College of Medicine and Health Sciences

School of Health Sciences

HIGH RATE OF POST CESAREAN SECTION SURGICAL SITE INFECTIONS IN MATERNITY WARD AT KABGAYI DISTRICT HOSPITAL

A capstone dissertation submitted and presented in partial fulfillment of requirements of Master's degree in Hospital and Healthcare Administration

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DECLARATION

This capstone dissertation entitled “Reducing Hospital Post-Cesarean Surgical Site Infections at Kabgayi district hospital” is done in partial fulfillment of the requirements of Master’s degree in Hospital and Healthcare Administration:

- represents my own work;
- has never been presented for any thesis or dissertation for any qualification;
- the contribution of any supervisors and others to the research and to the capstone dissertation was consistent with normal supervisory practice;
- external contributions to the research are acknowledged.

Signature:……..

Date:……

DEDICATION

I dedicate this capstone to holy trinity: Father, son and Holy Spirit, and holy Virgin Mary. God's mercy and love I have been able to accomplish what I could not. God proved supremacy and faithfulness to me through this work.

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My lonely efforts would not be enough to the fulfillment of this work. I have a duty and I take this opportunity to express my acknowledgements to all of them who highly contributed to my studies:

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ABSTRACT

Background

The post cesarean surgical site infection rate at Kabgayi district hospital represented 6.2% in 2015. Considering the fact that these infections are associated with negative impact to patients, staff and hospitals, this study aimed to reduce the post-cesarean surgical site infection (SSI) rate from 6.2 to 3% in 5 months period from November 2016 to March 2017 by implementing an effective patient hygiene to contribute to quality health care delivery.

Methods

A pre-and post-interventional study design was used. A strategic problem solving approach to conduct a baseline assessment, root cause analysis, then proposed, implemented and evaluated the intervention which was an effective patient hygiene before and after cesarean section.

Results

The SSI reduced from 6.2 to 3.5 %($P < 0.005$) by implementing the effective patient hygiene including pre and post-operative patient cleaning with water and soap, daily bed sheets change and every time they are duty, women putting on proper gown provided by the department, patient education in relation to surgical site infection as well as availability of policy and procedure regarding patient hygiene before and after caesarian section. Initially patients education was 30% and after intervention it became at 100%. No woman was cleaned by a midwife pre and post-operative but after intervention this was done for all women except extreme emergencies. To analyze the data a Statistical Package for the Social Sciences(SPSS) was used.

Conclusion

The results showed that by applying an effective patient hygiene the post caesarian surgical site infection was reduced. However, We reject The hypothesis (Ho) which is “Applying an effective patient hygiene at the maternity ward will not reduce the post cesarean surgical site infection at Kabgayi Hospital”.

There is a need for regular supervision for the sustainability of the project. Similar settings experiencing poor patients’ hygiene can apply the same strategy to reduce Post CS SSI.

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ACRONYMS AND ABBREVIATIONS

CS: Cesarean Section

IPC: Infection prevention and control

SSI: Surgical Site Infection

USA: United States of America

WHO: World Health Organization

PACU: Post Anesthesia Care Unity

QI: Quality improvement

SPSS: Statistical Package for the Social Sciences

MHA: Master's in Healthcare Administration

DEFINITION OF KEYS TERMS

Caesarian section: A cesarean section (CS) is defined as a surgical procedure in which incisions are made through a woman's abdomen and uterus to deliver the fetus(1).

Surgical site infection occurs when endogenous or exogenous organisms enter the body via the breach on the integrity of the skin and mucous membranes after the surgery (5). Surgical site infection is an infection occurs within 30 days after the operation. And infection involves only skin or subcutaneous tissue of the incision.

Maternity: a section of a hospital devoted to the care of women at childbirth and of their newborn infants.

CHAPTER ONE: INTRODUCTION

1.1 Background

Kabgayi Hospital was founded in 1937,with only 50 beds. It has now expanded to 372 beds with many of Medical, surgical and diagnostic services. It is located in the Southern Province, in the District of Muhanga. It has 273 employees and among them 2 medical specialist, 20 general medical doctors, 96 nurses, 42 midwives, 37 allied professionals and 76 administrative staff.

Kabgayi Hospital has a catchment area of 700000 population and receives referrals from 15 health centers as well as the Gitarama prison dispensary. It has 8 departments and 16 unities, with an occupancy rate of 69.3%.

The Mission of Kabgayi hospital is to ensure and promote the health status of the population of Rwanda. This Mission will be achieved by providing quality preventive, curative, rehabilitative and promotional services.

The Vision of Kabgayi District Hospital is to continually improve the health of the people of Rwanda, through coordinated interventions by all stakeholders at all levels, thereby enhancing the general well-being of the population we serve and contributing to the reduction of poverty.

This capstone, focuses on maternity department also called obstetrics and gynecology department. Maternity department is staffed by 4 general practitioners and 42 midwives (Kabgayi Hospital 2016).

The occupancy rate was 80.5% (quarterly report January-March 2017).

The maternity department has a number of beds established in the table below:

Table 1 Bed distribution in maternity Department

ROOM	**NOMBER OF BED/OPERATING TABLE**
Delivery room	6
Theatre	2
Waiting room	10
Post-partum(accouchement euthocique)	12
Pathologies in gynecology and obstetrics	12
Private room	10
Reception room	1
Kangaroo	4

1.2. Problem statement

There was a high rate of post-operative cesarean infections in maternity department at Kabgayi district hospital.

This problem has been identified via meeting with quality improvement committee, Infection Prevention and Control committee (IPC) and Head of maternity department.

A retrospective survey conducted from July 2015 to November 2015 revealed a post cesarean infection rate of 6.2%. This rate is high compared to the accepted rate of Surgical site Infection (SSI) which should not exceed 3% according to WHO(2). Considering the consequences of post cesarean infection on clients, staff and hospital this problem should be addressed.

1.3. Objective of the study

To reduce post Cesarean Section infection in maternity ward at Kabgayi Hospital from 6.2% to 3% from November 2016 to March 2017.

1.4. Hypothesis

Ho: Applying an effective patient hygiene at the maternity ward will not reduce the post-cesarean surgical site infections at Kabgayi Hospital.

H1: Applying an effective patient hygiene at the maternity ward will be reducing the post-cesarean surgical site infections at Kabgayi Hospital.

1.5. Justification of the study

A post cesarean surgical site infection is associated with increased morbidity, mortality , prolonged length of hospital stay, increase the hospital cost (3). Therefore, there is a need to prevent these kinds of infections. The objective of this project was to reduce the Cesarean Section Surgical Site Infection (CS SSI) to contribute to quality health care service delivery.

1.6. Organization of the dissertation

This capstone is structured and organized in six chapters. Chapter one is an introduction of dissertation and provides an overview of the hospital background, the problem statement, the magnitude of problem, the objective of the project, the hypothesis and the justification of the project. Chapter two is literature review where different readings on post cesarean surgical site infections are exposed. In literature review, some guideline and standards related to reduce post cesarean SSI are also exposed. In chapter three, the methodology used by the project is described. The results will presented in chapter four and the discussion of the results will be presented in chapter five. At the end, chapter six will include both conclusion and recommendations.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction and Epidemiological significance

A cesarean section (CS) is defined as a surgical procedure in which incisions are made through a woman's abdomen and uterus to deliver the fetus(24).

Historically, the first cesarean section was believed to have been done in 320 BC, under the circumstance that the pregnant women had died and her abdomen was cut open to deliver and, thus, save the baby's life(25). With the decrease in related maternal mortality and morbidity, cesarean delivery became a reasonable alternative for vaginal delivery(6).

Even though vaginal birth is generally safer than cesarean birth, cesarean section is preferred if certain maternal medical or obstetric indications exist such as placenta previa, preeclampsia, repeated cesarean delivery, arrest in progress of labor and fetal intolerance of labor, or fetal distress; and whenever the ongoing risk of labor was believed to potentially outweigh the risk of undergoing a major abdominal surgery(25).

Like any other surgical operation, cesarean section has its own advantages and disadvantages. The main advantage is that caesarean sections can save lives of mothers and fetuses when vaginal delivery is not eligible. On the other hand, cesarean delivery may be accompanied by a number of complications, surgical site infection (SSI) being one of them(4,6,26,27).

Surgical site infection occurs when endogenous or exogenous organisms enter the body via the breach on the integrity of the skin and mucous membranes after the surgery (5). Post cesarean surgical site infections have both health and socio-economic consequences for the patient and healthcare institutions. Not only it can prolong the length of hospital stay, delay of recovery, cause mortality and morbidity to the patients; it can also incur extra financial burden to the hospital as well as the patients due to additional diagnostic and therapeutic interventions,

occupying the scarce hospital beds, prolonged outpatient treatments and necessity of readmission(8,12,13,27–29). It is therefore important that the quality of medical care in pre-, intra- and post-caesarean sections must be well managed to avoid post cesarean SSIs, hence the clinical significance of our study.

The rate of SSI following Cesarean Section ranges from 3% to 15% worldwide. The variation in incidence may reflect differences in population characteristics and risk factors, per operative practices, and the duration from the beginning of the procedure to the end.(2,25).

In sub-Saharan Africa, Cesarean Section Surgical Site Infections remain one of the most common hospital acquired infections. In a Multi-Country Study from Medecins Sans Frontieres, the reported post-cesarean surgical site infections rate in sub-Sahara Africa varied greatly; ranging from 1.7% in DRC, to 7.4% in Sierra Leone and 10.4% in Burundi(10).

In Rwanda, caesarean sections are also the majority of major procedures performed in district hospitals. They comprise nearly 90% of gynecological and obstetrical procedures and 50-65% of all procedures(30)

2.2 Microbiology and Risk factors

Surgical site infection is caused by entrance of both endogenous and exogenous microorganisms at incision site. The normal skin flora has been identified to be the most common causative agents(5). *Staphylococcus aureus* is the most common organism isolated in SSI, accounting for 15%–20% of cases. Gram-negative bacilli, coagulase negative staphylococci, *Enterococcus* species, and *Escherichia coli* are other organisms commonly isolated from SSIs (2,29).

Risk factors for surgical site infection following caesarean section can be classified into intrinsic and extrinsic factors. Intrinsic factors are patient related and include age, obesity, underlying

medical conditions like diabetes mellitus, hypertension, asthma, immunocompromised states like HIV infection, hypoalbuminemia, hyperlipidemia, and anemia. Extrinsic factors relate to the management and care, which include preoperative preparation of the patient (part preparation and skin asepsis), type of procedure (emergency/elective), type of anesthesia (regional/general), type of skin incision (horizontal/vertical), method of skin closure, type of suture used (mono/ polyfilament) or use of staples, antibiotic prophylaxis, length of time membranes ruptured prior to operation, manual extraction of placenta, chorioamnionitis, number of vaginal examinations carried out before surgery, duration of operation, transfusion of blood products, grade of operator (consultant/registrar/senior resident), previous caesarean section, and environment of the operating room(2,8,13,25,27,28).

2.3. Prevention and Management

Employing strict infection control policies by a functional infection control committee is the most important step in preventing SSI(4)

The practices used to reduce SSI rate can be divided into three categories according to the time of intervention: preoperative, intraoperative, and postoperative practices.

Management of comorbidities diabetes mellitus is a well-known comorbidity associated with postoperative wound complications. Poorly controlled diabetes impairs host immune response and delays re-epithelialization of wounds. For diabetic women, perioperative glycemic control may be essential for preventing SSI(2,4,10). However on top of the above mentioned measures, the WHO (2) recommends the preoperative bathing using an antimicrobial soap as a more effective measure in reducing the incidence of SSI in surgical patients. Similarly a number of

literature is in agreement of this intervention as pathogens are on skin and can easily get into the wound when the skin continuity is broken during the surgical incision (31, 25).

Skin preparation

The skin is a main source of pathogens causing SSI. Preoperative skin preparation with antiseptic agents has been proven to reduce the risk of SSI. In our settings, most women are from rural area and we find their skin to be more dirty. For this reason, we adopted the cleaning of skin with soap and water before we apply antiseptic. The most used antiseptic in our settings is Povidone Iodine. Again we included post-operative wound care education as it was objectified most of our patient are not aware of it.

Antibiotic prophylaxis

This has been found to be a significant component that affects the rate of post cesarean section surgical site infection , as it was evidenced by three Cochrane reviews that evaluated the role of antibiotic prophylaxis in cesarean section. When comparing antibiotic prophylaxis to no prophylaxis or placebo for preventing infection following cesarean section, the use of prophylactic antibiotics significantly reduced the incidence of wound infection , endometritis , and maternal serious infectious complications(4,9,10,10,12,22)

Surgical personnel

Staff education programs and refresher courses in aseptic and scrub techniques have been shown to reduce the incidence of SSI in elective and non-elective cesarean deliveries (2,4,8,11,21,31)

Management

The management of post cesarean wound infection includes antibiotic treatment, wound exploration, and debridement as soon as indicated (2,11,25,31)

CHAPTER THREE: METHODOLOGY

3.1. Study design

In this project, we conducted a pre-and post-interventional study. A baseline assessment from July 2015 to November 2015 was conducted to measure the magnitude of the problem. A root cause analysis was also conducted in the pre-intervention period. Based on the identified final root cause, an intervention was implemented in November 2016 and the post-intervention evaluation was just conducted this period (from November 2016 to March 2017). The pre-and post-interventional results were compared to evaluate the intervention.

3.2. Measuring the magnitude

To identify post caesarian infection rates at Kabgayi Hospital, the researcher collected date from maternity logbooks designed for cesarean infection reporting, the researcher found that during a period of five months, 734 women attended theater room for cesarean section, 46 became infected after cesarean section which is equal to 6.2%.

The monthly report from July 2015 to November 2015 have shown the results as indicated in the following table

Table 3 1: The incidence rate of cesarean SSI by month (July 2015- November 2015)

Months	**Number of cesarean section**	**Number of infection**	**Incident rate**
July 2015	179	12	6.7%
August 2015	131	5	3.8%
September 2015	149	13	8.7%
October 2015	139	5	3.6%
November 2015	136	11	8.1%
Total	**734**	**46**	**6.2%**

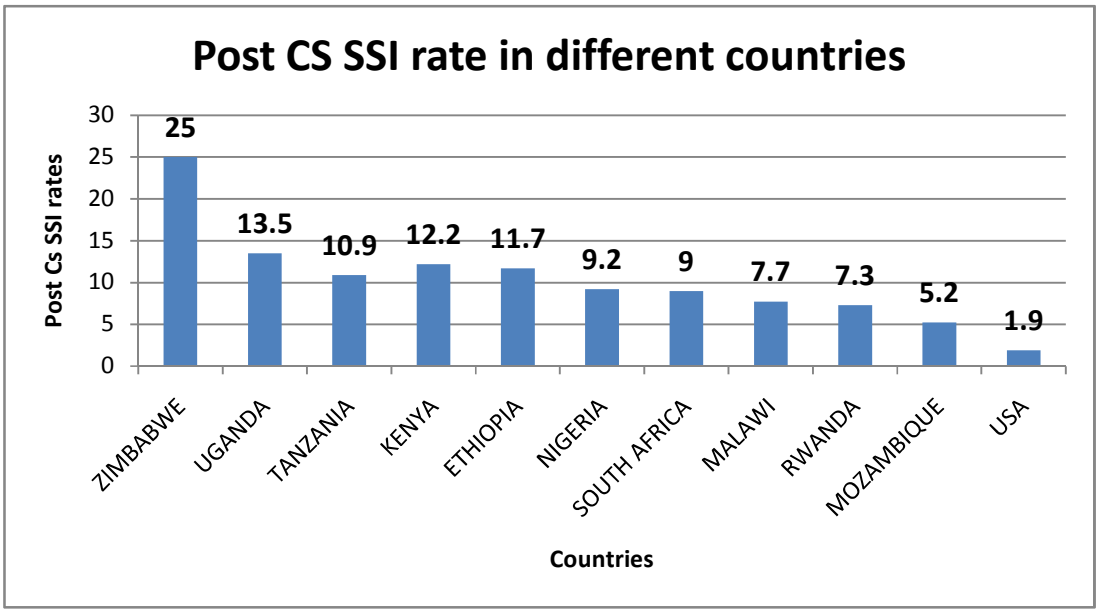
Source: Logbook of c-section in maternity department , July 2015- November 2015

Formula for rate of c-section infection equal = Number of c-section infected women X 100

Total number of women who had c-section

Average of c-section infection in 5 months =46*100/734= **6,2%**

According to Wanyoro Antony K. 2012, the post CS SSI varied from country as shown in figure 1



Source: Antony K.Wanyoro 2012+ Petroze RT, Nzayisenga A, : A Retrospective Review of National Data in Rwanda. 2011.

Figure 3 1 Average surgical site infection rate following cesarean section in different countries

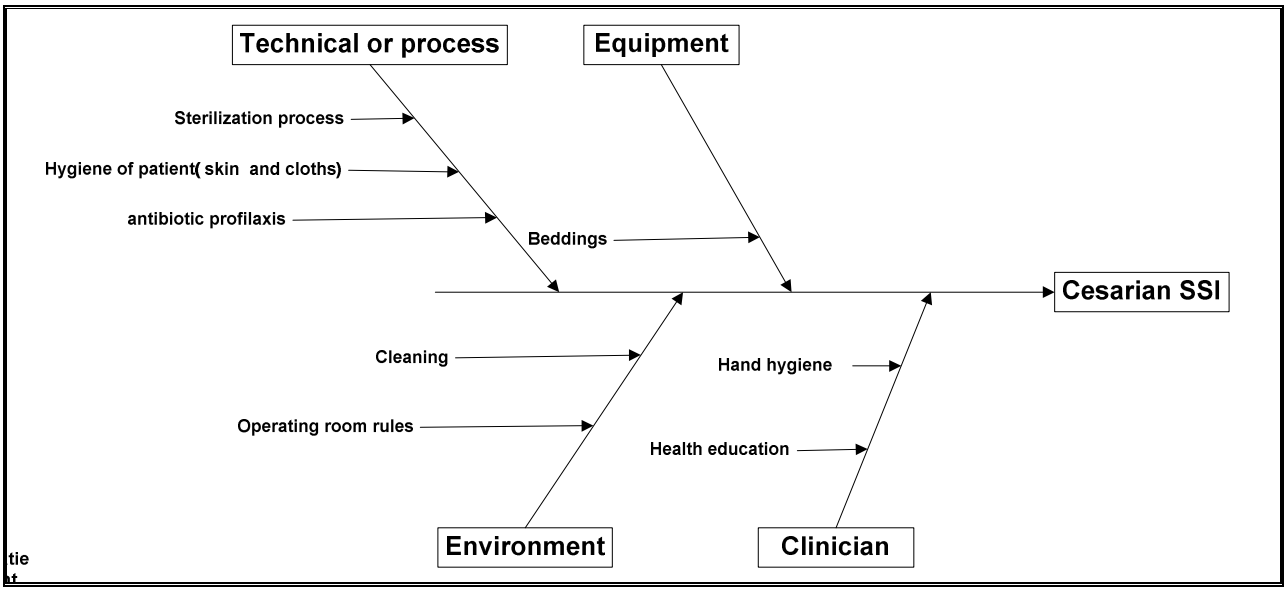
3.3. Root cause analysis

Participants in identifying root causes : Staff of maternity ,1 physician member of IPC committee, midwives responsible of maternity, 12 midwives (5 in theatre room, 7 in hospitalization and 3 cleaners**,** 2 anesthetists and 4 cleaners of operating theatre**,** staff of surgical ward including 1 medical doctor, 5 midwives and 1cleaner**,** 1 data manager 8 members of Infection Prevention Control (IPC) .

The possible root causes collected in the meeting was:

1. Patient hygiene before and after C-Section
2. Ineffective administration of antibiotics prophylaxis
3. Poor Hand hygiene for staff
4. Non respect of Operating room rules
5. Poor hygiene of beddings
6. Ineffective patient education
7. Ineffective decontamination and sterilization process

Figure 3 2.Fishbone diagram of caesarian SSI in Kabgayi hospital



VERIFICATION PROCESS

To verify each proposed root cause, different methods were used. For some indicators, a check list was filled by the research and the IPC committee members after collecting patient's information. Depending on the nature of the indicators, observations were also used to collect data after which tally sheets were filled.

Table 3 2. Patient hygiene before and after C-Section

Indicators	**Yes**	**%**	**No**	**%**
Is the Shower done before surgery	0	0%	52	100%
Is skin disinfection done properly?(with proper antiseptic, and technique respected)	46	88%	6	12%
Do patients enter in theatre with hospital's clothes ?	7	13%	45	87%
Vaginal revision after C/S	33	63%	19	37%
Total (average)	**21**	**40%**	**31**	**60%**

Source of data: Check list and Observation

The above table indicates that the patient hygiene is not done in 60% of woman undergoing CS.

Table 3 3. Administration of prophylactic antibiotics

Indicators	**Yes**	**%**	**No**	**%**
Respect of criteria of antibiotics selection	40	77%	12	23%
Antibiotics have been administrated to the women who are going to be operated (at 30 mn before skin incision)	45	86%	7	14%
Respect of posology	40	77%	12	23%
Is operated women take medicines regularly (If necessary)	35	67%	17	33%
Total(average)	**40**	**77%**	**12**	**23%**

When considering the results of the above table, the administration of prophylactic antibiotics is respected at 77%

Table 3 4. Hand hygiene before surgery for staff

Population=208 staff who done cesarean section for 52 woman undergone C-S

Indicators	**Yes**	**%**	**No**	**%**
Removing hand Jewellery	196	94%	12	**6%**
Washing visibly dirty hands with soap and water	200	96%	8	**4%**
Cleaning debris from beneath the fingernails using a nail cleaner	160	77%	48	**23%**
Removing artificial nails	172	83%	36	**17%**
Ensuring hands and forearms are washed before donning sterile gloves	200	96%	8	**4%**
Washing the hands for an extended period typically 2-5mn	204	98%	4	**2%**
Not using surgical hand rubs or scrubs should not be used concomitantly with alcohol based sanitizers	172	83%	36	**17%**
Not using poor quality water	148	71%	60	**29%**
Allowing hands to dry thoroughly after using alcohol rubs before putting on gloves	128	62%	80	**38%**
Total(Average)	**175**	**84%**	**33**	**16%**

Observed population=208: For every woman undergone C-S there are a team composed by four staff who must done hand hygiene practice before enter in theater room. Therefore, when you consider 52 woman operated in that period * 4 number of staff =208

The results from the table above indicate that Hand hygiene before surgery for staff is respected at 84%

Table 3 5 Tools of operating room rules

Indicators	**Yes**	**%**	**No**	**%**
1.Operating room rules				
Do Doctors/assistants wear proper shoes, mask, sterile towels	14	27%	38	**73%**
Is technical hand washing scrubbing well applied	48	92%	4	**8%**
Is op cleaned and disinfected regularly	42	81%	10	**19%**
Remove trash and debris	50	96	1	**4%**
Remove soiled linen from operating room table	52	100		**0%**
Kept free of lint and dust	50	96%	2	**4**
Clean and disinfect operating room furnishing	45	97%	7	**13%**
2. Are disinfectants solutions being prepared correctly?				
Before the first case of the days, using the lint free cloth moistened with disinfectant	45	87%	7	**13%**
In between cases, linen, trash and infectious waste removal	45	87%	7	**13%**
Terminal clean after the last case of the day using disinfectant and microfiber cloths	39	75%	13	**25%**
Is sterile alese used on operating table during operation?	25	48%	27	**52%**
There is permanent water and hand washing suppliers in theatre?	37	71%	15	**29%**
Is there permanent water in others maternity wards?	40	77%	12	**23%**
Total(Average)	**41**	**79%**	**11**	**21%**

The table above indicates that in general operating rules are respected at 79%

Table 3 6 Hygiene of beddings

Indicators	**Yes**	**%**	**No**	**%**
Are beds cleaned in between the patients (matelas) with hypochlorite sodium	38	73%	14	**27%**
Are beds cleaned before one week	18	35%	34	**65%**
Are beds rinsed in between the patients	28	54%	24	**46%**
Are beds dried between the patients	43	83%	9	**17%**
Are bed sheer cleaned and regularly changed(one /day)	17	33%	35	**67**
Total(Average)	**29**	**55%**	**23**	**45%**

Hygiene of beddings is respected at 55% as indicated by the above table

Table 3 7 Patient education before and after c-section

	Yes	**%**	**No**	**%**
Health education records before	6	12	46	**88**
Health education records after	27	52	25	**48**
Health education records related to surgical intervention before	7	13%	45	**87%**
Health education records related to surgical intervention after	23	44%	29	**56%**
Total(Average)	**16**	**30%**	**36**	**70%**

The above table indicates that patient education before and after c- section is only done in 30% of the cases and not done in all 70%

Table 3 8 Decontamination, cleaning and sterilization process

Decontamination and cleaning	**Yes**	**%**	**No**	**%**
Are surgical items respect decontamination standards?	44	85%	8	**15%**
Are linens items respect decontamination standards?	33	63%	19	**37%**
Are washing linens well done?	28	54%	24	**46%**
Are cleaning instrument well done (not soiled)	34	65%	18	**35%**
Sterilization		0		**0**
Are sterilization machines?	31	60%	21	**40%**
Are sterile machines monitor with temperature time and pressure for autoclave	5	10%	47	**90%**
Are protocol of sterilization available and updated and respected	34	65%	18	**35%**
Surgical materials				
Are C-Section kits ready to be used enough	6	12%	46	**88%**
Are C- section kits ready to be used in good quality	7	13%	45	**87%**
Total(Average)	**25**	**48%**	**27**	**52%**

Decontamination, cleaning and sterilization process is well done at 48% while it is not well done in 52% of cases

Table 3 9 Root cause rejected and accepted

For the table below, 52 women with C-S in the period of data collection for possible root cause were considered.

Possible Root cause (n1=52):(1,2,4,5,6,7) n2=208:(4)	**YES**		**NO**		**Observation**
	frequency	**%**	**frequency**	**%**	
1.Patient hygiene	**21**	**41%**	**31**	**60%**	**Accepted**
2.Administration of prophylactics	**40**	**77%**	**12**	**23%**	Rejected
3.Hand hygiene for staff	**175**	**84%**	**33**	**16%**	Rejected
4. Respect of operating room rules	**41**	**79%**	**11**	**21%**	Rejected
5.Hygiene of bedding	**29**	**55%**	**23**	**45%**	Rejected
6.Patient education	**16**	**30%**	**36**	**70%**	**Accepted**
7.Decontamination, cleaning and sterilization process	**25**	**48%**	**27**	**52%**	**Accepted**

Even though other preventive measures are not respected at 100%, but at least they are respected at a high percentage therefore the confirmed root causes are patient hygiene, patient education decontamination, cleaning and the sterilization process as they were not done in more done 50% of women undergoing CS.

Based on results from root cause analysis, and considering the fact that within the scope of this project it cannot be possible to address all root causes contributing to the high rate of C-section surgical site infection in maternity of Kabgayi hospital, the ineffective patient hygiene and patient education will be addressed particularly as they represent the highest percentage compared to the rest of the preventive measures.

3.4. Interventions

Based on the main root cause which is ineffective patient's hygiene and patient education , five interventions were proposed and after a comparative analysis (appendix 2) considering time, feasibility cost and impact all interventions were selected as it was realized that all of them were feasible and necessary to achieve objective. These interventions were a pre-operative patient hygiene with water and soap done by a midwife and patient education with regard to post caesarian infection, daily bed sheets change (Every time bed sheets are duty), Every operated patient must put on proper gown given by hospitalization (before and after operation), and availability of policy and procedure regarding patient hygiene for above mentioned measures.

In detail the five interventions were implemented as follow:

After cesarean section is decided and consent form signed, water is warmed using kettle. This warmed water, together with soap; personal washcloth and new basin are used to wash a woman, who is candidate for the operation. This action must be done by a midwife. After this action the woman put on a proper hospital gown and is conducted into operating room(theatre),where the rest of skin preparation is done with disinfectant (povidone iodine) before skin incision. This preoperative body washing should be ignored in extreme emergency cases, like in case of cord prolapse.

A pre-operative patient bathing with water and soap was done by a midwife every time the patient was going for a CS except in extreme emergency cases. Each woman who delivered by Cesarean must have a new basin, warm water and a washcloth to wash properly according to the conditions of a woman who gave birth to Caesarean. When it's impossible find a new basin, the hospital will make available the basins for this kind of patients and on their return they hand

them over before their departure. The choice to use the new pools or those that are disinfected is based on the fact that using pools that are used for other things can increase the risks of infection. The hygiene of the woman is also taken into account in the Post Anesthesia Care Unity (PACU), where it continues to be done by midwife while explaining to the mother. Here the vaginal hygiene, pamper change, and other skin related hygiene are done by the midwife and this helps avoid spotting spread out of lochia (the vaginal discharge after giving birth containing blood, mucus, and uterine tissue) into surgical site and staining of bed sheets and the mattress by with blood. After that she receives a clean dress given and maintained by the maternity department before being moved in to the postpartum. Arrived in the postpartum, the woman must continue to wash at least 2 times a day: morning and evening. The bath is given by the midwife or, if necessary, by a sick guard next of kin who has received instruction about the hygiene of the woman in the ward. With regard to bed sheets change, we sensitize the staff in laundry to wash sheets regularly and the store keeper of the department to avail enough sheets that were kept in store without being used. Having enough bed sheets, it is easy to change bed sheets every day and/or whenever it became becomes dirty. Concerning the patient education, it was is recommended for midwife to provide education when performing the patient bathing before CS and in PACU . Again the patient education was done by midwives in post-partum ward meaning that the patient use to receive the education at least three times in hospital. The education is about how body and clothes hygiene is maintained without self-surgical site contamination. The content of the education is how to maintain a proper hygiene for someone who underwent a CS . With regard to proper gown given by the hospital, the hospital administration avails the budget to make enough gowns available and all patients received them when necessary. Finally the policy (appendix8) regarding the patient hygiene was developed by the IPC committee and the QI team

then approved by the hospital director and published on the walls in three areas, where a patients who underwent CS pass. These areas are delivery room, PACU and postpartum wards. Policy is also communicated and explained to all the maternity staff to remind them their duty and to remind them the importance of doing all possible means to reduce post-cesarean infection.

3.5. Measures

Three indicators were used to measure the effect of the intervention. Post-operative caesarian infection rate as an outcome indicator and process indicators were: the number of pre and postoperative patient cleaned with water and soap by midwifes and the number of educated of women pre and post caesarian

3.6. Data analysis

The data entry as well as data analysis were done using Microsoft Excel. The chi square test was used to analyze all indicators

3.7. Ethical considerations

A letter to request for authorization to conduct a quality improvement project was addressed to the management of the hospital and the permission was granted. The maternity staffs were involved as a team activity in relation to their everyday tasks. With regard to patients a verbal informed consent was obtained after explaining them the necessity of the project to reduce the post caesarian infection.

CHAPTER FOUR: RESULTS

In pre intervention period, five months from July to November 2015 were considered and among 734 women underwent CS, 46 of them developed infection and the rate was 6.2%. In post intervention phase, again five months from November 2016 to March 2017 were considered to identify the infection rate after interventions have been implemented. In total there were 704 women observed and among them 25 developed the post caesarian SSI which gives a rate of 3.5%

Table 4 1Monthly report of post caesarian in post intervention

Month	**Number of c-section**	**Number of infection**	**Infection rate %**
November 2016	135	3	2.2%
December 2016	156	5	3.2%
January 2017	143	7	4.8%
February 2017	131	4	3.0%
March2017	139	6	4.3%
Total	**704**	**25**	**3.5%**

Table 4. 2 Summary of pre and post intervention results

Indicators	**Baseline data**	**Post intervention data**	**Change**	**P value** ($p<0.05$)
Post-operative caesarian infection rate	6.2%	3.5%	2.7%	0.001
Number of pre and postoperative patient cleaning with water and soap by midwife	0%	97.6%	97.6%	0.001
Patient education before and after C-section	30%	97.6%	67.6%	<0.001

Results for other indicators

Indicators	**Pre intervention**	**Post intervention**	**Comments**
Availability of policy	Not available	Available	improvement
Number of patients wearing hospital gowns	None	All	improvement
Bed sheets change every day and when dirty	Not done regularly	Done regularly	improvement

CHAPTER FIVE: DISCUSSION

The project objective was to reduce the post-cesarean surgical site infections at Kabgayi district hospital from 6.2 to 3% by March 2017. By implementing an effective patient hygiene including Pre and post-operative patient cleaning with water and soap by midwife, Daily bed sheets change and whenever sheets are duty, putting on proper gown given by hospital to every operated patient during hospitalization(before and after CS), providing patient education related to surgical site infection, and avail the policy and procedure regarding patient hygiene for above mentioned measures the Post CS SSI was reduced from 6.2 to 3.5% ($P<0.05$).

The SSI rate differs widely from hospital to hospital and from one geographic location to another. At Kabgayi hospital most women are from rural areas and we find their skin to be more dirty and for this reason the skin preparation by cleaning with water and soap by midwife and other patient hygiene measures were the successful strategies to reduce the post CS surgical site infections. According to a number of literatures a pre-operative bathing using antiseptic soap could be effective to prevent the surgical site infections(2,24,25).

The results obtained are almost similar to Mibilizi district where implementing wound dressing protocol reduced Post C-S SSI rate from 5% to 1.8% (24). However different Post C-S SSI rates were achieved using various measures in different countries worldwide. A study conducted in Uganda showed the significant improvement by administration of prophylactic antibiotics one hour before incision(22). This is in agreement with another study in Tanzania where the rate was 6.8% in the group that received antibiotics less than one hour before incision and 4.8% in another group that had antibiotics in an hour and beyond (22).

The successful results of this project were also due to awareness and commitment of the maternity staff as well as the administration support. This has caused the staff to improve on

others preventives measures that were not concerned with this project. However during the implementation, the resistance on behavioral change for some midwives in performing pre and post-operative physical -hygiene was observed. To overcome this challenge the IPC team organized a close monitoring and supervision and finally the team understood the impact of the intervention and implemented it successfully. As the policy was published on the wall it was also necessary to abide by the policy. Another limitation was a possible Hawthorne effect especially for the respect of operating room rules as staffs were aware that quality improvement project involving their observations was in progress. In addition to limitation, the project focused only on reducing post CS SSI by implementing an effective patient hygiene while there are also other factors like decontamination and sterilization process that could also addressed to be effective. Many other preventive measures were respected at a good percentage but still need be respected at 100% achieve the good results. The interventions were not implemented in extreme emergency cases although they could be in need of the pre operative skin preparation and other patient hygiene.

The last limitation was the nature of the study design that doesn't allow to conclude that the obtained results are exclusively imputable to the intervention in question. A quasi experimental study design would have been better to conclude on this question. However, considering the conditions, it was not possible to conduct a quasi-experimental study.

This project is implemented since November 2016 to March 2017 and working properly in Kabgayi Hospital where the number of patients suffering from the infection has been decreased from 6.2% to 3.5%. Even, after the time mentioned above, the project is still in use. There is a sustainability of the work as the Ministry of Health has accepted and financed the project, where

20 staff from Kabgayi hospital has been trained for IPC in April 2017. In addition to that, in service refresher will be continuous.

CHAPTER SIX. CONCLUSION AND RECOMMENDATIONS

6.1. CONCLUSION

The post caesarian infection rate was 6.2% at the Kabgayi district hospital with the main root cause being poor patient hygiene. After implementation of the effective patient hygiene done by a midwife the infection rate decreased from 6.2 to of 3.5% (P value of 0.001). Initially there was no women cleaned before CS (0%) but post intervention data showed that 97.4% of women were cleaned by midwives before and after CS (P value of <0.001). For the intervention to succeed the patient education with regard to post caesarian infection was also reinforced. Results from this project showed that cleaning women before and after cesarean section reduced post CS infection in Kabgayi District Hospital. The successful results of this project were also due to awareness and commitment of the maternity staff as well as the administration support. This has caused the staff to improve on others preventives measures that were not concerned with this project.

6.2. RECOMMENDATIONS

Considering the fact that our intervention contributed to the reduction of post caesarian surgical site infection we recommend similar interventions to be used by other District Hospital in Rwanda and other developing countries where there is a poor patient hygiene.

The regular supervision should be done to ensure the sustainability of the project and continue the process of post caesarian infection reduction

We also recommend the hospital to train the maternity staff about the strategic problem solving to enable them to systematically address other root cause of post caesarian infections.

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APPENDICES

Appendix1: Request letter for permission to conduct a quality improvement project in Kabgayi District Hospital

KANTENGWA Immaculee

MUHANGA DISTRICT

Kabgayi District Hospital

Tel:0788680780

Email: imma2174@gmail.com

3th June 2016

The Director of Kabgayi Hospital

R.E: **REQUEST FOR PERMISSION TO CONDUCT A QUALITY IMPROVEMENT PROJECT**

Sir,

I request permission to conduct a quality improvement project at Kabgayi hospital.

I am presently registered at the University of Rwanda, Masters Degree in Hospital administration and health care management (MHA), under the supervision of **Prof Manasseh NZAYINAMBAHO.** The title of the Project is "**High rate of post caesarian surgical site infection in maternity department Kabgayi Hospital**". Structured questionnaire, tally sheet, interview, observation and brainstorming with Infection Prevention and Control. The information will be treated as strictly confidential.

The results of the project may help hospital to deliver a good quality service to the Women delivered by cesareans, her family, community in whole and Kabgayi Hospital.

Yours Faithfully

KANTENGWA Immaculee

Appendix 2:

Acceptance letter for conduct a quality improvement project in Kabgayi Hospital

8th June 2016

KANTENGWA Immaculee

University of Rwanda

Kigali

Dear Immaculee,

RE: Your request for the permission to conduct a quality improvement project at Kabgayi Hospital.

Reference is made to letter of 03th June 2016 requesting the permission to conduct a quality improvement project on **"High rate of post caesarian surgical site infection in maternity department Kabgayi Hospital''.**

I am pleased to inform you that you allowed to conduct your research at Kabgayi Hospital. We kindly request you to share with us your findings.

We wish you all the best in this project.

Dr KAJIBWAMI Espoir

Director of Kabgayi Hospital

P.O Clinical Director

CC:

-Administrator of Kabgayi Hospital

Appendix 3:

Policy and procedures about Post operative C.S infection control in Maternity ward

<table>
<tr><td rowspan="2">KABGAYI DIOCESE

MUHANGA DISTRICT
KABGAYI HOSPITAL
B.P:66 GITARAMA – RWANDA.
E– mai : kabgayihospital1@gmail.com</td><td colspan="3">TITLE: POST OPERATIVE INFECTION CONTROL</td></tr>
<tr><td>Policy code/ Number:
KDH/POIC</td><td>Effective Date:
October 2016</td><td>Revision date:
September 2018</td></tr>
<tr><td>Department: Clinic Department</td><td colspan="2">Applies to Gynecology department</td></tr>
<tr><td>Responsible Person:
Clinical Director</td><td>Approvals:
Hospital Director
Dr. KAJIBWAMI Espoir
P.O Clinical Director</td><td>Signatures/dates:
24 October 2016</td></tr>
</table>

PURPOSE OF THE POLICY

The primary purpose of kabgayi district hospital regarding Infection Prevention and Control policy and procedure especially for women undergoing caesarian is to give direction to health personnel and clients in the prevention and control of infections within healthcare settings so as to ensure patient safety and the protection of health workers.

POLICY STATMENT

Kabgayi District hospital ensures that all patients undergoing ceasarien are well prepared by midwives qualified according to related guidelines.

DEFINITIONS

PACU: Post Anesthesia Care Unity

ASEPSIE: Literally means without microorganisms.

ASEPTIC TECHNIC: Refers to practices that help reduce the risk of post-procedure infections in patients/clients by decreasing the likelihood of microorganisms entering the body during clinical procedures. It also reduces the service provider's risk of exposure to potentially infectious blood and blood products, other body fluids and tissues during clinical procedures.

CLEANING: It is the second step in processing instruments and other medical devices or personal body. It removes foreign materials, which may contain micro-organisms from an instrument.

DECONTAMINATION: It is a process that involves the removal or destruction of most micro-organisms to render a surface or object safe to handle.

DISINFECTION: Refers to the use of chemical or physical agents to eliminate virtually all disease-causing micro-organisms but not bacteria spores on objects and surfaces to a level that is not normally harmful.

NOSOCOMIAL INFECTION: Also called health care associated infections or hospital acquired infections. It is an infection that is not present or incubating at the time the patient comes to the health care facility.

STERILIZATION: It is the destruction of all microorganisms including bacteria spores. This is achieved principally by autoclaving.

PROCEDURES

A) PRE OPERATIVE CLEANING WITH WATER AND SOAP

- Post operative infection prevention begin in pre operative period
- Pre operative cleaning with water and soap is one of means to reduce post operative infection in our hospital
- Every patient before entering operating room(theater) must be cleaned with water and soap
- She must explained, know the importance of that act in order to reduce post operative infection.
- For elective surgery, the doctor, midwife/nurse after taking decision of surgery, they must explain to the patient and guardian if is there, the role of body hygiene them serves(cleaning with water and soap) and that done by the hearth cares before c-section

- The patient and her guardian must educated about they participation to prevent or reduce the risk of post operative infection in collaboration with hearth cares.
- Cleaning is done by midwives/nurses systematically before c-section
- Cleaning is done in delivery room
- After enough psychological preparation of the patient about the importance of that action, midwife /nurse cleans all the body except the head(except if is necessary: is dirty) with lukewarm water (eau tiede) with soap except in case of allergy of the patient on lukewarm water, for her choice or lack of means of boiling water (absence of electricity or keto)
- Every patient must have her basin
- If she hasn't it, the basin of service is used
- The patient must have also her own soap, if she hasn't it the soap of service is also used
- For more cleaning , midwife /nurse uses gauzes and soap
- After cleaning, patient is wear a dress of service(gown services) reserved for it(before and during hospitalization)
- Even the patient has done body cleaning herself, cleaning of the midwife/nurse is obligatory.
- For emergencies cases, the doctor, midwife/nurse explains to the patient the role of body cleaning with soap before
- The procedure is done as the same as elective c-section
- After cleaning with soap and water, the midwife/nurse gives to the guardian of the patient all material of the patient
- After that cleaning midwife /nurse begin other preparations like IV lines taking, urinary catheterization, and administration of antibiotics…
- After that, patient is transported to operating room herself accompanied with midwife/nurse
- If she is not able to move he self, is helped by hearth providers (doctor, anesthetist, midwife/nurse or cleaners if necessary all or one of them in collabollation
- At arrive in theater, in order to prevent propagation of infection, only the patient enters in after changing shoes, others stay there; they not cross red line.

- Only theater room team with proper shoeses, dresses, bonnet and masks is permitted to enter theater room.
- Shoes reserved only in theater are reserved.
- The operating room team receives the patient and his file
- In some situation of extreme emergency like: cord prolaps, outside team can enter operating room (theater) without those conditions.
- The operating table, is cleaned and disinfected before that patient arrive
- The theater room team installs the patient on operating table after putting the sterile drap
- The patient has three dresses: the first is reserved for pre operative period after cleaning her with water and soap, two others are for post operative period and hospitalization.
- In normal condition our patient is hospitalized three days using those three dresses
- Dresses are cleaned after decontamination and ironed once every day or more if necessary by laundry.
- The midwife/nurse in charge of theater must ensure the availability of those dresses, cleanliness of them and of theater room and if the patients has been cleaned.
- Theater room is cleaned three a day and every time is used
- Theater room is disinfected once a week
- In order to prevent infection all materials used are decontaminated and sterilized

B) THE ROLE OF MIDWIFE/NURSE IN PACU FOR PREVENTING POST OPERATIVE INFECTION

- **PACU :**Post Anesthesia Care Unity
- After operation, patient is cleaned also with normal saline in site of incision including around, removing all blood or other secretions like stool which can be on her body.
- After, patient is put in proper drape and transported to PACU on brancard which has been disinfected

- The bed to receive her is already prepared and disinfected
- Patient is received by PACU nurse/midwife
- Monitoring of vital parameters and bleeding is done closely.
- Patient is covered by proper sheet and blanket
- The sheet is for one patient, is used once and after it use is brought in laundry for cleaning.
- For limiting the propagation of infection in PACU, no guardians are permitted to enters there or to stay with the patient except when are necessary(needed)
- In PACU all activities are done by midwife /nurse
- The sheets and drapes are changed if necessary (more bleeding, stool or other secretions).
- All used dresses or sheets in PACU are put in recipient reserved for it and carried in laundry.
- KANDAGIRA UKARABE, gloves and hand disinfection are reserved there to be used after any contact with the patient or her materials in order to prevent the propagation of infection.
- Midwife/nurse must ensure the administration of drugs include antibiotics if prescribed.
- Patient stay in PACU under monitoring until is stable at least 4-6h (see Aldret score).
- In order to prevent infection, is prohibited to anyone to eat and drink in PACU, and no patient's materials is permitted to be there.
- Before leaving PACU midwife/nurse cleans the patient also with water and soap protecting the dressing wound, wears her another dress (of hospital) in presence of one of her guardian in order to begin to educate her guardian how cleaning is done.
- In PACU patient is also educated the role of body hygiene, nutrition , in order to prevent post operative infection.

C) THE ROLE OF MIDWIFE/NURSE IN WARD INCLUDE DELAYED RECOVERY ROOM

- Patient leaves PACU to delayed recovery room where she stays at list also 6h under monitoring.
- She is transported in bicycle by cleaner accompanied by midwife/nurse of PACU

- ❖ In delayed recovery room and ward, midwife/nurse continues to clean the patient every 12 h (two time a day: morning and night) and also to educate her and guardian to do that themselves (how).
- ❖ Midwife/nurse demonstrates the patient and guardian how to do cleaning with water and soap protecting the wound.
- ❖ When there are more hearth providers or students in formation, that cleaning is done by them but in presence of guardian.
- ❖ Patient and her guardian are educated about:
    - Importance of cleaning the patient with water and soap before during hospitalization and at home, protecting wound at list two times a day.
    - Role of nutrition (balanced diet) to prevent post operative infection
    - How to prepare and do it
- ❖ Midwife/nurse evaluates if the guardian and patient has catch how to do the cleaning with water and soap protecting the wound, leaves them/her to do that under her supervision.
- ❖ Guardian or patient do the cleaning herself in presence of midwife/nurse
- ❖ If some mistake is done, the midwife/nurse corrects them.
- ❖ If the patient is able to do the cleaning herself, she can do it.
- ❖ Patient is educated that no things must enter the dressing wound (breast milk, rochies, water or other secretions
- ❖ The dress must be changed every day or more time if necessary
- ❖ Patient uses dresses and sheets of hospital (not use of her dress or sheets).

D) CHANGING BED SHEETS REGULARY TO PREVENT POST OPERATIVE INFECTION

- ❖ In delayed recovery room and hospitalization, beds also are disinfected before it use
- ❖ Midwife/nurse ensure that every bed has his sheets
- ❖ Sheets to use must be washed, and ironed.
- ❖ Sheets must be changed once a day or more time if necessary
- ❖ Midwife /nurse of that room must ensure the availability of proper sheets
- ❖ In collaboration with laundry service, midwife must ensure the collection of used sheets, to wash and iron them before they use

E) THE ROLE OF CONTINUOS IEC TO PREVENT POST OPERATIVE INFECTION

I EC: Information Education and Communication.

- The IEC has the major role in prevention of post operative infection
- Generally, all patients enter maternity service are educated about body property and other aspect like nutrition, medication, rights of patients….
- Particularly, about infection prevention, IEC begin after decision of operation by multidisciplinary team (doctors, anesthetists in pre operative consultation or visit, midwives/nurses…..
- Patient is educated the importance of cleaning her body with water and soap herself and that done by midwives/nurses before or after operation.
- IEC on different subjects especially on body hygiene is done every morning by midwives/nurses
- In general, every day patient is educated about different subjects, but body hygiene (cleaning the body with soap and water and wearing proper dresses) are added to all subject given in order to prevent post operative infection.
- Some subjects are educated to be respected in hospital and out of it: body hygiene, taking drugs, nutrition, use of traditional drugs, fils ablation, wound dressing,…
- Supervision in health centers are done to educate and supervise nurses/midwives about infection control
- IEC done is recorded and signs in register.

M

Appendix 4: **Study Questionnaire**

KABGAYI DISTRICT HOSPITAL

Post-cesarean section surgical site infections: rate and risk factors

Study Questionnaire

Patient Names: ……

I. Potential risk factors

1. Age: ……..
2. Education:

a. Primary ☐

b. Secondary ☐

c. Illiterate ☐

3. BMI: …….(kg/m^2)
4. Smoking status:

a. Smoker ☐

b. Non-Smoker ☐

c. Unknown ☐

5. HIV status:

a. Negative ☐

b. Positive ☐

6. Diabetic:

a. Yes ☐ Pre-op glycaemia……mg/dl

b. No ☐

7. Other infectious disease:

a. Condyloma ☐

b. Other ☐

8. Parity……..

9. Duration of labour prior to c/s: …….hours

10. Aspect of the amniotic fluid prior to c/s: ……

11. Elapsed time since rupture of membranes prior to c/s: ……

12. Pre-operative diagnosis: ……..

13. Washing the abdomen and thighs with a soap and hair shaving prior to the procedure:

a. Performed ☐

b. Not performed ☐

13 Operation time: …….. Minutes

14. Type of wound closure:

a. Vertical mattress ☐

b. Continuous ☐

c. Intradermic ☐

d. Unknown ☐

15. Type of incision:

a. Pfannesteil's ☐

b. Midline ☐

16. Antibiotic prophylaxis:

a. Given ☐

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b. Not given ☐

17. Has been sterility assured (Surgical team, materials)?:

a. Yes ☐

b. No ☐

18. Elapsed time for storage of materials after sterilization:

a. Hours ☐

b. days ☐

19. Antiseptic solution used for skin prepping:

a. Povidone Iodine ☐

b. other solution ☐

20. Frequency of operating room formolization: ……..

II. <u>Infection confirmed:</u> Physical exam findings

21. Superficial (Pus from incised skin and subcutaneous tissues):

a. Yes ☐

b. No ☐

22. Deep incisional infection (Pus from fascia and muscles):

a. Yes ☐

b. No ☐

23. Organ/space infection (Peritonitis/endometritis):

a. Yes ☐

b. No ☐

24. Period of Infection occurrence: …….

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25. Length of follow-up postoperatively: ……..days

26. 1st wound dressing: ……

27. Outcomes:

a. Improved & discharged ☐

b. Re-operated on ☐

c. Referred ☐

d. Dead ☐

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Appendix 5. Hand hygiene tool

N^0	**Moments of hand hygiene**	**Rates of hand hygiene**
1	Before performing a clean procedure	
2	After patient body fluid exposure	
3	Before touching a patient and	
4	after exposure to body fluid	
5	After touching a patient	

Appendix 6. Hand hygiene before surgery

Indicator	**Yes**	**No**
Removing hand jewellery including rings, bracelets and wrist watches before starting to wash the hands;		
Washing visibly dirty hands with soap and water according to the correct technique, before commencing surgical hand preparation;		
3.Cleaning debris from beneath the fingernails using a nail cleaner. The nails should be cleaned under running water where possible		
4.Removing artificial nails – they must not be worn by individuals performing surgical procedures		
5.Ensuring hands and forearms are washed before donning sterile gloves, using either		
6.Washing the hands for an extended period typically 2-5 minutes. Longer rubbing times of up to ten minutes are not necessary		
7.Not using surgical hand rubs or scrubs should not be used concomitantly with alcohol based sanitisers		
8.Not using poor quality water. If water quality cannot be guaranteed, health care workers should use alcohol based rub to decontaminate their hands;		
9.Allowing hands to dry thoroughly after using alcohol-based rubs and before putting on gloves.		
Total of Yes and No		

Appendix 7 .Pre and post operative patient hygiene tool

Indicator	**Yes**	**No**
Is the Shower done by midwife before and after c-section ?		
Is skin disinfection well done?		
Do patient enter in theatre with their own clothes?		
Vaginal revision after C/S		
Total of Yes and No		

Appendix 8.Administration of antibiotics prophylaxis

Rational use of antibiotics	**Never (1)**	**Rarely (2)**	**Sometimes (3)**	**Often (4)**	**Always (5)**
Respect of criteria of antibiotics selection					
Respect of time (The normal cesarean procedure averages 45 minutes to an hour)					
Respect of dose					
Respect of frequency					
Existence of antibiotics resistance					

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Appendix 9. Patient education

Date	**Patient ID**	**# of health education records**	**# of health education records related to surgical intervention done**
Total			

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Appendix 10. Data collection, analysis and presentation tools

No	Possible causes	Data collection	Data presentation	Date due
1	Hand hygiene	Observation using tally sheet to assess five moment of hand hygiene	Table	25 july2016
2	Time duration for al caesarean section	Observation in patient fire using the tally sheet in other to assess the duration of intervention for the patients who had the infection to see the duration of these cesarean.	Table	20 July 2016
3	Poor hygiene of beddings	Interview using the tally sheet to the midwives and cleaners on the management of clean and soiled beddings	Table	24 July 2016
4	Ineffective administration of antibiotics prophylaxis	Observation in patient fire of those who had the infection to assess if the antibiotic prophylaxis is given, the respect of time, dose and frequency..We will use the tally sheet	Table	21July
5	Patient hygiene(skin and cloths)	Observation and interview by using tally sheet in other to asses physical hygiene of the patient	Table	25July 2016
6	Ineffective patient education	Observation in patient files and interview to the patient using tally sheet to assess the number of patient health education records before and after cesarean	Table	22 July 2016
7	Ineffective decontamination and sterilization process	Observation and interview using the tally sheet to staff of theatre room, maternity room and sterilization room in other to assess the process of decontamination and sterilization of materials	Table	20 July
8	Respect of operating room rules	Observation using tally sheet in other to assess the respect of operative room rules to surgery time	Table	23July

Appendix11: Comparative analysis

CRITERIA / STRATEGIES	Impact	Cost	Feasibility	Time to effect	Total
Pre and post-operative patient cleaning with water and soap by midiwife	4	4	5	3	16
Daily bed sheets change (Every time bed sheets are duty)	3	3	4	3	13
Every operated patient must put on proper gown given by hospital during hospitalization(before and after operation)	4	2	5	2	13
Patient education related to surgical site infection	4	5	2	3	14
Availability of policy and procedure regarding patient hygiene for above mentioned measures	5	3	3	4	15

Appendix 11: **IMPLEMENTATION PLAN**

GANTT'S CHART

No	Detailed list of tasks/activities	2016												2017							
		Oct.	November				December				January				February				March			
		w4	w1	w2	w3	w4	w1	w2	w3	w4	w1	w2	w3	w4	w1	w2	w3	w4	w1	w2	w3	w4
1	Pre and post-operative patient cleaning with water and soap by midiwife																					
2	Daily bed sheets change (Every time bed sheets are duty)																					
3	Every operated patient must put on proper gown given by hospital during hospitalization(before and after operation)																					
4	Patient education related to surgical site infection																					
5	Availability of policy and procedure regarding patient hygiene for above mentioned measures																					

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Appendix 12.

Outcome indicator

Indicator	**Definition**	**Person**	**How**	**When**
Post operative caesarian infection rate	Number of c-section infected women over total number who had c-section	Researcher	The researcher collected data from maternity logbooks designed for cesarean reporting.	March 2017

Process indicator

Indicator	**Definition**	**Person**	**How**	**When**
Number of pre and postoperative patient cleaning with water and soap by midwife	Number of woman having c-section after being cleaned with water and soap	Researcher	Observation using tally sheet	March 2017
frequency change of patient gown given by hospital during hospitalization (before and after operation)		Researcher	Observation using tally sheet	March 2017
Number of education women receive education about c-section before and after c-section		Researcher	Observation using tally sheet	March 2017
Frequency of daily bed sheet change		Researcher	Observation using tally sheet	March 2017
Availability of policy , procedures and protocol about how to monitor the women with C-S		Researcher	Observation to see if the protocol is in delivery room, Post anesthesia care unit(PACU) and in post partum	March 2017