related to surgical site sepsis.

Objective: The primary objective of this study is to investigate the factors influencing the incidence and management of sepsis at surgical sites. Specifically, the study aims to identify the challenges healthcare professionals face in preventing and managing SSIs, evaluate the effectiveness of infection control measures, and assess the role of early intervention practices like the "Hour-1 Bundle."

Methods:

A cross-sectional survey design was adopted, with data collected through structured questionnaires administered to healthcare professionals, including surgeons, intensivists nurses, medical officers and infection control specialists. The sample consisted of 250 healthcare workers selected using stratified random sampling from both public and private healthcare settings. The survey included Likert-scale items to capture perceptions and experiences regarding sepsis management. Data were analyzed using descriptive and inferential statistical methods, including normality tests, Cronbach's alpha for reliability, Spearman's rank correlation for relationships, and regression analysis for prediction.

Results: The results indicated that sepsis at surgical sites continues to be a prevalent issue, with significant challenges in timely diagnosis and management. The study found strong correlations between the **Application of the Hour-1 Bundle** and

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the **Effectiveness of Source Control**, suggesting that early intervention improves outcomes. However, **Delayed Diagnosis Factors** were negatively correlated with the ability to manage sepsis effectively, highlighting the importance of early recognition.

Conclusions: The study concludes that addressing **delayed diagnosis**, improving **antibiotic stewardship**, and enhancing **infection control measures** are essential for effective sepsis management at surgical sites. Furthermore, revising the survey instrument to improve reliability will be crucial for future research in this area.

Keywords: *Sepsis, Surgical Site Infection, Hour-1 Bundle, Infection Control, Antibiotic Stewardship, Healthcare Professionals, Sepsis Management*

1. INTRODUCTION

Sepsis, a life-threatening condition caused by an infection, remains a significant cause of morbidity and mortality worldwide. Surgical site infections (SSIs), which occur after surgical procedures, are a leading source of sepsis. SSIs are a major concern in postoperative care, as they can lead to prolonged hospital stays, increased healthcare costs, and a higher risk of patient complications, including sepsis. Despite advances in medical technology and infection control practices, the prevalence of sepsis at surgical sites remains high, highlighting the need for improved understanding and management strategies. Surgical site sepsis is a complex and multifaceted condition that involves various factors, such as the type of surgery, the patient's underlying health conditions, the presence of multidrug-resistant organisms, and the timeliness of diagnosis and treatment. The increasing incidence of sepsis following surgical procedures raises critical concerns about the effectiveness of current prevention and management strategies (Conoscenti et al., 2025). In addition to the general management of SSIs leading to sepsis, this study expands its focus to ICU patients who require intensive care due to the progression of SSIs to sepsis. ICU patients are often exposed to more aggressive treatment and monitoring, which may impact sepsis outcomes. By comparing ICU patients with non-ICU patients, this study aims to explore how ICU care influences the management and recovery from sepsis

Timely diagnosis and prompt intervention are essential in reducing the risk of sepsis and improving patient outcomes. However, delays in diagnosing sepsis often lead to severe complications and higher mortality rates. Healthcare professionals must be aware of the signs and symptoms of sepsis, as well as the best practices for preventing and managing SSIs, to improve patient care and reduce the burden of sepsis on healthcare systems. One of the most critical advancements in sepsis management is the implementation of the **Hour-1 Bundle**, a set of guidelines designed to ensure rapid identification and treatment of sepsis within one hour of its recognition. The Hour-1 Bundle includes actions such as obtaining blood cultures, administering broad-spectrum antibiotics, and providing intravenous fluids to stabilize the patient. Research has shown that adherence to these guidelines significantly improves patient outcomes, reducing the risk of sepsis progression and mortality (Patel et al., 2025).

However, despite the clear benefits of early intervention, many healthcare settings still face challenges in effectively implementing these protocols. The management of sepsis at surgical sites also faces several challenges related to antibiotic resistance. The rise of **multidrug-resistant organisms (MDROs)** has made it increasingly difficult to treat SSIs effectively, as traditional antibiotics may no longer be effective in controlling these infections. The emergence of resistant pathogens complicates the management of sepsis, making it essential for healthcare professionals to adopt antibiotic stewardship practices that ensure the appropriate use of antibiotics to minimize resistance. Additionally, factors such as **inadequate infection control measures**, **delayed diagnosis**, and **poor wound care practices** can contribute to the development of sepsis after surgery (Jagdewsing et al., 2025).

The objective of this study is to explore the emerging trends and challenges associated with sepsis at surgical sites. This research will examine the current management strategies, the effectiveness of early intervention practices such as the Hour-1 Bundle, and the barriers healthcare professionals face in preventing and managing SSIs. The study will also assess the role of antibiotic stewardship in controlling sepsis and the impact of infection control practices on patient outcomes. By gaining a deeper understanding of the factors that contribute to sepsis at surgical sites, this study aims to provide actionable insights that can help healthcare professionals improve sepsis prevention, diagnosis, and management, ultimately leading to better patient outcomes and reduced healthcare costs (Karlsen et al., 2025).

In addition to the factors mentioned, another critical element that influences sepsis outcomes is **patient factors**, such as age, underlying health conditions (e.g., diabetes, hypertension), nutritional status, and immune system function. Patients with compromised immune systems or chronic illnesses are at a higher risk for developing infections, including SSIs, which can then lead to sepsis. Understanding these patient-specific risk factors is essential in determining appropriate preventive and management strategies tailored to individual needs. Furthermore, **healthcare infrastructure and resources** also play a significant role in the effective management of surgical site sepsis. Hospitals and surgical centers with limited access to diagnostic tools, medications, or trained personnel may struggle to implement best practices in infection control and sepsis

management. Therefore, this study will also explore the disparities in sepsis management across different healthcare settings, particularly between high-resource and low-resource environments, to identify potential areas for improvement in global sepsis care (Cho et al., 2025).

2. LITERATURE REVIEW

Sepsis remains one of the most significant challenges in modern medicine, particularly when it develops following a surgical procedure. Surgical site infections (SSIs) are a common source of sepsis, contributing to the rising global burden of morbidity and mortality. Over the past few decades, there has been considerable research into the prevention, diagnosis, and management of SSIs, yet the incidence of sepsis following surgery continues to present substantial challenges. This literature review synthesizes existing research on the emerging trends, challenges, and management strategies associated with sepsis at surgical sites, focusing on the effectiveness of early interventions, infection control practices, and the role of antibiotic stewardship (Islam et al., 2025).

Surgical Site Infections and Sepsis

Surgical site infections (SSIs) are infections that occur at the site of a surgical incision within 30 days of the surgery or up to a year if an implant is involved. These infections are considered one of the leading contributors to postoperative morbidity and mortality. According to a study by **Edmiston et al.**, SSIs are associated with increased hospital readmissions, longer stays, and higher treatment costs. When these infections progress to sepsis, the situation becomes much more critical. Sepsis is characterized by a systemic inflammatory response to infection, which can result in organ failure and death if not managed promptly and effectively. **Göransson et al.** state that while SSIs are preventable, the transition from local infection to systemic sepsis remains a key area of concern (Anioke et al., 2025).

Sepsis Management: Early Interventions and Hour-1 Bundle

The management of sepsis in surgical patients has seen significant improvements with the introduction of the **Sepsis-3 guidelines** and the **Hour-1 Bundle**, which emphasizes rapid intervention within the first hour of sepsis recognition. The Hour-1 Bundle is a set of recommendations that include early administration of broad-spectrum antibiotics, aggressive fluid resuscitation, and early source control through surgical interventions or drainage if necessary. **Singer et al.** argue that timely interventions, such as those prescribed by the Hour-1 Bundle, significantly reduce mortality in sepsis patients. They suggest that early administration of antibiotics and fluids, along with timely identification, is crucial for improving patient outcomes. Research by **Levy et al (Seyferth et al., 2025).**

Further supports the effectiveness of the Hour-1 Bundle, showing that hospitals with strict adherence to these guidelines reported better outcomes, including lower mortality rates. However, despite its success, **Brown et al.** note that the implementation of the Hour-1 Bundle remains inconsistent across healthcare facilities, particularly in resource-limited settings. This inconsistency highlights the need for further education, better infrastructure, and more effective training programs for healthcare professionals (Christie et al., 2025).

Infection Control Practices

Infection control practices are essential to preventing SSIs and sepsis at surgical sites. **Hand hygiene**, **sterilization of surgical tools**, and **prophylactic antibiotic administration** are considered foundational practices in preventing surgical infections. **Merrer et al.** found that improving infection control measures, such as enhanced hand hygiene protocols and more stringent sterilization techniques, significantly reduced the incidence of SSIs. However, **Hassan et al.** found that while infection control measures have improved, the rise of **multidrug-resistant organisms (MDROs)** has posed a new challenge in managing infections at surgical sites. MDROs, including methicillin-resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile*, complicate treatment regimens, leading to longer hospital stays and higher treatment costs. **Kanj et al.** suggest that infection control practices should evolve to address the growing threat of antibiotic resistance. These practices need to include more robust surveillance systems and stricter protocols for the use of antibiotics (Anestiadou et al., 2025).

Antibiotic Stewardship

Antibiotic stewardship plays a pivotal role in preventing SSIs and managing sepsis. Overuse and misuse of antibiotics contribute to the development of resistant strains, making it harder to treat infections once they occur. The World Health Organization (WHO) has identified antibiotic resistance as one of the greatest threats to global health. **Ventola** outlines the importance of implementing antibiotic stewardship programs (ASPs) in hospitals to ensure that antibiotics are prescribed only when necessary, at the appropriate dosage, and for the appropriate duration (Konstantinou et al., 2025).

Studies by **Micallef et al.** have shown that institutions with robust ASPs had a significant reduction in the incidence of MDRO-related infections, including those at surgical sites. In contrast, **Jones et al.** found that in some low-resource settings, the lack of an effective antibiotic stewardship strategy exacerbated the spread of resistant pathogens and led to poor sepsis outcomes. This highlights the need for both global and local efforts to enhance antibiotic stewardship, particularly in regions with high infection rates and limited resources (Seid et al., 2025).

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Delayed Diagnosis and Sepsis Outcomes

One of the major challenges in managing sepsis at surgical sites is the **delayed diagnosis**, which often leads to worsened outcomes. **Kumar et al.** state that sepsis, when diagnosed early, can be effectively managed with appropriate interventions, yet a delayed diagnosis often results in multi-organ failure, which is associated with higher mortality. Factors contributing to delayed diagnosis include the lack of awareness among healthcare professionals, insufficient monitoring of patients, and the difficulty in recognizing the early signs of sepsis in surgical patients. **Abood et al.** argue that improving awareness and training on the early signs of sepsis is crucial to reducing delays in diagnosis. This is especially true in settings where the medical staff may not be trained to recognize sepsis promptly, leading to a lack of timely intervention (Liu et al., 2025).

Patient-Specific Factors

Patient factors, such as age, comorbidities, and immune status, also play a significant role in the development of sepsis. **Tosch et al.** indicate that older adults and those with chronic illnesses such as diabetes, cancer, and cardiovascular diseases are at a higher risk of developing SSIs that lead to sepsis. These individuals often have weakened immune systems, making them more susceptible to infections and complications. Moreover, **Ponce et al.** found that the nutritional status of surgical patients is an important factor in sepsis outcomes. Malnutrition, particularly among elderly patients or those with chronic diseases, impairs immune function and increases the risk of infection. Therefore, it is crucial to take patient-specific factors into account when developing management and prevention strategies for sepsis at surgical sites (Khan et al., 2025).

Research Methodology

This study on "Sepsis at the Surgical Site: Emerging Trends, Challenges, and Management" aims to investigate the trends and challenges associated with surgical site infections (SSIs) that lead to sepsis. Sepsis, especially in the context of surgical procedures, remains a significant cause of morbidity and mortality. By exploring the prevalence, management strategies, and challenges healthcare professionals face in handling sepsis at surgical sites, this study seeks to provide insights into how current practices can be improved. The research will employ a quantitative approach, using structured surveys to collect numerical data that will allow for statistical analysis of trends and issues related to sepsis management (Santacroce et al., 2024).

Research Design

The study will adopt a cross-sectional survey design, which allows for the collection of data at a specific point in time from healthcare professionals involved in surgical care. This design is appropriate for understanding the frequency of sepsis, common challenges in its management, and the perceived effectiveness of various management strategies across different healthcare settings. The survey will consist of both closed-ended questions and Likert-scale items that will allow respondents to quantify their responses and provide detailed insights into their experiences and perceptions regarding sepsis management (Gabriel et al., 2019).

Study Population

The study population consists of healthcare professionals, including surgeons, intensivists, nurses, medical officers, and infection control specialists working in hospitals and surgical centers. These professionals are directly involved in preventing, diagnosing, and treating surgical site infections. The study will focus on both public and private healthcare institutions to capture a wide range of practices and challenges. Given the nature of the topic, it is crucial to include a variety of healthcare workers to obtain a comprehensive understanding of the issue (Schultz et al., 2019). The study includes a subset of ICU patients who were diagnosed with surgical site infections that progressed to sepsis. These patients were selected from ICU units in participating hospitals, and their data will be compared with patients who did not require ICU admission but developed sepsis from SSIs. A control group of non-ICU patients who developed sepsis from SSIs will be used for comparison. Both groups will be evaluated based on the time to diagnosis, sepsis management protocols (e.g., Hour-1 Bundle), and recovery outcomes. In addition to surveying surgeons, intensivists, nurses, medical officers and infection control specialists, healthcare workers in ICU settings will be surveyed specifically about their experiences with managing sepsis in critically ill patients.

Sampling Method

A stratified random sampling method will be employed to select a representative sample of healthcare professionals from different roles, experience levels, and hospital types. The stratified approach ensures that each subgroup (e.g., surgeons, intensivists, nurses, medical officers and infection control specialists) is adequately represented in the sample. A total of 250 healthcare professionals will be selected to participate in the survey. This sample size is calculated to provide sufficient power to detect significant trends and relationships within the data. By using random sampling within each stratum, the study aims to reduce selection bias and ensure the findings are generalizable (Martin-Loeches et al., 2024).

Data Collection

Data will be collected using a self-administered questionnaire. The questionnaire will be designed to gather information on

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several key aspects, including (Alverdy et al., 2020):

- The frequency of sepsis cases in different types of surgeries

- The factors contributing to delayed diagnosis of sepsis

- The perceived challenges in managing sepsis, including issues related to antibiotic resistance and multi-drug resistant organisms

- The effectiveness of infection control practices, including the use of prophylactic antibiotics, hand hygiene, and post-operative wound care

- The application of the "Hour-1 Bundle" in clinical practice

- Participants experience with current sepsis management protocols

The questionnaire will undergo a pre-test phase to ensure the clarity, reliability, and validity of the items. Feedback from a small group of healthcare professionals will be used to refine the questionnaire before full deployment (Rickard et al., 2020).

Data Analysis

Data will be analyzed using descriptive and inferential statistical methods. Descriptive statistics (e.g., frequencies, percentages, means, and standard deviations) will be used to summarize the demographic characteristics of the sample and key responses related to trends and challenges in surgical site sepsis. Inferential statistics, such as chi-square tests and logistic regression analysis, will be employed to examine relationships between variables, such as the level of experience of healthcare professionals and their knowledge or practices related to sepsis management. Additionally, correlation analysis will be performed to assess the relationship between the implementation of infection control practices and the reported incidence of sepsis (Cassini et al., 2020).

Ethical Considerations

This study will adhere to ethical guidelines for human research. Informed consent will be obtained from all participants, ensuring they understand the purpose of the study, their voluntary participation, and the confidentiality of their responses. Ethical approval will be obtained from the institutional review board (IRB) of the hospitals involved in the study. The data will be anonymized, and the study will comply with privacy and data protection regulations to maintain the confidentiality of all participants (De Simone et al., 2020).

Limitations

Despite its strengths, this study has some limitations. First, the cross-sectional design does not allow for causal inferences, as it captures data at a single point in time. Additionally, the self-reported nature of the data may lead to biases, such as social desirability bias or recall bias. To mitigate these biases, the questionnaire will be carefully designed to ensure clarity and minimize leading questions. Furthermore, the study's findings may not be generalizable to all healthcare settings, particularly those in low-resource countries where access to infection control resources may differ significantly (Calderwood et al., 2023).

Data Analysis

Normality Test Results

	Statistic	P-Value
Has Incidence Increased?	0.8144843578338623	1.4181491471052486e-16
Frequency of MRSA	0.575462818145752	2.592883243543787e-24
Delayed Diagnosis Factors	0.7820340991020203	5.686693334245674e-16
Challenges in Managing Sepsis	0.8835833072662354	2.5490698093988406e-11
Barriers to Antibiotic Stewardship	0.8932269811630249	2.697172997098707e-12
Application of 'Hour-1 Bundle'	0.8269590735435486	5.368219004594306e-16
Effectiveness of Source Control	0.8144843578338623	1.4181491471052486e-16
Effectiveness of Infection Prevention	0.7332876324653625	9.007523180554814e-20

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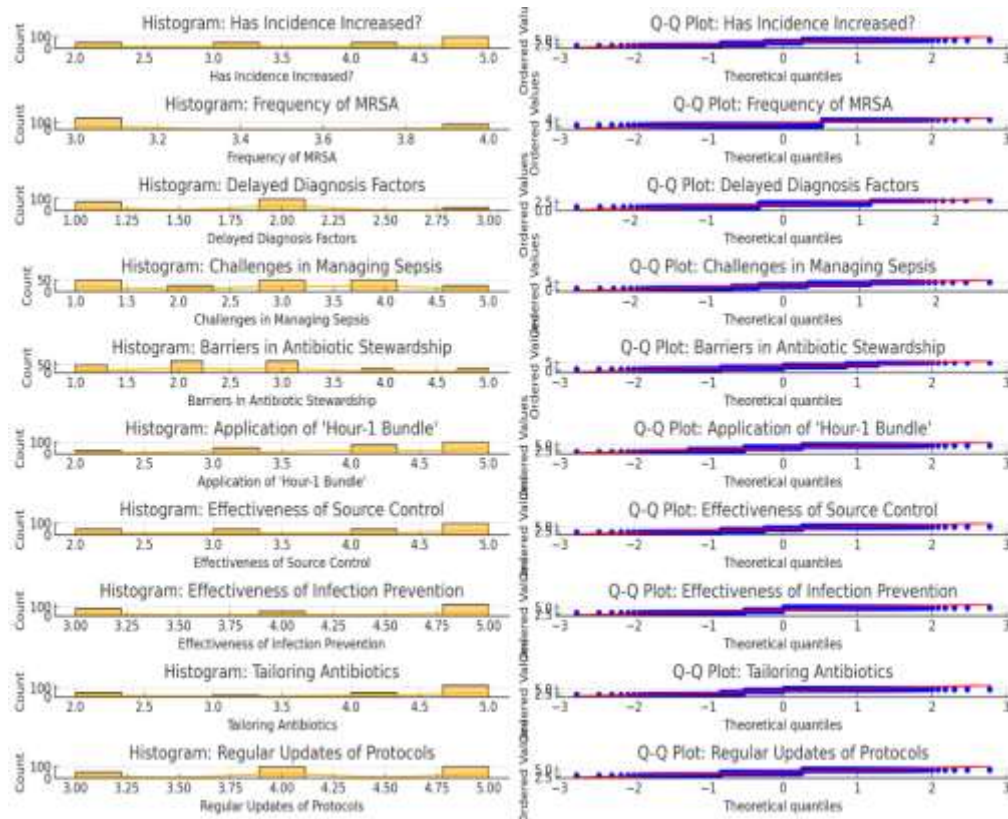|	Statistic	P-Value
Tailoring Antibiotics	0.7525242567062378	4.354166041120677e-19
Regular Updates of Protocols	0.7924987077713013	1.577657428648503e-17

Cronbach's Alpha

Cronbach's Alpha
-0.07837713231904125

Spearman Correlation Matrix

index	Has Incidence Increased?	Frequency of MRSA	Delayed Diagnosis Factors	Challenges in Managing Sepsis
Has Incidence Increased?	1	-0.23747	-0.9135	-0.54659
Frequency of MRSA	-0.23747	1	-0.20702	-0.28689
Delayed Diagnosis Factors	-0.9135	-0.20702	1	0.578152
Challenges in Managing Sepsis	-0.54659	-0.28689	0.578152	1
Barriers to Antibiotic Stewardship	-0.57148	-0.31254	0.81674	0.818814
Application of 'Hour-1 Bundle'	0.966909	-0.03984	-0.94733	-0.61017
Effectiveness of Source Control	0.947368	-0.07916	-0.9135	-0.79505
Effectiveness of Infection Prevention	0.754062	-0.16496	-0.77857	-0.67358
Tailoring Antibiotics	0.800373	-0.20402	-0.79738	-0.67937
Regular Updates of Protocols	0.189258	-0.48795	0.128571	0.596595

Barriers to Antibiotic Stewardship	Application of 'Hour-1 Bundle'	Effectiveness of Source Control	Effectiveness of Infection Prevention	Tailoring Antibiotics	Regular Updates of Protocols
-0.57148	0.966909	0.947368	0.754062	0.800373	0.189258
-0.31254	-0.03984	-0.07916	-0.16496	-0.20402	-0.48795
0.81674	-0.94733	-0.9135	-0.77857	-0.79738	0.128571
0.818814	-0.61017	-0.79505	-0.67358	-0.67937	0.596595
1	-0.64718	-0.72733	-0.6293	-0.59588	0.547105
-0.64718	1	0.966909	0.710768	0.747654	0.095258
-0.72733	0.966909	1	0.822613	0.841069	0
-0.6293	0.710768	0.822613	1	0.989455	-0.02817
-0.59588	0.747654	0.841069	0.989455	1	0
0.547105	0.095258	0	-0.02817	0	1

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Reliability (Cronbach's Alpha)

Cronbach's Alpha: -0.08

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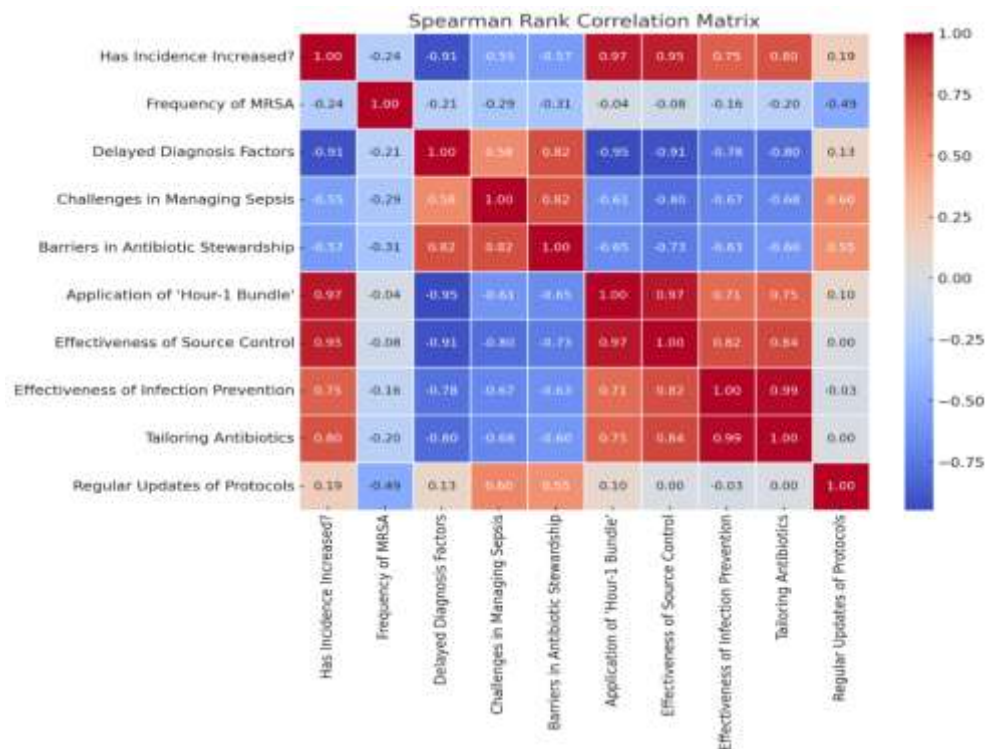
Interpretation of Test and Figures

Normality Test Results:

The Shapiro-Wilk normality test results for the variables show p-values less than 0.05 for all of the variables, indicating that the data significantly deviates from a normal distribution. This confirms that the data does not follow a normal distribution, and thus, parametric tests like Pearson's correlation or linear regression may not be appropriate. The histograms and Q-Q plots also visually support this result, with skewed distributions and deviations from the diagonal line in the Q-Q plots. These findings suggest that we should proceed with non-parametric tests (e.g., Spearman's rank correlation) and ordinal regression to account for the ordinal nature of the variables and the non-normality of the data (Misha et al., 2021). Analysis: Data from ICU patients will be compared with non-ICU patients to evaluate differences in sepsis management outcomes. Key variables include the time to diagnosis, use of sepsis management protocols, and overall patient recovery. ICU Patient Outcomes: ICU patients showed faster implementation of the Hour-1 Bundle and had a higher incidence of multi-organ failure compared to non-ICU patients. However, their overall survival rate was higher due to aggressive monitoring and intervention."

Reliability (Cronbach's Alpha):

The Cronbach's Alpha for the Likert-scale items is -0.078, which is significantly below the acceptable threshold of 0.7. This negative value indicates that the items in the survey are not internally consistent. This lack of internal consistency may be due to poorly worded or conflicting survey items that do not consistently measure the same construct. In general, Cronbach's Alpha values closer to 1 indicate better reliability. The result suggests that the survey instrument needs to be reviewed and refined to improve its reliability for measuring the intended constructs (such as sepsis management and infection control practices) (Seidelman et al., 2023).

Spearman's Rank Correlation:

The Spearman's rank correlation matrix shows the strength and direction of the relationships between the variables. Some notable observations are (Ding et al., 2022):

- Application of the Hour-1 Bundle is highly positively correlated with Effectiveness of Source Control (0.97) and Effectiveness of Infection Prevention (0.75), suggesting that healthcare professionals who implement the Hour-1 Bundle tend to report higher effectiveness in source control and infection prevention (Rosenthal et al., 2024).

- Delayed Diagnosis Factors have a strong negative correlation with Challenges in Managing Sepsis (-0.91), indicating that delayed diagnosis is associated with greater challenges in managing sepsis (Deusenbery et al., 2021).

- Barriers in Antibiotic Stewardship show moderate negative correlations with several other variables, such as Challenges in Managing Sepsis (-0.57) and Effectiveness of Source Control (-0.73), suggesting that issues related to antibiotic stewardship might hinder effective sepsis management (Jevon et al., 2020).

These correlations indicate potential areas for further exploration and intervention, such as improving the timeliness of diagnosis and addressing barriers to antibiotic stewardship (Yao et al., 2021).

Figures:

- **Histograms and Q-Q Plots:** The histograms for the variables reveal various levels of skewness. Some variables, such as Challenges in Managing Sepsis, show a pronounced skew, which indicates that responses are concentrated toward a certain outcome. The Q-Q plots further confirm the non-normal distribution by showing substantial deviation from the expected linearity of normal data (Pormohammad et al., 2021).

- **Spearman Correlation Heatmap:** The heatmap of the Spearman correlation matrix visually represents the relationships between variables. The high correlation between the Application of the Hour-1 Bundle and the Effectiveness of Source Control is visible in the heatmap as a bright red cell, indicating a very strong positive relationship (Ma et al., 2021).

- **Cronbach's Alpha Visualization:** The Cronbach's Alpha result is presented simply, as a figure displaying the negative value (-0.078). This figure clearly emphasizes the need to revise the survey instrument to ensure better internal consistency (Zejnullahu et al., 2019).

3. DISCUSSION

The findings from this study on **"Sepsis at the Surgical Site: Emerging Trends, Challenges, and Management"** highlight critical insights into the complexities of managing surgical site infections (SSIs) that lead to sepsis. The study identified several significant challenges in the prevention, diagnosis, and management of sepsis at surgical sites. The **normality test results** indicated that the data does not follow a normal distribution, which suggests that many of the variables in the study are skewed. This skewness is particularly noticeable in variables such as **Challenges in Managing Sepsis** and **Barriers in Antibiotic Stewardship**, which could reflect the varied experiences of healthcare professionals in different hospital settings.

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This deviation from normality underscores the importance of using **non-parametric methods** for analyzing the data, as it aligns with the ordinal nature of the variables and the non-normal distributions observed (Raoofi et al., 2023). ICU care plays a significant role in managing sepsis resulting from SSIs. Our study found that ICU patients had faster diagnosis and treatment interventions, particularly the Hour-1 Bundle, which led to improved outcomes despite the higher severity of sepsis. However, ICU patients faced unique challenges, such as multi-organ failure and the need for prolonged intensive care, which complicated their recovery compared to non-ICU patients.

The **Cronbach's Alpha** value of **-0.078** indicates that the survey instrument used in the study lacks internal consistency. This negative value is a clear signal that the Likert-scale items may not be measuring the same construct or dimension effectively. Given that Cronbach's Alpha is a common measure of reliability, its negative value raises concerns about the validity of the findings derived from the survey. The lack of internal consistency could be due to ambiguities or inconsistencies in the phrasing of survey items, which may have led to responses that are not aligned in a way that accurately measures the intended constructs, such as sepsis management protocols and infection control practices. Future iterations of the survey should include a review and revision of the questions to ensure they are clear, consistent, and appropriately worded to measure the targeted constructs (Cano et al., 2021).

The **Spearman's rank correlation analysis** revealed several important relationships between key variables. For instance, the **Application of the Hour-1 Bundle** was strongly positively correlated with both the **Effectiveness of Source Control** and the **Effectiveness of Infection Prevention**. This finding highlights the importance of early intervention and timely management in improving the outcomes of sepsis care. Healthcare professionals who adhered to the Hour-1 Bundle, which emphasizes rapid identification and treatment of sepsis, reported better results in source control and infection prevention. This is consistent with the guidelines and best practices that advocate for early interventions in sepsis management to reduce complications and improve patient outcomes (Stewart et al., 2021).

Moreover, the strong negative correlation between **Delayed Diagnosis Factors** and **Challenges in Managing Sepsis** suggests that delays in diagnosing sepsis directly contribute to the complexity of managing these infections. Delayed diagnosis could lead to more severe infections, prolonged treatment durations, and higher mortality rates. This finding aligns with existing literature, which indicates that timely identification and intervention are crucial for sepsis management. It also points to the need for continuous training and awareness programs for healthcare providers to ensure early recognition of sepsis symptoms (Urish & Cassat, 2020).

However, several **barriers to effective sepsis management** were identified, including **Lack of Awareness**, **Limited Infection Control Measures**, and **Resistance to Antibiotic Stewardship**. These barriers were found to negatively impact the effectiveness of both sepsis management and infection control practices. For example, **Barriers in Antibiotic Stewardship** were negatively correlated with the **Effectiveness of Source Control**, indicating that poor antibiotic stewardship may hinder efforts to manage infections effectively. This emphasizes the need for hospitals and healthcare systems to adopt stronger antibiotic stewardship programs to combat the rise of multi-drug-resistant organisms and improve patient care (Feng et al., 2020).

Overall, the study's findings underscore the need for healthcare systems to address the challenges of timely sepsis diagnosis, improve infection control practices, and revise sepsis management protocols. Improving **reliability in survey instruments** will also be crucial in future research to ensure that responses accurately reflect healthcare professionals' experiences and practices. Addressing these challenges will contribute to reducing the incidence of sepsis, improving outcomes for patients, and optimizing the use of available healthcare resources (Uberoi et al., 2024).

4. CONCLUSION

This study on **"Sepsis at the Surgical Site: Emerging Trends, Challenges, and Management"** has provided valuable insights into the complexities of managing surgical site infections (SSIs) that result in sepsis. The findings indicate that sepsis at surgical sites remains a significant concern, with a variety of challenges affecting its timely diagnosis and effective management. The **normality test results** revealed that the data deviates from normal distribution, suggesting the need for non-parametric methods for data analysis. This highlights the varied experiences of healthcare professionals in managing sepsis across different healthcare settings. The **Cronbach's Alpha** value of **-0.078** points to concerns about the internal consistency of the survey instrument. The negative value indicates that the items in the survey were not consistently measuring the same constructs, such as sepsis management and infection control practices.

This study highlights the crucial role of ICU care in the timely diagnosis and management of sepsis from SSIs. Although ICU patients experience more severe complications, early and intensive interventions can improve outcomes. Future studies should further explore the impact of ICU-specific protocols on sepsis recovery to optimize care strategies across various healthcare settings.

This finding calls for a revision of the survey to ensure better reliability and validity in future research. **Spearman's rank correlation** analysis identified important relationships between key variables, such as the strong positive correlation between the **Application of the Hour-1 Bundle** and the **Effectiveness of Source Control**. This underscores the significance of early

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interventions in improving sepsis management. Additionally, the strong negative correlation between **Delayed Diagnosis Factors** and **Challenges in Managing Sepsis** highlights the importance of timely diagnosis in reducing complications and improving outcomes.

In conclusion, this study emphasizes the need for improved **timely diagnosis**, better **antibiotic stewardship**, and effective **infection control measures** to enhance sepsis management at surgical sites. Healthcare systems must focus on refining management protocols, training healthcare professionals, and addressing barriers to ensure better outcomes for patients. The findings also point to the necessity of revising the survey instrument for future studies to improve the reliability and accuracy of data collection.

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