UNIVERSITY OF
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EQUITY

Capstone Practicum Report

A QUALITY IMPROVEMENT PROJECT TO IDENTIFY THE ACCURATE RATE OF POST CESAREAN SECTION SURGICAL SITE INFECTIONS IN A DISTRICT HOSPITAL OF KIGALI CITY

A quality improvement project to identify the accurate rate of Post Cesarean Section Surgical Site Infections in a district hospital of Kigali City

By

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DECLARATION

I, UWAMUNGU Evode, hereby declare that the practicum capstone thesis has been written by me without any external unauthorized help, that it has been neither presented to any institution for evaluation nor previously published in its entirety or in parts. Any parts, words, or ideas in the thesis, however limited, that are quoted from or based on other sources, have been acknowledged as such without exception.

Signature: UWAMUNGU Evode Date: May 18th, 2018

DEDICATION

To my first family: BANINEMA Flavia, IMENA Génie Christa, ERA Chris-Ray Gianni and INEMA Jani Valen; I praise God frequently for giving me such great gifts.

To the memory of my Grand Mother, MUKABUTERA Gaudence: Although you have left us, we always carry good memories of you in our hearts. I'll always remember that you have been the cornerstone of my life since my childhood and that you stood for mother and father for all of us as your children!

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ABSTRACT

Background: Post cesarean section infections (PCSIs) remain a burden in Low and Middle Income Countries (LMICs) with an important need to be closely monitored and addressed. Although, many hospitals have established PCSIs surveillance systems, these haven't been able to capture most of infections occurring after a patient has been discharged, leading to inaccurately reports in PCSI rates.

Primary objective: To identify the accurate rate of post cesarean section infection in Kacyiru hospital by April 2018.

Secondary Objective: To assess the potential risk factors associated with post cesarean section infections in Kacyiru by April 2018.

Methodology: A new PCSI surveillance system was implemented in parallel with the existing hospital system, from November 2017 to February 2018, targeting all women who had cesarean section (CS) delivery. The new system observed and monitored a patient while at the hospital (during hospitalization and readmissions) and telephone calls follow-up were made with the patient on the 10^{th} and 30^{th} post-operation days after discharge.

Results: 540 women have had a CS delivery at Kacyiru hospital during the study period and 340 (63%) completed the new surveillance. The new system identified a PCSIs rate of 11.2% while the hospital system reported 3.1%. During hospitalization and readmissions, the two systems collected similar information, but the new system was able to identify many PCSIs after discharge.

Women who have had a prolonged labor – longer than 12 hours - (odds ratio=5.9, p=0.003) and those who have had rupture of membrane before CS procedure (odds ratio=2.1, p=0.024) were found to be at high risk of PCSIs.

Conclusions: PCSIs surveillance using telephone call during post discharge period is feasible and require relatively low cost. This method allowed identifying a disparity in the rate of reported cases by the hospital. The new surveillance method should be implemented by the hospital on periodic basis. An emphasis on early management of labor and close monitoring of women with premature rupture of membranes is required.

Keywords: Post cesarean section infections, surveillance, risk factors, cesarean section.

TABLE OF CONTENTS

Contents

LIST OF TABLES

CHAPTER ONE: INTRODUCTION

Background

Post cesarean infection is a global health and financial burden (Conroy et al., 2012; Bagnall, Vig & Trivedi, 2009). The rates of post cesarean infections in low and middle income countries (LMICs) vary substantially and have ranged from 4.9% to 10.9% in Rwanda and surrounding country hospitals (Bizimana et al., 2016; Chu, Maine, & Trelles, 2015; Mpogoro et al., 2014). The prevalence of post cesarean infections in LMICs is usually under-reported and inaccurate due to lack of proper reporting system (Allegranzi & Pittet, 2008; Lukas et al., 2016).

The reported cesarean infection rate at Kacyiru hospital was around 1.6%, very low percentage compared to other similar hospitals. The infection surveillance at Kacyiru hospital only recorded infection during hospital stay after delivery and if the patient was readmitted to or visited the hospital for another surgical site care. The surveillance does not include data on patients who acquire infections after discharge but don't return to the hospital for care. Since it is known that PCSIs may occur any time up to 30 days after operation, it is essential to implement a proper surveillance which can accurately identify all post caesarian infections and thus inform better the hospital leadership in decision making.

Problem Statement

The surveillance of post-cesarean section infections in Kacyiru hospital was insufficient to capture the true PCSI rate.

Objective

Primary objective: To identify the accurate rate of post cesarean section infection in Kacyiru hospital by April 2018.

Secondary Objective: To assess potential risk factors associated with post cesarean section infections in Kacyiru hospital by April 2018.

Justification of the project

Setting and Beneficiaries

This study was conducted in Kacyiru hospital, Kigali City, Rwanda. The hospital receives about 650 maternal deliveries each month and among them more than 150 are cesarean section deliveries. The reported post cesarean infection rate of the hospital is very low compared to the rates in other LMICs hospitals. This reported rate is inaccurate because the after discharge data on post cesarean infections collected by the hospital involves only patients who revisit the hospital for seeking care on their surgical site. The hospital does not collect data on patients who acquire infections after discharge but don't return back to the hospital for care. The aim of this project was to identify the real rate of post cesarean section delivery infections by implementing a surveillance that would follow women from post-delivery through observation and continue after discharge up to 30 days after delivery via telephone interview with the patients on the symptoms of infections.

The surveillance that follows up patients during 30 days period would provide a more accurate rate of post cesarean infections. Results from this study will inform Kacyiru hospital leaders on the actual situation on the rate of infections following cesarean section deliveries. Findings in this report will also serve as a reference to raise awareness to the wider health sector audience and researcher community, on potential discrepancies between reported and actual rates of infections.

Layout of the capstone

This study report is presented in five chapters. The first chapter introduces the study, providing background information, statement of the problem, objectives and justification of the study.

The second chapter covers the literature review. It presents post cesarean infections and their incurred burden, indicates the classification of Surgical Site Infections (SSIs) and documented risk factors associated with SSIs, exposes the approach on infection surveillance, shows empirical results on identification of PCSIs rates and highlights the need for complete surveillance of PCSIs. This chapter also highlights existing gaps in the literature and current practices.

The third chapter describes the study methodology including a description of study design, sampling, data collection tools and procedures, data management, ethical consideration, and data analysis.

The fourth chapter presents study findings after analysis. This section provides the rate of PCSIs obtained through the current approach to PCSIs surveillance and compare it with the rate obtained through the hospital system. Results obtained through a no-parametric test and regression analysis, assessing the significance of risk factors associated with PCSIs, were also presented in this chapter.

In the fifth chapter, the author interprets and discusses the results of the study.

The last chapter (chapter six) concludes this project report. It summarizes the findings, provides suggestions for identifying PCSIs as well as relevant recommendations.

CHAPTER TWO: LITERATURE REVIEW

Post cesarean infections and incurred burden

An hospital acquired infection (HAI) is an infection that is neither present nor incubating on hospital admission that is developed at least 48 hours after hospital admission without proven prior incubation (Eggimann & Pittet, 2001). It is considered an HAI when it occurs within 30 days after an operative procedure and includes infections acquired after hospital discharge (Eggimann & Pittet, 2001; Owens & Stoessel, 2008). The HAIs vary greatly in different settings and their prevalence in LMICs ranged from 5% to 65% among hospitalized patients, predominated by surgical site infections (Lukas et al., 2016). Surgical site infections (SSIs) category is a significant form of HAIs and efforts to identify and control HAIs must be targeted to SSIs (Maruta, 2015).

Post-caesarean surgical site infections constitute a major type of puerperal infections and are generally HAIs (Conroy et al., 2012). Being an important component of all SSIs, post caesarean section infections (PCSIs) rates vary substantially with a range of 0.3 to 38.7 per cent in developing countries (Kelly & Monson, 2012; Conroy et al., 2012). PCSIs have negative consequences resulting into a patients' morbidity and mortality, financial burden on patients themselves and their families, and increased risk of contamination to healthcare workers (Lukas et al., 2016; Kelly & Monson, 2012;Conroy et al., 2012). The PCSIs rates have been reported to range from 4.9% to 10.9% in Rwanda and hospitals in its surrounding countries (Bizimana et al., 2016; Chu, Maine, & Trelles, 2015;Mpogoro et al., 2014). Caesareans represent the primary and most important risk factor for postpartum infections with an estimated 5 to 20-fold increase in incidence compared to normal delivery, and post caesarean infections remain a global health

and financial burden (Conroy et al., 2012; Bagnall et al., 2009). However, it has been reported that the prevalence of post caesarean infections in low and middle income countries is usually under-reported and inaccurate due to lack of proper reporting system (Allegranzi & Pittet, 2008; Lukas et al., 2016).

Classification of Surgical Site Infections (SSIs)

Surgical site infections (SSIs) are classified as incisional (also reclassified as superficial and deep) and organ or space infections (Kirby & Mazuski, 2009). A SSI is superficial incisional when the infection is limited to the skin and subcutaneous tissue, deep incisional when it extends into the deeper tissues (e.g. facial and muscle layers), and organ space when the infection occurs anywhere within the operative field beyond the body wall tissues incised (Kirby & Mazuski, 2009; Horan TC; Andrus, M; Dudeck, 2008).

A superficial surgical site infection occurs within 30 days of the operative procedure and involves at least one of the following: purulent drainage from the superficial incision; organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision; any sign or symptom of infection (pain or tenderness, localised swelling, redness or heat, and when superficial incision is deliberately opened by a surgeon, unless culture of incision is negative); and diagnosis of superficial incisional SSI by the surgeon or attending physician (Petherick, Dalton, Moore, & Cullum, 2006; Horan, Andrus, & Dudeck, 2008).

A deep incisional SSI occurs within 30 days after the operation and involves at least one of the following: purulent drainage from the deep incision but not from the organ/space component of the surgical site; a deep incision spontaneously dehisces or is deliberately opened by a

surgeon when the patient has at least one of the following signs or symptoms: fever (> 38C), localized pain, or tenderness, unless site is culture-negative; an abscess or other evidence of infection (Horan TC; Andrus, M; Dudeck, 2008; Opøien, Valbø, Grinde-Andersen, & Walberg, 2007).

An organ/space SSI occurs within 30 days after the operation and involves any part of the anatomy (e.g. organs or spaces), other than the incision, which was opened or manipulated during an operation and at least one of the following: purulent drainage from a drain that is placed through a stab wound into the organ/space; organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space; an abscess or other evidence of infection (Horan TC; Andrus, M; Dudeck, 2008; Opøien, Valbø, Grinde-Andersen, & Walberg, 2007).

Risk factors

The identification of the SSIs risk factors is important and helps to target high-risk patients who need specific prevention measures (Mitt, Lang, Peri, Maimets, & National, 2002). Risk factors for post cesarean infections include intrinsic or patient related factors, such as age, obesity, diabetes, preoperative condition (Lilani, Jangale, Chowdhary, & Daver, 2005; Mitt, Lang, Peri, Maimets, & National, 2002). PCSIs also have extrinsic risk factors, or related to management and care, such as type of procedure, type of skin incision, method of skin closure, duration of operation, procedure-related blood loss, no prescription of antibiotic prophylaxis, grade of operator, and environment of the operating room (Lilani, Jangale, Chowdhary, & Daver, 2005;Mitt, Lang, Peri, Maimets, & National, 2002). The extrinsic risk factors are usually a reflection of hospital acquired infections (HAIs) where both infected patients hospitalized,

potential transmission agents (healthcare personnel, visitors and patients' relatives) and susceptible or vulnerable subjects (recipients) are accommodated (Agut, 2001; G. Ducel, J. Fabry, 2002). Malnutrition and low socioeconomic status have been said to exacerbate the risk of caesarean section infections (Gur et al., 2015).

Caesarean section is a type of surgery where procedure related chances of infection are lower, therefore careful pre- inter- and post-surgical prevention as well as management of associated risk factors with strict infection control practices should be able to achieve minimal infection rates (Gur et al., 2015; World Health Organization, 2016; Auerbach, 2001). Patient, family and/or caregivers education is considered a key strategy to prevent SSIs. This has to address information on the risk of SSIs, how to reduce them, the surgical wounds management after discharge, signs of SSIs and invitation to return back for care with contact persons when there are concerns about wound healing (Saskatchewan Ministry of Health, 2015).

Infection surveillance

A surveillance mechanism of SSI must "identify infections based on epidemiologically-sound definitions, effective surveillance methods, stratification of SSI rates according to risk factors, and should provide appropriate feedback to the surgeons" (Mangram, Horan, Pearson, Silver, & Jarvis, 1999). A SSI surveillance that provides appropriate feedback data to surgeons has been indicated as an important strategy to reduce the SSIs rates by 10 to 35 percent (HALEY et al., 1985). The ideal strategy should maximize the follow-up rate of the subjects, incur low costs, and be reliable with high sensitivity and specificity (Smyth & Emmerson, 2000). Despite this

view on ideal surveillance method, there is no widely accepted strategy for monitoring SSIs infections (Yokoe et al., 2001).

Post cesarean section infections that are reported by hospitals are mostly recorded in the short period of hospitalization following cesarean delivery which leads to under detection of these infections, while 27% to 95% of post cesarean infectious morbidity occurs after discharge from hospitals (Conroy et al., 2012). The post discharge surveillance has become increasingly important to obtain accurate rates of SSIs due to that SSIs may not be detected for weeks after discharge and may not require readmission, while hospitals continue to decrease the length of postoperative hospitalization (Mitt et al., 2002). The CDC nosocomial infections standardized definition of wound infection is recommended and widely relied upon for implementing a feasible, valid and reliable approach to post discharge SSIs surveillance (Petherick et al., 2006).

Petherick & Al (2006) conducted a systematic review of post discharge surveillance methods for surgical wound infection. They found that the methods used to detect post-discharge SSIs were direct observation of the wound by health professionals, telephone interviews with patients, patient questionnaire, review of operating logs to examine surgical revisions, cards for patients to notify health care personnel of a surgical site infection, examination of hospital readmission data, review of pharmacy data and use of combined methods for case ascertainment (Petherick et al., 2006). The telephone surveillance method has been indicated to be feasible and cost effective (Taylor et al., 2003). It has also been tested and found to have moderate sensitivity and high specificity in Tanzania and was suggested to be used for SSI surveillance in low-income settings (Nguhuni et al., 2017).

Empirical evidence for determination of PCSIs rates

In the study conducted in 2015 by a team from Medecin Sans Frontière on 1,276 women who delivered through cesarean section at four sites in three sub-Saharan countries (Burundi, the Democratic Republic of Congo, and Sierra Leone), findings revealed that the incidence of infections was 7.3 % (1.7 – 10.4%) with 93% of them being superficial infections (Chu et al., 2015). In this study, women were not systematically followed after discharge, hence the rate of infections might have been under-reported (Chu et al., 2015). In a prospective study conducted at the Butare University Teaching Hospital (CHUB) following 323 women undergoing caesarian section for up to 30 days after delivery, a prevalence of 4.9% infections was found with a majority being superficial surgical site infections (75%) and developing after discharged (62.5%) (Bizimana et al., 2016). A similar exercise was conducted in a Medical Centre in Tanzania on 345 pregnant women and an overall cumulative incidence of infections was 10.9% with a median time of seven days to develop infection (Mpogoro et al., 2014). The rates of HAIs following post cesarean infections are unpredictable and vary between facilities.

The need for complete surveillance of PCSIs

Although essential infection prevention methods are universal and well known, infection prevention continues to fail (Fry, 2009). The prevention fail because facilities lack the following: consistent diagnostic criteria for identifying infection occurrence, practical and efficient ways for identifying the incidence of the infectious events, real-time reporting of outcomes for quality monitoring and improvement, and accountability or consequences for failed prevention (Fry, 2009). The lack of accurate and relevant data as well as inconsistent reporting of information have been mentioned as barriers that hinder data integration in decision-making

(Nyiratuza et al., 2016). A need to implement a surgical site infection surveillance has been raised in order to get standardized incidences of infections (Dhar et al., 2014; Gould, 2007).

The inconsistencies in HAIs surveillance in low to middle-income countries (LMICs) are mainly associated with absence or lack of microbiology laboratory infrastructure to accurately diagnose HAIs and incomplete surveillance, especially for surgical site infection, that is conducted in a shorter period than the required (usually 30 days after surgery) (Allegranzi & Pittet, 2008; Lukas et al., 2016). To palliate to the increasing pressure of infection rates comparison, data should be standardized and should include post-discharge surveillance as many surgical site infections patients after discharge do not present to the original healthcare facility (Humphreys, 2009).

Gap in the literature and practice

Different literatures have identified and reported weaknesses in the current approach for surveillance of SSIs in health facilities that record infections of the patients only when they are present in those facilities. However, the criticized approach continues to be implemented in many countries yielding inaccurate rates of infections. In addition, there is no agreed upon surveillance approach to consistently identify the accurate rate of infections in health facilities. The studies have been conducted to determine the complete rate of PCSIs but provided a variety of results, making infections rates unpredictable with variation from one country to another and facility to another. The surveillance of PCSIs still needs to be conducted in individual health facilities to identify the accurate rate of infections in each of those facilities. Implementation research also needs to be conducted to determine a systematic surveillance

approach that can be implemented by facilities for identification of accurate infection rates in order to make informed decisions regarding their prevention.

CHAPTER THREE: METHODS

Setting

This study was conducted in Kacyiru hospital, located in Kigali City, Gasabo district. The hospital was formally managed by the Rwanda National Police since 2007 and handed over to the Ministry of Health in June 2016. In the period of July 2016 to June 2017, the hospital had an average capacity of 86 beds with bed occupancy of 58% and provides maternal and child health services. The hospital is in the process of expanding the infrastructure with the support of the government in order to provide a full Rwandan district hospital package. With a main mandate to particularly focus on maternal and child health, Kacyiru hospital receives a substantial number of women in need for cesarean section delivery. An average of five to eight cesarean sections per day is performed in Kacyiru hospital. The surveillance of PCSIs in Kacyiru hospital is limited to records registered during inpatient stay of the women after delivery and when the patients return to the hospital for surgical site care (readmissions and outpatient department (OPD) SSIs), resulting in the hospital monthly PCSIs rates of approximately 1.6%.

Study design

This study was a prospective cross-sectional implementation study aimed at identifying the accurate rate of post cesarean infections and potential associated factors at Kacyiru hospital through a thorough surveillance approach. We involved Kacyiru hospital personnel as data collectors. Data collection was carried out using a multi-method approach: during hospitalization period prior and following patients' discharge, data collectors used observation and interview with patients, and reviewed patient records. During post discharge period, data collectors used telephone interviews. Patient visits, or visits to other health facilities where

patients sought care, were planned in instances where telephone conversation would not allow obtaining clear information on PCSIs status.

Sample

All women who underwent cesarean section deliveries in Kacyiru hospital during the period of November 20th2017 to February 20th2018 composed our population sample. All women who voluntarily accepted to be part of the survey during the specified period were enrolled in this study. Any woman who expired (died) during the surgical operation was excluded.

Measures

The key measure collected in this study was the "PCSIs rate from the study surveillance method (new system)", calculated using the following formula (Noy & Creedy, 2002):

$$PCSIs\ rate = \frac{Number\ of\ patient\ who\ acquired\ PCSIs\ within\ 30\ days}{(Total\ number\ of\ patient\ admitted - Number\ of\ patient\ lost\ to\ follow\ up)}$$

The above rate was compared to the "PCSI rate for the existing hospital system", calculated as:

$$PCSIs\ rate = \frac{Number\ of\ hospitalized\ and\ readmitted\ patients\ who\ acquired\ PCSIs}{Total\ number\ of\ patient\ admitted\ for\ cesarean\ section}$$

Other information that included demographic and medical history was collected to be used as independent variables to identify the risk factors.

Data collection tools

We developed two types of data collection tools to be used for post cesarean section infection surveillance. We developed these tools adapting them from the Saskatchewan Infection Prevention and Control Surveillance program Protocol (Saskatchewan Ministry of Health, 2015) after consultation with local experts in the surgical field and we developed them following the

criteria of the CDC National Nosocomial Infections Surveillance guidelines. Data for the first tool - In-Patient and Readmissions Post Cesarean Section SSIs Surveillance Case Report Form (see appendix 1) – was completed during inpatient stay after delivery and readmission in the hospital. This part did not require language translation as it was completed by trained health professionals (data collectors) just before and/or after providing care to the patient. The data collected at this phase included:

- Patient Information: Names, unique identification number, date of admission, telephone numbers, age, height, weight, body mass index (BMI), number of previous cesarean section, duration patient was in active labor before procedure and pre-diagnosed illnesses/diseases;
- Surgical operation procedure details: Date of operation, existence of a ruptured membrane before procedure with the period it happened, a preoperative condition assessed following the American Society of Anesthesiologists (ASA) scoring, emergency nature of the operation, wound classification, interruption of skin closure, type of skin closure, blood loss or post-partum hemorrhage and prescription of prophylaxis antibiotic;
- Diagnostic of PCSI: the data collector determined whether he/she noted a PSCI and its type either during inpatient hospitalization or readmission.

Data for the second type of the tools - Post Discharge Telephone Surveillance of Post Cesarean SSIs Forms (see appendices 2 and 3) – was completed using a questionnaire through a telephone call to the patient at 10^{th} and 30^{th} days of cesarean delivery operation. As this part

involve telephone interview with the patient, questions were translated in Kinyarwanda to guide the data collectors. The data collected at this phase included:

- Information on patient and telephone call: Names, unique identification number, date of surgery, telephone numbers, call date, number of days that call was attempted and whether call was successful or not;
- Self-reported information on classical surgical site infection signs including redness, heat and/or swelling, pus draining, pain or tenderness on surgical site, and fever or chills;
- Self-reported information on visiting other health facility, recording the reasons of choosing to visit that facility and the care that the patient received there;
- Self-reported information on health care, capturing whether the patients received post-operative instructions and whether she complied with them;
- Post discharge diagnosis outside the hospital: the data collectors provided the results of the diagnostic and specified a step taken while contacting the patient to confirm the presence or absence of SSI.

Data collection tools were introduced during training sessions organized for all concerned data collectors (clinicians from the maternity and operating units). A five-day pretest was conducted before validation of the tools. The validation was done during the clinical staff meeting headed by the hospital director. A data collection guideline was also developed and was referred to by data collectors during the data collection process.

Data collectors

Data collection was conducted by four trained nurses working in the Maternity unit at Kacyiru hospital. In collaboration with a surgeon (a medical doctor performing cesarean surgery) from

Kacyiru hospital, we trained four nurses on using the tools for data collection. We also provided a guideline manual on completing the surveillance tool. One of data collectors in this process was the hospital Infection Prevention and Control (IPC) focal person and helped in coordinating and supervising the data collection. The data was collected during the periods of inpatient stay after delivery, readmission, and twice call interview during a post discharge period. We provided monthly financial incentive for data collectors.

Data collection procedure

The data collectors approached every woman before she was prepared for elective cesarean section delivery or after delivery for emergency cases, and explained about this surveillance study to ensure patients understood that they would be contacted after discharge by telephone and physically if needed.

During hospitalization, the data collectors (in consultation with surgeons and anesthetists) collected data and completed the inpatient and readmission form. When the patient was discharged, the data collection forms were taken to the IPC focal person office in a locked cupboard. When a patient was readmitted, the data collection forms were refilled in the medical record for the nurses (data collectors) to complete readmission data accordingly.

The hospital IPC focal person checked daily the quality and completeness of the patient record forms and made regular follow up to make sure that data collection process was consistent.

For discharged patients, the data collectors made telephone calls to those patients on 10th and 30th days after operation, between 8:00 AM and 6:00 PM, to identify whether they acquired infections after discharge. Conducting the telephone surveillance at the 10^{th} day was

recommended by surgical specialists, suggesting that PCSIs are most likely to happen within ten days post-operation. If the patient didn't respond to the call or was inaccessible, the investigator made at least two attempts per day for five days following the 10th or the 30th day after surgery.

The surveillance was closed for a patient if:

1) PCSI was identified within 30 days after surgery
2) No PCSI identified after 30 days of surgery
3) A patient couldn't be reached within five days 30 days after operation: these were classified as lost to follow up.

Data management

All data were entered via a data entry mask in Epi-info to ensure quality transcription of the data from the record forms to computer. The researcher manually checked the accuracy of data entry by comparing the data on the form and the ones entered. Once data entry was completed, data were exported to MS-Excel spreadsheet to calculate the PCSIs rates and to STATA for risk factor analysis.

Data Analysis

Descriptive statistics were used to present the demographics, underlying medical procedure information, and PCSI rates.

Fisher exact tests and Logistic Regression Analysis were used to analysis the association between potential risk factors to PCSI. That analysis was conducted using STATA. Odds ratios and P-value set at 0.05 were reported.

Ethical consideration

Vulnerable populations

This study was conducted on women starting from when they were ready to undergo cesarean section delivery until 30 days after delivery. Though, by default, this category is considered as vulnerable, the study did not involve any harm to them. However, it could be considered harmful and sensitive to interview a woman while she is suffering severe complications. A woman in this study was only consented and interviewed before or after delivery following an assessment on her ability to express herself in condition judged not harmful by a present doctor. In case the discharged patient couldn't easily express herself, it was planned to visit her in her home in order to learn about her physical condition and the presence or absence of post cesarean infection.

There was a possibility for minors or people with disability to come for cesarean section delivery. In this situation, we made consent with their parents or legal guardians for whom we got information regarding the patient. If the parent/legal guardian indicated that a patient was aware enough to make consent and gave us permission to consent with her, we also made consent with the patient. It was also possible that a prisoner would come for cesarean section delivery. If it happened, we would have first sought permission from the prison authority before consenting with the patient. During post discharge surveillance, we would have sought the

permission from the prison authority and visited the patient at the prison (in a private area) since it would not have been possible to call her.

Assessment of risks to participants

The cesarean section is a risky operation performed on human being in critical health condition. It happened that a woman arrives at the hospital already in a critical situation of emergency. She was neither consented nor interviewed before or after delivery when she was in a critical condition of health. She was consented after delivery when her health condition was assessed safe by the doctor.

Medical or psychosocial support

We assumed the patient who lost her child during or after delivery not to be psychologically comfortable. For such case, we first provided comforting message to the patient during the post-discharge interview. By telephone interview, when we identified that a patient was sick, we advised her to come back to the hospital for care and we assisted her in obtaining healthcare. If we had identified that she was critically sick and was unable to come to the hospital or her family couldn't bring her to the hospital, we had planned to provide assistance by arranging for her transportation to the hospital.

Information and consent process

Before a woman was prepared for cesarean section delivery, a consent form was presented to her by the data collector nurse inviting her to participate in the study. The purpose of this

project was explained to her, indicating that it was intending to identify the rate of post cesarean infections in Kacyiru hospital for comparison with the rates routinely reported by the hospital. A copy of the consent form was given to the patient for reading and the nurse responded to any question or concern that the patient had. If the patient was unable to read, the data collector nurse read the information written on the consent form to her and provided explanations on any concern from the patient. When the patient agreed, she signed (or put a fingerprint) on the consent form to acknowledge that she understood and agreed with the consent form. If a person to consent was a minor, we sought permission (or consent) from her parent or guardian (see the annex 8). Since that child was an adolescent (14 – 17 years), an assent form to agree with and sign was also provided to her with simplified and easily understandable information (see annex 10).

The patient was only consented when she was capable of expressing herself in condition judged not harmful by the doctor. So, if the operation was an emergency, the consent was presented to the patient after cesarean operation and when the patient health state was evaluated by the doctor not to be harmful to her life. Participants were given explanations that participation in the study was voluntary and that they could have withdrawn from the study at any time. We provided the contact information of the persons whom they can contact if they wanted to withdraw from the study. There was no monetary or in-kind compensation for participating in the study. However, we provided advice or were committed to facilitate transportation to the hospital for the patient who would have been critically in need.

Protection of privacy and confidentiality

- *The inpatient and readmission surveillance tool:*

During the data collection period, the inpatient and readmission surveillance tool was kept in the patient file. The hospital has already a protection policy for patient files which cannot be accessed by a third party without permission.

- *The post discharge data collection tool:*

After discharge of the patient, the inpatient and readmission surveillance tool was joined to the post discharge data collection tool. These were filed in a locked cupboard at the hospital IPC focal person office without access to other persons than data collectors.

De-identification of data

During transcription of data from data collection tools to the data entry mask, we used our computer that is locked with password and there was no other person who had access on it. When we completed data entry, we exported data in MS-Excel spreadsheet and Stata files, and we destroyed the data entry mask. In the exported files, we deleted the patients' names and replaced their unique identifier with other simple codes for de-identification of the patients.

Safekeeping of data

The patient forms used for data collection were kept by the hospital IPC focal person, archived in the hospital patients' files shelves, and will be destroyed after ten years period. A copy of the soft data set was transmitted to the hospital leadership as their property and we'll keep confidentially the data set with de-identifiable data in a locked computer.

CHAPTER FOUR: RESULTS

Data Collection Summary

A total of 540 women underwent CS in the hospital between November 20th2017 and February 20th 2018. Four (0.7%) patients did not consent for the study. Data collection was therefore completed for 536 (99.3%) sample during the hospitalization phase. Twenty two (4.1%) patients who accepted enrollment to the study had no telephone and could not be called after they were discharged. During five days attempting to call twice each day during post discharge, 174 (32.2%) patients were not able to be reached on telephone contacts that they provided. In total, 196 (36.3%) of patients who delivered by CS at the hospital did not complete the surveillance, resulting in 340 (63%) final samples that completed the surveillance (Table 1).

Table 1: Sample that completed the surveillance

Patients	Number
Number of CS surgery	540
Number of patients who refused to participate	4
Number of lost to follow-up	196
Final sample size	340

Characteristics of the sample

The Table 2 presents the results for each variable assessed for risk factor of PCSIs and classified in two categories: demographic variables and medical procedure related variables. It presents the number (and percentage) of observation of categories in the variable (Table 2).

Demographic variables: 147 (43.6%) women who have had CS delivery at Kacyiru hospital were between the age 26 and 30 years, 71 (21.1%) under 26 years, 75 (22.2%) between 31 and 35 years and 44 (13.1%) were over 35 years; 135 (46.7%) were overweight. The majority of women (255, 76.3%) had zero to two previous deliveries, 160 (47.7%) never had CS before and 88 (26.3%) had one previous CS. 229 (68.1%) of them belong to the third social economic category. 293 (94.8%) had less than 12 hours of active labor, while 16 (5.2%) had a prolonged labor. The majority of patients (321, 94.4%) had no critical pre-diagnosed diseases (Table 2).

Table 2: Characteristics of the sample

Variable name		Number (%)
Demographic variables		
Age (N=337)	<= 25 years	71 (21.1%)
	26 to 30 years	147 (43.6%)
	31 to 35 years	75 (22.2%)
	More than 35 years	44 (13.1%)
BMI (N=289)	Normal	57 (19.7%)
	Overweight	135 (46.7%)
	Obese	97 (33.6%)
Previous number of Delivery (N=334)	0	88 (26.3%)
	1	89 (26.6%)
	2	78 (23.4%)
	3	41 (12.3%)
	4	22 (6.6%)
	5+	16 (4.8%)
Previous number of cesarean sections (N=335)	0	160 (47.7%)
	1	88 (26.3%)
	2	58 (17.3%)
	3	24 (7.2%)
	4+	5 (1.5%)
Social Economic category (N=336)	I	16 (4.8%)
	II	91 (27.1%)

Variable name		Number (%)
	III	229 (68.1%)
Duration of Active labor (N=309)	Normal (<= 12 hours)	293 (94.8%)
	Prolonged (> 12 hours)	16 (5.2%)
Pre-diagnosed diseases (N=340)	Non	321 (94.4%)
	Yes	19 (5.6%)
Medical procedure related variables		
Rupture of membrane (N=336)	No	252 (75.0%)
	Yes, less than 24 hours	80 (23.8%)
	Yes, greater than 24 hours	4 (1.2%)
ASA classification (N=336)	Class 1	218 (64.9%)
	Class 2	106 (31.5%)
	Class 3	12 (3.6%)
Type of operation (N=334)	Elective	99 (29.6%)
	Emergency	235 (70.4%)
Wound class (N=337)	Class I	301 (89.3%)
	Class II	36 (10.7%)
Skin closure (N=333)	Interrupted	4 (1.2%)
	Not interrupted	329 (98.8%)
Type of skin closure (N=337)	Dissolvable sature	337 (100%)
Hemorrhage (N=339)	No	338 (99.7%)
	Yes	1 (1%)
Duration of Operation (N=327)	< 45 min	124 (37.9)
	45 min to 1 hour	107 (32.7)
	1 to 1.5 hours	81 (24.8%)
	> 1.5 hours	15 (4.6%)
Prophylaxis antibiotic given	No	3 (0.9%)
	Yes	336 (99.1%)

Medical procedure related variables: 84 (25%) of the patients had rupture of membranes before procedures. From the assessment by anesthetists, 218 (64.9%) were in class 1 and 106 (31.5%) were in class 2. Majority of CS were emergencies (235, 70.4%) and the rest were elective CS (99, 29.6%). 301 (89.3%) of the CS wounds were Class 1. 329 (98.8%) patients had a

non-interrupted skin closure and all (100%) skin closures were done using “dissolvable sature”. Only 15 (4.6%) of CS operations were longer than 1.5 hour. 366 (99.1%) were given prophylactic antibiotic (Table 2).

Analysis Results

PCSI rates

From the hospital record, out of the 540 patients who underwent CS in the hospital, 17 developed PCSI, making the PCSI rate 3.1%. Among 17 infections, 3 (0.6%) developed during first hospitalization after surgery, 6 (1.1%) resulted in readmission at the hospital, and 8 were identified during follow up at outpatient services. Six (35.3%) of the infections identified by the hospital were deep and 11 (64.7%) were superficial (Table 3).

Table 3: PCSIs detected during hospitalization and post discharge periods

		Current hospital system	New surveillance system
Sample		540	340
PCSIs	hospitalization	3 (0.6%)	3 (0.9%)
	Readmissions	6 (1.1%)	5 (1.5%)
	OPD FU	8 (1.5%)	NA
	10^{th} day post-surgery	NA	13 (3.8%)
	30^{th} day post-surgery	NA	17 (5.0%)
	Total	**17 (3.1%)**	**38 (11.2%)**
PCSIs type	Superficial	11 (64.7%)	32 (84.2%)
	Deep	6 (35.3%)	6 (15.8%)
	Total	**17 (100%)**	**38 (100%)**

From the new surveillance system, out of 340, 38 developed infection within 30 days post-operation, making the PCSI rate 11.2%. Six (15.8%) of these infections were deep infections and all were readmitted at the hospital, while 32 (84.2%) of the infections were superficial. Among

the 38 infections, 3 (0.9%) developed during first hospitalization after surgery, 5 (1.5%) were identified during readmission of patients at the hospital, 13 (3.8%) developed within 10 days post-surgery after discharge, and 17 (5.0%) developed between 10 and 30 days post-surgery (Table 3). One case identified during 10th day surveillance through telephone call was later readmitted in the hospital. Among the eight patients that revisited the outpatient department (OPD) for treatment of PCSIs, five had been contacted by data collectors during post discharge surveillance and had been advised to revisit the hospital for care.

Analysis of the association between PCSIs and potential risk factors

Two variables were found to be significantly associated with PCSIs: "duration of active labor (p=0.003)" and "rupture of membrane (p=0.024)". No statistical significant associations were found between PCSIs and all other variables (Table 4).

Table 4: Results of the analysis of association between PCSIs and potential risk factors

Variable name		PCSIs (%)	P-Value
Demographic variables			
Age (n=38)	<= 25 years	9(12.7%)	0.359
	26 to 30 years	15(10.2%)	
	31 to 35 years	6(8.0%)	
	More than 35 years	8(18.2%)	
BMI (n=27)	Normal	4 (7.0%)	0.835
	Overweight	13 (9.6%)	
	Obese	10 (10.3%)	
Previous number of Delivery (n=38)	0	9 (10.2%)	0.295
	1	7 (7.9%)	
	2	11 (14.1%)	
	3	6 (14.6%)	
	4	1 (25%)	

Variable name		PCSIs (%)	P-Value
	5+	4 (10.5%)	
Previous number of cesarean sections (n=38)	0	22 (13.8%)	0.513
	1	11 (12.5%)	
	2	4 (6.9%)	
	3	1 (4.2%)	
	4+	0 (0.0%)	
Social Economic category (n=38)	I	4 (25.0%)	0.163
	II	11 (12.1%)	
	III	23 (10.0%)	
Duration of Active labor (n=33)	Normal (<= 12 hours)	27 (9.2%)	0.003
	Prolonged (> 12 hours)	6 (37.5%)	
Pre-diagnosed diseases (n=38)	Non	36 (11.2%)	1.000
	Yes	2 (10.5%)	
Procedure related variables			
Rupture of membrane (n=37)	No	23 (9.1%)	0.024
	Yes, less than 24 hours	12 (15.0%)	
	Yes, greater than 24 hours	2 (50.0%)	
ASA classification (n=336)	Class 1	31 (14.2%)	0.083
	Class 2	7 (6.6%)	
	Class 3	0 (0.0%)	
Type of operation (n=37)	Elective	6 (6.1%)	0.084
	Emergency	31 (13.2%)	
Wound class (n=37)	Class I	35 (11.6%)	0.399
	Class II	2 (5.6%)	
Skin closure (n=37)	Interrupted	1 (25.0%)	0.377
	Not interrupted	37 (10.9%)	
Type of skin closure (n=38)	Dissolvable sature	38 (100%)	1.000
Hemorrhage (n=37)	No	37 (10.9%)	1.000
	Yes	0 (0.0%)	
Duration of Operation (n=37)	< 45 min	14 (11.3%)	0.911
	45 min to 1 hour	11 (10.3%)	
	1 to 1.5 hours	10 (12.3%)	
	> 1.5 hours	2 (13.3%)	
Prophylaxis antibiotic given (n=38)	No	1 (33.3%)	0.301
	Yes	37 (11.0%)	

Strength of association for risk factors

Table 5: Analysis of the strength of the association with PCSIs

Variable name		PCSIs (%)	OR	P-Value
Duration of Active labor	Normal (<= 12 hours)	27 (9.2%)	5.9	0.003
	Prolonged (> 12 hours)	6 (37.5%)		
Rupture of membrane	No	23 (9.1%)	2.1	0.021
	Yes, less than 24 hours	12 (15.0%)		
	Yes, greater than 24 hours	2 (50.0%)		

The odds ratio for duration of labor to have PCSI was 5.9 (p=0.0033) and the odds ratio for rupture of membrane was 2.1 (p=0.0261) (Table 5).

CHAPTER FIVE: DISCUSSION

The rate of PCSIs

The regular system Kacyiru hospital used to track PCSI involved the clinical personnel and the data manager. When PCSIs were identified, they were registered on the reporting form, recounted and aggregated periodically for further reporting. This method has similarity to our new system: both used the same CDC definition criteria for identification of PCSIs and did not require special diagnostic methods such as culture of fluid or tissue from the incision. Both systems used clinical personnel of the hospital to track the PCSIs. Therefore, the information collected during hospitalization and readmission to the hospital was similar. Both systems had identified 3 PCSIs during hospitalization, while the old system identified 6 and the new system identified 5 PCSIs during readmission to the hospital. The one PCSI was identified by the new system during post discharge surveillance rather than at the time of readmission.

The main difference was that the new system was able to track PCSIs developed during post discharge period. The new system was feasible and able to track a relatively high number of infections during the surveillance. The new system had identified 38 PCSIs, 21 more than by the old hospital system (17). Since the new system could only use the number of patients who participated in the surveillance during 30 days, the PCSI rate could potentially be higher.

The old hospital system was under-reporting PCSIs because many infections were not identified after discharge from the hospital. At Kacyiru hospital, most patients were discharged within 3 days after delivery while PCSIs could be acquired within longer period. The PCSI rate by the new system is consistent with data shown in other previous studies in Rwanda and surrounding

country hospitals; averaging from 4.9% to 10.9% (Bizimana et al., 2016; Chu, Maine, & Trelles, 2015; Mpogoro et al., 2014).

The new data collection system has potentially influenced the rate of infection reported by the hospital system. Previous studies found that diagnosis of SSIs after discharge is associated with a high readmission rate (Gibson, Tevis, & Kennedy, 2014). Before implementing our surveillance, the PCSIs hospital rate used to be around 1.6%, which is the average PCSIs identified by the hospital in 2017, and raised to 3.1% when we implemented this new system. The influence might have due to the fact that nine of 17 women with PCSIs identified by the hospital system had already been contacted by data collectors in the new system, and had been advised to visit the hospital for surgical wound care.

The new surveillance system costed about 250,000 RWF (USD 290) a month, including wages for the data collectors and fee for telephone calls. This cost would be a worthy investment for a value based-healthcare delivery, given that SSIs are known to be highly costing and have adverse consequences (Badia et al., 2017). Previous studies indicated that nosocomial infections surveillance could effectively reduce infection rates though its effective role has not been determined (Li et al., 2017). The system can provide feedback that could be used by the hospital to make informed decisions for prevention of PCSIs and can help to identify timely potential and new infections for early treatment before aggravation. The system can help the hospital to exercise its accountability and responsiveness towards clients. The personal calls to patients also helped to build the reputation of the hospital and establish trust in the

community. In many cases, during the telephone calls, many patients expressed their astonishment that the hospital was taking care of them even after discharge from the hospital.

Risk factors

Our study results found that the duration of active labor was a significant factor associated with PCSIs. Patients with prolonged active labor have a higher risk of PCSIs than patients with short duration of active labor. A prolonged active labor occurs when regular painful contractions last more 12 hours after cervical dilation (Ali & Masakhwe, 2010). Prolonged labor has been found to constitute a risk factor for PCSIs in other studies (Bizimana et al., 2016).

Patients with a rupture of membranes also had a higher risk of acquiring PCSIs than patients who did not have a rupture of membranes. This result is consistent with the findings from previous studies (Gelaw, Aweke, Astawesegn, Demissie, & Zeleke, 2017).

PCSIS were not associated with other variables assessed in this study. There was variations in the findings from previous studies where some found an association while others didn't find it (Wloch et al., 2012; Sanger et al., 2016; Boggess et al., 2017; Dlamini et al., 2015). The findings from this study add to the available evidence of how risk factors influence PCSIs, particularly in Kacyiru hospital. However, the association of PCSIs for some variables (skin closure, type of skin closure, having hemorrhage, and taking prophylaxis antibiotic) could have not been detected due to lack of power resulting from few observations in their categories. Despites the lack of association, it is important to monitor these factors regularly and take preventative measures if an association is detected (Kirby & Mazuski, 2009b).

Challenges and limitations

This surveillance was based on the observation and telephone contact and used CDC definition criteria, but didn't involve the culture of fluids or tissue from the wounds, which could improve surveillance accuracy and provide information on the causative organism of the infection (Bell & Conway, 2015). However, the observation method using CDC definition criteria has been proved to be sensitive in detecting PCSIs and unnecessary culture is not recommended (Bell & Conway, 2015). The surveillance done without culture is actually the only method used at Kacyiru hospital and it is the affordable method generally used in LMICs' facilities. In addition, the accuracy of PCSIs identified in this surveillance was higher because the identified cases were also confirmed at health facility (17 at Kacyiru hospital and 21 at other health facilities).

There has been a higher number of lost follow up (196 cases). The patients who were lost to follow up might have different characteristics and outcome. This could have impact on the observed rate of infections and results of risk factors. Despite the lost to follow up, the new system still detected 7% more PCSIs than the old system.

Since the data collectors were hospital staff, they had competing work duties and data collection was not their first priority. This made that data were only collected during break time or when data collectors were off duties. This could have contributed to the reasons for many lost to follow up. Future implementation of this new system should consider data collectors to have enough time for data collection to improve response rate. Also, it may help if the patients were asked before discharge to provide their available time for telephone calls after discharge.

CHAPTER SIX: CONCLUSION AND RECOMMENDATION

Over the last decades, cesarean section (CS) delivery has been steadily rising worldwide (Betrán et al., 2016). However, post cesarean section infections remained a burden in LMICs and it is important for the hospitals to detect PCSIs for better prevention. Kacyiru hospital has only collected PCSI data when patients were present at the hospital, resulting in only reporting the partial PCSIs rate. The purpose of this study was to identify the accurate rate of PCSIs by implementing a new surveillance system. The new system was found to be feasible and can be implemented with a relative low cost to identify about 7% more PCSIs compared to the existing system. The hospital should consider implementing the new system adopted in this study in order to provide a more accurate PCSIs rate.

Telephone surveillance is a reliable and feasible approach for PCSIs surveillance after discharge. To be successful, the hospital should give staff enough time for data collection. It is also important to ask patients to provide their available time to receive telephone calls to reduce lost to follow up. As this new system requires a budget and can be labor intensive, it is recommended for the hospital to conduct this surveillance twice a year. However, if budget allows, the hospital should routinely use the new surveillance in order to improve value in healthcare of PCSIs.

The hospital should consider strategies to reduce duration of women taking longer time in active labor, which can also reduce the incidence of rupture of membrane before procedure (these two variables were found to be correlated in this study). The hospital should monitor closely for women who have prolonged labor or rupture of membrane before CS procedure for

timely intervention in case of PCSI. Future research should consider to implement other mHealth solutions (e.g. Mobile Post-Operative Wound Evaluator application (Sanger et al., 2014)). Future researches should also focus on qualitative study design, exploring further reasons why women are having PCSIs.

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APPENDICES

Appendix 1. In-Patient and Readmissions Post Cesarean Section SSIs Surveillance – Case Report Form

Preliminary Information			
Patient's Name:			
Patient's ID (unique number):		Date of admission (dd/mm/yy):	
Tel. Number:		Alternative Tel. Number:	
Age (in years):	Weight (in kg):	Height (cm):	BMI:
Previous number of delivery: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5+		Previous cesarean section: ☐ 1 ☐ 2 ☐ 3 ☐ 4+	
Socio-economic category: ☐ I ☐ II ☐ III ☐ IV		Duration patient was in active before procedure (in hrs):	
Pre-diagnosed illnesses/diseases:			

Surgical operation procedure details					
Code for the Surgeon/Operator (initials):			Date of operation (dd/mm/yy):		
Ruptured membrane before procedure: ☐ No ☐ Yes, less than 24 hours ☐ Yes more than 24 hours					
ASA classification/score: ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ Unknown			Type of operation: ☐ Elective ☐ Emergency		
Wound classification: ☐ Class I ☐ Class II ☐ Class III ☐ Class IV			Skin closure: ☐ Interrupted ☐ Not interrupted		
Type of skin closure: ☐ Removable sature ☐ Dissolvable sature ☐ Staples ☐ Glue					
Post-partum hemorrhage: ☐ Yes ☐ No		Time of incision:		Time of closure	
Prophylaxis antibiotic given: ☐ No ☐ Yes, prior to incision ☐ Yes, after incision					

Infection diagnostic during inpatient stay	
Names of the persons diagnosing the SSI:	
Type of SSI detected: ☐ None ☐ Superficial ☐ Deep ☐ Organ/Space	Date of SSI detection:
Note/comment:	

Infection diagnostic during readmission			
Names of the persons diagnosing SSI during readmission:			
Date of readmission:		Date of SSI detection	
Type of SSI detected: ☐ None ☐ Superficial ☐ Deep ☐ Organ/Space			
Note/comments:			

Appendix 2. Post Discharge Telephone Surveillance of Post Cesarean SSIs – 10th day after surgical operation

Preliminary Information			
Patient's Name:			
Patient's ID (unique number):		Date of surgery (dd/mm/yyyy):	
Tel. Number:		Call date (dd/mm/yyyy):	
Number of days call was attempted:		Call concluded: ☐ Yes ☐ No	
Self-reported information on surgical site (ask patient)			
Is your surgical site okay with no problem?		☐ Yes	☐ No
Is there redness, heat and/or swelling around your surgical site?		☐ Yes	☐ No
Is there pus draining from your surgical site?		☐ Yes	☐ No
Are you experiencing increased pain or tenderness at your surgical site?		☐ Yes	☐ No
Do you have fever or chills?		☐ Yes	☐ No
Self-reported information on visits to other health facilities (ask patient)			
Did you visit a clinic, doctor's office or emergency room due to any problem with your incision?		☐ Yes	☐ No
If yes, what facility and service have you gone?			
Why have you chosen to go to that facility?			
What was the date of the visit (dd/mm/yy)?		Were you prescribed an antibiotic?	☐ Yes ☐ No
Has the doctor confirmed the presence of infection at your surgical site?		☐ Yes	☐ No
Self-reported information on health care (ask patient)			
Before you left Kacyiru hospital, were you given post-operative care instructions		☐ Yes	☐ No
If yes, did you comply with instructions given at the hospital?		☐ Yes	☐ No
Do you have any comments or concerns about your care experience?		☐ Yes	☐ No
If yes, please describe:			
Post discharge diagnosis (to be completed by the senior nurse)			
Post discharge SSI detected? ☐ Yes ☐ No	Type of SSI detected: ☐ None ☐ Superficial ☐ Deep ☐ Organ/Space		
If yes, how was the post discharge SSI detected/confirmed?			
☐ Confirmed following interview with the patient on telephone call		☐ Confirmed after visiting the patient at home	
☐ Confirmed after visiting the patient at another health facility		☐ Confirmation obtained from the doctor at another health facility	
Nurse's names:			
Note/Comments:			

Appendix 3. Post Discharge Telephone Surveillance of Post Cesarean SSIs – 30th day after surgical operation

Preliminary Information			
Patient's Name:			
Patient's ID (unique number):		Date of surgery (dd/mm/yyyy):	
Tel. Number:		Call date (dd/mm/yyyy):	
Number of days call was attempted:		Call concluded: ☐ Yes ☐ No	
Self-reported information on surgical site (ask patient)			
Did your surgical site heal fully with no problem?		☐ Yes	☐ No
Since we contacted you last time			
Was there redness, heat and/or swelling around your surgical site?		☐ Yes	☐ No
Was there pus draining from your surgical site		☐ Yes	☐ No
Did you experience increased pain or tenderness at your surgical site?		☐ Yes	☐ No
Did you have fever or chills?		☐ Yes	☐ No
Self-reported information on visits to other health facilities (ask patient)			
Did you visit a clinic, doctor's office or emergency room due to any problem with your incision?			☐ Yes ☐ No
If yes, what facility and service have you gone?			
Why have you chosen to go to that facility?			
What was the date of the visit?		Were you prescribed an antibiotic?	☐ Yes ☐ No
Has the doctor confirmed the presence of infection at your surgical site?	☐ Yes ☐ No		
Self-reported information on health care (ask patient)			
Before you left Kacyiru hospital, were you given post-operative care instructions		☐ Yes	☐ No
If yes, did you comply with instructions given at the hospital?		☐ Yes	☐ No
Do you have any comments or concerns about your care experience?		☐ Yes	☐ No
If yes, please describe:			
Post discharge diagnosis (to be completed by the senior nurse)			
Post discharge SSI detected? ☐ Yes ☐ No	Type of SSI detected: ☐ None ☐ Superficial ☐ Deep ☐ Organ/Space		
If yes, how was the post discharge SSI detected/confirmed?			
☐ Confirmed following interview with the patient on telephone call		☐ Confirmed after visiting the patient at home	
☐ Confirmed after visiting the patient at another health facility		☐ Confirmation obtained from the doctor at another health facility	
Nurse's names:			
Note/Comments:			

Appendix 4.Post Discharge Telephone Surveillance of Post Cesarean SSIs – 10th day after surgical operation (Kinyarwanda version)

Amakuru ku biranga umurwayi n'ikiganiro kuri telefoni			
Amazina y'umurwayi:			
Nomero y'umurwayi (unique ID number):	I Tariki yabazweho (dd/mm/yyyy):		
Nomero ya Tel.:	I Tariki yo guhamagara (dd/mm/yyyy):		
Umubare w'iminsi umurwayi yahamagawe	Kuvugana n'umurwayi byarabaye: ☐ Yego ☐ Oya		
Amakuru atangwa n'umurwayi ku byerekeranye n'aho yabazwe (baza umurwayi)			
Aho wabazwe hameze neza nta kibazo?	☐ Yego	☐ Oya	
Ufite ubushye/gutukura, ubushyuhe cyangwa kubyimba hafi y'aho wabazwe?	☐ Yego	☐ Oya	
Hari amashyira ava aho wabazwe?	☐ Yego	☐ Oya	
Urababara cyangwa ugatonekara aho wabazwe?	☐ Yego	☐ Oya	
Ugira umuriro cyangwa gutengurwa?	☐ Yego	☐ Oya	
Amakuru atangwa n'umurwayi ku byerekeranye no kujya kwivuriza ku rindi vuriro (baza umurwayi)			
Wigeze ujya ku rindi vuriro cyangwa wabonaye n'undi muganga ku birebana n'aho wabazwe?	☐ Yego ☐ Oya		
Niba waragiyeyo, ni kurihe vuriro na service wagiyeho?			
Kubera iki iryo vuriro ariryo wahisemo kujya kwivurizaho?			
Warigiyeho ku yihe tariki (dd/mm/yy)?		Wahawe umuti wa antibiyotike?	☐ Yego ☐ Oya
Dogiteri/Muganga yakubwiyeko wari ufite infection aho wabazwe?	☐ Yego ☐ Oya		
Amakuru atangwa n'umurwayi ku byerekeranye na serivise yahawe (baza umurwayi)			
Mbere yo gusezererwa ku bitaro bya Kacyiru, wabwiwe uko ugomba kwitwara?	☐ Yego	☐ Oya	
Niba warabibwiwe, wakurikije amabwiriza wahawe?	☐ Yego	☐ Oya	
Hari icyo wavuga cyangwa ikizazo ku bijyanye na serivise wahawe?	☐ Yego	☐ Oya	
Niba gihari, kivugeho:			
Post discharge diagnosis (to be completed by the senior nurse)			
Post discharge SSI detected? ☐ Yes ☐ No	Type of SSI detected: ☐ None ☐ Superficial ☐ Deep ☐ Organ/Space		
If yes, how was the post discharge SSI detected/confirmed?			
☐ Confirmed following interview with the patient on telephone call	☐ Confirmed after visiting the patient at home		
☐ Confirmed after visiting the patient at another health facility	☐ Confirmation obtained from the doctor at another health facility		
Nurse's names			
Note/Comments:			

Appendix 5. Post Discharge Telephone Surveillance of Post Cesarean SSIs – 30th day after surgical operation (Kinyarwanda version)

Amakuru ku biranga umurwayi n'ikiganiro kuri telefoni			
Amazina y'umurwayi:			
Nomero y'umurwayi (unique ID number):	I Tariki yabazweho (dd/mm/yyyy):		
Nomero ya Tel.:	I Tariki yo guhamagara (dd/mm/yyyy):		
Umubare w'iminsi umurwayi yahamagawe:	Kuvugana n'umurwayi byarabaye: ☐ Yego ☐ Oya		
Amakuru atangwa n'umurwayi ku byerekeranye n'aho yabazwe (baza umurwayi)			
Aho wabazwe hakize neza nta kibazo?	☐ Yego	☐ Oya	
Nyuma yuko twavuganye mu minsi ishize:			
Wagize ubushye/gutukura, ubushyuhe cyangwa kubyimba hafi y'aho wabazwe?	☐ Yego	☐ Oya	
Hari amashyira yigeze ava aho wabazwe?	☐ Yego	☐ Oya	
Wigeze ubabara cyangwa ugatonekara aho wabazwe?	☐ Yego	☐ Oya	
Wigeze ugira umuriro cyangwa gutengurwa?	☐ Yego	☐ Oya	
Amakuru atangwa n'umurwayi ku byerekeranye no kujya kwivuriza ku rindi vuriro (baza umurwayi)			
Wigeze ujya ku rindi vuriro cyangwa wabonaye na muganga ku birebana n'aho wabazwe?	☐ Yego	☐ Oya	
Niba waragiyeyo, ni kurihe vuriro na service wagiyeho?			
Kubera iki iryo vuriro ariryo wahisemo kujya kwivurizaho?			
Warigiyeho ku yihe tariki (dd/mm/yy)?		Wahawe umuti wa antibiyotike?	☐ Yego ☐ Oya
Dogiteri/Muganga yakubwiyeko wari ufite infection aho wabazwe?	☐ Yego ☐ Oya		
Amakuru atangwa n'umurwayi ku byerekeranye na serivise yahawe (baza umurwayi)			
Mbere yo gusezererwa ku bitaro bya Kacyiru, wabwiwe uko ugomba kwitwara?	☐ Yego	☐ Oya	
Niba warabibwiwe, wakurikije amabwiriza wahawe?	☐ Yego	☐ Oya	
Hari icyo wavuga cyangwa ikizazo ku bijyanye na serivise wahawe?	☐ Yego	☐ Oya	
Niba gihari, kivugeho:			
Post discharge diagnosis (to be completed by the senior)			
Post discharge SSI dedected? ☐ Yes ☐ No	Type of SSI detected: ☐ None ☐ Superficial ☐ Deep ☐ Organ/Space		
If yes, how was the post discharge SSI detected/confirmed?			
☐ Confirmed following interview with the patient on telephone call	☐ Confirmed after visiting the patient at home		
☐ Confirmed after visiting the patient at another health facility	☐ Confirmation obtained from the doctor at another health facility		
Nurse's names			
Note/Comments:			

Appendix 6. PRACTICUM PROJECT INFORMATION AND CONSENT FORM

A quality improvement project to improve Post Cesarean Section Surgical Site Infection Surveillance in a district hospital of Kigali City

Researcher identification

Main researcher: UWAMUNGU Evode

Master of Science in Global Health Delivery candidate, University of Global Health Equity

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Dear participant,

You are being invited to participate in a research project which can help us to identify the risk of surgical site infections among women undergoing caesarian section at Kacyiru hospital. Before accepting to join this project, you must understand and take into consideration the contents of this form, since it contains important information to assist you in deciding whether to participate or not.

This project is being conducted as part of a core requirement for the Master of Science in Global Health Delivery at the University of Global Health Equity. The project has received required ethical approval from UGHE and complies with international ethical standards for

research to be carried out in Rwanda. Permissions have also been obtained from Kacyiru hospital senior management team.

The purpose of this project

The purpose of this project is to identify the rate of post cesarean infection for comparison with the rates routinely recorded by the hospital.

The procedure for participation in this project

If you chose to participate, information about you, which includes your age, medication you are taking and your health condition, will be recorded by the clinicians and we will use that information for this study. If you consent to this study you will be required to provide your contact telephone number or that of your next of kin so that we check on you for any signs and symptoms of infection. After discharge from hospital you will be contacted on 10^{th} and 30^{th} post-operative day.

If you develop any signs and symptoms of infection which include gaping wound purulent discharge from incision site, pain, localized swelling, fever redness or heat. You are advised to come to the hospital for healthcare. The information gathered will help us to identify the risk of surgical site infections among women undergoing caesarian section at Kacyiru hospital and will help us to advocate for appropriate patient care to mitigate the risk.

The possible benefits of taking part in this project

Your participation will help us to advocate for appropriate patient care to mitigate the risk of post cesarean section in hospitals, particularly at Kacyiru hospital.

Possible risks or discomforts related to taking part in this project

If you choose to participate, we will record information about your individual characteristics such as age and social-economic category, about your patient care and the status of surgical wound while you are at the hospital. We will also record the surgical wound status data if you are readmitted at the hospital or call you at the 10^{th} and 30^{th} days of surgical operation. If you are not comfortable with the telephone call, please let us know your preferred type of communication.

Protection of your privacy

Information about you will be kept anonymous and confidential and the records of the study will be kept private. Access to the records will be limited to the data collectors in the hospital. The results will be used for research purposes only. We will not share your individual records with anyone outside the research team at any time. All paper records will be kept safe in locked storage and we will recommend the hospital to destroy them after 10 years. The transcript data will be de-identified and will be will be kept in a computer and file protected with passwords. The results of the study will be made public through publication and presentation of aggregated data so that they can be useful to healthcare providers, but no personal information will be included in the publication or presentation.

If I have any questions, concerns or complaints about this project, who can I talk to?

In case: 1) You have questions, concerns, or complaints, 2) You would like to talk to the study team, 3) You think the study has harmed you, or 4) You wish to withdraw from the study; please feel free to contact the principle researcher,Evode UWAMUNGU (0782229970) or the representative of UGHE, Mutesi Mukinisha (0783285359).

Participation is voluntary

It is your right to decide to participate in this project or not. If you choose to participate, you may change your mind and leave the study at any time. Refusal to participate or stopping your participation will involve no penalty.

Statement of consent

Your signature (or finger print) below indicates that you acknowledge that:

- You have understood the content of this form.
- You have had the opportunity to ask questions and received answers that were satisfactory.
- If needed, you took time to discuss this information with others to help you decide whether to participate.
- You will receive a dated and signed copy of the form.
- You agree to participate in this project.

Participant name	Signature/ finger print	Date
Researcher name/person requesting consent	Signature	Date

Appendix 7.PRACTICUM PROJECT INFORMATION AND CONSENT FORM

(Kinyarwanda version)

Ubushakashatsi bugamije kugenzura neza ibijyanye na "Infections" z'ababyeyi babyaye babazwe mu bitaro by'Umujyi wa Kigali

Umushakashatsi

Izina ry'umushakashatsi: UWAMUNGU Evode

Umukandida wa "Master of Science in Global Health Delivery" muri "University of Global Health Equity"

Mutumirwa,

Tukurarikiye gufatanya mu gikorwa cy'ubushakashatsi kizadufasha kumenya niba hari ababyeyi babyara babazwe mu bitaro bya Kacyiru bagira "infections" nyuma yo kubyara.Mbere yuko wemera gufatanya natwe muri iki gikorwa, urasabwa kumenya ibiri muri iyi nyandiko kuko ikubiyemo amakuru agufasha guhitamo kwemera cyangwa kwanga gufatanya natwe muri iki gikorwa.

Ubu bushakashatsi ni kimwe mu by'ingenzi bisabwa mu masomo y'icyiciro cya gatatu cya Kaminuza mu bijyanye n'ubuzima (Master of Science in Global Health Delivery) muri Kaminuza ya "University of Global Health Equity (UGHE)". Twemerewe gukora ubu bushakashatsi duhabwa uruhushya na "University of Global Health Equity (UGHE)", kandi ubu bushakashatsi bwubahirije ibisabwa ku rwego mpuzampahanga kugirango bukorwe mu Rwanda. Twahawe kandi uburenganzira n'Ubuyobozi bw'ibitaro bya Kacyiru kugirango tuhakorere ubu bushakashatsi.

Impamvu y'ubushakashatsi

Ubu bushakashatsi bugamije kugenzura neza no kumenya uko ababyeyi babyara babazwe mu bitaro bya Kacyiru bagira “infections” nyuma yo kubyara, imibare y’ababonetse ikazagereranywa n’iyo i bitaro bigaragaza.

Uko uzadufasha muri ubu ubushakashatsi

Iyo ufatanije natwe muri ubu bushakashatsi, tukubaza cyangwa tukifashisha amakuru yanditswe na muganga mu ifishi yawe arimo imyaka, uko wavuwe, imiti wahawe n’andi makuru ajyanye n’ubuzima bwawe. Niwemera gufatanya natwe, uzaduha nomero ya telephone cyangwa iy’undi muntu wawe wa hafi kugirango tuzakubaze niba hari ikibazo cya “infection” wagize. Nusezererwa kwa muganga, tuzaguhamagara ku munsi wa 10 n’uwa 30 uhereye igihe wabyariye.

Nuramuka ugize ikibazo cyo kubabara, kocyerwa cyangwa kuzana amashyira aho wabazwe, cyangwa ukagira ikibazo cyo gutengurwa, byaba byiza wihutiye kugaruka kwa muganga ukavurwa. Amakuru uzaduha azadufasha kumenya niba hari ababyeyi babyara babagiwe mu bitaro bya Kacyiru bagira “infection” nyuma yo kubyara.Ibi kandi bizadufasha gukorera ababyeyi ubuvugizi kugirango hakorwe ibishoboka byose ngo “infections” zishire.

Inyungu zizaturuka mu bufatanye bwawe mu ubu bushakashatsi

Ubufatanye bwawe buzadufasha mu buvugizi kugirango hakorwe ibishoboka byose ngo “infections” z’ababyeyi babyarira mu bitaro bya Kacyiru zishire.

Imbogamizi ushobora kugira iyo ufatanije natwe mu ubu bushakashatsi

Niwemera gufatanya natwe, tuzafata amakuru akuranga arimo imyaka, icyiciro cyawe cy’Ubudehe, uburyo wavuwe n’uko aho wabazwe hameze mu gihe uri hano mu bitaro. Tuzafata kandi amakuru y’uko aho wabazwe hameze nuramuka ugarutse kwa muganga cyangwa ku munsi wa 10 na 30 nyuma yo

kubagwa. Ubaye utifuza ko tuzaguhamagara kuri telephone watubwira ubundi buryo tuzakoresha tukavugana.

Kurinda amakuru twakiriye ku buzima bwanyu

Amakuru uzaduha azagirwa ibanga kandi abikwe neza mu bitaro ahantu habugenewe. Umushakashatsi n'abaganga bo mu bitaro bari muri ubu bushakashatsi nibo bonyine bazashobora kureba amakuru watanze ajyanye n'ubuzima bwawe. Amakuru utanga azakoreshwa muri ubu ubushakashatsi gusa. Nta wundi uzabona ayo makuru igihe icyo aricyo cyose atari mu ikipe y'ubu bushakashatsi. Impapuro twanditseho amakuru yanyu zizabikwa neza ahantu habugenewe kandi hafunze, zikazavanwaho burundu (gutwikwa) nyuma y'imyaka 10. Tuzandukura amakuru twahawe muri mudasobwa tudashyizemo amazina cyangwa nomero yanyu yo kwa muganga ku buryo hatazamenyekana nyiri ayo makuru. Nyuma tuzatangaza imibare y'uko twabonye "infections" zihagaze, kandi ntabwo tuzigera dutangaza ibijyanye n'amakuru yihariye ku muntu.

Ngize ikibazo cyangwa impungenge kuri ubu bushakashatsi ni nde navugisha?

Mu gihe: 1) wagira ikibazo cyangwa impungenge, 2) washaka kuvugisha abantu bari mu ubu bushakashatsi, 3) wumva ko wahohotewe cyangwa waguwe nabi biturutse ku ubu bushakashatsi, cyangwa 4) utagishaka kukomeza gufatanya mu ubu bushakashatsi; uzahamagare ukora ubu bushakashatsi, Evode UWAMUNGU (Tel. 0782229970) cyangwa Uhagarariye UGHE, Mutesi Mukinisha (0783285359).

Gufatanya natwe muri ubu bushakashatsi ni ubushake

Ni uburenganzira bwanyu kwemera cyangwa kwanga gufatanya natwe muri ubu bushakashatsi.Mu gihe wari wemeye gufatanya natwe, ushobora no kubihindura igihe icyo

aricyo cyose ukareka gufatanya natwe.Kwanga gufatanya natwe cyangwa kubivamo nta ngaruka byakugiraho.

Inyandiko yo kwemera gufatanya natwe muri ubu bushakashatsi

Sinyatire yawe (cyangwa igikumwe cyawe) uza gutera hasi kuri uru rupapuro biraba byerekana ngo wemeye ko:

- Wumvise ibiri muri iyi nyandiko y'ubufatanye muri ubu bushakashatsi;
- Wagize uburyo bwo kubaza ibibazo ukanahabwa ibisubizo bikunyuze;
- Mu gihe wabikenera, ko wafashe igihe cyo kubiganiraho n'abandi kugirango bigufashe mu gufata icyemezo cyo gufatanya natwe muri ubu bushakashatsi;
- Uzashyikirizwa kopi y'urupapuro y'iyi nyandiko yo kwiyemeza mu bufatanye bw'ubu bushakashatsi ruriho i tariki kandi rusinye;
- Wemeye gufatanya natwe mu ubu bushakashatsi.

Izina ry'umutumirwa	**Sinyatire/igikumwe**	**I tariki**
Umushakashatsi	**Sinyatire**	**I tariki**

Appendix 8. PRACTICUM PROJECT INFORMATION AND CONSENT FORM

PARENTAL PERMISSION FORM FOR CHILD'S RESEARCH PARTICIPATION

A quality improvement project to improve Post Cesarean Section Surgical Site Infection Surveillance in a district hospital of Kigali City

Researcher identification

Main researcher: UWAMUNGU Evode

Master of Science in Global Health Delivery candidate, University of Global Health Equity

Dear Parent/Legal Guardian;

We are requesting you to give permission for your child to participate in a research project which will help us to identify the risk of surgical site infections among women undergoing caesarian section at Kacyiru hospital. Before accepting to provide that permission, you must understand and take into consideration the contents of this form, since it contains important information to assist you in deciding whether to guarantee that permission for the child to participate or not.

This project is being conducted as part of a core requirement for the Master of Science in Global Health Delivery at the University of Global Health Equity. The project has received required ethical approval from UGHE and complies with international ethical standards for

research to be carried out in Rwanda. Permissions have also been obtained from Kacyiru hospital senior management team.

The purpose of this project

The purpose of this project is to identify the rate of post cesarean infection for comparison with the rates routinely recorded by the hospital.

The procedure for participation of your child in this project

If you choose to provide the permission for your child to participate in this study, information about your child,which includes her age, medication she's taking and her health condition, will be recorded by the clinicians and we will use that information for this study. If you give the permission for the child to participate in this study, we will ask her to provide her contact telephone number or that of her next of kin so that we check on her for any signs and symptoms of infection. After discharge from hospital, we will contact her on 10^{th} and 30^{th} post-operative day.

If the child develops any signs and symptoms of infection which include gaping wound purulent discharge from incision site, pain, localized swelling, fever redness or heat; we will advise her to come back to the hospital for healthcare. The information that we will get from your child will help us to identify the risk of surgical site infections among women undergoing caesarian section at Kacyiru hospital and will help us to advocate for appropriate patient care to mitigate the risk.

The possible benefits of taking part in this project

The participation of your child in the study will help us to advocate for appropriate patient care to mitigate the risk of post cesarean section in hospitals, particularly at Kacyiru hospital.

Possible risks or discomforts related to taking part in this project

If you give permission for your child to participate, we will record information about her individual characteristics such as age and social-economic category, about her patient care and the status of surgical wound while she is at the hospital. We will also record the surgical wound status data if she is readmitted at the hospital or call her at the 10^{th} and 30^{th} days of surgical operation. If she is not comfortable with the telephone call, we will ask her to let us know other preferred type of communication to contact her.

Protection of privacy

Information about the child will be kept anonymous and confidential and the records of the study will be kept private. Access to the records will be limited to the data collectors in the hospital. The results will be used for research purposes only. We will not share her individual records with anyone outside the research team at any time. All paper records will be kept safe in locked storage and we will recommend the hospital to destroy them after 10 years. The transcript data will be de-identified and will be kept in a computer and file protected with passwords. The results of the study will be made public through publication and presentation of aggregated data so that they can be useful to healthcare providers, but no personal information will be included in the publication or presentation.

If I have any questions, concerns or complaints about this project, who can I talk to?

In case: 1) You havequestions, concerns, or complaints, 2) You would like to talk to the study team, 3) You think the study has harmed your child, or 4) You wish to withdraw her from the

study; You can contact the principle researcher, Evode UWAMUNGU (0782229970) or the representative of UGHE, Mutesi Mukinisha (0783285359).

Participation is voluntary

It is your right to provide permission for your child to participate in this project or not. If you choose to provide the permission, you may change your mind and tell us to withdraw the child from the study at any time. Refusal of your child to participate or stopping her participation will involve no penalty.

Statement of permission

Your signature (or finger print) below indicates that you acknowledge that:

- You have understood the content of this form.
- You have had the opportunity to ask questions and received answers that were satisfactory.
- If needed, you took time to discuss this information with others to help you decide whether to provide permission for your child to participate.
- You will receive a dated and signed copy of the form.
- You provide the permission for your child to participate in this project.

Parent/Legal Guardian names	Signature/ finger print	Date
Researcher names/person requesting parental permission	Signature	Date

Appendix 9. PRACTICUM PROJECT INFORMATION AND CONSENT FORM

UBURENGANZIRA BW'UMUBYEYI KUGIRANGO UMWANA AGIRE URUHARE MU BUSHAKASHATSI

Ubushakashatsi bugamije kugenzura neza ibijyanye na "Infections" z'ababyeyi babyaye babazwe mu bitaro by'Umujyi wa Kigali

Umushakashatsi

Izina ry'umushakashatsi: UWAMUNGU Evode

Umukandida wa "Master of Science in Global Health Delivery" muri "University of Global Health Equity"

Mubyeyi,

Tukurarikiye kwemera guha umwana wawe uburenganzira bwo gufatanya natwe mu gikorwa cy'ubushakashatsi kizadufasha kumenya niba hari ababyeyi babyara babazwe mu bitaro bya Kacyiru bagira "infections" nyuma yo kubyara.Mbere yuko umwemera gufatanya natwe muri iki gikorwa, urasabwa kumenya ibiri muri iyi nyandiko kuko ikubiyemo amakuru agufasha guhitamo kumwemera cyangwa kumwangira gufatanya natwe.

Ubu bushakashatsi ni kimwe mu by'ingenzi bisabwa mu masomo y'icyiciro cya gatatu cya Kaminuza mu bijyanye n'ubuzima (Master of Science in Global Health Delivery) muri Kaminuza ya "University of Global Health Equity (UGHE)". Twemerewe gukora ubu bushakashatsi duhabwa uruhushya na "University of Global Health Equity (UGHE)", kandi ubu bushakashatsi bwubahirije ibisabwa ku rwego mpuzampahanga kugirango bukorwe mu Rwanda. Twahawe kandi uburenganzira n'Ubuyobozi bw'ibitaro bya Kacyiru kugirango tuhakorere ubu bushakashatsi.

Impamvu y'ubushakashatsi

Ubu bushakashatsi bugamije kugenzura neza no kumenya uko ababyeyi babyara babazwe mu bitaro bya Kacyiru bagira “infections” nyuma yo kubyara, imibare y’ababonetse ikazagereranywa n’iyo i bitaro bigaragaza.

Uko umwana wawe azadufasha muri ubu ubushakashatsi

Umwana wawe nafatanya natwe muri ubu bushakashatsi, tuzamubaza cyangwa twifashishe amakuru yanditswe na muganga mu ifishi ya arimo imyaka ye, uko yavuwe, imiti yahawe n’andi makuru ajyanye n’ubuzima bwe. Numwemerera gufatanya natwe, azaduha nomero ye ya telephone cyangwa iy’undi muntu we wa hafi kugirango tuzamubaze niba hari ikibazo cya “infection” yagize. Nasezererwa kwa muganga, tuzamuhamagara ku munsi wa 10 n’uwa 30 uhereye igihe yabyariye.

Umwana wawe naramuka ugize ikibazo cyo kubabara, kocyerwa cyangwa kuzana amashyira aho yabazwe, cyangwa ukagira ikibazo cyo gutengurwa, byaba byiza wihutiye kumugarura kwa muganga ukavurwa. Amakuru umwana wawe azaduha azadufasha kumenya niba hari ababyeyi babyara babagiwe mu bitaro bya Kacyiru bagira “infections” nyuma yo kubyara.Ibi kandi bizadufasha gukorera ababyeyi ubuvugizi kugirango hakorwe ibishoboka byose ngo “infections” zishire.

Inyungu zizaturuka mu bufatanye mu ubu bushakashatsi

Kwemerera umwana wawe ubufatanye bizadufasha mu buvugizi kugirango hakorwe ibishoboka byose ngo “infections” z’ababyeyi babyarira mu bitaro bya Kacyiru zishire.

Imbogamizi zishoboka numwemerera gufatanije natwe mu ubu bushakashatsi

Niwemerera umwana wawe gufatanya natwe, tuzafata amakuru amuranga arimo imyaka ye, icyiciro cyanyu cy’Ubudehe, uburyo yavuwe n’uko aho yabazwe hameze mu gihe ari hano mu bitaro. Tuzafata

kandi amakuru y'uko aho yabazwe hameze nuramuka ugarutse kwa muganga cyangwa ku munsi wa 10 na 30 nyuma yo kubagwa. Ubaye utifuza ko tuzamuhamagara kuri telephone watubwira ubundi buryo tuzakoresha tukavugana nawe.

Kurinda amakuru twakiriye

Amakuru umwana wawe azaduha azagirwa ibanga kandi abikwe neza mu bitaro ahantu habugenewe. Umushakashatsi n'abaganga bo mu bitaro bari muri ubu bushakashatsi nibo bonyine bazashobora kureba amakuru yatanze ajyanye n'ubuzima bwe. Amakuru atanga azakoreshwa muri ubu ubushakashatsi gusa. Nta wundi uzabona ayo makuru igihe icyo aricyo cyose atari mu ikipe y'ubu bushakashatsi. Impapuro twanditseho amakuru ye zizabikwa neza ahantu habugenewe kandi hafunze, zikazavanwaho burundu (gutwikwa) nyuma y'imyaka 10. Tuzandukura amakuru twahawe muri mudasobwa tudashyizemo amazina cyangwa nomero yanyu yo kwa muganga ku buryo hatazamenyekana nyiri ayo makuru. Nyuma tuzatangaza imibare y'uko twabonye "infections" zihagaze, kandi ntabwo tuzigera dutangaza ibijyanye n'amakuru yihariye ku muntu.

Ngize ikibazo cyangwa impungenge kuri ubu bushakashatsi ni nde navugisha?

Mu gihe: 1) wagira ikibazo cyangwa impungenge, 2) washaka kuvugisha abantu bari mu ubu bushakashatsi, 3) wumva ko umwana wawe yahohotewe cyangwa yaguwe nabi biturutse ku ubu bushakashatsi, cyangwa 4) utagishaka ko umwana wawe akomeza gufatanya mu ubu bushakashatsi; uzahamagare ukora ubu bushakashatsi, Evode UWAMUNGU (Tel. 0782229970) cyangwa Uhagarariye UGHE, Mutesi Mukinisha (0783285359).

Gufatanya natwe muri ubu bushakashatsi ni ubushake

Ni uburenganzira bwawe kwemerera cyangwa kwangira umwana wawe gufatanya natwe muri ubu bushakashatsi.Mu gihe wari wemwemereye gufatanya natwe, ushobora no kubihindura

igihe icyo aricyo cyose akareka gufatanya natwe.Kumwangira gufatanya natwe cyangwa kubimukuramo nta ngaruka byakugiraho.

Inyandiko yo kwemera gufatanya natwe muri ubu bushakashatsi

Sinyatire yawe (cyangwa igikumwe cyawe) uza gutera hasi kuri uru rupapuro biraba byerekana ngo wemeye ko:

- Wumvise ibiri muri iyi nyandiko y'ubufatanye muri ubu bushakashatsi;
- Wagize uburyo bwo kubaza ibibazo ukanahabwa ibisubizo bikunyuze;
- Mu gihe wabikenera, ko wafashe igihe cyo kubiganiraho n'abandi kugirango bigufashe mu gufata icyemezo cyo gutanga uburenganzira kugurango umwana wawe afatanye natwe muri ubu bushakashatsi;
- Uzashyikirizwa kopi y'urupapuro y'iyi nyandiko yo kwemerera umwana wawe mu bufatanye bw'ubu bushakashatsi ruriho i tariki kandi rusinye;
- Wemereye umwana wawe gufatanya natwe mu ubu bushakashatsi.

Izina ry'umubyeyi	**Sinyatire/igikumwe**	**I tariki**
Umushakashatsi	**Sinyatire**	**I tariki**

Appendix 10. PRACTICUM PROJECT INFORMATION AND ASSENT FORM

ADOLESCENT ASSENT FORM FOR PARTICIPATION IN THE RESEARCH PROJECT

A quality improvement project to improve Post Cesarean Section Surgical Site Infection Surveillance in a district hospital of Kigali City

Dear participant,

We are inviting you to give permission for your child to participate in a research project which can help us to identify the risk of surgical site infections among women undergoing caesarian section at Kacyiru hospital.

What is a research study?

A research study is a way to find out new information about something. Children do not need to be in a research study if they don't want to.

The purpose of this project

The purpose of this project is to identify the rate of post cesarean infection for comparison with the rates routinely recorded by the hospital.

The procedure for participation in this project

If you agree to participate in this study, we will use information about you including our age, medication you are taking and your health condition that will be recorded by the clinicians. We will also ask you to provide your contact telephone number or that of your next of kin so that we check on her for any signs and symptoms of infection. After discharge from hospital, we will contact her on 10^{th} and 30^{th} post-operative day. If you develop any signs and symptoms of

infection which include gaping wound purulent discharge from incision site, pain, localized swelling, fever redness or heat, you are advised to come back to the hospital for healthcare.

The importance of taking part in this project

Your participation in the study will help us to advocate for appropriate patient care to mitigate the risk of post cesarean section in hospitals, particularly at Kacyiru hospital.

Possible risks or discomforts related to taking part in this project

If you agree to participate, we will record information about your individual characteristics such as age and social-economic category, about your patient care and the status of surgical wound. We will also call you at the 10^{th} and 30^{th} days of surgical operation. If you are not comfortable with the telephone call, you can let us know other preferred type of communication to contact you.

Protection of your privacy

Information about you will be kept anonymous and confidential and the records of the study will be kept private. Access to the records will be limited to the data collectors in the hospital. The results will be used for research purposes only. The results of the study will be made public through publication and presentation of aggregated numbers, but no personal information will be included in the publication or presentation.

If I have any questions, concerns or complaints about this project, who can I talk to?

In case: 1) You have questions, concerns, or complaints, 2) You would like to talk to the study team, 3) You think the study has harmed your child, or 4) You wish your child to withdraw from the study; please feel free to contact the principle researcher, Evode UWAMUNGU (0782229970) or the representative of UGHE, Mutesi Mukinisha (0783285359).

Participation is voluntary

Your participation is voluntary and you it is your right to agree or refuse to participate in this project. If you choose to participate, you may change your mind and withdraw from the study at any time.

Statement of assent

Please, circle the appropriate case below to select if you want to be in this project study or not, and write your name below. You will be given a copy of this paper to keep.

☐ Yes, I will be in this research study. ☐No, I don't want to do this.

Child's names	Signature/ finger print	Date

Person/Researcher names/person requesting assent	Signature	Date

Appendix 11. PRACTICUM PROJECT INFORMATION AND ASSENT FORM

ADOLESCENT ASSENT FORM FOR PARTICIPATION IN THE RESEARCH PROJECT

UBURENGANZIRA BUTANGWA N'UMWANA UKUZE KUGIRANGO AGIRE URUHARE MU BUSHAKASHATSI

Ubushakashatsi bugamije kugenzura neza ibijyanye na "Infections" z'ababyeyi babyaye babazwe mu bitaro by'Umujyi wa Kigali

Umushakashatsi

Izina ry'umushakashatsi: UWAMUNGU Evode

Umukandida wa "Master of Science in Global Health Delivery" muri "University of Global Health Equity"

Mutumirwa,

Tukurarikiye gufatanya natwe mu gikorwa cy'ubushakashatsi kizadufasha kumenya niba hari ababyeyi babyara babazwe mu bitaro bya Kacyiru bagira "infections" nyuma yo kubyarira mu bitaro bya Kacyiru.

Ubushakashatsi ni iki?

Ubushakashatsi ni igikorwa kiba kigamije kugira ubumenyi bushya ku bintu bitandukanye. Abana ntabwo bashyirwa mu bushakashatsi Iyo batabishaka.

Uko uzadufasha muri ubu ubushakashatsi

Iyo ufatanije natwe muri ubu bushakashatsi, tukubaza cyangwa tukifashisha amakuru yanditswe na muganga mu ifishi yawe arimo imyaka, uko wavuwe, imiti wahawe n'andi makuru ajyanye n'ubuzima bwawe. Niwemera gufatanya natwe, uzaduha nomero ya telephone cyangwa iy'undi muntu wawe wa hafi kugirango tuzakubaze niba hari ikibazo cya "infection" wagize. Nusezererwa kwa muganga, tuzaguhamagara ku munsi wa 10 n'uwa 30 uhereye igihe wabyariye. Nuramuka ugize ikibazo cyo kubabara, kocyerwa cyangwa kuzana amashyira aho

wabazwe, cyangwa ukagira ikibazo cyo gutengurwa, byaba byiza wihutiye kugaruka kwa muganga ukavurwa.

Inyungu zizaturuka mu bufatanye bwawe mu ubu bushakashatsi

Ubufatanye bwawe buzadufasha mu buvugizi kugirango hakorwe ibishoboka byose ngo “infections” z’ababyeyi babyarira mu bitaro bya Kacyiru zishire.

Imbogamizi ushobora kugira iyo ufatanije natwe mu ubu bushakashatsi

Niwemera gufatanya natwe, tuzafata amakuru akuranga arimo imyaka, icyiciro cyawe cy’Ubudehe, uburyo wavuwe n’uko aho wabazwe hameze mu gihe uri hano mu bitaro. Tuzakubaza kandi amakuru y’uko aho wabazwe hameze ku munsi wa 10 na 30 nyuma yo kubagwa. Ubaye utifuza ko tuzaguhamagara kuri telephone watubwira ubundi buryo tuzakoresha tukavugana.

Kurinda amakuru twakiriye ku buzima bwanyu

Amakuru uzaduha azagirwa ibanga kandi abikwe neza mu bitaro ahantu habugenewe. Umushakashatsi n’abaganga bo mu bitaro bari muri ubu bushakashatsi nibo bonyine bazashobora kureba amakuru watanze ajyanye n’ubuzima bwawe. Nyuma tuzatangaza imibare y’uko twabonye “infections” zihagaze, kandi ntabwo tuzigera dutangaza ibijyanye n’amakuru yihariye ku muntu.

Ngize ikibazo cyangwa impungenge kuri ubu bushakashatsi ni nde navugisha?

Mu gihe: 1) wagira ikibazo cyangwa impungenge, 2) washaka kuvugisha abantu bari mu ubu bushakashatsi, 3) wumva ko wahohotewe cyangwa waguwe nabi biturutse ku ubu bushakashatsi, cyangwa 4) utagishaka kukomeza gufatanya mu ubu bushakashatsi; uzahamagare ukora ubu bushakashatsi, Evode UWAMUNGU (Tel. 0782229970) cyangwa Uhagarariye UGHE, Mutesi Mukinisha (0783285359).

Gufatanya natwe muri ubu bushakashatsi ni ubushake

Ni uburenganzira bwawe kwemera cyangwa kwanga gufatanya natwe muri ubu bushakashatsi.Mu gihe wari wemeye gufatanya natwe, ushobora no kubihindura igihe icyo aricyo cyose ukareka gufatanya natwe.

Kwemera gufatanya natwe muri ubu bushakashatsi

Ca akazeru ku gisubizo uhisemo ugaragaza ko ushaka gufatanya natwe muri ubu bushakashatsi cyangwa utabishaka, hanyuma wandike izina ryawe ahakurikira. Tuzaguha kopi y'uru rupapuro kugirango uyibike.

☐Yego, nzafatanya namwe mu bushakashatsi.☐Oya, sinshaka kuba mu ubu bushakashatsi.

Izina ry'umutumirwa	**Sinyatire/igikumwe**	**I tariki**
Umushakashatsi	**Sinyatire**	**I tariki**

Appendix12.GUIDELINE FOR COMPLETING THE PCSIS SURVEILLANCE TOOLS

This surveillance has two types of tools that will be used for post cesarean section infections (PCSIs) surveillance. The first tool - *In-Patient and Readmissions Post Cesarean Section SSIs Surveillance Case Report Form* - will be completed during inpatient stay and readmission in the hospital. The second type of the tool - *Post Discharge Telephone Surveillance of Post Cesarean SSIs Form* - will be completed using a questionnaire through a telephone call to the patient at 10th and 30th day of cesarean delivery operation. As this 2nd part will involve telephone interview with the patient, the questions to ask the patient will be translated in Kinyarwanda to guide the surveyors who will be interviewing the patient.

In-Patient and Readmissions Post Cesarean Section SSIs Surveillance – Case Report Form

Information in this tool will be entered through free text or cross-checking the appropriate case determining the information needed. The data will be recorded during initial admission or readmission following the surgical operation.

Preliminary Information

The nurse on duty will consult the patient file or/and ask to the patient to determine the information required in this section:

- Patient's Name: You will record the patient's names;
- Patient's ID (unique number): You will record the number attributed to the patient by the hospital in the medical records;
- Date of admission: You will record the date, in the format "date/month/year", when the patient was admitted in the hospital for delivery;
- Tel. Number: You will record the telephone number of the patient;
- Alternative Tel. Number: You will record the telephone number of the patient's husband or other close relative;
- Age (in years): You will record the patient's most recent age documented in the medical record prior to the procedure;
- Weight (in kg): You will record the patient's most recent weight documented in the medical record prior to the procedure;

- Height (in cm): You will record the patient's most recent height documented in the medical record prior to the procedure;
- BMI: You can provide this measure using the patient's height and weight recorded;
- Previous number of delivery: You will ask the patient or consult her file and cross-check the appropriate case determining the number of delivery that the patient had before the actual pregnancy/delivery;
- Previous cesarean section: You will ask the patient or consult her file and cross-check the appropriate case determining the number of cesarean sections that the patient had before the actual pregnancy/delivery;
- Socio-economic category: You will ask the patient and cross-check the appropriate case determining the socio-economic category (Ubudehe) in which the patient's family belongs;
- Duration patient was in active before procedure (in hrs): You will monitor the patient or consult her file and record the estimated duration, in hours, in which the patient was in active before procedure;
- Pre-diagnosed illnesses/diseases: You will record any pre-diagnosed illness/disease before the procedure.

Surgical operation procedure details

The nurse on duty will collaborate with the responsible surgeon and the anesthetist to determine the information required in this section:

- Code for the Surgeon/Operator (initials): You will record the initials of the principle surgeon (e.g. For "Manzi Callixte" you would record "MC");
- Date of operation (dd/mm/yy): You will record the date, in the format "date/month/year", when the patient was operated for delivery;
- Ruptured membrane before procedure: You will cross-check the appropriate case to indicate if the patient's membrane was ruptured (with the estimated duration of rupture before the procedure) or if it was not ruptured;
- ASA classification/score: You will consult the anesthetist and cross-check the appropriate case to determine the patient's physical condition (ASA score or ASA physical status). The

ASA scores derive from the ASA classification system, an approach developed by the American Society of Anesthesiology. It is an assessment made by an anesthesiologist based on a patient's pre-operative physical condition (https://www.asahq.org/resources/clinical-information/asa-physical-status-classification-system). The following are the ASA classification definitions and examples:

Table 1: ASA classification

Classification	Definition	Examples
ASA 1	A normally healthy patient	Healthy, non-smoking, no or minimal alcohol use
ASA 2	A patient with mild systemic disease	Mild diseases only without substantive functional limitations. Examples include (but not limited to): current smoker, social alcohol drinker, pregnancy, obesity (30 < BMI < 40), well-controlled DM/HTN, mild lung disease
ASA 3	A patient with severe systemic disease	Substantive functional limitations; One or more moderate to severe diseases. Examples include (but not limited to): poorly controlled DM or HTN, COPD, morbid obesity (BMI ≥40), active hepatitis, alcohol dependence or abuse, implanted pacemaker, moderate reduction of ejection fraction, ESRD undergoing regularly scheduled dialysis, premature infant PCA < 60 weeks, history (>3 months) of MI, CVA, TIA, or CAD/stents.
ASA 4	A patient with severe systemic disease that is a constant threat to life	Examples include (but not limited to): recent (< 3 months) MI, CVA, TIA, or CAD/stents, ongoing cardiac ischemia or severe valve dysfunction, severe reduction of ejection fraction, sepsis, DIC, ARD or ESRD not undergoing regularly scheduled dialysis.
ASA 5	A moribund patient who is not expected to survive without the operation	Examples include (but not limited to): ruptured abdominal/thoracic aneurysm, massive trauma, intracranial bleed with mass effect, ischemic bowel in the face of significant cardiac pathology or multiple organ/system dysfunction

- Type of operation: You will cross-check the appropriate case to indicate whether the operation was elective or emergency. The "Elective operation" is defined as a scheduled surgical procedure for which a patient is neither in labor nor has ruptured membranes. An

"Emergency procedure" is defined as a procedure for which a patient presents to Labor and Delivery while in labor or with ruptured membranes;

- Wound classification: You will cross-check the appropriate case to indicate the wound class. The surgical wound class predicts the risk of post-operative infection based on the degree of bacterial contamination of surgical wounds at the time of surgery. The Table 2 describes the classification of wounds:

Table 2: Wound classification

Classification	Description
Class I: Clean Risk of infection: ≤ 2%	▸ Uninfected operative wound where respiratory, GI, genital, and urinary tracts aren't entered; ▸ Wounds are primarily closed, and a drain (if needed) is connected to a closed system; ▸ No inflammation is encountered.
Class 2: Clean/Contaminated Risk of infection: 5-15%	▸ Operative wound that enters the respiratory, GI, genital, or urinary tract under controlled conditions; ▸ No major break in sterile technique; ▸ No spillage; ▸ No acute inflammation.
Class III: Contaminated Risk of infection: > 15%	▸ Open, fresh, accidental wounds; ▸ Operations with major breaks in sterile technique (e.g., open cardiac massage); ▸ Gross spillage from the GI tract; ▸ Acute, no purulent inflammation is encountered; ▸ Necrotic tissue without evidence of purulent drainage (e.g., dry gangrene).
Class IV: Dirty/Infected Risk of infection: > 30%	▸ Old traumatic wounds with retained devitalized tissue; ▸ Perforated viscera; ▸ Presence of purulence or abscess.

- Skin closure: You will cross-check the appropriate case to indicate whether or not the skin closure was interrupted;
- Type of skin closure: You will cross-check the appropriate case to indicate the type of skin closure used;
- Post-partum hemorrhage: You will cross-check the appropriate case to indicate whether or not the patient had a post-partum hemorrhage;
- Time of incision: You will indicate the time the operation started (time of skin incision);

- Time of closure: You will indicate the time the operation ended (time when the skin closure ended);
- Prophylaxis antibiotic given: You will cross-check the appropriate case to indicate whether the antibiotic was administered and when (prior: administered and completely absorbed within 0 - 60 minutes prior to surgical incision; after: administered and completely absorbed after incision), whether the antibiotic was not administered, or whether prescription of antibiotic was not applicable in case the patient was already receiving an antibiotic for a pre-existing condition.

Infection diagnostic during inpatient stay

In this section, the nurse on duty, in consultation with the surgeon, will record the required information for identification of PCSI during the initial admission or readmission following the surgery:

- Names of the persons diagnosing the SSI: You will indicate the names of the persons who diagnosed the PCSI;
- Type of SSI detected: You will indicate whether the PCSI was identified in the patient. You will determine the type of SSI if detected. SSI will have been identified before the patient was discharged from the hospital following surgery. The type of PCSI will be determined based on criteria described in the table 3:

Table 3: Identification of SSI during hospitalization or readmission

SSI Type	SSI Criteria
Superficial	A SSI occurs within 30 days of the operative procedure and involves only the skin or subcutaneous tissue of the incision, and at least one of the following: • purulent drainage from the superficial incision; • organisms isolated from an aseptically obtained cultureof fluid or tissue from the superficial incision; • at least one of the following signs or symptoms of infection:pain or tenderness, localised swelling, redness orheat and superficial incision is deliberately opened by asurgeon, unless culture of incision is negative; • diagnosis of superficial incisional SSI by the surgeon orattending physician.
Deep	A SSI occurs within 30 days after the operation and infection involves deep soft tissue (e.g. fascial and muscle layers) of the incision and at least one of the following: • purulent drainage from the deep incision but not from the organ/space component of the surgical site.

SSI Type	SSI Criteria
	• a deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms: fever (> 38C), localized pain, or tenderness, unless site is culture-negative. • an abscess or other evidence of infection involving the deep incision is found on direct examination, during reooperation, or by histopathologic or radiologic examination. • diagnosis of a deep incisional SSI by a surgeon or attending physician.
organ/ space	A SSI occurs within 30 days after the operation and infection involves any part of the anatomy (e.g. organs or spaces), other than the incision, which was opened or manipulated during an operation and at least one of the following: • Purulent drainage from a drain that is placed through a stab wound into the organ/space. • Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space. • An abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination • Diagnosis of an organ/space SSI by a surgeon or attending physician.

- Date of SSI detection: You will record the date, in the format “date/month/year”, when the PCSI will have been detected;
- Note/comments: You will record any other relevant information not specified regarding the patient condition, circumstance of procedure or infection diagnostic.

Infection diagnostic during readmission

In this section, the nurse on duty, in consultation with the surgeon, will record the required information for identification of PCSI during the readmission period:

- Names of the persons diagnosing the SSI: You will indicate the names of the persons who diagnosed the PCSI;
- Date of readmission: You will record the date, in the format “date/month/year”, when the patient was re-admitted in the hospital;
- Type of SSI detected: You will indicate whether the PCSI was identified during re-admission. You will determine the type of SSI if detected. The type of PCSI will be determined based on criteria described in the table 3;

- Note/comment: You will record any other relevant information not specified regarding the patient condition, circumstance of procedure or infection diagnostic).

Post Discharge Telephone Surveillance of Post Cesarean SSIs – 10th day after surgical operation

Information in this tool will be entered through free text or cross-checking the appropriate case determining the information needed. The data will be recorded during the post-discharge surveillance at the 10th day after surgical operation. This will include SSIs identified in the Emergency Department where the patient was not readmitted to the hospital. The investigators will include the senior nurse in the hospital who will be trained for data collection and the IPC focal person.

Instructions:

The investigators will contact the patient between 8:00 AM to 5:00 PM, or another time convened by the patient. A call will be made on 10th day after surgery. If a patient doesn't respond to the call or inaccessible, the investigators will continue to make calls (at least two attempts per day) during five days following the 10th day after surgery. The conversation will be held in Kinyarwanda unless the patient prefers another language (the Kinyarwanda version of the data collection questionnaire will be provided).

Explaining the purpose of call:

When you will call a patient, you will address to her the following message: "Recently you had a cesarean section at Kacyiru hospital and we would like to know how you have been feeling since then. Do you have a time to answer a few questions? The information you provide may help us to improve the quality of patient care in our hospital. Your answers will remain confidential".

Preliminary Information

- Patient's Name: You will have recorded the patient's names prior to call and will check that he is the person you are talking on call;
- Patient's ID (unique number): You will have recorded the number attributed to the patient by the hospital in the medical records;

- Tel. Number: You will have recorded the telephone number of the patient or the telephone number of the patient's husband or other close relative;
- Call date (dd/mm/yyyy): You will record the date of call if the call is concluded;
- Number of days call was attempted: You will record the number of days the call was attempted since the 10th day;
- Call concluded: You will cross-check the appropriate case to indicate whether the call was concluded or not.

Self-reported information on surgical site (ask the patient)

You will ask the patient the following questions:

- Is your surgical site okay with no problem?
- Is there redness, heat and/or swelling around your surgical site?
- Is there pus draining from your surgical site
- Are you experiencing increased pain or tenderness at your surgical site?
- Do you have fever or chills?

Self-reported information on visits to other health facilities (ask the patient)

You will ask the patient the following questions:

- Did you visit a clinic, doctor's office or emergency room due to any problem with your incision?
- If yes, what facility and service have you gone?
- Why have you chosen to go to that facility?
- What was the date of the visit?
- Were you prescribed an antibiotic?
- Has the doctor confirmed the presence of infection at your surgical site?

Self-reported information on health care (ask the patient)

You will ask the patient the questions to check whether the patient received instruction on post-operative care and whether she complied with them. You will also ask her to provide comments or concerns about her care experience. Ask the following questions:

- Before you left Kacyiru hospital, were you given post-operative care instructions?
- If yes, did you comply with instructions given at the hospital?
- Do you have any comments or concerns about your care experience?
- If yes, please describe.

Based on the information provided by the patient, the team will decide to rely on that information or to make further investigations, at the patient's home or at the health facility where the patient will have eventually sought care, to confirm the presence of SSI.

Post discharge diagnosis outside the hospital (to be completed by the senior nurse)

- The team that will conduct the post-discharge surveillance will refer to the information provided by the patient, and determine whether the patient has a PCSI or not.
- If the PCSI is identified, the team will cross-check the appropriate case to indicate the type of SSI identified;
- If the PCSI is identified, the team will cross-check the appropriate case to indicate how or where the SSI will have been detected;
- The nurse who will have organized the telephone interview with the patient will record her names;
- The nurse who will have organized the telephone interview with the patient will record any other relevant information not specified regarding the patient condition, circumstance of procedure or infection diagnostic).

Post Discharge Telephone Surveillance of Post Cesarean SSIs – 30th day after surgical operation

Information in this tool will be entered through free text or cross-checking the appropriate case determining the information needed. The data will be recorded during the post-discharge surveillance at the 30th day after surgical operation. This will include SSIs identified in the Emergency Department where the patient was not readmitted to the hospital. The

investigators will include the senior nurse in the hospital who will be trained for data collection and the IPC focal person.

Instructions:

The investigators will contact the patient between 8:00 AM to 5:00 PM, or another time convened by the patient. A call will be made on 30th day after surgery. If a patient doesn't respond to the call or inaccessible, the investigators will continue to make calls (at least two attempts per day) during five days following the 30th day after surgery, the period after which the follow-up will be closed. The conversation will be held in Kinyarwanda unless the patient prefers another language (the Kinyarwanda version of the data collection questionnaire will be provided).

Explaining the purpose of call:

When you will call a patient, you will address to her the following message: "Recently you had a cesarean section at Kacyiru hospital and we would like to know how you have been feeling since then. Do you have a time to answer a few questions? The information you provide may help us to improve the quality of patient care in our hospital. Your answers will remain confidential".

Preliminary Information

- Patient's Name: You will have recorded the patient's names prior to call and will check that he is the person you are talking on call;
- Patient's ID (unique number): You will have recorded the number attributed to the patient by the hospital in the medical records;
- Tel. Number: You will have recorded the telephone number of the patient or the telephone number of the patient's husband or other close relative;
- Call date (dd/mm/yyyy): You will record the date of call if the call is concluded;
- Number of days call was attempted: You will record the number of days the call was attempted since the 30th day;
- Call concluded: You will cross-check the appropriate case to indicate whether the call was concluded or not.

Self-reported information on surgical site (ask the patient)

You will ask the patient the following questions:

- Was your surgical site okay with no problem?
- Was there redness, heat and/or swelling around your surgical site?
- Was there pus draining from your surgical site
- Did you experiencing increased pain or tenderness at your surgical site?
- Did you have fever or chills?

Self-reported information on visits to other health facilities (ask the patient)

You will ask the patient the following questions:

- Did you visit a clinic, doctor's office or emergency room due to any problem with your incision?
- If yes, what facility and service have you gone?
- Why have you chosen to go to that facility?
- What was the date of the visit?
- Were you prescribed an antibiotic?
- Has the doctor confirmed the presence of infection at your surgical site?

Self-reported information on health care (ask the patient)

You will ask the patient the questions to check whether the patient received instruction on post-operative care and whether she complied with them. You will also ask her to provide comments or concerns about her care experience. Ask the following questions:

- Before you left Kacyiru hospital, were you given post-operative care instructions
- If yes, did you comply with instructions given at the hospital?
- Do you have any comments or concerns about your care experience?
- If yes, please describe.

Based on the information provided by the patient, the team will decide to rely on that information or to make further investigations, at the patient's home or at the health facility where the patient will have eventually sought care, to confirm the presence of SSI.

Post discharge diagnosis outside the hospital (to be completed by the surveyors)

- The team that will conduct the post-discharge surveillance will refer to the information provided by the patient, and determine whether the patient has a PCSI or not.
- If the PCSI is identified, the team will cross-check the appropriate case to indicate the type of SSI identified;
- If the PCSI is identified, the team will cross-check the appropriate case to indicate how or where the SSI will have been detected;
- The nurse who will have organized the telephone interview with the patient will record her names;
- The nurse who will have organized the telephone interview with the patient will record any other relevant information not specified regarding the patient condition, circumstance of procedure or infection diagnosis.