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# COMPARATIVE STUDY OF NOSOCOMIAL INFECTION RATES BEFORE AND AFTER IMPLEMENTATION OF STANDARD OPERATING PROCEDURES IN THE SURGICAL CENTER OF THE MUNICIPAL HOSPITAL OF MARABÁ- PA

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## ABSTRACT

**Objective:** To evaluate the rates of nosocomial infection before and after the implementation of Standard Operating Procedures (SOPs) in the operating room of a municipal hospital. Methods: This is an epidemiological, cohort, quantitative and analytical study that was carried out in a medium-sized municipal hospital, analyzing retrospective and prospective data over a period of 12 months. Information was collected on cases of surgical site infection in the period of 06 months before the implementation of the SOPs in the months of February to July 2024 and in the 06 months following until January 2025. Infection rates were compared by applying the independent Student's t-test. Data on

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surgical site infection (SSI) over 12 months were analyzed, divided into periods before and after the implementation of the protocols. **Results:** The results indicate a statistically significant reduction in infection rates after the implementation of standard operating procedures in the operating room, demonstrating the effectiveness of standardization of processes in infection prevention and control. **Conclusion:** The adoption of Standard Operating Procedures in the operating room is essential to reduce the incidence of nosocomial infections, ensuring safe and efficient patient care. The standardization of processes, strict infection control, reduction of errors, and constant training are fundamental pillars for safety in the surgical environment.

**Keywords:** Hospital infection. Standard Operating Procedures. Surgical Center. Infection Control.

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## INTRODUCTION

Nosocomial infections, also known as Healthcare-Associated Infections (HAIs), are a critical problem that compromises patient safety and increases hospital costs (MUCELINI et al, 2021). They represent a major challenge for health services, especially in surgical centers, where there is a higher risk of contamination**,** as they increase morbidity, mortality, and related costs, in addition to negatively affecting patient safety and the quality of health services (LORKOWSKI, J. et al, 2023) However, it is important to highlight that a large percentage of HAI are preventable if effective infection prevention and control (IPC) measures are implemented by health services (EBSERH, 2020). Research shows that when health services and their teams know the magnitude of the problem of infections and start adhering to programs for the prevention and control of HAIs, there can be a reduction of more than 70% in some infections, such as bloodstream infections (MOREIRA, LC et al 2023 apud ALMEIDA, ISA, 2024). The operating room is one of the areas most susceptible to infections, due to the invasive nature of the procedures performed (SILVA, AP.; COSTA, LH.; FERREIRA, RM. 2021). The implementation of Standard Operating Procedures (SOPs) has been a widely recommended strategy to minimize risks and standardize safe practices, significantly reducing the incidence of hospital infections (ANVISA, 2020 apud RODRIGUES AL, et al 2020). The protocols range from hand hygiene to equipment sterilization and control of people flows within the operating room (OLIVEIRA, MS.; MENDES, FA, 2022).

Nosocomial infection, especially surgical site infection (SSI), is one of the main postoperative complications, and can increase the length of hospital stay and hospital costs, in addition to compromising the patient's recovery (XAVIER, ISA, 2024). It is defined as any infection that occurs at the incision site within 30 days after surgery or up to one year if prosthetic material has been implanted (CDC, 2023). According to a study by (SANTOS et, al, 2022), factors such as inadequate hand hygiene, failures in asepsis, and the use of inappropriate prophylactic antibiotics are directly related to the increased incidence of SSI. In addition, immunosuppressed patients or those with comorbidities are more vulnerable to infection (RODRIGUES, PR et, al, 2022)

Standard Operating Procedures ensure that all professionals follow the same guidelines for critical procedures, reducing variations in care practices and improving the quality of services provided. This includes standards for asepsis, antisepsis, gowning,

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preparation of the surgical field, and manipulation of instruments (EBSERH, 2020 apud WHO, 2018)

The clear definition of processes minimizes human errors, promoting safer and more efficient performance. Well-structured standard operating procedures (SOPs) avoid errors such as the incorrect use of PPE, failure to clean materials, and failure to observe practices for isolating contaminated areas (SOBECC, 2021). The existence of well-defined protocols allows for the continuous training of teams, ensuring that all professionals are up to date with the best practices of biosafety and infection prevention, they also allow periodic audits and evaluations to identify possible failures in the process and implement continuous improvements, promoting an increasingly safe hospital environment. According to (ANVISA, 2023), Health Care-Associated Infection (HAI) is one that occurs after the patient's admission to the hospital, and can manifest itself during hospitalization or after discharge (CASTRO, JA, et al 2024). These infections are associated with the hospital environment and/or the procedures performed during this period, thus representing a serious public health problem on a global scale (BARROS, 2022). The objective of this study was to evaluate the rates of nosocomial infection before and after the implementation of Standard Operating Procedures (SOPs) in the operating room of a municipal hospital.

## METHODOLOGY

This analytical cohort study was conducted in a medium-sized municipal hospital with the aim of evaluating the impact of implementing Standard Operating Procedures (SOPs) on reducing Surgical Site Infection (SSI) rates. The study combined retrospective and prospective analyses over a 12-month period, divided into two intervals: 6 months before and 6 months after the implementation of the SOPs in July 2024. The methodology was designed to compare SSI rates in the two periods and analyze the association between the adoption of POPs and the reduction of infections. The study was conducted as an analytical cohort, comparing the rate of SSIs between patients during pre-intervention (patients undergoing procedures between February and July 2024) and post-intervention (patients undergoing surgical procedures in the 6 months following the implementation of SOPs, i.e., August 2024 to January 2025). Thus, data collection can be considered retrospective for the pre-intervention group and prospective for the post-intervention group, and included data made available by the service's CCIH, which describe the incidence rate of SSI for each month of the year 2024. The source of these data is the medical records of

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patients who were admitted to the ward of the surgical clinic of this hospital. This monthly cut allowed graphs to be prepared, allowing the visualization of the behavior of the data more clearly.

The intervention studied was the implementation of Standard Operating Protocols (SOPs) as of July 2024. These protocols involved improved infection prevention practices, including standardization of the use of prophylactic antibiotics, aseptic surgical techniques, strict control of the surgical environment, and ongoing training of medical and nursing staff. The objective of SOPs is to reduce the incidence rate of surgical site infection and improve the clinical outcomes of patients undergoing surgical procedures.

Statistical analyses were performed using descriptive statistics, showing the infection rate, mean, and standard deviation of the compared periods, and inferential with the application of the independent Student's t-test, adopting a significance level $\alpha = 0.05$. The data were compiled in tables in Microsoft Excel 2016 and the test applied in BioEstat® 5.4.

Data collection, despite being secondary data, was carried out by the CCIH itself, which carries out the epidemiological control of the service, but with multisectoral authorization for the research team's access to this information.

Among the limitations of the study, the potential bias of recording in medical records, the difficulty in completely controlling confounding variables, especially those related to patient behavior and the characteristics of the surgical procedure, stand out. In addition, the retrospective analysis limits the ability to attribute direct causality to the implementation of SOPs, being an observational association, which disregards other factors of increase or decrease in the incidence rate of SSIs, such as greater flow of people in the hospital, defects in autoclaves, change of surgical team members, etc.

## RESULTS

The graph shows a gradual increase in the hospital infection rate between February/24 (2.74) and July/24 (8.02), when the value reaches its peak. As of August/24, one month after the implementation of the Standard Operating Procedures (SOPs), there was a significant reduction, from 6.79 (Aug/24) to 2.10 (Sep/24). In the following months, although there are oscillations (between 2.33 and 4.30), the rate remains at a lower level than before the adoption of the SOPs.

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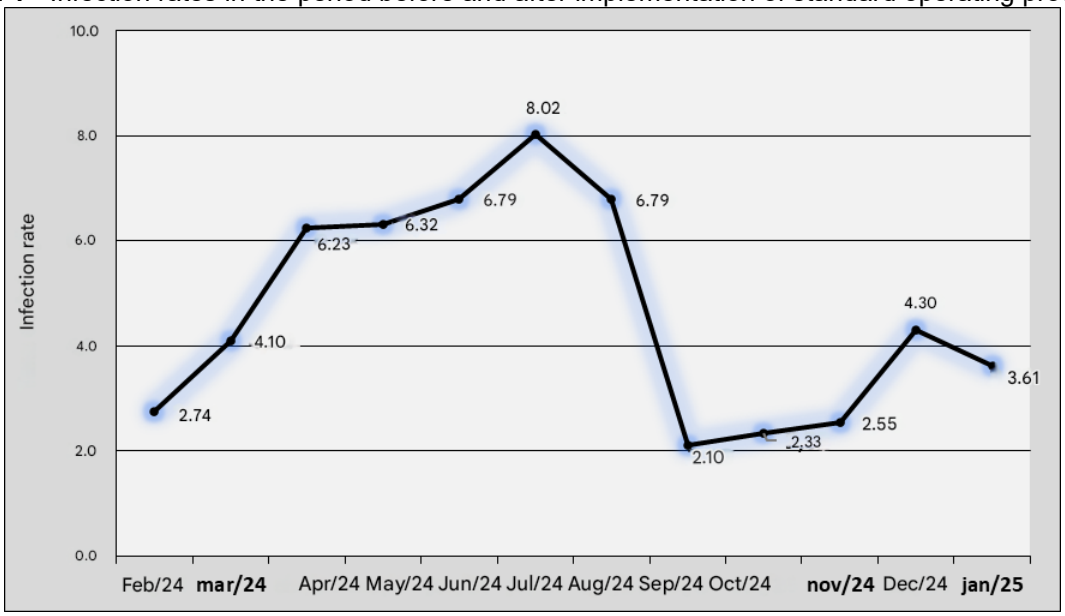
These results suggest that the implementation of SOPs had a positive effect on the control of hospital infections, consistently reducing the rates after the peak of July/24. Although there are small variations in the values from October to January, the fact that the rate did not return to previous levels indicates that the standardization of prevention and control procedures may have been decisive for the containment of infections. Thus, continuous monitoring and strict compliance with the standards established in the SOPs emerge as effective strategies for maintaining lower rates of hospital infection over time.

Table 1 - Infection rates in the period before and after the implementation of standard operating procedures.

| Period | Rate | | Period | Rate |
|---|---|---|---|---|
| Feb/24 | 2,74 | | Aug/24 | 6,79 |
| Mar/24 | 4,10 | | Sep/24 | 2,10 |
| Apr/24 | 6,23 | | Oct/24 | 2,33 |
| May/24 | 6,32 | | Nov/24 | 2,55 |
| Jun/24 | 6,79 | | Dec/24 | 4,30 |
| Jul/24 | 8,02 | | Jan/25 | 3,61 |
| Average ± SD | 5.7 ± 1.9 | | Average ± SD | 3.6 ± 1.8 |

**Source:** CCIH; *p = 0.0395 t-test - Independent student

**GRAPH 1 -** Infection rates in the period before and after implementation of standard operating procedures




**Source:** CCIH; *p = 0.0395 t-test - Independent student

## DISCUSSIONS

The results of this study corroborate previous research that highlights the importance of standardization of processes in the prevention of nosocomial infections. The growth trend observed in the first half of the year, culminating in July/24, may be related to seasonal factors or the relaxation of prevention measures, resulting in greater

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dissemination of infectious agents. The significant drop after the peak suggests that control interventions or behavioral changes may have had an effect, contributing to the reduction in rates in September/24.

The oscillations in the following months (between October and January) indicate that the infection rate has not yet stabilized, possibly due to seasonal events, such as agglomerations or festive periods, which may have contributed to the increase observed in December/24 (4.30). The value of January/25 (3.61) suggests a reduction compared to December, but still above the lowest values seen in the second half of 2024.

Overall, the analysis reinforces the importance of continuous monitoring and timely preventive interventions to contain possible new peaks. Factors such as climate, public health policies, population behavior, and seasonality may explain the variations recorded, indicating the need for complementary studies to evaluate in more detail the underlying causes of fluctuations in the infection rate (SILVA, AP et al, 2024). In addition, with the drop in infection rates, there was a shorter hospital stay and less need for prolonged antibiotic therapy, reflecting both clinical and economic benefits for the hospital. Among the factors that contributed to the effectiveness of the implementation of SOPs, the continuous training of the team, the rigorous monitoring of protocols, and the adoption of technologies for infection control (SANTOS, ACR, et al 2024) stand out.

## CONCLUSION

The adoption of Standard Operating Procedures (SOPs) in the operating room and hospital services resulted in a significant reduction in hospital infection rates, as demonstrated by the analysis of the data after their implementation. The standardization of practices and the reinforcement of care safety routines contributed to the consistent reduction of rates, promoting greater safety for patients and evidencing the effectiveness of infection control and prevention measures. These positive results underscore the importance of maintaining continuous adherence to SOPs and conducting periodic assessments, ensuring the sustainability of the improvements achieved over time.

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