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Knowledge and Practices of Healthcare Personnel on Risk Factors for Surgical Site Infections : Case of Makiso General Referral Hospital

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Introduction: *According to the World Health Organization, surgical site infections affect up to one-third of patients undergoing a surgical procedure, despite advances in surgical techniques and prevention.*

The objectives of this study were to assess healthcare professionals' knowledge of the risk factors for surgical site infections, and to evaluate the level of adherence to hygiene and barrier measures for patient safety at Makiso General Referral Hospital.

Materials and Methods: *We conducted an analytical cross-sectional study involving all healthcare professionals working in the surgical, obstetrics and gynecology, and operating room departments of this facility from June 10 to 20, 2024. A total of 42 staff members were surveyed. Data collection included a questionnaire-based survey and non-participatory observation of hygiene practices. Data were collected from June 21 to 23, 2024. Proportions were used to measure healthcare professionals' practices and knowledge regarding the risks of postoperative infections.*

Results: *A total of 42 healthcare professionals were included in the study. The average age of respondents was 38.6 ± 9.4 years. Among them, 40.5% correctly knew the definition of a postoperative infection. Only 28.6% stated that poor hygiene, lack of equipment sterilization, the surgical team, and the hospital environment were the main risk factors for postoperative infection. Compliance with barrier and hygiene measures during care, as well as adherence to operating room principles, was low among healthcare professionals.*

Conclusion: *Our findings show that poor hygiene practices and insufficient knowledge among healthcare professionals are major contributors to the occurrence of postoperative infections. Across all professional categories, 66.7% reported that strict adherence to hygiene principles in the operating room was not followed and that their application remained inadequate. These results confirm the weak implementation of quality-of-care and patient-safety protocols in the health system at Makiso General Referral Hospital.*

Training of staff is crucial. Support at the intermediate level through formative supervision is necessary to combat postoperative infections.

Keywords: knowledge, practices, risk factors, surgical site infections, Kisangani

Introduction

Healthcare-associated infections represent a major public health problem with significant consequences both at the individual level and economically. Among these infections are surgical site infections, which occur following a surgical procedure. They are caused by bacteria introduced either during the incisions made in the operation or during the first dressing change. Each year, they threaten the lives of millions of patients and contribute to the spread of antibiotic resistance. Yet, global guidelines for the prevention of surgical site infections include a list of 29 concrete recommendations. These infections can prolong hospital stays and increase healthcare system costs. They may also raise morbidity and mortality rates (Dégbey et al., 2021; World Health Organization [WHO], 2018).

Healthcare facilities are designed to treat and cure patients. However, from the middle Ages to the present day, it has become evident that they also expose patients to an additional risk of infection (Arefian et al., 2016).

The main risk factors involved include the patient's pre-, intra-, and postoperative environment, as well as the healthcare team, the host's immune defenses, and above all, the level of asepsis during the surgical act (Adou Yapi et al., 2022).

In developing countries, the determinants of these infectious risks include, among others, lack of infrastructure, insufficient equipment, inadequate hygiene conditions, non-application of protocols, inappropriate use of antibiotics, non-compliance with hygiene standards, and insufficient knowledge among healthcare professionals, which may originate from inadequate initial training (Arefian et al., 2016).

Despite progress made in surgical techniques, prevention, and efforts by the World Health Organization to reduce the number of such infections, their resurgence remains evident. They affect up to one-third of patients undergoing surgery (WHO, 2018; Cataife et al., 2014).

According to the WHO, the postoperative infection rate ranges from 0.5% to 15%, exceeding 25% in some developing countries (Ellenberg, 2004), and accounting for a fatality rate of 2.5% to 6% depending on the study (Sawadogo et al., 2019).

In the United States, these infections contribute to more than 400,000 additional hospital days, increasing total expenditures by 900 million US dollars annually. They represent 14 to 16% of all nosocomial infections, making them the second most frequently reported. It is estimated that 2 to 6% of patients undergoing surgery will develop an infection (Adou Yapi et al., 2022).

In low- and middle-income countries, 11% of surgical patients acquire an infection during the procedure. In Africa, up to 20% of women undergoing cesarean delivery develop a wound infection, compromising their health and their ability to care for their children (Adou Yapi et al., 2022).

In 2016, studies conducted in Lubumbashi (DR Congo) found an overall prevalence of 34.5% for nosocomial infections, of which 27% were attributed to postoperative infections (Kakupa et al., 2016).

To gain insight into the risk factors associated with postoperative infections, it is therefore essential to identify and analyze healthcare professionals' knowledge regarding these risks and to assess the level of adherence to hand hygiene and barrier measures to ensure patient safety. This situational analysis will help generate evidence-based information that can support more in-depth studies.

Materials and Methods

Study Setting

The study was conducted at Makiso General Referral Hospital (Hôpital Général de Référence MAKISO–KISANGANI), located in the BOYOMA health area within the Makiso–Kisangani Health Zone, in the western part of downtown Kisangani, the capital city of Tshopo Province in the Democratic Republic of the Congo.

Study Period and Type

The survey was carried out in three departments of Makiso General Referral Hospital during the period from June 10 to June 20, 2024. These departments were: Surgery, Obstetrics and Gynecology, and the Operating Room.

This was a descriptive analytical study involving all staff members working in the above-mentioned departments.

Study Population and Sampling Technique

The target population consisted of healthcare professionals working in the selected units who agreed to participate in the study.

A non-probability sampling method was used, with an exhaustive sampling technique that included all staff members of the operating room and the surgical and gynecological hospitalization units of Makiso General Referral Hospital during the study period. A total of 42 staff members were included.

Data Collection Tools and Procedures

Data were collected using a questionnaire-based survey to assess knowledge and a direct, non-participatory observation of practices. The questionnaire was distributed to all healthcare professionals in the selected departments. Data collection took place from June 21 to June 23, 2024.

Data Analysis

The collected data were recorded and encoded in Excel 2010. Data analysis was performed using STATA 13® software. Proportions were used to assess healthcare professionals' knowledge regarding infectious risks.

Ethical Considerations

Authorization to conduct this study was obtained from the Medical Director of Makiso General Referral Hospital. Consent was obtained from all participants, and anonymity was respected throughout the study.

Results

Socio-Demographic Characteristics

Table 1 shows that among the respondents, healthcare professionals were mostly represented by nurses, accounting for 59.5% (25/42). The average age of the healthcare professionals was 38.6 ± 9.4 years (range: 28–54 years), with a sex ratio of 1.1 (22 males / 20 females). Professional experience of less than 5 years was predominant, representing 73.8%.

Table 1: Socio-demographic Characteristics

Variables	n = 42	Proportion (%)
Age (years), mean ± SD	38.6 ± 9.4	
Professional Category		
Physician	12	28.6
Nurse	25	59.5
Anesthetist	1	2.4
Other Categories	4	9.5
Sex		
Female	20	47.6
Male	22	52.4
Professional Experience		
< 5 years	31	73.8
≥ 5 years	11	26.2

Table 2: General Knowledge on Surgical Site Infections (SSI)

Variables (N = 42)	Freq	%
Definition of SSI		
Infection acquired only during hospital stay following a surgical procedure	25	59.5
Infection acquired in the hospital and occurring within 30 days after a surgical procedure	17	40.5
Risk factors for SSI		
Lack of hygiene	2	4.8
Non-sterile equipment	25	59.5
Surgical team	2	4.8
Hospital environment	1	2.4
All answers are correct	12	28.6
Knowledge of asepsis among healthcare professionals		
Yes	34	80.9
No	8	19.1
Type of material used for dressing		
Clean	8	19.1
Sterile	34	80.9
Type of compress used for dressing		
Clean	8	19.1
Sterile	34	80.9

The analysis of knowledge content showed that 40.5% (17/42) of healthcare professionals defined surgical site infection as an infection acquired in the hospital and occurring within 30 days following a surgical procedure. Among the responses obtained, only 28.6% stated that lack of hygiene, non-sterilization of equipment, the surgical team, and the hospital environment were the main risk factors for postoperative infection. Furthermore, 80.9% of the healthcare staff reported using sterile materials and sterile compresses and demonstrated good knowledge of asepsis.

Table 3: Healthcare Professionals' Knowledge of Their Practices Regarding Hygiene Barrier Methods During Care

Variables (N = 42)	Freq	%
Moments for Handwashing		
Before and after each care procedure	20	47.6
After contact with the patient's environment	7	16.7
After contact with biological fluids	14	33.3*
After contact with the patient	11	26.2
Knowledge of different types of handwashing		
Yes	15	35.7
No	27	64.3
Influence of using clean gloves on infections		
No	29	69.0
Yes	13	31.0
Changing attire before entering the Operating Room		
Yes	3	7.1
No	39	92.9
Training on universal precautions		
Yes	6	14.3
No	36	85.7

Regarding training on universal precautions, 6 out of 42 healthcare professionals reported having received training within the past three years, representing 14.3%. The practice of hygiene barrier methods during care—such as the different types of handwashing and changing attire—was not carried out in most cases among the respondents, with rates of 35.7%, 31%, and 7.1% respectively. Additionally, 69% of the healthcare staff believed that the use of clean gloves could be a source of surgical site infection. However, they demonstrated better knowledge regarding appropriate moments for handwashing (47.6%).

Table 4: Practices of Healthcare Staff Regarding Postoperative Infections

Variables (N = 42)	Freq	%
Procedure to follow for sterilization		
Wash then sterilize	32	76.2
Disinfection and sterilization	4	9.5
Wash, disinfect, and sterilize	6	14.3
Disinfection of the Operating Room after each procedure		
Yes, always	6	14.3
Yes, sometimes	28	66.7
No	8	19.0
Cleaning of the hospitalization room		
Once per week	9	21.4
Once per month	9	21.4
By default (irregular / when possible)	24	57.2
No	36	85.7

Washing followed by sterilization of equipment, occasional disinfection of the operating room, and cleaning of the hospitalization room were practices carried out in most cases, with frequencies of 76.2%, 66.7%, and 57.2% respectively.

Table 5: Compliance with Operating Room Principles

Variables (N = 42)	Freq	%
Movement in and out (back-and-forth traffic)		
Yes	34	80.9
No	8	19.1
Change of practice (modifying behavior according to hygiene rules)		
Yes	16	38.1
No	26	61.9
Number of people in the operating room		
Fewer than 5	8	19.1
More than 5	34	80.9
Changing the trolley before entering the operating room		
Yes	4	9.5
No	38	90.5
Strict compliance with hygiene principles in the operating room (gloves for single use, handwashing at every step, wearing a cap, short and clean nails, etc.)		
Yes	14	33.3
No	28	66.7

The number of people present in the operating room was greater than five in most of the respondents' answers. Movement in and out of the operating room was frequent (80.9%). In the majority of cases (90.5%), there was no change of trolley upon entering the operating room. Only 33.3% of respondents reported adhering to hygiene principles in the operating room.

Discussion

Socio-demographic Characteristics

Out of a total of 42 respondents, nurses represented the largest professional category (59.5%), with a mean age of 38.6 ± 9.4 years. This may be explained by the retrospective nature of the study and the number of staff assigned to the targeted departments. Professional experience of less than five years was predominant (73.8%). This result is consistent with the findings of Hien et al. (2013), Such limited experience may be a risk factor for surgical site infections due to inadequate mastery of existing protocols.

General Knowledge on Postoperative Infections

In our study, only 40.5% of healthcare professionals correctly identified the definition of a postoperative infection. Furthermore, only 28.6% stated that poor hygiene, non-sterilization of materials, the surgical team, and the hospital environment were the main risk factors for postoperative infection.

Several factors may explain this lack of knowledge, including insufficient training for healthcare professionals and the absence of specific training modules on healthcare-associated infections and their prevention. Often, they acquire these prevention skills during introductory or preparatory clinical rotations, which are frequently of limited quality (Coker et al., 2009).

However, 80.9% of healthcare staff demonstrated adequate knowledge of asepsis and reported using sterile equipment and compresses. These aspects are crucial for the prevention of surgical site infections.

Knowledge of Hygiene Barrier Practices During Care

Only 6 out of 42 healthcare professionals (14.3%) declared having received training on universal precautions during the past three years. Hygiene barrier practices during care—such as glove use and changing attire—were not followed in most cases among the respondents. However, healthcare professionals showed better knowledge regarding handwashing moments (47.6%).

Our results are consistent with those of Amiel C. and Hien H. et al., who highlighted poor compliance with hand hygiene practices, an essential element in infection prevention (Amiel, 2005; Hien et al., 2013). Lack of knowledge alone cannot explain these shortcomings. The absence of adequate handwashing stations in care units, non-existence or poor application of protocols and procedures, and insufficient quality of continuous supervision may also contribute to these observations (Rosenthal, 2011).

Surgical hand hygiene by the surgical team before each operation is one of the long-established rituals of the operating room. Its purpose is to eliminate and/or reduce both transient and resident flora present on the hands. The importance of hand hygiene before surgery is justified by the fact that in about 35% of operations lasting at least two hours, glove perforation may occur, allowing bacteria to be transmitted from the surgeon to the patient (Hien et al., 2013).

To ensure high-quality care, it is essential to wash hands between each patient and each procedure. Gloves provide an effective barrier against cross-transmission of pathogens (Ligi et al., 2010).

Practices of Healthcare Staff Regarding Postoperative Infections

Our study revealed that the sterilization process for equipment was not adequately adhered to. A total of 76.2% of respondents—and our own observations—indicated that materials were sterilized immediately after washing without undergoing the full sterilization procedure. Cleaning of hospitalization rooms was performed irregularly (57.2%). Disinfection of the operating room after each procedure was carried out only sometimes.

These findings raise important considerations regarding the need to develop and support awareness among healthcare professionals and hospital managers to foster a culture of infection prevention in healthcare settings, particularly postoperative infections (Ligi et al., 2010). The lack of knowledge and insufficient quality of ongoing supervision may explain these shortcomings.

Compliance with Operating Room Principles

Our findings show that the number of people in the operating room was often more than five. Frequent movement in and out of the operating room was also reported. In most cases, trolleys were not changed before entering the operating room.

Across all professional categories, 66.7% of respondents reported that strict adherence to hygiene principles in the operating room—such as using disposable gloves, handwashing at every step, wearing surgical caps, and keeping nails short and clean—was not respected and that compliance remained insufficient.

Yet, these measures have been cited in many studies as crucial for reducing postoperative infections (Hein et al, 2013). This situation may be explained by a lack of knowledge, absence of staff training, and lack of formative supervision by management.

Conclusion

Our findings indicate that inadequate hygiene practices among healthcare professionals and insufficient knowledge related to these practices during patient care contribute significantly to the occurrence of postoperative infections. Across all professional categories, 66.7% reported that strict adherence to operating room hygiene principles—such as using single-use gloves, handwashing at every step, wearing a cap, and maintaining short and clean nails—was not respected and that compliance remained insufficient. These results confirm the weak implementation of quality-of-care and patient-safety measures within the health system at Makiso General Referral Hospital – Kisangani.

Maintaining adequate hygiene in both the operating and hospitalization rooms—considering the number of people involved in care and ensuring regular cleaning of premises—plays a key role in preventing these infections. Likewise, training healthcare staff on universal precautions and hygiene practices would be beneficial for improving the quality of care.

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