

# The Place of Nursing Theory in the Management of Post-Operative Infections in a Hospital Environment: Case of Cibitoke District Hospital

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## Abstract

**Introduction:** Post-operative infections, such as surgical site infections (SSIs), are a significant concern in healthcare settings. Nurses play a crucial role in the prevention and management of these infections. The use of nursing theory could contribute to the prevention of SSIs. The aim of this study was to evaluate the role of nursing theory in the management of surgical site infections (SSIs) in a hospital environment. **Method:** A cross-sectional study was conducted using descriptive and analytical methods to assess the role of nursing theory in the management of Post-operative infections (POI) in a hospital setting in October 2023. The study population consisted of nurses working in the Surgery, Emergency, and Maternity units at Cibitoke District Hospital. A sample size of 71 nurses working full or part time in the Surgery were invited to participate in this study. A questionnaire was used to collect the data, and SPSS version 21.0 software was used for analysis. **Results:** The study found that nursing theory did not have any statistically significant place in the management of POI (p-value = 0.523). However, the results showed that experience was the only significant factor influencing the management of POI (p-value = 0.004). This is explained by the analysis of the net effects of the explanatory variable where we noticed that those who had more experience were more likely to manage post-operative infections. The participants' knowledge regarding nursing theory in the management was poor as they scored less than 30% in all the variables used to measure their knowledge. **Conclusion:** The study revealed that nurses' knowledge of nursing theories and their applications in the management of SSIs was poor. Continuing professional development, curriculum review, and in-service training were highly recommended.

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## Keywords

Nurses, Postoperative Infection, Surgical Site Infections, Management, Nursing Theory

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## 1. Introduction

The infection results from a complex interaction between the patient's defense mechanism, the site of the surgical intervention and the bacteria which will lead to microbial proliferation resulting in cellular, tissue or general reactions, most often resulting in an inflammatory syndrome. Postoperative infection is an infection that occurs in the immediate or distant aftermath of a surgical procedure and is directly related to the latter [1].

According to the WHO, the constant is that postoperative infections threaten the lives of millions of patients each year and contribute to the spread of antibiotic resistance, and that in low- and middle-income countries, 11% of patients who undergo surgery are infected in the process. In this case, the WHO reports that post-operative infections occupy third place (20%) of nosocomial infections [2].

In developed countries such as those of Europe and the United States, the prevalence of post-operative infections is estimated at 1.9 to 2% in general surgery [1].

In developing countries, study conducted in Sudan in 2015 to determine the level of nurse's knowledge and practice regarding postoperative infection prevention who work in the surgical departments of the military hospital revealed a poor knowledge score as only 37.6% of the participants were able to give a correct answer regarding the prevention of postoperative infection [3]. Another study conducted in the DR Congo to determine the prevalence of surgical wound infections in Kinshasa, it reveals that surgical wound infections constitute a poorly documented area, nevertheless, the rate recorded was 15.38% during a study which was limited to the departments of surgery of the University Clinics of Kinshasa [4]. A prospective study over 6 months [from February 1 to July 31, 2011] carried out to determine the incidence of nosocomial infections in the surgery department of Kamenge Hospital-University Center (CHUK), in Burundi shows that out of 470 patients collected in the surgery department of CHUK, 62 patients had developed a nosocomial infection among them 38.7% had developed postoperative infections followed by 30.6% who had urinary infections [5]. Among nosocomial infections, the postoperative infection ranks first in terms of morbidity leading on one hand to an additional length of stay in the hospital and additional costs, and on the other hand, a seriousness of the after-effects which can go as far as the death of patients [6].

To our knowledge, few similar studies have been carried out on this matter. It is in this context that our study was carried out in this health institution to evaluate the place of nursing theory in the management of post-operative infections

in a hospital environment in order to improve nursing practice in this care structure. The following specific objectives were addressed: 1) Determine the factors associated with the management of post-operative infections; 2) Evaluate the nurses' knowledge regarding nursing theory in the management of post-operative infections.

## 2. Theoretical Framework

The study focused on Florence Nightingale's environmental theory for controlling post-operative infection. Nightingale identified the five environmental factors which include air, water, light, heat, cleanliness and calm. She believed that these environmental factors can contribute to the healing of infections occurring in the healthcare setting. Postoperative infections are infections occurring in the hospital environment following the lack of adequate cleanliness when handling instruments or during the procedure, or even following one or the other of these environmental factors. Florence was the first theorist to identify the relationship between nursing and infection control. Her theory explains the importance of practicing hospital infection control measures such as maintaining and using sterile materials, bedding hygiene, but also maintaining an ambient temperature that is cool in order to avoid perspiration at the site of operation that could encourage the multiplication of germs. Therefore, applying this theory by maintaining a healthy environment by practicing the five environmental factors could reduce the incidence of postoperative infections.

## 3. Methods

The present study was carried out at Cibitoke district Hospital in October, 2023, which is located in the North-west of the country in the Cibitoke province, Rugombo commune, Burundi at 52 km from the Bubanza province on National Road number 5 (RN5) and 72 kilometers (44.7 miles) of Bujumbura, the capital city. The main objective of this study was to evaluate the place of nursing theory in the management of post-operative infections in a hospital environment among 71 nurses working full and part time in the Operating Room, Internal Medicine and Maternity units of Cibitoke District Hospital. Cibitoke District Hospital is a public rural hospital with 226 beds that serves a population of 242,469 habitats as the primary level hospital for national referrals, built in 1965 and inaugurated in 1968. Cross-sectional study design was used to evaluate the 87 nurses working full and part time in the Operating Room, Internal Medicine and Maternity units. The YAMANE formula (1967-1986) was used to calculate the sample size of the population.

$$n = \frac{N}{1 + N(e)^2}$$

$$n = \frac{87}{1 + \frac{87}{1.2175} + 87(0.05)^2} = \frac{87}{1 + (87 \times 0.0025)} = \frac{87}{1 + 0.2175} = \frac{87}{1.2175} = 71$$

where:

$n$  = sample size;

$N$  = population size;

$e$  = margin of error at 95% = 0.05.

A self-report method involving questionnaire completion with five components addressing demographic data, patients' habits and lifestyle factors; health-care planning structure's factors; nurses' knowledge factors and environmental factors was used to collect data. Therefore, the questionnaire was analyzed and undergoes a face validity before being distributed to the participants chosen in this study after verbal consent. However, the distribution of the questionnaire was done according to these latter taking into account their placement in their services of this hospital. The filling was done under the supervision of the investigator to avoid collaboration in order to exclude bias and direct them in the event of misunderstanding. After filling the questionnaires, they were collected for useful purposes.

The data were analyzed using SPSS 21 software, and the results were presented in tables and graphs. Bivariate analysis, a statistical technique that examines relationships between two variables at a time, was used to test our hypothesis regarding the role of nursing theory in the management of postoperative infection in a hospital setting. The analysis included measures of association between variables at different levels and chi-square tests for observed data with two groups and more than two groups. Our dependent variable was qualitative (management of postoperative infections), while the independent variables were categorical (level of study, experience, and nursing theory). The participant responses to the questionnaire were categorized the levels of nurses' knowledge based on their scores. Scores above 50% were considered good/high score of knowledge, while scores below 50% were considered poor/low knowledge. The purpose of the study was to determine whether nursing theory plays a significant role in the management of postoperative infection in a hospital environment.

## 4. Results

The current results from our study show that 51.0% of the participants were male compared to 48.0% female with an age range of 20 - 54 years (mean age = 33.13 years). The majority of the participants (34.0%) were 20 to 25 years old; 31.0% were 31 to 40 years old; 17.0% 41 to 50 years old. The majority of participants (40.0%) had experience of 1 - 5 years; 25.0% 6 to 10 years; 20.0% less than a year, and finally 14.0% were over 10 years old. 65.0% of participants had the baccalaureate level in nursing training while 34.0% had the A2 level. The majority of participants (38.6%) worked in Maternity; 31.40% in Surgery and 30.0% in Emergency ([Table 1](#)).

### 4.1. Factors Related to Patients' Habits and Lifestyle

Our study findings show that the majority (91.40%) of our participants affirmed that patients' hygiene, nurses, or clothing could contribute to the occurrence of

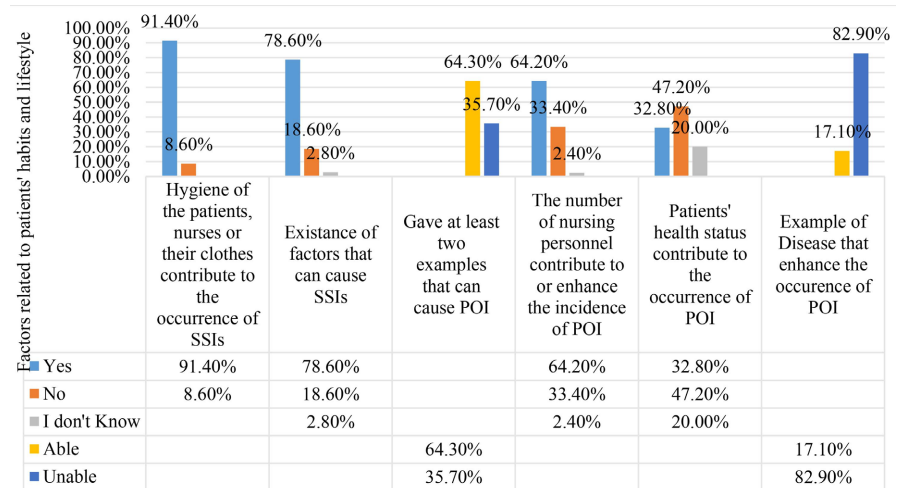
**Table 1.** Distribution of participant demographics.

Characteristics		Frequency (n = 70)
Age	20 - 25 years	24 (34.0%)
	26 - 30 years	6 (8.0%)
	31 - 40 years	22 (31.0%)
	41 - 50 years	12 (17.0%)
	More than 50 years	6 (8.0%)
	Mean	33.13 years
	Range	20 - 54 years
Sex:		
	Male	36 (51.0%)
	Female	34 (48.0%)
Length of work experience:		
	Less than one year	14 (20.0%)
	1 - 5 years	28 (40.0%)
	6 - 10 years	18 (25.0%)
	More than 10 years	10 (14.0%)
Education level:		
	A2	24 (34.0%)
	Bachelor	46 (65.0%)
Hospital Department:		
	Surgery	22 (31.4%)
	Emergency	21 (30.0%)
	Maternity	27 (38.6%)

post-operative infections. Furthermore, 78.60% were aware of the factors that could cause post-operative infections, while only 64.3% of them were able to cite at least two examples. Similarly, 64.2% of our participants stated that the number of personnel in healthcare settings could promote the occurrence of post-operative infections. Finally, majority of the participants (67.2%) did not know that patient's health status could contribute to the occurrence of POI, among those who agree, only 17.1% were able to give the example of disease that enhance the occurrence of POI such as malnutrition, VIH, etc. (**Figure 1**).

#### 4.2. Factor Related to Healthcare Planning Structure

The results of our study show that 65.70% state that the number of healthcare personnel in a hospital setting could contribute to the prevention of postoperative infections. Moreover, 42% of the participants confirm that different tasks of nurses responsible for monitoring operated patients could increase the incidence of POIs. However, 12.9% were the only ones that were able to state that the lack



**Figure 1.** Distribution of participants on factors related to patients' habits and lifestyle.

of asepsis during wounds care, drugs administrations, patient's body hygiene, bedding care, etc., were the most factors of nurses' stated tasks that could increase the frequency of POIs. Additionally, a significant number of participants (48.6%) affirm that demotivation of nursing staff due poor remuneration could lead to the occurrence of POIs, while a great number of participant (70%) assume that regular monitoring of patient after surgical intervention could help in the prevention of POIs (Figure 2).

### 4.3. Environmental Factors

Our study unveiled that only 40% of our respondents were able to describe the importance of preventing SSIs during surgery, with an average of 28% who knew that the importance of preventing SSIs is attributed throughout the entire patient care process (Figure 3).

In our study, 47.1% of our participants had erroneously stated that the cleanliness of the operating room and hospitalization could influence the occurrence of post-operative infections, while 10% had no ideas. Only 42.9% of the participants had affirmed it (Figure 4).

### 4.4. Nurses' Knowledge on the Use of Nursing Theory in the Management of Post-Operative Infections

The current study shows that the nurses' knowledge on the use of nursing theory while taking care of postoperative infections was poor, as for all the variables used to measure their knowledge scored less than 30%. Even though some of the participants (14.3%) said that they have already used a nursing theory in their practice, only less than 2% well able to give at least two examples of nursing theory and explain how it can be applied in the management of POI. 91.4% affirm that there was no clinical protocol for the management of POI that exist in their hospital while 72.9% could not find rational to use nursing theory when preventing POI (Figure 5).

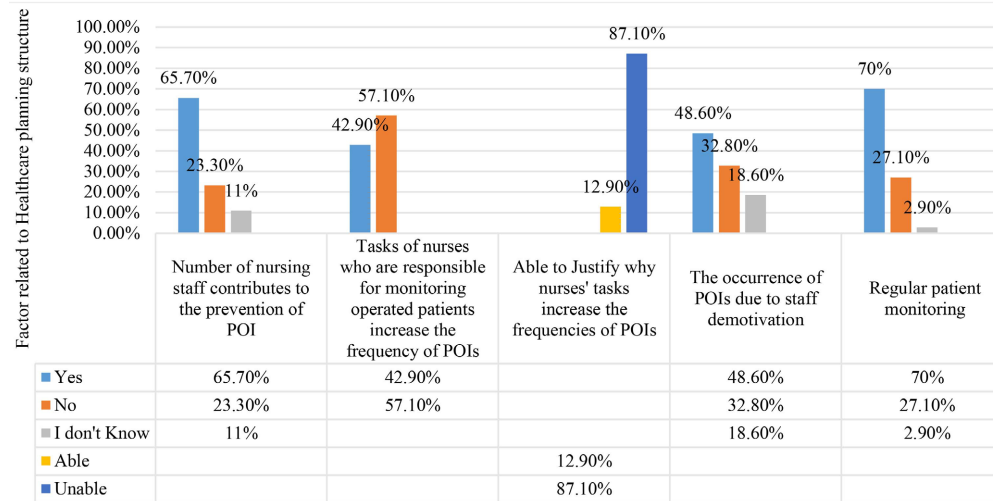


Figure 2. Factor related to Healthcare planning structure.

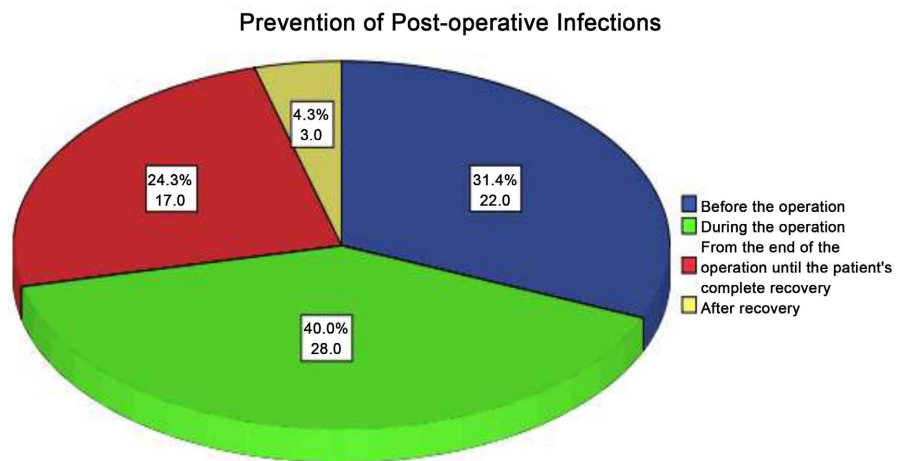


Figure 3. Proportion of participants' distribution at the time of preventing postoperative infections.

Influence of the cleanliness of operating and hospitalization rooms in the occurrence of SSIs.

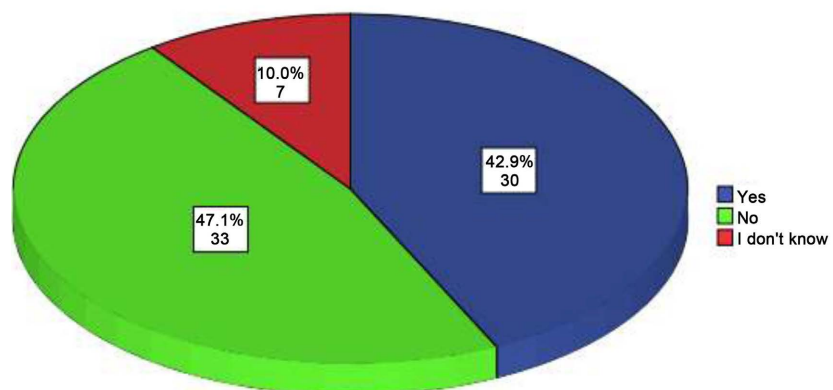
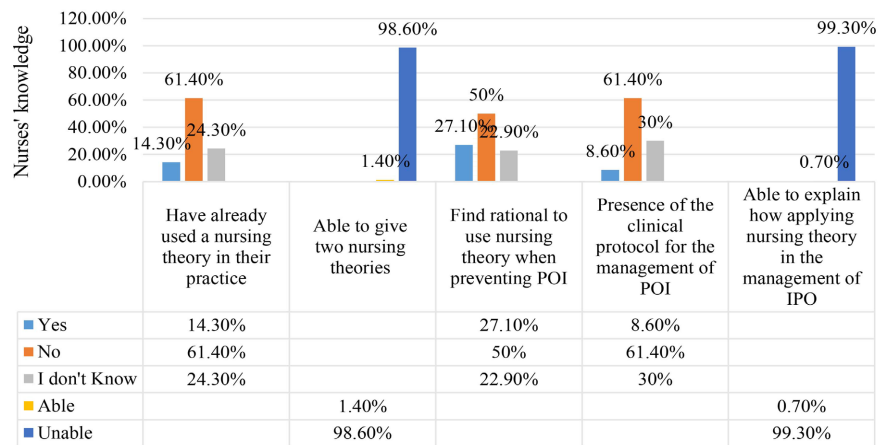


Figure 4. Proportion of participants on the occurrence of SSIs following hygiene in the hospital environment.





**Figure 5.** Distribution of the participants' knowledge on the use of nursing theory in the management of POI.

It emerges from our study that 45.7% of our respondents were unable to utilize the nursing theory during the management of postoperative infections. Despite that more than 50% of our respondents considering this theory, its utilization is not significant ( $P = 0.239$ ) (Table 2).

Our study reveals that nurses with vocational nursing training (A2) (66.7%) were more able to describe the process of post-operative infection management compared to the BSN ones (47.8%). Nonetheless, the education level of the participant was not significant correlated to the management of post-operative infections ( $P = 0.105$ ) (Table 3).

Our study findings show that 85.7% of nurses who have an experience of less than one year were capable of handling post-operative infections while 14.3% were unable; 42.9% of nurses with an experience of 1 to 5 years were capable of handling post-operative infections while 57.1% weren't; 44.4% of nurses with an experience of 6 to 10 years were capable to take care of post-operative infections while 55.6% were not and finally, 60% of nurses who have an experience of more than 10 years were able to take care of post-operative infections while 40.0% were incapable. Looking at the significance, we have a positive probability of 0.008 that the experience of nurses could influence the management of post-operative infections ( $p < 0.05$ ) (Table 4).

The final Interpretation of our binary logistic model, show that among the three independent variables (the level of education, experiency and knowledge of nursing theory) only the experience of the participants could significantly influence the management of post-operative infections ( $p = 0.004$ ) (Table 5).

Finally, our study illustrate that nurses who have an experience of 1 to 5 years are 1.125 times more likely to manage post-operative infections compared to nurses with less than one year, while nurses who have an experience of 6 to 10 years old are 1.133 times more likely to manage well the post-operative infections compared to nurses with less than a year. Moreover, nurses who have an experience of more than 10 years are 1.250 times more likely to do the management of post-operative infections compared those less than one year old (Table 6).



**Table 2.** Proportion of participants on the management of postoperative infections according to Nurses' knowledge on nursing theories.

	Management of POI		Total	P-value
	No	Yes		
Nursing Theory	49.1%	50.9%	100.0%	0.239
	35.3%	64.7%	100.0%	
Total	45.7%	54.3%	100.0%	

**Table 3.** Proportion of Management of postoperative infections according to the level of education of the participants.

	Management of POI		Total	P-value
	No	Yes		
A2	33.3%	66.7%	100.0%	0.105
BSN	52.2%	47.8%	100.0%	
Total	45.7%	54.3%	100.0%	

**Table 4.** Proportion of the management of post-operative infections according to participants' experience.

		Management of POI		Total	P-value
		No	Yes		
Work experience	Less than one year	14.3%	85.7%	100.0%	0.008
	1 - 5 Years	57.1%	42.9%	100.0%	
	6 - 10 Years	55.6%	44.4%	100.0%	
	More than10 Years	40.0%	60.0%	100.0%	
Total		45.7%	54.3%	100.0%	

**Table 5.** Estimation of parameters by logistic regression model.

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 <sup>a</sup>	Experience	-0.231	0.271	3.726	1	0.004	0.794
	Level of education	-0.645	0.540	1.430	1	0.232	0.524
	Nursing theory	0.383	0.600	0.408	1	0.523	1.467
	Constant	1.704	1.092	2.433	1	0.119	5.495

**Table 6.** Net effects of explanatory variables.

		Net effects	
		Sig.	Exp(B) (OR)
Step 1 <sup>a</sup>	Participants' Experience		
	Less than one year	Ref	Ref

**Continued**

1 - 5 years	0.015	1.125
6 - 10 years	0.025	1.133
More than 10 years	0.006	1.250
Constant	0.019	6.000

**5. Discussion**

The current study was carried out to evaluate the place of nursing theory in the management of post-operative infections in a hospital environment in order to improve nursing practice in this care structure and the two specific objectives were addressed: 1) Determine the factors associated with the management of post-operative infections 2) Evaluate the nurses' knowledge regarding nursing theory in the management of post-operative infections. The results of our study show that the nursing theory does not have a statistically significant role in the management of postoperative infections ( $p = 0.523$ ). This could be explained by the fact that the managing of postoperative infections requires multidimensional and multi-professional approaches. The literature shows that there are few studies on the treatment of infected wounds, which could depend on physical examination findings such as fever, redness, wound opening, drainage, etc., where local care with wet dressing and empirical antibiotic selection by the caregiver are common practices [7]. Nursing theories are considered as indicator of science and evidence of nursing practice. Although, our study shows that nursing theories do not influence the management of postoperative infections, nurses should still utilize this scientific knowledge. According to Hashemiparast, Negarandeh, and Theofanidis (2019) in their study on barriers to using theoretical knowledge in clinical settings, the absence of standard clinical practices, lack of confidence in clinical competence, significant lack of professional support, deficiencies in the teaching and learning process, and differences between performing tasks in simulated and real clinical situations (what is taught and what is done) were identified as barriers to the use of nursing theories in clinical settings [8]. Curriculum revision in nursing programs and strengthening the implementation of nursing theories in practice are recommended. However, the results of our study indicate that only the participants' experience could significantly influence the management of postoperative infections ( $p = 0.004$ ). The literature shows that there have been few studies that have examined both the temporal and transactional nature of experience, and these studies have been limited to measuring experience in terms of years of practice. It unveiled that nurses with more experience reported performing more complex functions than those with less experience, as it was found that years of experience were associated with expertise [9]. Additionally, the participants' knowledge regarding nursing theory in the management was poor as they scored less than 30% in all the variables used to measure their knowledge. This contract a study conducted in Bahir Dar, Northwest Ethiopia for assessing the nurses' knowledge and practice regarding

prevention of surgical site infection where their findings show a good knowledge among participants as their scores were 74.5% [10].

The current results from our study show that 51.0% of the participants were male with an age range of 20 - 54 years (mean = 33.13 years). These results differ from those of Niyongabo, *et al.* (2022) in their study conducted at the Clinic Prince Louis Rwagasore, in Burundi for assessing nurses' knowledge, attitude, and practice regarding PU prevention and treatment, where the results showed that the majority of participants were women [11]. The majority of the participants (34.0%) were 20 to 25 years old and 17.0% 41 to 50 years old. The majority of the participants (40.0%) had experience of 1 - 5 years; 25.0% 6 to 10 years; 20.0% less than a year, while 14.0% were over 10 years old. Cibitoke health district was officially inaugurated in 1968, which could be explained by the fact that this hospital have people who are old (17% with more than 40years) and a big number of man compared to female. In the past, in Burundian community, it was believed that boys are the ones that have to access education while female were supposed to stay at home and deal with household work [12]. Moreover, 65.0% of participants had the baccalaureate level in nursing training while 34.0% had the A2 level [vocational secondary nursing practice, which a four 4 years training program]. This could be explained by the fact that in Burundi, from 1945 to 1997, the nursing skills were taught only at vocational high school, and all nurses were either A3 or A2 levels till 2009, when Licence (Bachelor) level was launched in Burundi (Table 1). Majority (91.40%) of our participants affirmed that patients' hygiene, nurses, or clothing could contribute to the occurrence of post-operative infections. Furthermore, 78.60% were aware of the factors that could cause post-operative infections, even though 64.3% only were able to cite at least two examples like patients' nutrition or health status, HIV, age, lack of asepsis, length of surgery procedure, drugs administrations/ antibiotic prophylaxis, patient's body hygiene, bedding care, etc. According to WHO, preparation for a surgical procedure should always include a bath or shower, excluding shaving, in order to prevent postoperative infections [13]. Similarly, 64.2% of our participants stated that the number of personnel in healthcare settings could promote the occurrence of post-operative infections. This is also supported by Lonjon *et al.* (2012) who said also that the number of individuals in the operating room was one of the risk factors linked to post-operative infections [14] (Figure 1). Additionally, a significant number of participants (48.6%) affirm that demotivation of nursing staff due poor remuneration could lead to the occurrence of POIs, while a great number of participant (70%) assume that regular monitoring of patient after surgical intervention could help in the prevention of POIs (Figure 2). Furthermore, our study unveiled that only 40% of our respondents were able to describe the importance of preventing SSIs during surgery, with an average of 28% who knew that the importance of preventing SSIs is attributed throughout the entire patient care process (Figure 3). Post-operative infections are responsible to increased postoperative stays, higher readmission rates and healthcare costs, and hinder health outcomes, thus, their

prevention of should be a high priority for all healthcare provider working in surgical settings [15].

Finally, 47.1% of our participants had erroneously stated that the cleanliness of the operating room and hospitalization could influence the occurrence of post-operative infections, while 10% had no ideas. Only 42.9% of the participants had affirmed it (Figure 4). This could be explained by the fact of lack of in-service training on asepsis or their incapacity to apply the scientific knowledge from nursing theory. Florence Nightingale's environmental theory state the interconnectedness of the person, health, nursing, and the environment, where nurses are called to maintain a cleanliness patient's environment so that it can contribute in the healing process and minimize the risk of infection [16].

## 6. Recommendation

The following are recommendations arising from this study:

- To nurses, they should strive to advance their career through ongoing education and by developing a scientific inquiry mindset that will enable them to provide quality care and improve population health effectively and efficiently.
- To healthcare facilities: Develop a continuous professional development plan for staff in service based on ongoing education, nursing theory, etc.
- To the Universities, specifically, the program of nursing, to revise and update the curriculum in regards to post-operative nursing management or wound care and strengthening the implementation of nursing theories into practice to enhance students' nursing knowledge before they reach the clinical setting.

## 7. Conclusion

This study was conducted for evaluating the place of nursing theory in the management of post-operative infections in a hospital environment. Results reveal that the nursing theory does not have a statistically significant role in the management of postoperative infections ( $p = 0.523$ ). However, the results of our study indicate that only the participants' experience could significantly influence the management of postoperative infections ( $p = 0.004$ ). Additionally, the participants' knowledge regarding nursing theory in the management was poor as they scored less than 30% in all the variables used to measure their knowledge. Continuous professional development of nurses and curriculum revision were highly recommended.

## 8. Limitation

This study has some limitations. This study focuses only on nurses working in the Operating Room, Internal Medicine and Maternity units in one district hospital of Cibitoke.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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