Nurse-related factors and adherence to World Health Organization blueprints on prevention of Surgical Site Infections among nurses in Kenya

Gakuanyi Roseline Muthoni[1], Mwenda C. Syombua[2], Josphat Njuguna[3]

[1]Master's in nursing student, Mount Kenya University School of Nursing, Thika, Kenya.
[2]Senior Lecturer, South Eastern Kenya University, Kitui, Kenya.
[3]Principal, Health Sciences Department, Mount Kenya University, Thika, Kenya.

Abstract:
Background: Surgical Site Infections (SSIs) are a common morbidity source in most healthcare facilities following surgical interventions. They contribute to the bulk of nosocomial infections, prolonged hospitalizations, as well as high economic burden. In Africa, the infection rates are a bit high making up to 5.6 cases per 100 surgeries. Cumulatively Africa has the highest number of cases which can go as high as 30.9%. SSIs are largely avoidable but remain a significant cause of mortality, morbidity, and increased economic burden. Numerous improvements have been effected by different organizations and agencies to help lower the disease burden that accrue from SSIs. For instance, WHO came up with guidelines targeted at ensuring that SSIs are prevented and diagnosed to reduce the associated mortality and morbidity. However, the efforts seem not to produce the outcomes anticipated. This study is informed by the fact that despite the utilization of the guidelines in many countries, the adherence levels remains poorly studied. Therefore, it is fundamental to assess the nurse-related factors influencing adherence to WHO blueprints on prevention of SSIs among nurses in Kenya.
Materials and Methods: A descriptive cross-section research design was adopted. The study was conducted in a select hospital in Central Kenya. The target population was 115 nurses registered with the Kenya Nursing Council. The study's sample size was 98 nurses. Stratified technique of sampling was used in sample size selection. Data collection was conducted using a self-administered questionnaire and a checklist. Data collected was cleaned, coded and entered into SPSS version 26.0 for analysis. Descriptive statistics such as frequencies and percentages were used in data analysis. The relationship between the dependent and independent variables was assessed through the use of Chi-Square test statistics.
Results: Majority of the nurse's level of adherence to WHO guidelines on prevention of SSIs was low at 55.1%. through the Chi-square test statistics nurse-related factors which had a significant relationship with adherence to WHO blueprints on SSI prevention included; knowledge (P- value=0.012, χ^2=9.87), frequency of caring for surgical patients (p-value=0.003, χ^2=11.530), administration of prophylactic antibiotics (P-value=0.025, χ^2=5.01), tool used to remove hair prior to surgical procedures (P-value=0.043, χ^2=6.290), gender (P-value<0.001, χ^2=10.999) and work experience (P-value=0.032, χ^2=6.865).
Conclusion: The overall level of adherence to WHO guidelines on prevention of SSIs by nurses in Kenya was low. Nurse-related factors which had a significant influence on adherence to WHO guidelines on SSIs prevention included knowledge, practices, gender and work experience.
Key Words: Nurse-related, SSIs, blueprints, adherence.

I. Introduction

Surgical Site Infections (SSIs) are a common morbidity source in most healthcare facilities following surgical interventions. SSIs contribute to the bulk of nosocomial infections, prolonged hospitalizations, as well as high economic burden.[1] The Center for Disease and Control (CDC) in the US describe SSI as morbidity happening either near or at the surgical site usually within 30 days post operation or 1 year where an implant is inserted. On a global scale, SSIs make from 2.5 to 40% of the disease burden.[2] Intra-abdominal surgeries constitute up to 20% of the morbidities in Western countries with the overall rates for clean surgeries ranging from 2-5%. In Africa, the infection rates are a bit high making up to 5.6 cases per 100 surgeries. However, cumulatively Africa has the highest number of cases which can go as high as 30.9%. For instance, a country such as Ethiopia has recorded cases estimated to range from 10.9% -75%.

SSIs are largely avoidable but remain a significant cause of mortality, morbidity, and increased economic burden. Those that develop SSIs have a 60% chance of proceeding to the Intensive Care Unit (ICU). The possibility of mortality is also doubled as opposed to other patients who do not develop the conditions. Globally, those affected end up spending an estimated cumulative 3.7 million days receiving care in the facilities. The economic burden is also estimated to be around 1.6 billion dollars in additional costs of drugs and care. The estimated cost is put at 15,800- 43,900 dollars per SSI.[3]

Numerous improvements have been effected by different organizations and agencies to help lower the disease burden that accrue from SSIs. For instance, WHO came up with guidelines targeted at ensuring that SSIs are prevented and diagnosed to reduce the associated mortality and morbidity.[2] However, the efforts seem not to produce the outcomes anticipated. For instance, advancements in behaviors relating to the operating room, ensuring sterility of instruments, as well as good choice of incision sites have been adopted and implemented across the globe. Improvements in hand cleanliness, observance of aseptic techniques, decolonization, screening for potential careers, and proper utilization of prophylactic antibiotics assists lower the rates of SSI.[3] Nonetheless, the approaches have produced little fruits. WHO recommends that periodic surveillance and providing feedback be done as the efforts can lower SSIs by up to 50%.[2]

A study conducted in Kenya concluded that with the necessary training, anesthetists and surgeons adopted consistent mechanisms that were crucial in wound care. In this case, the investigators also sought to evaluate the effectiveness of telephones calls towards discovering the development of post-discharge morbidities. With an approval rate of 95%, the calls had 70% sensitivity to in the study. Thus, effective surveillance of the morbidities could not be realized through telephone. Nonetheless, the process can be performed in low-income facility settings with committed staff, thorough training, and alterations in the monitoring approaches.[4] This study is informed by the fact that despite the utilization of the guidelines in many countries, the adherence levels remains poorly studied. Therefore, it is fundamental to assess the nurse-related factors influencing adherence to WHO blueprints on prevention of SSIs among nurses in Kenya.

II. Material and Methods

Research Design: A descriptive cross-section study was adopted.
Study Location: The study was conducted in a select hospital in Central Kenya.
Target Population: The study focused on 115 nurses working in surgical, theatre, maternity, and outpatient departments in the select hospital.
Sample Size: The sample size was 98 nurses.
Sample Size Calculation: Yamane (1967) formula, $n = \frac{N}{1+Ne^2}$, was used in determining the sample size. In addition, 10% of the entire sample size was added to account for non-responses.
Sampling Technique: Stratified sampling technique was used in sample size selection.
Inclusion Criteria: The study incorporated all the nurses registered with Kenya Nursing Council and working in outpatient, maternity, surgical, and theatre departments in the select hospital in Central Kenya.
Exclusion Criteria: Nurses who were on leave and those who never consented were not included in the study.
Data Collection Tools: A self-administered questionnaire was used in data collection. A checklist was also used in assessing the adherence to WHO blueprints on prevention of SSIs.
Statistical Analysis: Data collected was cleaned, coded, edited and then entered into SPSS for analysis. Data was analyzed using descriptive statistics and the findings presented using tables, and bar graphs. Descriptive statistics entailed calculation of frequencies and percentages. In addition, Chi-Square test statistic was utilized in testing the significance of the relationship among the variables of the study. The confidence interval was set at 95% for all the statistical tests conducted in the study.

III. Results

Demographic Characteristics of the Respondents

Table 1 shows that majority of the nurses were female (f=84, P=85.7%); most of the nurses were aged 31 years and above (f=96, P=98.0%). On the highest level of education, majority of the nurses had a diploma in nursing (f=71, P=72.4%). However, majority of the respondents did not have specialized training in nursing (f=92, P=93.9%). More than half of the respondents had work experience exceeding 15 years (f=54, P=55.1%).

Table 1: Demographic Characteristics of the Respondents

Demographic characteristic		Frequency	Percentage
Age in years	21-30	2	2
	31-40	35	35.7
	41-50	24	24.5
	>51	37	37.8
Gender	Male	14	14.3

	Female	84	85.7
Highest level of education	Certificate	17	17.3
	Diploma	71	72.4
	Higher diploma	2	2
	Bachelors' degree	8	8.2
Special training in nursing	Yes	6	6.1
	No	92	93.9
Work experience	1-5 years	1	1
	6-10 years	22	22.4
	11-15 years	21	21.4
	>15 years	54	55.1

Nurses' Adherence to WHO Blueprints on Prevention of SSIs

A checklist with 20 items was used to evaluate the nurses' level of adherence to the WHO guidelines on prevention of surgical site infection. The highest a nurse could have scored is 20 and the lowest was zero. The researcher had set 10 as pass mark for adherence level in following the WHO guidelines on SSIs' prevention. Those who scored above 10 were considered to have high adherence level while those who scored less than 10 were considered to have low level of adherence. Reverse coding was done for the statements that were negative before analysis was done. The findings revealed that the majority of the nurse's level of adherence was low at 55.1%. Those who had high level of adherence were 44.9%, and this was used as the general level of adherence (see Figure 1).
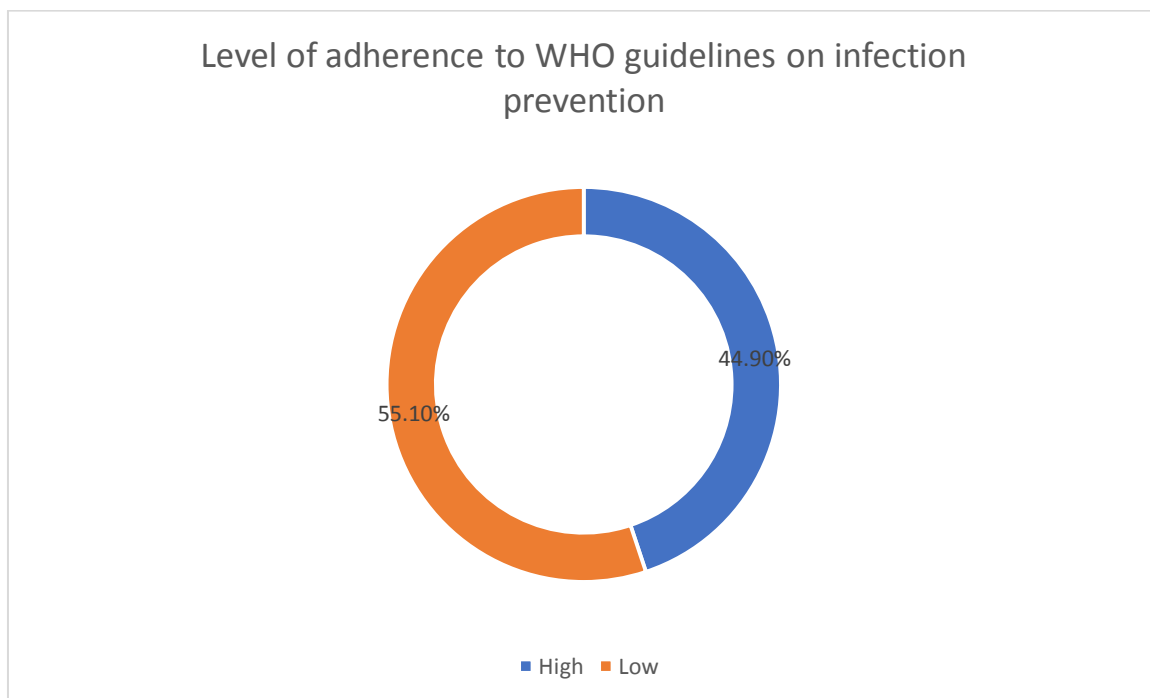

Figure 1: Level of adherence to WHO Blueprints on SSIs Prevention

Nurse-related Factors influencing Adherence to WHO blueprints on Prevention of SSIs

The nurses-related factors that were studied included; nurses' knowledge on infection prevention, gender, specialty in training and working experience. On the nurses knowledge on SSIs prevention, the findings show that majority of the nurses 58.2% (57) had not attended any special training on infection prevention and only relied on their college training knowledge. Also, majority of the nurses as shown by a response of 90.8% (89) had not participated in trainings on surgical site infection prevention strategies. The findings also showed that majority of the nurses 74.5% (73) were aware of the WHO guidelines on prevention of surgical site infections.

Table 2: Nurses' Knowledge in SSI Prevention

Variable	Category	Frequency	Percentage
Have you attended any training regarding infection control and prevention	Yes	41	41.8
	No	57	58.2
Have you participated in training on surgical site infections prevention strategies	Yes	9	9.2
	No	89	90.8
Are you familiar with WHO guidelines on prevention of surgical site infection	Yes	73	74.5
	No	25	25.5

The general level of knowledge was computed and the results in Figure 2 showed that 67.35% of the nurses had poor level of knowledge on SSI prevention.
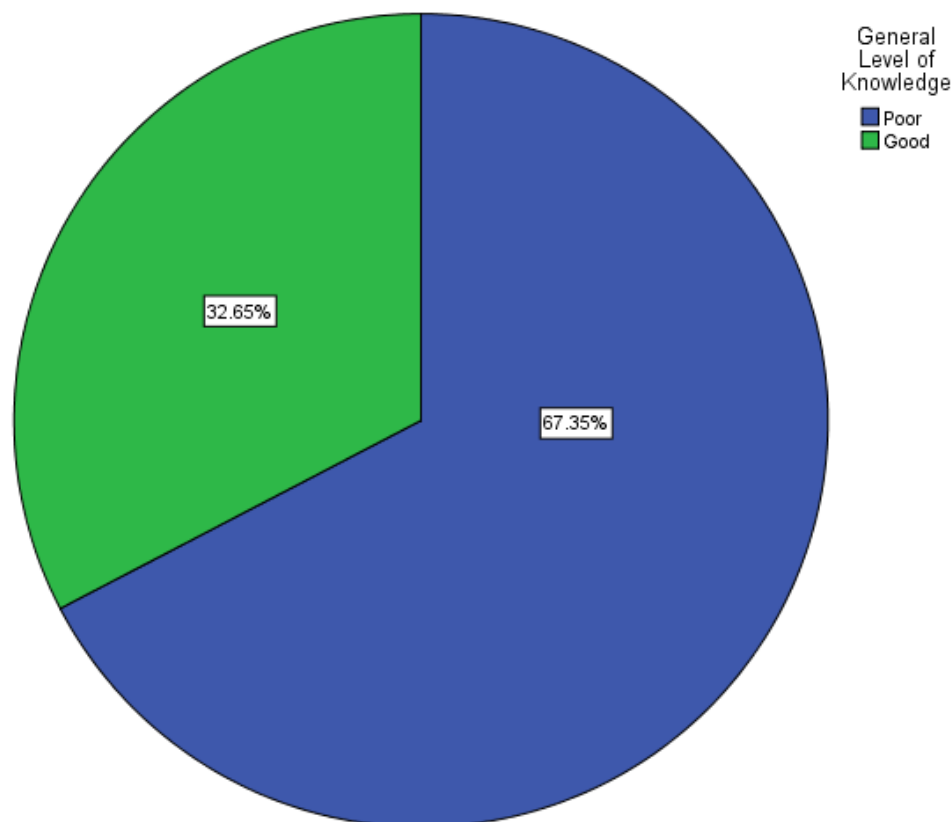

Figure 2: General Level of Knowledge on WHO Guidelines

The nurses' practices on prevention of SSIs were also assessed. From the findings, 57.1% (56) of the nurses handled surgical patients twice a week, 43.9% (43) and 42.9% (42) of the nurses provided care for surgical patients bi-weekly and daily respectively. In order to prevent SSIs, majority of the nurses as shown by 87.7% (86) indicated that they administer prophylactic antibiotics. The most commonly used surgical tool for removing hair prior to surgical procedures is a scalpel as recommended by 67.3% (66); further, 67.3% (66) of the nurses do not know whether to recommend the use of mupirocin decolonization in known carriers of S. aureus in cardiac or orthopedic surgeries. All the nurses recommend that surgical patients bathe with soap before going for surgery.

Table 3: Nurses' Practices on SSIs Prevention

Nurses Practices	Category	Frequency (%)
Frequency of handling surgical patients	Weekly	14 (14.3%)
	Bi-weekly	56 (57.1%)
	When necessary	28 (28.6%)
Frequency of caring for surgical patients	Daily	42 (42.9%)
	Weekly	13 (13.3%)
	Bi-weekly	43 (43.9%)
The nurse administers prophylactic antibiotics	Yes	86 (87.7%)

	No	12 (12.2%)
Tool used to remove hair prior to surgical procedures	Clippers	17 (17.3%)
	Razor blade	15 (15.3%)
	Scalpel	66 (67.3%)
Recommend to use mupirocin decolonization in known carriers of S. aureus in cardiac or orthopedic surgeries	Yes	19 (19.4%)
	No	13 (13.3%)
	Do not know	66 (67.3%)
Recommend for patients going for surgery to bathe with soap	Yes	98 (100.0%)

Through Chi-Square test statistics, the association between different nurse related factors with adherence to WHO blueprints on SSIs prevention was assessed. Nurse-related factors which had a significant relationship with adherence to WHO blueprints on SSI prevention included; knowledge (P- value=0.012, χ^2=9.87), frequency of caring for surgical patients (p-value=0.003, χ^2=11.530), administration of prophylactic antibiotics (P-value=0.025, χ^2=5.01), tool used to remove hair prior to surgical procedures (P-value=0.043, χ^2=6.290), gender (P-value<0.001, χ^2=10.999) and work experience (P-value=0.032, χ^2=6.865).

Table 4: Chi-Square Results on Variables' Association

Variable	Category	Adherence level		Chi-Square
		High	Low	
General level of knowledge on SSI prevention	Good	28	4	P- value=0.012 χ^2=9.87
	Poor	16	50	
Frequency of handling surgical patients	Weekly	8	6	P-value=0.395 χ^2=1.856
	Bi-weekly	26	30	
	When necessary	10	18	
Frequency of caring for surgical patients	Daily	27	15	p-value=0.003 χ^2=11.530
	Weekly	3	10	
	Bi-weekly	14	29	
The nurse administers prophylactic antibiotics	Yes	35	51	P-value=0.025 χ^2=5.01
	No	9	3	
Tool used to remove hair prior to surgical procedures	Clippers	3	14	P-value=0.043 χ^2=6.290
	Razor blade	7	8	
	Scalpel	34	32	
Recommend to use mupirocin decolonization in known carriers of S. aureus in cardiac or orthopedic surgeries	Yes	13	6	P-value=0.057 χ^2=5.723
	No	4	9	
	Do not know	27	39	
Gender of the nurse	Male	12	2	P-value<0.001 χ^2=10.999
	Female	32	52	
Work experience	6-10 years	5	17	P-value=0.032 χ^2=6.865
	11-15 years	9	12	
	>15 years	30	24	

IV.   Discussion

The study found that majority of the nurses had low adherence to WHO blueprints on prevention of SSIs. These findings are congruent with[5] who found that SSIs' prevalence in Ethiopia was high due to low adherence on WHO prevention guidelines. A study conducted in England by[6] on SSIs in colorectal surgery patients found total compliance in only 19% of patients with SSIs. [7]found that the WHO guidelines on SSIs prevention were timely for developing countries due to limited data on adherence level, and subsequently low adherence to SSIs prevention. In fact, most studies in developing countries focus on incidence and prevalence of SSIs. The current study will therefore enrich on level of adherence by the nurses to SSIs prevention in developing nations.

The overall knowledge level of the nurses on WHO guidelines on prevention of SSIs was poor. This agreed with[8] who demonstrated that Ethiopian nurses possessed little knowledge on SSIs prevention. However, [9]conducted a study in Jordan and found that the nurses' knowledge level was very high. This contradicts the findings of the current study; differences which might be attributed by the varying status between the two countries. In Jordan, there are frequent in-service trainings for nurses as compared to Kenya. The study further found that knowledge of the nurses' on WHO guidelines on SSIs prevention had a significant relationship with adherence to the guidelines. This agreed with a study by[10] where knowledge was frequently mentioned as a barrier to adherence on SSIs prevention guidelines. When practitioners are unaware on current trends and knowledge, they are tempted to manage situations with irrelevant knowledge, which in the medical world can cause harm to the patients.

Nurses' practices such as frequency of caring for surgical patients, administration of prophylactic antibiotics, tool used to remove hair prior to surgical procedures, and recommendation on mupirocin decolonization in known carriers of S. aureus in cardiac or orthopedic surgeries had significant relationship with

adherence to WHO blueprints on prevention of SSIs. According to a study conducted in Ethiopia, poor nurses' practices in most of the nurses in the country do not guarantee quality care prior to, during and after surgical interventions.[11] Nurses' practices on adherence to SSIs avoidance and found that failure to practice hygiene before and after wound dressing, for instance, hand hygiene and pre-operative shaving hygiene, would lead to SSIs.[12]

The gender of the nurse also had a significant influence on adherence to WHO guidelines on prevention of SSIs. The findings agreed with[13] who conducted a study on SSIs in Uganda's Iganga District using caesarian section mothers. Gender as a socio-demographic factor influenced SSIs prevention, with male nurses possessing more knowledge on SSIs prevention as compared to their female counterparts.[13] In Nigeria male nurses were found to have three times more knowledge in comparison with female nurses.[14]

Work experience also had a significant influence on adherence to WHO guidelines on prevention of SSIs. Health care workers' experience is a facilitator to prevention of SSIs. More experienced nurses are active in information-seeking and have more understanding on the importance of preventing SSIs. In addition, experienced nurses understand aseptic techniques and wound care practices and therefore possess higher levels of adherence to guidelines on prevention of SSIs.[15]

V. Conclusion

From the study's findings, it can be concluded that the level of adherence to WHO guidelines on prevention of SSIs by nurses in Kenya was low. Nurse-related factors such as knowledge, practices, gender and work experience have a significant influence on adherence to WHO guidelines on SSIs prevention.

References

[1]. Laloto TL, Gemeda DH, Abdella SH. Incidence and predictors of surgical site infection in Ethiopia: prospective cohort. BMC infectious diseases. 2017 Dec;17(1):1-9.
[2]. World Health Organization. Global guidelines for the prevention of surgical site infection. World Health Organization; 2016.
[3]. Curcio D, Cane A, Fernández F, Correa J. Surgical site infection in elective clean and clean-contaminated surgeries in developing countries. International Journal of Infectious Diseases. 2019 Mar 1;80:34-45.
[4]. Aiken AM, Wanyoro AK, Mwangi J, Mulingwa P, Wanjohi J, Njoroge J, Juma F, Mugoya IK, Scott JA, Hall AJ. Evaluation of surveillance for surgical site infections in Thika Hospital, Kenya. Journal of hospital infection. 2013 Feb 1;83(2):140-5.
[5]. Deribe B, Jemebere W, Bekele G. Surgical site infection prevalence and associated factors in Hawassa University comprehensive specialized hospital, southern Ethiopia.
[6]. Tanner J, Kiernan M, Hilliam R, Davey S, Collins E, Wood T, Ball J, Leaper D. Effectiveness of a care bundle to reduce surgical site infections in patients having open colorectal surgery. The Annals of The Royal College of Surgeons of England. 2016 Apr 1;98(4):270-4.
[7]. Leaper DJ, Edmiston CE. World Health Organization: global guidelines for the prevention of surgical site infection. Journal of Hospital Infection. 2017 Feb 1;95(2):135-6.
[8]. Bekele I, Yimam I, Akele G. Adherence to Infection prevention and factors among nurses in jimma university medical center. Immunome Research. 2018;14(2):1-7.
[9]. Nofal M, Subih M, Al-Kalaldeh M, Al Hussami M. Factors influencing compliance to the infection control precautions among nurses and physicians in Jordan: A cross-sectional study. Journal of infection prevention. 2017 Jul;18(4):182-8.
[10]. Hassan S, Chan V, Stevens J, Stupans I. Factors that influence adherence to surgical antimicrobial prophylaxis (SAP) guidelines: a systematic review. Systematic reviews. 2021 Dec;10(1):1-20.
[11]. Teshager FA, Engeda EH, Worku WZ. Knowledge, practice, and associated factors towards prevention of surgical site infection among nurses working in Amhara regional state referral hospitals, Northwest Ethiopia. Surgery research and practice. 2015 Dec 15;2015.
[12]. Sadaf S, Inayat S, Afzal M, Hussain M. Nurse's knowledge and practice regarding prevention of surgical site infection at allied hospital Faisalabad. Int J Sci Eng Res. 2018 May;9(5):351-69.
[13]. Namugeere S. *Factors Contributing to Wound Infection Among Caesarean Section Mothers Attending Iganga Hospital in Iganga District* (Doctoral dissertation, International Health Sciences University).
[14]. Labeau SO, Witdouck SS, Vandijck DM, Claes B, Rello J, Vandewoude KH, Lizy CM, Vogelaers DP, Blot SI, Executive Board of the Flemish Society for Critical Care Nurses.. Nurses' knowledge of evidence-based guidelines for the prevention of surgical site infection. Worldviews on Evidence-Based Nursing. 2010 Mar;7(1):16-24.
[15]. Lin F, Gillespie BM, Chaboyer W, Li Y, Whitelock K, Morley N, Morrissey S, O'Callaghan F, Marshall AP. Preventing surgical site infections: Facilitators and barriers to nurses' adherence to clinical practice guidelines—A qualitative study. Journal of clinical nursing. 2019 May;28(9-10):1643-52.