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SCHOOL OF HEALTH SCIENCES

IMPROVING HAND HYGIENE COMPLIANCE AMONG HEALTHCARE WORKERS IN ACCIDENT AND EMERGENCY DEPARTMENT AT THE UNIVERSITY TEACHING OF KIGALI

A dissertation submitted in partial fulfillment of the requirements for award of Masters of Hospital and Healthcare Administration

By

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Declaration

I declare that this capstone Dissertation entitled"Improving Hand Hygiene compliance among healthcare workers in Accident and Emergency department at University Teaching Hospital of Kigali" submitted in partial fulfillment of requirement for the degree of Masters in Hospital and Healthcare Administration at University of Rwanda /College of Medicine and Health Sciences, contains my own work except where specifically acknowledged and it has been passed through the anti-plagiarism system and found to be compliant and this is the approved final version of the Thesis:

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Dedication

The Capstone Dissertation is dedicated to:

My beloved wife Perpetue NIYITEGEKA for her care and support during my studies.

My sons Gavareli MUGISHA, ISHIMWE MUGISHA Mathis and daughter ASHIMWE Blessy Aliza for their love.

My Father Alexandre GATO, and my late mother Esther NYIRANKUNDWA

All my brothers and sisters for good collaboration and support,

All my classmates for the moments shared together,

My workmates officers in Quality Assurance Management Directorate and SHAHIDI TWAHIRWA Timothee Director of QAM directorate for their advices, encouragement and share the experience with me.

My neighbor Mr. KAYIRANGA Dieudonnee for valuable contribution to the project. Your love, patience, and support helped me through all this master's education. May the Almighty God bless you.

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I would like to acknowledge all my classmates in MHA program for their morale, teamwork, hardworking and mutual support.

Abstract

Background: Hand Hygiene is the single most important intervention for preventing Hospital Acquired infections in healthcare facilities. Compliance with HH has remained low in Healthcare settings worldwide is about 40%[1]

Methods: Researcher conducted Pre and post intervention study on compliance of Health workers to Hand Hygiene at Accident and Emergency Department at CHUK, data were collected using WHO observation tool for Hand Hygiene before and after implementation of intervention from November to December 2021 for pre intervention and March to April 2022 for post intervention and the implementation of interventions started in January to March 2022. Paired sample T-test was used to compare the pre and post intervention results to measure the improvement change.

Results: 200 opportunities were observed in pre-intervention and 200 in post-intervention. Overall Hand Hygiene compliance improved from 72 actions to hand hygiene of 200 opportunities in pre-intervention (36%) to 136 actions to hand hygiene in 200 opportunities (68%) in post intervention among 40 staff (Nurses and doctors).

Conclusion: Initiating and displaying voice audio and reminder posters as interventions had led to behavior change to Hand Hygiene and improved Hand Hygiene compliance in healthcare workers at Accident and Emergency Department from 36% to 68% however, regular monitoring by Infection Prevention and Control unit and A&E managers is needed to improve Hand Hygiene compliance to the required standards as stipulated in CHUK Hand Hygiene policy.

Key words

Hand Hygiene Compliance, Healthcare workers, Accident and Emergency.

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List of acronyms and abbreviations

ABHR	Alcohol-based hand rub
A&E	Accident and Emergency
CHUK	Centre Hospitalier Universtaire de KIGALI
CMHS	College of Medicine and Health Sciences
COHSASA	Council for Health Services Accreditation of Southern Africa
HAI	Hospital Acquired Infection
HH	Hand Hygiene
HCAI	Healthcare Associated infection
HCWs	Healthcare workers
IRB	Institute of Review Board
LMICs	Low and Middle Incomes
MHA	Maters of Hospital and Healthcare Administration
NIH	National Institute of Health
QAM	Quality Assurance Management
QIP	Quality Improvement Project
PDSA	Plan-Do-Study-Act
SPSS	Statistical Package for Social Sciences
UR	University of Rwanda
US	United States
WHO	World Health Organization

Definition of key terms

Accreditation: Accreditation as the process of formal evaluation of an educational program, institution, or system against defined standards by an external body for the purposes of quality assurance and enhancement (Certification, licensure)[2].

Action plan: Action plans specify where, when, and how a goal will be implemented and help individuals plan the specific actions they will take to achieve their overarching goal. A precise, well-planned plan of activities to be implemented or continued at a specific health-care facility in order to promote Hand Hygiene [3]

Alcohol-based hand rub: An alcohol-based product (liquid, gel, or foam) that is applied to the hands to inhibit the growth of microorganisms. Excipients, additional active substances, and humectants may be present in such preparations, as well as one or more types of alcohol[4].

Assessment: is a compilation of subjective and objective data that is well-organized and reasonable data .In this study, the assessment entails determining the current state of attitudes of Hand hygiene compliance [5].

Perception : An individual method of organizing and interpreting his or her thoughts in order to give meaning to his or her surroundings, or is the process by which an employee organizes and interprets the impression in order to give meaning to his or her environment and thus, it influences significantly his or her work behavior. [6]

Adherence: Adherence is the process in which a person follows rules, guidelines or standards. Adherence to Hand Hygiene refers to the process through which nurses follow the WHO guidelines for five different Hand Hygiene situations[7,8].

A moment (or Indication): The term "moment" is used interchangeably with indication in this project (Is the moment during healthcare when hand hygiene must be performed to prevent harmful germs transmission or infection. It is the most important reason to wash your hands [9].

Effectiveness / Effective: The clinical conditions in which a hand hygiene solution was tested for its ability to minimize disease spread. [4].

Efficacy/efficacious: The effect of using a hand hygiene product in a Laboratory or environment [4].

Hand Hygiene: It is any act of hand cleansing (WHO, 2009).In this study is hand hygiene action or washing hand with water and hand washing product, or alcohol based hand massages in the context of this project [4].

Hand cleansing: It is the act of physically or mechanically eliminating dirt or microbes from the hands [4].

Hand rubbing: It is applying an antiseptic hand rub to prevent to prevent or inhibit microbes growth without using of an external supply of water and without the necessity for rinsing or drying with towels or other equipment [4]

Hand Hygiene opportunity: Point of time during healthcare activities when hand cleanness required to prevent germs transmission by hands. Once the indication or moment is recognized, it is counted as an opportunity in this project. [9].

Healthcare associated infection (HCAI), is also known as Nosocomial or hospital infection ,an infection that develops in patient while they are receiving care in a hospital or other healthcare setting or was not present or incubating at time of admission. [4].

Hospital acquired infection: It is an infection acquired in the hospital or healthcare services unit often known as nosocomial infections and occurs 48 hours or more after admission or within 30 days of discharge [10].

CHAPTER ONE: INTRODUCTION

1.1 Background

University Teaching Hospital of Kigali (CHUK) is Rwanda's largest hospital, located in Nyarugenge District on KN 4 Avenue in Kigali City. It has a capacity of 519 beds and on average, 1472 new patients are admitted to the hospital each month, with 9505 being admitted to the outpatient department. CHUK sees an average of 17 986 new patients in the hospital and 114 060 in the outpatient department each year [11].

CHUK employs 812 people, including 97 doctors, 446 nurses and midwives, 128 paramedical workers, and 141 support staff [11]. CHUK's mission is to provide quality health care according to international standards, train health professionals where an average of 800 students trained annually, contribute to the development of human resources, conduct outstanding research, and provide technical support to the health system with Values of Accountability-Integrity-Professionalism-Excellence [11].

It serves the people of the Northern Province, Western province, Eastern province, Southern province, and Kigali city. [11].

Accident and Emergency was the department to conduct the project. It has 46 nurses, three emergency physicians, and three general practitioners, with a total of 29 beds. Room 9(Resuscitation room), Room 8 (Post resuscitation room), Room 6 (Pharmacy), Room 5 (Procedure room), Room 4 (Examination room), Room 3 (Observation Room), Room 1(Isolation room), Nursing station, Doctor's office, and Manager's office are among the wards of the Accident and Emergency department. Because Accident and Emergency is the hospital's main entry, we conducted a project to assess the compliance to Hand Hygiene.

The table 1 indicates the number of Nurses and Medical Doctors at Hand Hygiene 52 in total and most of them are Nurses 46(88%),General practitioners 3 (5.7%), Medical specialists 3(5.7%).

Table 1 HCWs of Accident and Emergency Department

Category	Number	%
Nurses	**46**	**88.5**
General practitioners	**3**	**5.7**
Medical specialists	**3**	**5.7**
TOTAL	**52**	**100**

In provision of healthcare services, healthcare workers have contact with body fluids,patients,surfaces ,waste food that are increasing the transmission of infections including hospital acquired infection and still a burden in Healthcare delivered worldwide and the Practice of hand hygiene using hand washing or hand rubbing is single most fundamental method to prevent HAIs [12]

1.2 Problem statement

There is low Hand Hygiene Compliance at Accident and Emergency Department at CHUK.

Problem explanation

Hand Hygiene is the most significant infection control measure that has been proved to reduce the Hospital acquired infection in medical treatment in many healthcare settings, and adequate Hand Hygiene remains a difficulty and poor [13]. HAIs (Hospital-Acquired Infections) have become a serious global health problem for patient safety in recent years. Hundreds of millions of cases of these infections have been reported worldwide and they have become a severe concern to hospitalized patients even in developed countries. Poor Hand Hygiene rise to the HAIs and those infections cause the antibiotic resistance and contribute to higher patient mortality and morbidity [14,15].

To ensure continuous quality improvement of high quality of healthcare delivered to the patients, Researcher with Accident and Emergency staff investigated the cause of low Hand Hygiene compliance. In collaboration with IPC officers and Accident and Emergency IPC links, we have conducted an assessment on Hand Hygiene compliance among Accident and Emergency department staff and the showed that 36% performed Hand Hygiene practice according to WHO 5 moments of Hand Hygiene, and we compared to the CHUK Hand

Hygiene policy that state that all staff who perform every practice must practice Hand Hygiene meant 100% of opportunities.

A gap of 64% of non- compliance to Hand Hygiene can be a route of transmission of HAIs as indicated by the research conducted by Israel (2020). The study showed that poor hand hygiene practice in healthcare workers is the crucial sources of cross-contamination of HAIs among healthcare workers and HH performance rate remains low. [16].

Improving the Hand Hygiene compliance is the Quality improvement project, we started to close the gaps identified in Accident and Emergency Department and reduces the spread of HAIs due to low Hand Hygiene compliance. According to researcher Stone, healthcare-associated diseases can transfer from patient to patient due to infectious organisms contaminating healthcare workers' hands, and improving Hand Hygiene may reduce the transmission in HAIs [17].

As a result, Alzyood claimed that if nurses wash their hands, the transmission of illnesses(HAIs) will be reduced [18].

1.2.1 Magnitude of the problem

The findings of Hand Hygiene compliance that was 36% at Accident and Emergency Department is low according to the CHUK Hand Hygiene Policy. This policy of Hand Hygiene Page 1, says that all staff must apply Hand Hygiene before and after every clinical practice :<<All clinical staff must adhere the five moments of correct hand washing which are: Before touching a patient, Before clean/ aseptic procedure, After body fluid exposure risk, After touching a patient and After touching a patients' surrounding>> [19,20].

According to Septimiu Voidazan (2020), When Hand Hygiene is not followed, it might result in HAIs, which can cause mental stress and functional difficulties in the patient. It can also result in handicap, lowering one's quality of life. HAI are frequently one of the variables that contribute to death. It lengthens hospital stays and raises healthcare expenses dramatically [21].

The execution of correct hand washing processes must be undertaken and monitored to clear that Hand Hygiene compliance is completed, according to COHSASA standards in SE 8 Infection Prevention and Control, which are currently implemented in CHUK [22].

A gap of 64% shows that there is a problem that need to be addressed to improve the high quality of Healthcare delivered.To collect data, the adapted WHO observation tool was used and was validated because many researchers on Hand Hygiene use this tool reviewed in 2009. Data were collected in Accident and Emergency Department in room 9, Room 8, room 6, room 5, room 4, room 3, and room 1, Doctor's office, Manager's office, Nursing's station and Tea room.

The table 2 shows social demographic data that includes age, sex, education and experience of participants in the project study. According to the sex most were female that made a number of 23(57.5%), Male were 17(42.5%). Considering the age, majority of them were between 30-39years and made a number of 28 (70%). 20-29years were 2 (5%). 40-49 were 9(22.5%),50-59years was 1 (2.5%).Considering Education most of them were Nurses A1 that made a number of 29 (72.5%),Nurses A0 made a number of 4(10%),Nurses with master's degree were 2 (5%).Regarding experience the majority were between 10-14 years that made a number of 16(40%), 0-4years were 4(10%), 5-9years were 13(32.5%), 15-19years were 5(12.5%) ,20years and above were 2(5%)

Table 2 Social demographic of participants at the baseline data

		Number	**%**
SEX	Female	23	57.5
	Male	17	42.5
AGE	20-29years	2	5
	30-39 years	28	70
	40-49years	9	22.5
	50-59 years	1	2.5
EDUCATION	Nurse A1	29	72.5
	Nurse A0	4	10
	Master's Degree in nursing	2	5
	Medical Doctor	5	12.5
EXPERIENCE	0-4 Years	4	10
	5-9 years	13	32.5
	10-14 years	16	40
	15-19Years	5	12.5
	20 and Above	2	5

The table 3 shows the indication to Hand Hygiene to know: Indication 1: Before touching a patient, Indication 2: Before aseptic procedure, Indication3: After body fluid Exposure risk, Indication4: After touching a patient, Indication 5: After touching patient surrounding. Action means the applying practice of Hand Hygiene. When staff changed gloves after any indication this action is considered as missed (doesn't practice Hand Hygiene).

Table 3 Status of compliance to Hand Hygiene before intervention

		Frequency/Actions	**Percentage**
Action on indication1 before intervention	Hand Rubbing	14	35.0
	Hand Washing	4	10.0
	Missed	2	5.0
	Gloves	20	50.0
Opportunity		**40**	**100**
Action on indication 2 before intervention	Hand Rubbing	5	12.5
	Hand Washing	16	40.0
	Gloves	19	47.5
Opportunity		**40**	**100**
Action on indication 3 before intervention	Hand Rubbing	7	17.5
	Hand Washing	14	35.0
	Missed	3	7.5
	Gloves	16	40.0
Opportunity		**40**	**100**
Action on indication 4 before intervention	Hand Rubbing	1	2.5
	Missed	24	60.0
	Gloves	15	37.5
Opportunity		**40**	**100**
Action on indication 5 before intervention	Hand Rubbing	6	15.0
	Hand Washing	5	12.5
	Missed	12	30.0
	Gloves	17	42.5
Opportunity		**40**	**100**

Source: Primary data

The table3 shows the five indications and the action performed for compliance among 200 opportunities. To indication one before intervention 14(35%) actions to hand Rub, 4(10%) actions to Hand wash, 20(50%) wore gloves and 2 (5%) missed. The compliance was 18 actions (39%)

Indication two, 5(12.5%) actions to Hand Rub; 16(40%) actions to hand washing; then worn gloves 19(47.5%), the compliance to the indication 21 actions (52.5%)

Indication three, 7(17.5%) actions to Hand Rub; 14(35%) actions to hand washing; then worn gloves 16(40%), Missed 3(7.5%) and the compliance to the indication 21 actions (52.5%).

Indication four: 1(2.5%) actions to Hand Rub; worn gloves 15(37.5%), Missed 24(60%) and the compliance to the indication 1 (2.5%).

Indication five: 6(15%) actions to Hand Rub; 5(12.5%) actions to hand washing; then worn gloves 17(42.5%), Missed 12(30%) and the compliance to the indication 11 actions (27, 5%).

The figure 1 show the practice performed (Hand washing or Hand rubbing) and missed (didn't practice or wore gloves) before intervention action applied to Hand Hygiene was 72(36%) and missed 128 (64%)

Hand Hygiene compliance before intervention was 36%, and showed a gap of 64%.

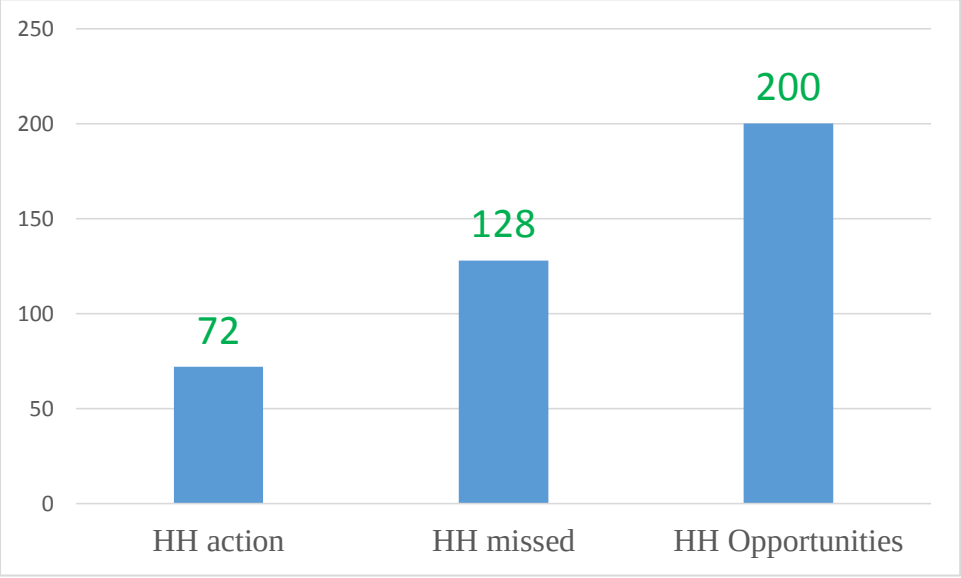

Figure 1 Graphical presentation of Hand Hygiene compliance at Accident and Emergency Department baseline data

1.3 Objective of the study

1.3.1. Main objective

To improve Hand Hygiene compliance from 36% to 70% from November 2021 to April 2022

We set an objective of 70% because of period we have in order to ensure the achievement. Whenever 70% is achieved we continue to monitor and sustain, and set another target of 100% after.

We also referred to the findings of other tertiary referral Hospitals which was around 70% eg the study conducted by Amalia Marjan Taryana (2019) showed a hole HH compliance of 74.5% in Neonatology Unit[23].in other study conducted by Siddharth Chavali at al reaveled an achievement HH compliance of 78% [24]. An intervention study conducted in China on improving Hand Hygiene compliance among health workers have shown that on 27,852 observations in 17months period, the rate of compliance with Hand Hygiene improved from 37.78% baseline to 75 .90% after intervention[25]

We have referred to the papers in setting such target of 70% of HH compliance.

1.3.2. Specific objectives

1. To assess the compliance rate to Hand Hygiene

2. To identify the real root cause.

3. To identify and apply the interventions for increasing Hand Hygiene compliance

1.4 Hypothesis

H0: Initiating and displaying voice audio and reminder posters will not improve the compliance to Hand Hygiene in healthcare workers of Accident and Emergency at CHUK.

HA: Initiating and displaying voice audio and reminder posters will improve the compliance to Hand Hygiene in healthcare workers of Accident and Emergency at CHUK.

1.5 Justification of the study

To improve Hand Hygiene Compliance will help the healthcare workers to improve practical skills and knowledge to apply Hand Hygiene practice and this reduces the transmission of Hospital Acquired infection through the uncleansed hands and will improve the Hand Hygiene compliance which is the requirement of Accreditation standards.

The IPC reports show that from 2019 to May2021 compliance to Hand Hygiene reduced gradually from 53% to 42.7% and this was a challenge to high quality of Healthcare delivered for healthcare workers and patients, considering that Hand Hygiene often receiving critical patients with different critical conditions.

The situation alarmed researcher to conduct a quality improvement project which is to improve Hand Hygiene compliance at Accident and Emergency to address the problem.

I.6 Organization of the study

The capstone Dissertation is divided into six main chapters. The chapter one introduces the settings background, Chapter two is for literature review on how quality improvement projects can improve hospital efficiency, Chapter three describes the methodology design of the project., Chapter four present the Results of the implementation, Chapter five is for discussion and explain if the intervention has been succeeded or failed and Chapter six states the conclusion and recommendation of the project.

CHAPTER TWO: LITTERATURE REVIEW

2.1 Introduction

The purpose of the project chapter was to give various facts and information about hand hygiene compliance. It provides a general overview of hand hygiene. It also provides an overview of the empirical research on Hand hygiene compliance. I t also went over many studies that have been done on the aforesaid topic in greater depth, as well as the research gaps that have been identified across these studies.

2.2 Theoretical literature review.

WHO defines hand hygiene as the primary measure to reduce infection as simple action, however the lack of compliance among healthcare is problematic worldwide[10]. Based on the research into the aspects influencing HH compliance and best strategies , new approaches have proven effective [10].Hand Hygiene is the most essential infection control measure in medical care that has been shown to reduce the incidence of hospital-acquired infections[26]. However, maintaining constant appropriate Hand Hygiene in healthcare settings is a major problem, and the burden of healthcare-associated infections (HAIs) is higher in LMICs than in high-income nations [26]. Moreover Hand Hygiene is the crucial critical intervention in the healthcare settings to reduce the Hospital acquired infection and the transmission of microorganisms which resist to multidrug. In hospital settings, around the world, compliance with Hand Hygiene has remained low at 40% of the total [27].Hand Hygiene compliance is defined as "a Hand Hygiene action performed before touching a patient, before aseptic procedure, after a procedure or body fluid exposure risk, after touching a patient, after touching a patient's surroundings"[26].

Additionally, relationship between Hand Hygiene and the reduction of infections in hospitals is well known; however, a systematic review of 96 empirical studies, including 65 studies in intensive care units, found that the median Hand Hygiene adherence rate was only 40%. Several other studies have reported similarly poor adherence to Hand Hygiene recommendations by health care workers (HCWs),however many factors contribute to HCWs' low compliance to Hand Hygiene, include a lack of understanding and training on why, when, and how to perform Hand Hygiene during healthcare delivery. Noncompliance has also been linked to a high workload and particular medical specialties. Lack of suitable products, limited time, inaccessible hand washing supplies, forgetfulness, and understaffing are all reasons that affect Hand Hygiene adherence [28].

According to Semmelweis' observation in 1847, Hand Hygiene has regularly proven to minimize hospital-acquired illnesses [13],therefore encouraging hand hygiene practice by involving patient and healthcare is a best strategy to improve the safety and the quality of healthcare workers in preventing the transmission of infection, antimicrobial resistance and ensure the efficiency of Healthcare at low cost [29]. Moreover, Hand Hygiene should be done before touching the client in order to protect him/her against colonization of microbe and exogenous infection, by pathogenic germs carried on the hands. Before clean or aseptic procedure hand washing should be done in order to prevent the infection to the patient and pathogenic germs. [29]

Whenever healthcare is provided, the hands are the highly involved germs transmission and therefore Hand Hygiene is also the best important measure to avoid the transmission of pathogenic germs and prevent HCAIs [9].WHO established the concept of my Five Moments of Hand Hygiene in healthcare settings to reduce HCAIs in 2009, as well as procedures for hand rub, and hand washing [9].

The figure 2 indicates the five moment to practice Hand Hygiene to know: before touching a patient, before aseptic procedure, after body fluids exposure risk, after touching a patient,

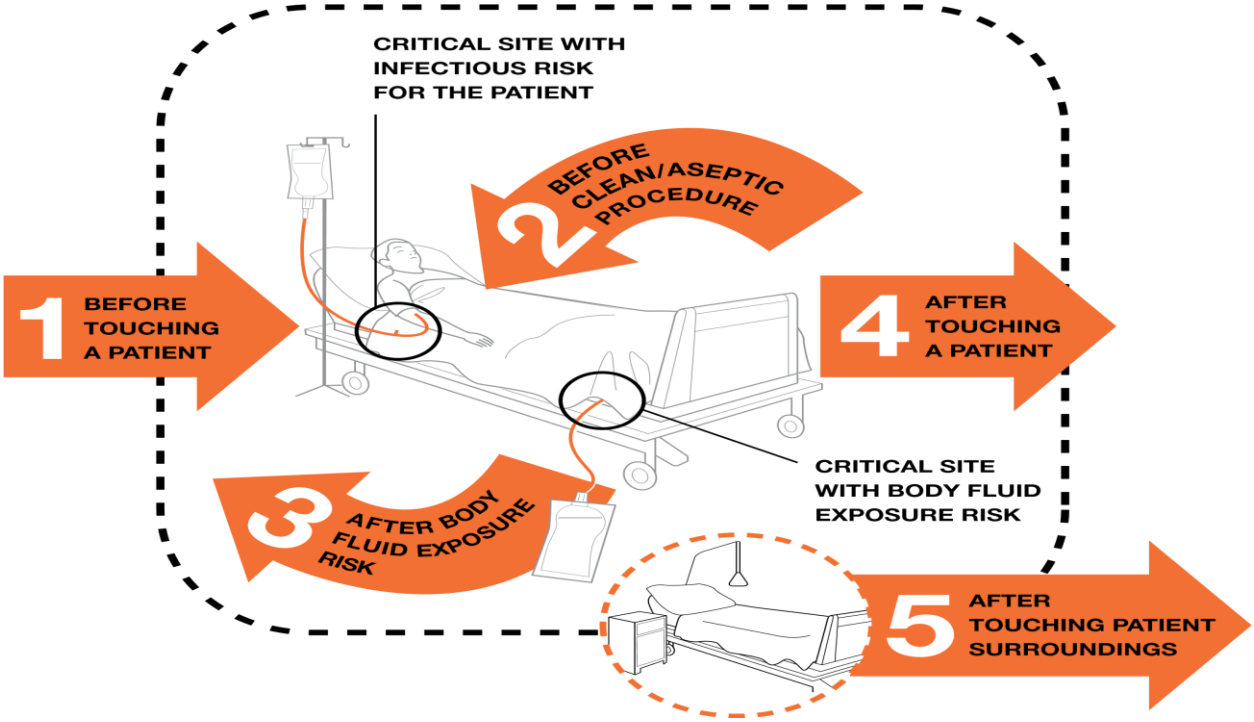

Figure 2: Five moment of Hand Hygiene

Source: WHO,(2009) [30]

The figure 3 indicates when and why to perform Hand Hygiene for each indication.

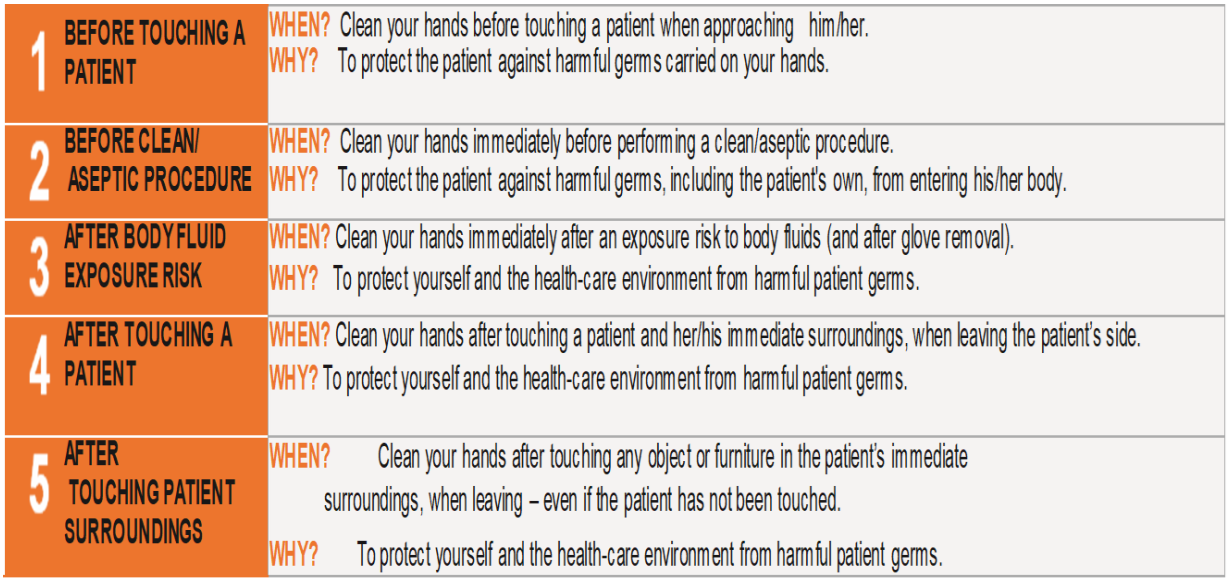

Figure 3 When and why Hand Hygiene

Sources: WHO (2009)

The figure 4 indicates the appropriate procedure to practice Hand washing.

Figure 4 Hand wash Procedure

Source: (WHO 2009)

The figure 5 illustrates the appropriate procedure to hand rub.

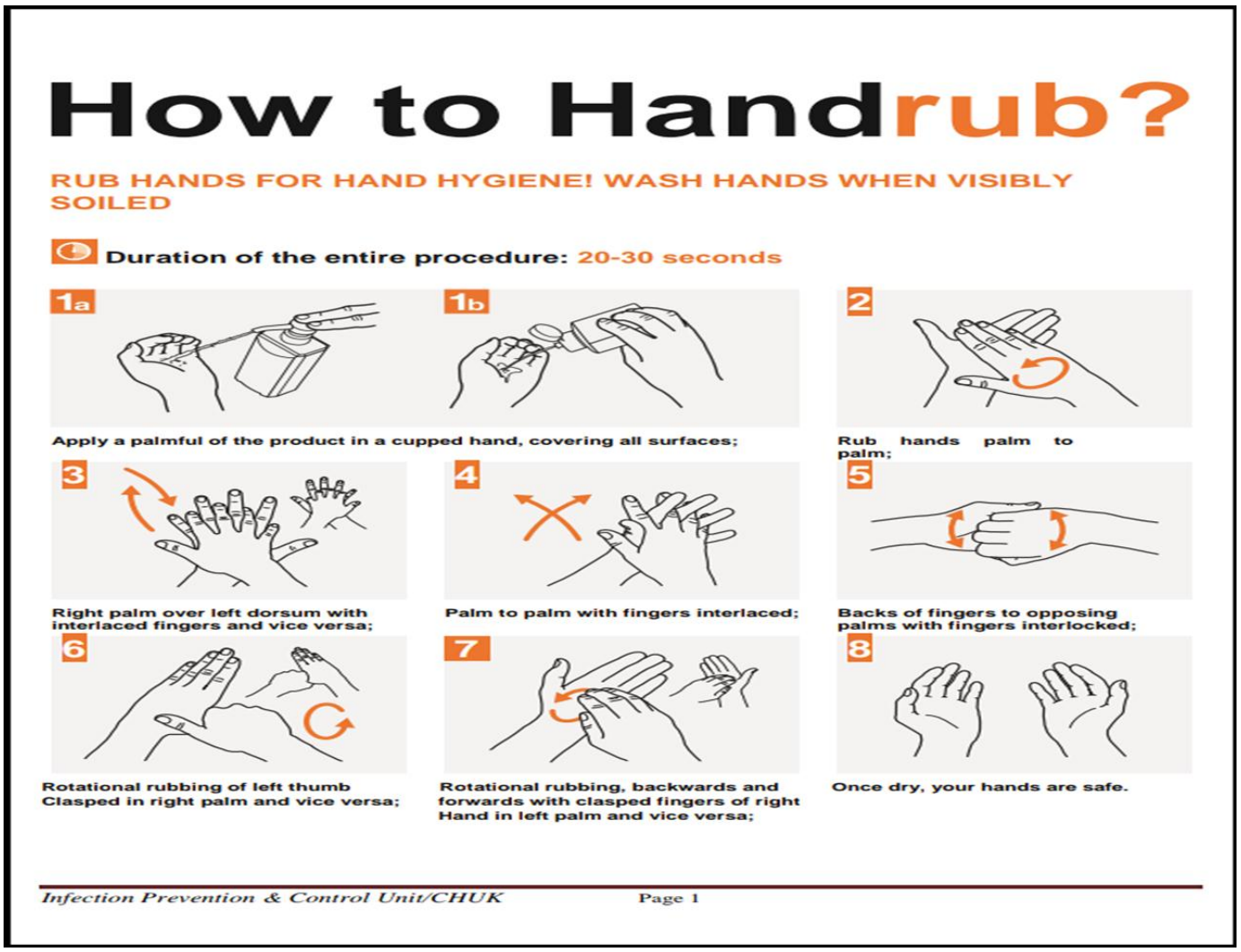

Figure 5 Hand Rubbing procedure

Source: (WHO 2009)

Hand Hygiene performed well and on real time the best strategy to protect someone and /the family from getting sick by keeping healthy and prevent the spread infections[31] in fact the pathogenic germs can spread from person to person or surface to person.

2.3. Empirical Literature

The study conducted in Southeast Asia showed that when healthcare provider had a good understanding of Hand Hygiene standards, they cannot need receiving the reminders from patients. Among the challenges to HH listed, there are limited resources, overcrowding, staff shortage, allergic reaction to hand sanitizers, and, forgetfulness, lack of reminders, lack of awareness. The total compliance rate was 31%; physicians had the lowest percentage of

compliance (15%), while nurses had the highest rate (39%)[32]. Intervention study conducted in China on improving hand hygiene compliance among healthcare workers have revealed that on 27,852 observations in 17months period, the compliance rate with hand hygiene improved from 37.78% baseline to 75 .90% after intervention [25] .

The study conducted at Teaching Hospital of Juba in South Sudan on assessment of skills and level of knowledge of hand washing among health care workers showed that the majority (62.7%) had no hand washing training within the last three years[33].Another study conducted in Japan, on Improving Hand Hygiene Adherence among Healthcare Workers before Patient Contact with objective of evaluating Hand Hygiene adherence among physicians and nurses before touching hospitalized patients and to evaluate changes in Hand Hygiene adherence after a multimodal intervention which was implemented The study showed that there were 2,018 patient observations pre-intervention and 1,630 post intervention[34] and overall, Hand Hygiene adherence improved from 453 of 2,018 pre-intervention observations (22.4%) to 548 of 1,630 post intervention observations (33.6%) and rate improved more among nurses (13.9 percentage points) than among doctors (5.7 percentage points) [35].Referring to the study done on factors Affecting Hand Hygiene Adherence at a Private Hospital in Turkey demonstrated that Hand Hygiene and hygiene adherence rate of trained doctors was higher than untrained ones before patient contact and after environment contact 48%(35/73) versus 82% (92/113).Hand Hygiene adherence rate of trained nurses was higher than untrained ones before patient contact and this study showed that hand antiseptic were used when hand washing was not possible[36].

Moreover, the study conducted in Ethiopia, on Hand Hygiene compliance and associated factors among healthcare providers in Central Gondar zone public primary hospitals northwest Ethiopia showed that the prevalence of HH compliance from observation was 14.9%, above half 181 (54%) of the respondents were knowledgeable about Hand Hygiene compliance,140 (41.8%) of the respondents were trained about Hand Hygiene compliance and 177 (52.8%) assured the presence of alcohol-based hand rub in their working area [37]. The same study demonstrated that knowledge of all steps of Hand Hygiene, five moments of Hand Hygiene, Hand Hygiene training, promotion for Hand Hygiene in the hospital, adequate soap and water for Hand Hygiene, adequate individual or wall matted alcohol-based hand rub for Hand Hygiene, posters for Hand Hygiene, protocol for Hand Hygiene, were significantly founded to be associated variables with the Hand Hygiene compliance of health care providers [37]. The study conducted in Finland on Hand Hygiene Compliance by hospital

staff and incidence of health care-associated infections concluded that the compliance of doctors and nurses with hand-hygiene practices improved with direct observation and feedback, and the change was associated with a decrease in the incidence of health-care-associated infections [38]. In same context in Nigeria, the research conducted on hand hygiene facilities assessment and healthcare providers adherence in a tertiary health care setting in northern revealed that 87% units did not have alcohol-based hand rubs (ABHRs), (72%) units had no reminder posters or written policy and procedure on hygiene, Soap or liquid hand wash was always available only in 24 units at 52%, nineteen (42%) of the units used multiple-use cloth-towel for hand drying which were changed daily on the average the study showed that there were no paper towels in any of unit and hand driers which are automatic [15].

In Rwanda, the study done with objective of assessing the possibility of the implementation of effective HH practices revealed that ensuring availability of supplies and training are the important keys to hand hygiene practice [7,8], Boniface Hakizimana conducted the study on HH improvement in Rwanda and revealed that the baseline data on hand hygiene adherence complied to 6.25%. The intervention was implemented from 2012 to 2013 and included provision of hand hygiene supplies, train of healthcare workers to HH practice, and displayed of reminders posters in the workplace. The evaluation post intervention of hand hygiene practice was done in 2015, and revealed an average score of 20.86% therefore there were 58 hand hygiene actions from 278 hand hygiene opportunities An improvement of 14.61% of hand hygiene practice (6.25% in 2012 to 20.86% in 2015) was noted [34].

CHAPTER THREE: METHODOLOGY

3.1 Study designed

The study was pre and post intervention in nature, and focused on improving Hand Hygiene compliance at Accident and Emergency Department. The researcher worked with a hospital team from IPC unit and Accidents and Emergency Department on the Quality improvement research project. Team members were A&E Matron, IPC unit Manager, IPC Officers, A&E Unit Manager, Specialist Doctor, QI Focal point, A&E, IPC Link at A&E, Customer care officer, Team Leader: Researcher, Continuous Quality improvement Officer.

The baseline data was collected from November to December, 2021 using WHO Hand Hygiene observation tool.200 opportunities were observed in pre and post intervention in in forty staff five Medical Doctors and Thirty five Nurses from Accident and Emergency Department and convenience method was used in period of observation .The results obtained from the baseline was used to measure the magnitude of the problem. We also conducted the root cause analysis to identify the real root cause. Alternative interventions were generated with the help of a decision matrix table. The best intervention was selected and implemented according to established implementation plan using the Gantt chart tool. Thereafter, the evaluation was carried out from March to April, 2022 to ensure the effectiveness of intervention.

3.2. Root cause analysis

We used to find out the possible causes of low compliance to hand hygiene in A&E department. The process of identifying the possible causes of problems and analysis in order to generate appropriate solutions is known as root cause analysis (RCA).By describing the different tools to use to verify each cause in the process to find out the real root cause [39].

3.3. Sample size

A sample of 200 opportunities were observed among 40 staff (5 Medical doctors and 35 nurses) on Hand Hygiene practice before and after the intervention. In WHO Hand Hygiene technical reference manual said that between 150 and 200 opportunities for hand hygiene should be assessed in Department or service [40]. We referred to that technical manual to set the opportunities to consider (200 opportunities).

3.4. Sampling technique

The 200 opportunities were conveniently observed in 40 staff on Hand Hygiene practice in planned period (November to December 2021) before intervention, and Medical doctors and Nurses were present in the period were taken in consideration.

3.5. Data collection Method

3.5.1. Baseline data collection procedure

The baseline data collection from November to December 2021, described the magnitude of the Problem. The nurses and doctors working at Accident and Emergency Department were observed on Hand Hygiene compliance before touching a patient, before aseptic procedure, after body fluid exposure risk, after touching a patient, after touching patient surrounding and a selected team was helping to carry out data collection.

3.5.1.1 Tool

The WHO Hand Hygiene observation tool was used to collect data

3.5.1.2. Sample

The World Health Organization (WHO) Hand Hygiene Observation tool was used to observe 200 opportunities in 40 staff of Accident and Emergency department to determine the action performed as the compliance to Hand Hygiene.

3.5.2. Conduct Root Cause Analysis

All stated possible causes were listed, verified to identify the real root cause.

A team of Nurses and doctors at Accident and Emergency department stated the possible causes of low compliance to Hand Hygiene. All listed possible causes were recorded on Fishbone diagram (Ishikawa Diagram or Cause Effect Diagram) in the four categories on Fishbone according to their nature to know: People, Equipment, Environment, and Policy/Process.

Recorded possible causes were verified to ensure that they were real root cause or not.

The figure 6 shows the record of all possible causes of low compliance to HH on fishbone.

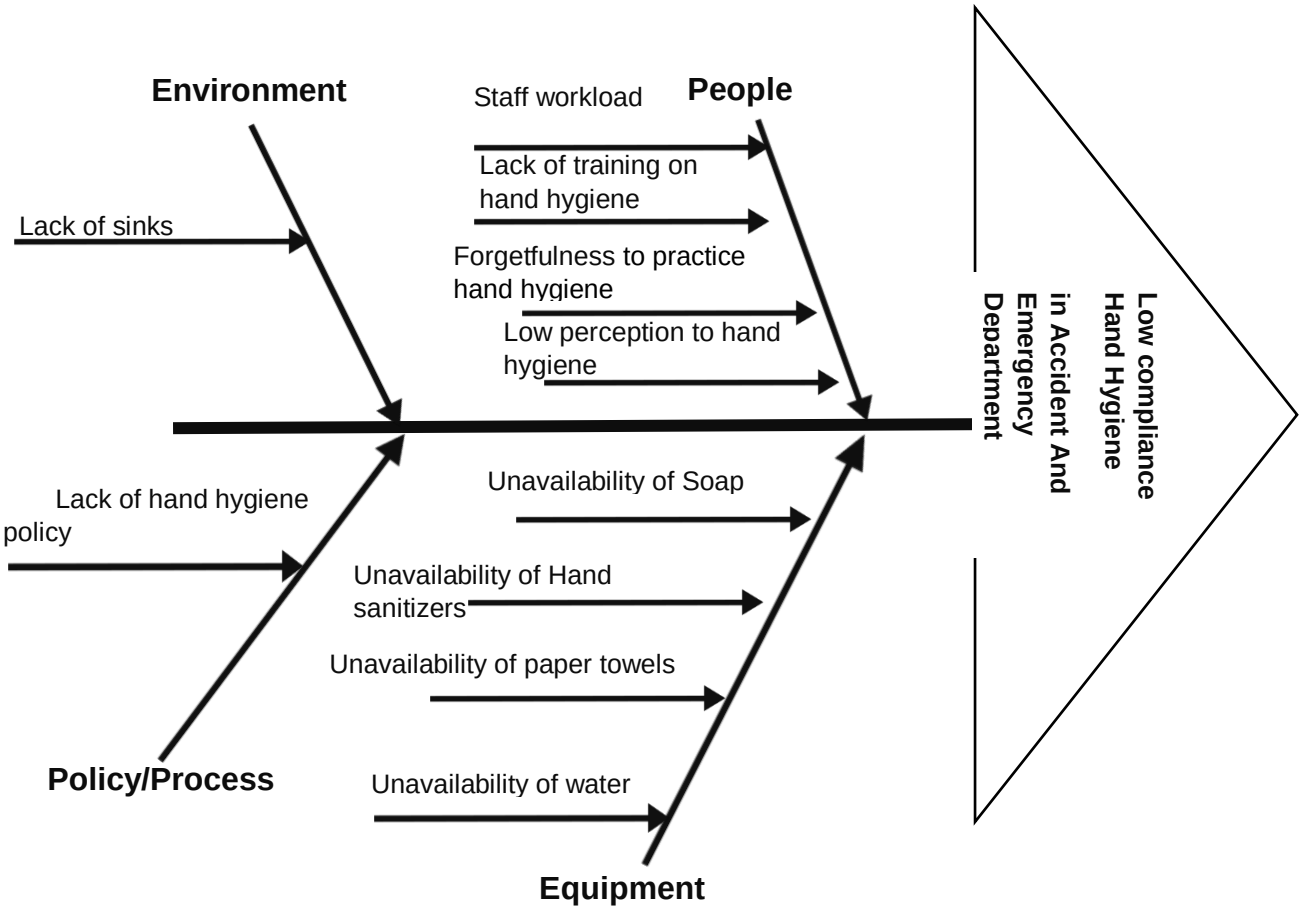

Figure 6 Fishbone Diagram

3.5.2.1. Verification of possible causes

All possible causes were verified for each possible cause data was collected and analyzed prior to the final root cause.

Staff workload: We have considered the number of staff and number of beds.

The total number of staff was 52 in total: 46 Nurses, 3 Medical practitioners, 3 Specialist Doctors and the number of the beds are 29 and the nurse patient ratio is 46/29=1.5 which is comply with normal standards. Therefore, Staff workload is not the cause of low compliance of Hand Hygiene. In Rwanda, study conducted by Munyiginya (2016) showed, as in many other countries, a 1:1 nurse patient ratio is generally considered adequate to meet the needs of critically ill patients. A 1:2 or greater nurse-patient ratio is used for stable patients [20].therefore the workload is not the real root cause of low compliance to Hand Hygiene.

Lack of training of staff on Hand Hygiene: Using Self-administered questionnaire, findings showed 87.5% were trained on HH practice in last three years and using current attendance lists, the analysis showed that 75% were trained on Hand hygiene practice and therefore the lack of training is not the real root cause of low compliance to Hand Hygiene.

Forgetfulness to practice Hand Hygiene: At time of verifying to the real root cause, using self-administered questionnaire, 90% highlighted forgetfulness to practice Hand Hygiene contribute to the low compliance to Hand Hygiene. It was also discussed in the meeting of 22 staff, 20 among them (90%), highlighted the forgetfulness as the major cause of low compliance to Hand Hygiene

Low perception to Hand hygiene process : Self-administered questionnaire was provided to the staff and after analyzing, the findings showed that staff perceive the importance of Hand Hygiene at 72 % this score showed that the staff had a good perception to Hand Hygiene therefore low perception it is not the cause of low compliance to Hand Hygiene.

EQUIPMENT

Unavailability of Soap: The observation was done 4 times in two weeks and using checklist, the soap was available in the 11 places (wards),Ward 9(Resuscitation room), Ward 8 (Post resuscitation room), Ward 6(Pharmacy), Ward 5 (Procedure room), Ward 4(Examination room), Ward 3 (Observation Room), Ward 1(Isolation room), Nursing station, Doctor's office, and Manager's office, Reception, therefore the soap isn't cause of Hand low compliance to hygiene.

Unavailability of Hand sanitizers: The observation was done 4 times in two weeks and using checklist, the soap was available in the 11 places (Rooms), Room 9(Resuscitation room), Room 8 (Post resuscitation room), Room 6(Pharmacy), Room 5 (Procedure room), Room4(Examination room), Room 3 (Observation Room), Room 1(Isolation room), Nursing station, Doctor's office, and Manager's office, Reception, therefore hand sanitizer isn't cause of Hand low compliance to hygiene.

Unavailability of paper towels: The observation was done 4times in two weeks and using checklist, the soap was available in the 11 places (wards), (Rooms), Room 9(Resuscitation room), Room 8 (Post resuscitation room), Room 6(Pharmacy), Room 5 (Procedure room),

Room4(Examination room), Room 3 (Observation Room), Room 1(Isolation room), Nursing station, Doctor's office, and Manager's office, Reception, therefore paper towels isn't cause of Hand low compliance to hygiene.

Unavailability of water: The assessment done 2 times in a week and showed that water was available in the 11 places (wards),Ward 9(Resuscitation room), Ward 8 (Post resuscitation room), Ward 6(Pharmacy), Ward 5 (Procedure room), Ward 4(Examination room), Ward 3 (Observation Room), Ward 1(Isolation room), Nursing station, Doctor's office, and Manager's office, Reception, therefore water isn't cause of Hand low compliance to hygiene.

ENVIRONMENT

Unavailability of sinks: The assessment was done once and showed that sinks are available in the 11 places (wards),Ward 9(Resuscitation room), Ward 8 (Post resuscitation room), Ward 6(Pharmacy), Ward 5 (Procedure room), Ward 4(Examination room), Ward 3 (Observation Room), Ward 1(Isolation room), Nursing station, Doctor's office, and Manager's office, Reception and all were well functional, therefore water was not the cause of Hand low compliance to hygiene.

POLICY/PROCESS

Availability of Hand Hygiene policy: The assessment was done once, the Hand Hygiene Policy was found in Policy and procedures file and is accessible to all staff who need it, and was trained to staff and the attendance list was made, therefore the Hand Hygiene policy was not the cause of low compliance to Hand Hygiene

3.6. Identification of real root cause

Suggested root cause	Information to prove or disprove	The findings	Accept/reject
Staff Overloaded	Staff workload	46 nurses/29beds,3 General practitioners/29, 3 Specialist doctors/29 The Nurse patient ration standard is 1:1 and at A&E nurse patient ration is 1.5:1	**Rejected**
Lack of training of staff on Hand Hygiene	Number of trained staff	The findings from Self-administered questionnaire showed 87.5% of staff were trained in last three years. And in service training, the attendance lists, analysis showed 75% were trained a training on Hand Hygiene in three months of current year	**Rejected**
Forgetfulness to practice Hand Hygiene practice	Number of staff who forget to practice HH	According to the findings from observation tool analysis on Hand Hygiene, 90% highlighted forgetfulness to practice Hand Hygiene contribute to the	**Accepted**

		low compliance to Hand Hygiene. It was also discussed in the meeting of 22 staff, 20 among them (90%), highlighted the forgetfulness as the main cause of low compliance to Hand Hygiene.	
Low perception to Hand	Perception of staff to HH	The findings from data analysis in SPSS showed that the perception was 72% to Hand Hygiene	**Rejected**
Unavailability of Soap	Availability of soap	11places(rooms) were observed 4 times in two weeks s observation in two weeks and soap was available	**Rejected**
Unavailability of Hand sanitizers	Availability of hand sanitizer	11places(rooms) were observed 4 times in two weeks, hand sanitizer was available	**Rejected**
Unavailability of paper towels	Availability of paper towel	11places(rooms) were observed 4 times in two weeks, paper towel was available	**Rejected**

Unavailability of water	Availability of the water	11places(rooms) were observed 2 times in one week, the water was available	**Rejected**
Unavailability of sink	Availability of sink	11places(rooms) were observed once and sinks were available and functional	**Rejected**
Unavailability of Hand Hygiene policy	Availability of HH Policy	Hand hygiene policy was available, accessible to the staff and were trained on it	**Rejected**

The Real root causes was Forgetfulness to practice Hand Hygiene and was highlighted by other researchers to be a cause of low compliance to Hand Hygiene In self-administered questionnaire, 90% highlighted forgetfulness to adhere to Hand Hygiene contribute to the low compliance to Hand Hygiene. It was also discussed in the meeting of 22 staff, 20 among them (90%), highlighted the forgetfulness .[8,36,41–44]. In other hand Mahlagha Dehghan (2021) highlighted among barriers to Hand Hygiene include also inappropriate attitude and wrong behavioral patterns, in which was incorporate the forgetfulness. [45] According to the Study conducted by Madeleine Sands highlighted the forgetfulness as barrier to Hand Hygiene [46].Another study conducted in Uganda showed that forgetfulness is also a barriers to Hand Hygiene [47]. In other side, Yetunde (2018),in sub Saharan showed that forgetfulness is the causes of low compliance to Hand Hygiene [1]. Another study conducted by Kiprotich K(2021)in Kenya has shown the forgetfulness is a cause of Low compliance to Hand Hygiene [48].

3.7. Intervention

The team of Accident and Emergency Department, generated alternative interventions, after identifying the real root Cause. The comparative analysis were conducted in order to select the best intervention among those generated. The selection criteria based on

1. The impact of intervention that means the Effectiveness or how much the intervention will improve the problem

2. Time: that means how long it will take to work.

3. Feasibility: mean that there is a capacity or stakeholders to support the implementation.

4. Cost: to show if the implementation of intervention is expensive or cheap to carry out

The table 4 the interventions to initiate that are to set reminder audio and posters are in WHO multimodal Hand Hygiene improvement strategies that illustrates how interventions will read to education to behavior change when implemented.

Table 4 WHO Multimodal Hand Hygiene improvement strategies

Elements of strategies	**Tool**
System change	Availability of infrastructure that contain continuous water supplies, soap and towel paper and/or Alcohol based hand rub at point of care that facilitate the health-care workers to practice Hand Hygiene efficiently.
Training and Education	To train regularly all the healthcare workers on correct procedure of Hand washing and hand rubbing using WHO 5 moments for hand, Hygiene approach.
Evaluation and feedback	To monitor regularly the HH practices and infrastructure, along with related perceptions and knowledge among healthcare workers.
Reminders in workplace	To encourage and remind the health-care workers about appropriate indication and procedures and the importance of Hand hygiene and performing it.
Institutional safety climate	To raise the consciousness and perception to patient safety by considering the improvement of hand hygiene practice as high priority at all level of healthworkers to ensure active involvement of institution and individual.

Source: WHO, (2009)**,** a Guide to the Implementation of the WHO Multimodal Hand Hygiene Improvement Strategy.

The generated interventions were the following:

1. To develop and display the voice audio in work place
2. To develop and put in workplace HH reminder posters.
3. To set a system which tracks staff who don't practice Hand Hygiene.

Using comparative matrix table, it showed the Playing of the Voice audio on HH practice and Reminder posters in workplace helped to improve HH compliance by changing the behavior of forgetfulness at Accident and Emergency Department as the best intervention to address the low compliance to Hand Hygiene, then after the implementation plan was developed using Gantt chart. Intervention number one play Voice audio and reminders posters contributed to the education to behavior change of the staff of Accident and Emergency at department**"** was the best interventions it was the same intervention implemented in study done by Ibrahim Usman Muhammad said that the intervention of voice reminder improved HH compliance among HCWs in the entire hospital.[14,49,50] For **Impact**, this can have a great impact to have a big change. Then **Cost:** It is cheaper to prepare Voice audio on HH and reminder posters. **Time**: the time to prepare Voice audio on HH and reminder posters. Can take a short time and they are feasible and these may be effective. The best strategies to improve HH compliance are the crucial components in the implementation of IPC (Infection Prevention and Control) [51].

The table 5 is Decision Matrix Table, it helps to compare different interventions to select the best one (Priority).Four criteria are based on to know as follow: impact cost, time and feasibility. The minimum score is 1 and the maximum score is 5.

To select intervention, each criteria was ranked and the total scores calculated. The high score to the intervention was taken as high priority.

Table 5 Comparative analysis of alternatives (Using Decision Matrix Table)

	Impact	Cost	Time	Feasibility	Total
To make the voice audio to display at workplace	5	5	4	5	19/20
To write Reminder posters and display in workplace	5	5	4	5	19/20
To set a system (Camera or alarm) which tracks staff who don't practice Hand Hygiene after each indication	5	2	2	1	10/20

IMPLEMENTATION (Following Gantt chart)
Sources: Primary data

The implementation was referred to prepare Voice Audio and reminders posters which are extracted in WHO Multimodal Hand Hygiene Improvement strategy, which was used for behavior change where we had emphasized on component 4: Reminders in the workplace .We first of all met managers to explain the implementation of intervention. We wrote the script and recorded voice audio in January 2022, and displayed the voice audio and put in workplace in February 2022. The reminder posters were prepared and displayed in January and February 2022 at HH stations and remind about the appropriate indications and procedures for performing Hand Hygiene. They contribute to the education creating an environment and the perceptions that facilitate awareness-raising about patient safety issues while guaranteeing consideration of Hand Hygiene improvement as a high priority [40].Our interventions were supported by studies conducted by Feather, A and Hugonnet,S as cited by Aaron Lawson(2019),where highlighted that use of reminders posters and audio and signage improve HH compliance by 98% and lead also to 16,1% on HH compliance[52]

The similar study conducted by Ward at al as cited by M Issa et al (2022) revealed that the interventions such as reminders practical simulations, audio visual sounds significantly improve hand washing compliance[53].In other hand our interventions were the same as listed in study done by WHO said that in multimodal strategies to promote HH,the reminder posters placed in workplace revealed that was very effective to remind HCWs to wash their hands[4].In other study conducted by Morkos Fakhry highlighted that voice audio improve HH effectively and is not expensive [49] these evidences support our best intervention.

The research conducted by Hakizimana Boniface (2018) showed that it is possible and feasible to do the implementation of WHO Hand Hygiene improvement[34] and Madeline Sands found original Hand Hygiene intervention that used the Behavior change design approach is simple intervention compared to most Hand Hygiene initiatives in the literature and our study emphasized on playing voice audio and reminder posters [54].The intervention of playing voice audio and reminder posters of behavior change of the staff to Hand Hygiene was also supported by Mohammad Hossein Kaveh our study emphasized on playing voice audio and display reminder posters [55]. A research conducted at A&E showed that change behavior to Hand Hygiene through displayed audio and reminders posters can provide a good outcome to Hand Hygiene[56].Gould DJ highlighted the behavior change as a good intervention to improve Hand Hygiene our study focused on playing voice audio and displaying reminder posters [14].

Finally, the intervention number three "To set a system which tracks staff who don't practice Hand Hygiene" It can have a good impact and it requires high budget, a long time, and its feasibility is very low. After comparing, those three interventions, we have selected the two interventions; the voice audio in work place and HH reminder posters which also contribute to education to behavior change of the staff to Hand Hygiene at Accident and Emergency department" using playing voice audio and displaying reminder posters as the best intervention. The training and education on reminder posters preparation provision took place in February 2022. Manager in collaboration with researcher invited trainers from IPC Unit to prepare and provide training to the staff and was done in February 2022, in that month IPC officers prepared training materials (PPT presentation), and manager looked for a room for training, projector etc. Participants were invited by manager and training was provided by IPC officers and researcher and was done in February 2022. We also assigned staff to monitor IPC in each ward including Hand Hygiene and communication on Hand Hygiene about compliance, monitoring of Hand Hygiene Practice and was done in February and March 2022, Finally we conducted an evaluation of Hand Hygiene compliance to see if there was an improvement and was done in March and April, 2022 by researcher and IPC Officers and A&E Managers.

3.8. Measures

We measured four indicators among them three were process indicators and one outcome indicator as follows.

Table 6 shows 8 Indicators among them seven are Process Indicators and one is an Outcome Indicator

Table 6 Table of indicators

Indicator	Definition	Who	Where to get info	When
Written script to record(Process indicator)	Formulation of the script to record then revised from validation	Reseacher,Customer care(Journalist) A&E Managers	A&E	January, 2022
Recorded script in voice audio(Process indicator)	Validated script was recorded in voice audio	Researcher Customer care(Journalist)	A&E	January, April 2022
Recorded audio displayed(Process indicator)	The voice audio was displayed through A&E summoning system	Reseacher,Customer care(Journalist)	A&E	February, 2022
Prepared reminder posters(Process indicator)	Needed reminder posters were printed out	Researcher	A&E	January-February, 2022
Reminder poster displayed(Process indicator)	The reminder posters were displayed at HH station	Reseacher,and IPC Officer	A&E	January-February, 2022
Education and training (Process indicator)	All participants should be trained registered on attendance list	Researcher and IPC officers	A&E	February, 2022
Availability of training material(Process indicator)	All required Material to facilitate the training	IPC Officers and Researcher	A&E	February, 2022
Hand Hygiene compliance rate (outcome indicator)	% Compliance of hand Hygiene among staff of A&E	Researcher, IPC Officers	Accident and Emergency Staff	April,2022

Evaluation of the indicators

Before intervention there was no displayed voice audio at A&E.in implementation phase we have started formulating the script that took 3 days. Developed script was recorded in voice audio and took 2 days, during implementation the voice audio was displayed through A&E

summoning system for attention of all staff. In the same context the reminder posters were not available in some places. Required poster reminders were 33 in 11 places but only 15 were available and 18 were not available. In implementation we prepared, printed out and displayed all 18 HH reminder posters at workplace at the HH stations.

Education and training: The voice audio and reminder posters contributed to education of staff to change behavior of forgetfulness to adhere to hand hygiene practices. Refresher training was provided to 40 participants, where 5(12.5%) were not trained. They were trained in implementation phase. Referring to availability of training material, IPC trainers provided refresher training and training materials and power point presentation was prepared and soft copy kept by researcher.A&E Managers provided the projector and room for facilitation. The Overall compliance to Hand Hygiene after intervention was 68% from 36% before intervention with improvement of 32% which is a great improvement for the project. There was significance relationship between intervention and root cause because of initiating and play Voice audio and display the reminder posters at workplace contribute to address the behavior of forgetfulness to adhere to hand hygiene practice. Where there was an improvement of 32% in 2 months.

3.9. Data analysis procedure

The data collection for HH before and after intervention were used WHO Hand hygiene observation tool, entered and analyzed using SPSS Vers 25 and Paired sample T test was used to show the compliance to Hand Hygiene in pre and post intervention data to show also the improvement gained with statistical significance.

Checklist was used to assess the availability of Hand sanitizers, sinks, soaps and excel sheet was used for analysis

3.10. Ethical consideration

The researcher has gotten a Certificate when he completed online research Ethics course of Human Participation in Research, Thereafter the researcher was provided an ethical clearance offered by University of Rwanda, College of Medicine and Health Science (UR-CMHS), Institution of Review Board (IRB).After getting the Ethical Clearance we have applied for Ethical approval at University Teaching Hospital of Kigali in Research Ethics Committee. The Ethical approval was provided and allowed the researcher to conduct Quality improvement Project including data collection.

The Ethical approval also was submitted in A&E Department where the researcher conducted the Quality improvement project and were explained the QIP that was going to be conducted.

CHAPTER FOUR: RESULTS

The project objective was to improve Hand Hygiene compliance from 36%to 70%.

The implementation plan for the intervention was executed and nurses and doctors were involved in Quality improvement project.

The overall Hand Hygiene compliance after intervention was 68% from 36% before intervention.

Table 7 shows the indication to Hand Hygiene after intervention and actions carried out: Indication 1: Before touching a patient, Indication 2: Before aseptic procedure, Indication 3: After body fluid exposure.

Table 7 Status of hand hygiene compliance after intervention

		Actions	**Percentage**
Action on indication 1 after intervention	Hand Rubbing	24	60
	Hand Washing	8	20.0
	Gloves	8	20.0
opportunity		**40**	**100**
Action on indication 2 after intervention	Hand Rubbing	14	35.0
	Hand Washing	20	50.0
	Gloves	6	15.0
opportunity		**40**	**100**
Action on indication 3 after intervention	Hand Rubbing	19	47.5
	Hand Washing	12	30.0
	Gloves	9	22.5
opportunity		**40**	**100**
Action on indication 4 after intervention	Hand Rubbing	13	32.5
	Hand Washing	5	12.5
	Missed	8	20.0
	Gloves	14	35.0
opportunity		**40**	**100**
Action on indication 5 after intervention	Hand Rubbing	14	35.0
	Hand Washing	7	17.5
	Missed	2	5.0
	Gloves	17	42.5
opportunity		**40**	**100**

Source: Primary Data

The majority of participants performed very well indication 1 which is before touching a patient at 32 actions (80%) where hand rubbing accounted for 24 actions (60%) and 8 actions (20%) washed their hands. The remain 8 missed (20%) of participants never complied with Hand Hygiene action because they only changed Gloves which is against the Hospital Hand Hygiene policy.

On indication 2 which is before aseptic procedure, majority 20 actions (50%)to hand washing then 14 actions (35%) to hand Rubbing and 6wore gloves(15%) wore gloves that was considered as missed and the compliance to the indication was 85%.On the indication 3 which is after body fluid risk, the majority of participants performed hand rubbing at 19 actions (47.5%),then hand washing 12 actions (30%) and gloves 9(22.5%) but this is considered as missed. On indication 4 which is after touching a patient majority performed hand rubbing 13 actions(32.5%),then hand washing 5 actions(12.5%),missed 8 (20%) wore gloves14(35%) the compliance to the indication was 18 (48%).On indication 5 which is after touching patient surrounding majority performed hand rubbing 14 action (35%) then 7 actions (17.5%) performed for hand washing; 17(42.5%) wore gloves and 2(5%) missed and the compliance to the indication was 52.5%

The action shows practice to Hand Hygiene carried out by staff among the opportunities. The staff who changed gloves after any indication was considered as missed to mean didn't practice Hand Hygiene.

The formula applied to calculate the Hand Hygiene compliance was:

$$\text{Compliance (\%)} = \frac{\text{Actions} \times 100}{\text{Opportunities}}$$

The formula is from WHO Hand Hygiene observation tool where compliance shows the rate of practice of Hand Hygiene among Health workers.

Action means practice to Hand Hygiene (Hand washing or Hand rubbing)

Opportunity means the chance allowed to practice Hand Hygiene.

Therefore Compliance (%) = 136X100/200=68%

Where 136 are actions (Hand washing or Hand rubbing) performed in all opportunities and 200 opportunities are from 40 staff whose each one was observed on 5 indications to make 200 opportunities.

The figure 7 summarizes the compliance to Hand Hygiene by showing the action performed and not performed (Missed) out of 200 opportunities.

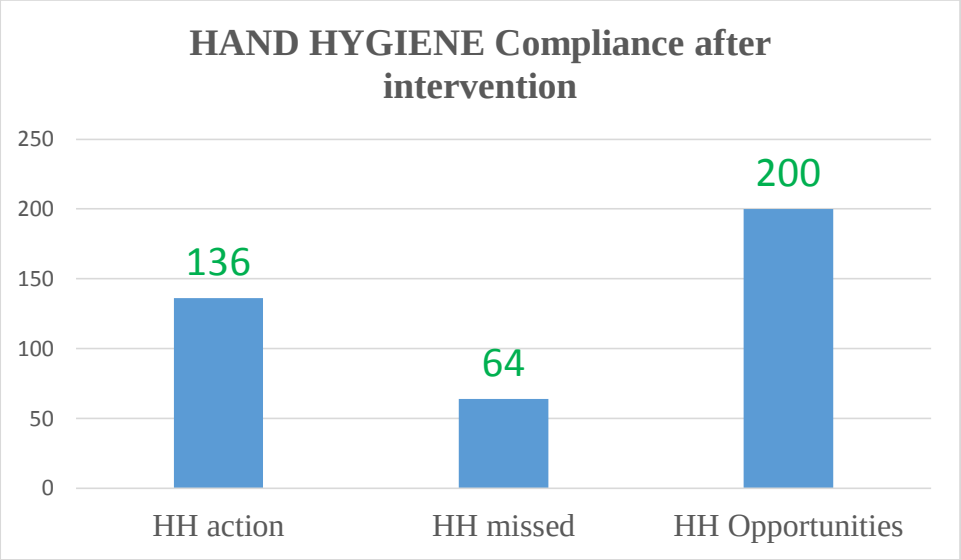

Figure 7 graphical presentation of Hand Hygiene compliance after intervention at Accident and Emergency Department

Sources: Primary data

The table 8 shows the compliance of Hand Hygiene for Nurses and Doctors, the result shows the Hand Hygiene compliance of Nurses and Medical doctors at each indication and action performed and the percentage. The action performed to hand rub and hand wash.

Table 8 Nurses and Medical Doctors compliance to Hand Hygiene before and after intervention

Indication 1 before intervention

	Action 1 before intervention			
	Hand Rubbing	Hand Washing	Missed	Gloves
Nurses	13(37.1%)	3(8.5%)	2(5.7%)	17(48.6%)
Medical Doctor	1(20%)	1(20%)	0	3(60%)

Indication 1 after intervention

	Action 1 after intervention		
	Hand Rubbing	Hand Washing	Gloves
Nurses	21(60%)	7(20%)	7(20%)
Medical Doctor	3(60%)	1(20%)	1(20%)

Indication 2 before intervention

	Action 2 before intervention		
	Hand Rubbing	Hand Washing	Gloves
Nurses	5(14.3%)	13(37.1%)	17(48.6%)
Medical Doctor	0(0%)	3(60%)	2(40%)

Indication 2 after intervention

	Action 2 after intervention		
	Hand Rubbing	Hand Washing	Gloves
Nurses	13(37.1%)	17(48.6%)	5(14.3%)
Medical Doctor	1(20%)	3(60%)	1(20%)

Indication 3 before intervention

	Action 3 before intervention			
	Hand Rubbing	Hand Washing	Missed	Gloves
Nurses	7(20%)	12(34,2%)	3(8.6%)	13(37.1%)
Medical Doctor	0(0%)	2(40%)	0(0%)	3(60%)

Indication 3 after intervention

	Action 3 after intervention		
	Hand Rubbing	Hand Washing	Gloves
Nurses	18(51.4%)	9(25.7%)	8(22.8%)
Medical Doctor	1(20%)	3(60%)	1(20%)

Indication 4 before intervention

4 after intervention

	Action 4 before intervention		
	Hand Rubbing	Missed	Gloves
Nurses	1(2.9%)	20(57.1%)	14(40%)
Medical Doctor	0(0%)	4(80%)	1(20%)

	Action 4 after intervention			
	Hand Rubbing	Hand Washing	Missed	Gloves
Nurses	10(28.6%)	4(11.4%)	8(22.9%)	13(37.1%)
Medical Doctor	3(60%)	1(20%)	0(0%)	1(20%)

Indication 5 before intervention

Indication 5 after intervention

	Action 5 before intervention			
	Hand Rubbing	Hand Washing	Missed	Gloves
Nurses	5(14.2%)	4(11.4%)	9(25.7%)	17(48.6%)
Medical Doctor	1(20%)	1(20%)	3(60%)	0(0%)

	Action 5 after intervention			
	Hand Rubbing	Hand Washing	Missed	Gloves
Nurses	13(37.1%)	5(14.2%)	2(5.7%)	15(42.8%)
Medical Doctor	1(20%)	2(40%)	0(0%)	2(40%)

Sources: Primary data

The table 8 shows how Nurses, Medical Doctors performed at each indication before and after intervention.

Indication1 before intervention, majority of Nurses wore gloves17 (48.6%), performed HR 13 actions (37.1%), Hand Washing 3 actions (8.5%), Missed 2(5.7%), for doctors performed HR 1 action (20%) Hand washing 1 action(20%) and wore gloves 3(60%).Indication 1 After intervention majority of nurses performed HR 21actions (60%) then 7 actions (20%) performed for HR,7(20%) wore gloves. Medical doctors performed Hand rubbing 3 actions (60%), Hand washing 1 action (20%).

In summary, for indication 1 Nurses complied to hand hygiene compliance was 45.6% before intervention and 80% after intervention, for Medical Doctors compliance before intervention was 40% and 80% after intervention

Indication2 before intervention, majority of Nurses wore gloves17 (48.6%), then 5 actions (14.3%) performed HR ,Hand Washing 13 actions (37.1%),For Medical doctors performed Hand washing 3 actions (60%) and wore gloves 2(40%).After intervention majority of Nurses Perform hand washing 17 actions (48.6%) then hand rubbing 13 actions (37.1%),wore gloves 5(14.3%).For Doctors 3 actions (60%) performed hand washing, 1 actions (20%) performed Hand Rub and 1(20%) wore gloves.

In summary, for indication 2 Nurses complied to hand hygiene compliance was 51.5% before intervention and 85.7% after intervention, for Medical Doctors compliance before intervention was 60% and 80% after intervention

Indication 3 before intervention, majority of Nurses wore gloves13 (37.1%), then 7 actions (20%) performed for HR ,Hand Washing 12 actions (34.2%),For Medical doctors performed Hand washing 2 actions (40%) and wore gloves 3(60%). After intervention majority of Nurses Perform hand rubbing 18 actions (51.4%) then hand washing 9 actions (25.7%) and wore gloves 8(22.8%). For Doctors 3 actions (60%) performed hand washing, 1 action (20%) performed Hand Rubbing and 1(20%) wore gloves.

In summary, for indication 3 Nurses complied to hand hygiene compliance was 54.2% before intervention and 77.1% after intervention, for Medical Doctors compliance before intervention was 40% and 80% after intervention

Indication 4 before intervention, majority of Nurses missed 20 (57.1%), then 1action (2.9%) performed for HR, wore Gloves 14(40%).For Medical doctors missed 4 (80%) and wore gloves 1(20%).After intervention, Nurses Performed hand washing 4 actions (11.4%) then hand rubbing 10 actions (28.6%),wore gloves 13(37.1%).For Medical Doctors 3 actions(60%) performed for hand rubbing, 1 action (20%) performed for Hand washing 1 (20%) wore gloves.

In summary, for indication 4 Nurses complied to hand hygiene compliance was 2.9% before intervention and 40% after intervention, for Medical Doctors compliance before intervention was 0% and 80% after intervention.

Indication 5 before intervention, majority of Nurses wore gloves 48.6%), then 5 actions (14.2%) performed for HR, 4 actions (11.4%) performed for hand Washing and missed 9(25.7%). For Medical doctors 3 (60%) missed; 1 action (20%) performed for Hand washing and 1 action (20%) performed for Hand rubbing. After intervention, Nurses Performed hand

rubbing 13 actions (37.1%) then hand washing 5 actions(14.2%), wore gloves 15(42.8%) and missed 2(5.7%). For Medical Doctors 1 action (20%) performed for hand rubbing, 2 actions (40%) performed for Hand washing and 2(24%) wore gloves.

In summary, for indication 5 Nurses complied to hand hygiene compliance was 25.6% before intervention and 51.3% after intervention, for Medical Doctors compliance to HH before intervention was 40% and 60% after intervention.

Table 9 shows Hand Hygiene compliance and improvement change in nurses and medical doctors at each indication in Pre and Post intervention.

Table 9 : Summary of Hand Hygiene compliance and improvement change in nurses and medical doctors

	Indication	**I**	**II**	**III**	**IV**	**V**
Nurses	**Pre intervention**	13(45.6%)	18(51.4%)	19(54.2%)	1(2.9%)	9(25.6%)
	Post intervention	36(80%)	30(85.7%)	27(77.1%)	14(40%)	18(51.3%)
	Improvement change	34.4%	34.3%	22.9%	37.1%	25.7%
Medical doctors	**Pre intervention**	2(40%)	3(60%)	2(40%)	0(0%)	2(40%)
	Post intervention	4(80%)	4(80%)	4(80%)	4(80%)	3(60%)
	Improvement change	40%	20%	40%	80%	20%

The indication **I**: means before touching a patient, **II**: Before aseptic procedure, **III**: after body fluids exposure risk, **IV**: after touching a patient, **V:** after touching patient surrounding

Nurse compliance to HH hygiene in pre-intervention in indication1:45.6% indication 2: 51, 4%; indication3: 54, 2%; indication 4:2.9%; indication5:25.6%

Nurses compliance to HH in post-intervention in indication1:80%; Indication 2:85.7%; indication 3:77.1%; indication4:40%; Indication 5:51.3%. Medical doctors compliance to HH hygiene in pre-intervention in indication1:40% indication 2:60%; indication3:40%; indication 4:0%; indication5: 40%.Medical doctors compliance to HH in post-intervention in indication1:80%; Indication 2:80%; indication 3:80%; indication4:80 %; Indication 5:60%.

The table 10 shows the overall compliance to Hand Hygiene in Nurses and Medical Doctors in pre and post intervention and the improvement change.

Table 10 overall Hand Hygiene compliance in Nurse and Medical Doctors

Nurses			**Medical doctors**		
Pre intervention %	Post intervention%	Improvement change%	Pre intervention %	Post intervention%	Improvement change%
35.9	66.8	30.9	36	76	40

The table11 shows the compliance to Hand Hygiene, Yes stands for practice hand washing or hand rubbing and no stands no practice to Hand Hygiene or wearing gloves

Table 11 Comparison of Hand Hygiene compliance before and after intervention

Action 1 before intervention			**Action 1 after intervention**		
	Frequency	%		Frequency	%
No(Missed and gloves)	22	55.0	**No** (Missed and gloves)	8	20.0
Yes(hand rub and hand wash)	18	45.0	**Yes** (hand rub and hand wash)	32	80.0
Action 2 before intervention			**Action 2 after intervention**		
	Frequency	%		Frequency	%
No(Missed and gloves)	19	47.5	**No** (Missed and gloves)	6	15.0
Yes (hand rub and hand wash)	21	52.5	**Yes**(hand rub and hand wash)	34	85.0
Action 3 before intervention			**Action 3 after intervention**		
	Frequency	%		Frequency	%
No(Missed and gloves)	19	47.5	**No**(Missed and gloves)	9	22.5
Yes(hand rub and hand wash)	21	52.5	**Yes**(hand rub and hand wash)	31	77.5
Action 4 before intervention			**Action 4 after intervention**		
	Frequency	%		Frequency	%
No(Missed and gloves)	39	97.5	**No**(Missed and gloves)	22	55.0
Yes(hand rub and hand wash)	1	2.5	**Yes**(hand rub and hand wash)	18	45.0
Action 5 before intervention			**Action 5 after intervention**		
	Frequency	%		Frequency	%
No(Missed and gloves)	29	72.5	**No**(Missed and gloves)	19	47.5
Yes(hand rub and hand wash)	11	27.5	**Yes**(hand rub and hand wash)	21	52.5

In table 11 shows overall compliance of nurses and Medical Doctors to Hand Hygiene compliance

The Nurses complied from 35.9% in pre intervention to 66.8% in post intervention with improvement change of 30.9% and Medical Doctors complied from 36% in Pre-intervention to 76% in post-intervention with an improvement change of 40%

Sources: Primary data

The table 12 below indicates the overall compliance based to the action performed to each indication. The action means practice to Hand Hygiene (hand rub or hand wash), The indication means the opportunity of practice Hand Hygiene such as (Indication I: Before touching a patient, Indication II: Before aseptic procedure, Indication III: After body fluid Exposure risk, Indication IV: After touching a patient, Indication V: After touching patient surrounding).The findings showed that action to all indications had a great statistical significance with the improvement ($P<0.05$).

Table 12 Hand Hygiene compliance referring to the action using statistical test

Indication	Healthcare workers	Action performed in Pre-intervention	Action performed in Post-intervention	Improvement change	P-Value
I	Doctors and Nurses	18(45%)	32(80%)	14(35%)	<0.001
II	Doctors and Nurses	21(52.5%)	34(85%)	12(32.5%)	<0.001
III	Doctors and Nurses	21(52.5%)	31(77.5%)	10(25%)	0.007
IV	Doctors and Nurses	1(2.5%)	18(45%)	17(42.5%)	0.002
V	Doctors and Nurses	11(27.5%)	21(52.5%)	10(25%)	0.0149

Table 12 shows an improvement change from intervention that was implemented Considering the indication 1 there is an improvement changes of 35% that was statistically significant (P<0.001),the indication 2 there was an improvement changes of 32.5% that was statistically significant (P<0.001),the indication 3 there was an improvement changes of 25% that was statistically significant (P=0.007),the indication 4 there was an improvement changes of 42.5% that was statistically significant (P=0.002),the indication 5 there was an improvement changes of 25% that was statistically significant (P=0.0149)

CHAPTER FIVE: DISCUSSION

The objective of the project was to improve the Hand Hygiene compliance among health workers on Hand Hygiene in A&E department. After implementation of interventions and evaluation of effectiveness of interventions, there was a great improvement of compliance to Hand Hygiene where there is an improvement gain of 32 %(From 36% before intervention to 68% after intervention)compared to study conducted by Erasmus (as cited in Yetunde2018),highlighted that the compliance to Hand Hygiene in developed countries was 40%[1] so the intervention was effective in A&E department as findings showed that overall score is 68%. For the current study the improvement was due to voice audio played at A&E department though summoning system and displayed the reminder posters at that contributed to education to behavior change of the staff to Hand Hygiene at Accident and Emergency Department that reduce the forgetfulness as highlighted by staff and was implemented through <WHO Multimodal Hand Hygiene Improvement Strategy which appearing the Reminders important for behavior change > by System change we had observed infrastructure in place allowed health-care workers to practice Hand Hygiene by considering access to a safe and continuous water supply as well as to soap and towels readily accessible alcohol-based hand rub at the point of care and we found they were available. Training / Education: it was provided on the importance of Hand Hygiene, based on the "My 5 Moments for Hand Hygiene" approach, and the correct procedures for hand rubbing and hand washing, to all health-care workers and explained the issues caused by HAIs.

For evaluation and feedback of monitoring Hand Hygiene practices communicated to health-care workers.

Reminders in the workplace, the reminders were displayed (posters, recorded voice audio) at the workplace where they were accessible to the health-care workers and reminds about the appropriate indications and procedures for performing Hand Hygiene. Institutional safety climate: During the education creating an environment to make Hand Hygiene a culture at Accident and Emergency Department.

The same intervention was implemented by Abdo Naglaa in his study (2018) and was effective where compliance improved from 58.81% to 73,17% and improvement gain of 14.36% (P<0.001)[12] which is consistently to our project.

Another study conducted in china the findings showed that after intervention there was an improvement from 37.7% before intervention to 75.90% after intervention, therefore the

study is closed to our quality improvement project that showed a significant improvement[25].

There was an improvement compliance to Hand Hygiene among nurses and medical doctors where Nurses improve from 35.9% to 66.8% with improvement change of 30.9% and medical doctors improve from 36% to 76% with improvement change of 40% that is consistently to the study conducted by Abdo Naglaa that showed an improvement in Nurses and Medical doctors was possible after implementing the intervention [12].Another study conducted in Jakarta revealed that there was an improvement on HH Compliance after intervention where compliance was from 27% at baseline and significantly improved to 77% post-intervention[57].

The findings from the study we have conducted showed that the Medical Doctors and Nurses complied to 76% and 66.8% respectively which is contrary to the study conducted in Vietnam where showed that Medical Doctors and Nurses complied at 15% and 39% respectively[32].

Normally, the intervention was effective and project was successful and the objective of study was achieved, when researcher presented the problem identified to the Managers and staff, they agreed as their own problem that need to be addressed. The involvement of leaders, managers, and staff, was a pillar to succeed. Again the project was feasible because to practice Hand Hygiene is to change the behavior to the staff and the voice audio displayed and reminder posters played a big role in the change. The availability of materials and facilities were available and therefore facilitated the success of the project.

Moreover, intervention had different tasks that include education and training to Hand Hygiene, reminders (posters, record audio displayed, communicate feedback, to monitors materials to Hand Hygiene), therefore the Hand Hygiene compliance was improved in A&E department.The display of reminder posters and recorded voice audio was accomplished, the refresher training and education will be continuous to behavior change because it take long the tasks of intervention implemented contributed to significant improvement of the project.

5.1. Challenges and how to overcome

Due to Covid-19, the Researcher found it challenging to implement an intervention that was based on behavior change. Changing people's behavior is an aspect that goes gradually and requires commitment that goes beyond three months. We managed to achieve the objective due to support from Hospital managers, IPC Managers and officers and IPC links. They were

committed to improve the compliance to Hand Hygiene in their specific Department at all costs.

5.2 MHA program help in the project

Through MHA program we have develop skills as analysis, in conducting Quality improvement project, solve problems strategically, communication, planning, research goal setting and team work. We are able to identify the barriers to high quality of healthcare delivered. The course of Strategic problem Solving helped us more, MHA was a key element to conduct and achieve the project because we learnt different steps such identification of the problem, setting the overall objective, Conduct the root cause analysis, generating alternative intervention, Perform comparative analysis of intervention, Selecting the best intervention, Doing implementation plan and implement finally Evaluation plan and evaluate We have well learnt and understood what to do at each step. The skills gained in different courses (for example Leadership Management and Governance, Strategic management that help to set priority, and decision making) gave as the ability and skills to be confident in conducting a good quality improvement project which improve also the Quality of healthcare delivered in healthcare settings.

5.3 Lesson learnt in the project

The lesson learnt during the implementation of intervention was to work hard, and involving management to accomplish all planned tasks and encouraging teamwork. We learnt about the variation in data**,** and not to be discouraged when scores are getting low but think to other strategies (using PDSA.) to put in place in order to address the problem.

5.4 Limitation of the project

The project was limited on Hand Hygiene compliance in Nurses and Medical doctors and didn't include Students, Residents, cleaners, patients and next of kin. The project was conducted in one department and not extent to other departments, and observation was limited to staff observed in period of November to mi December2022.The project was limited on Hand Hygiene compliance and not associated with HAIs. Development script was limited was displaying the voice not included displaying video.

CHAPTER SIX: CONCLUSION

6:1 Conclusion

Improving Hand Hygiene compliance among healthcare workers in Accident and Emergency at University Teaching Hospital of Kigali, was good project that aimed to improve the compliance to Hand Hygiene. It was believed that the trained staff on Hand Hygiene compliance will play a significant role in prevention of transmission of Healthcare associated infections not only in Accident and Emergency but also in other departments of CHUK. With the help of scientific problem solving approach, the project for improving Hand Hygiene compliance will continue until the target of the Hand Hygiene policy (100%) will be achieved and it is possible as shown the findings in short period. Quality improvement is a continuous process and through Scientific Problem Solving we will achieve more for entire Hospital.

6.2 Recommendation

We recommend to Ministry of health to sustain and make Hand Hygiene compliance a culture in all healthcare settings.

We recommend to the Hospital to sustain providing the Hand Hygiene materials, in order to sustain the compliance to Hand Hygiene by avoiding stock out and establish a system that help healthcare workers to adhere more to HH practice like system that tracks health care workers who do not perform HH Practice.

Managers of Department have to make Hand Hygiene a culture in the department by continuing education and training to Hand Hygiene and avail all supplies related to Hand Hygiene.

To set a new target whenever Hand Hygiene compliance is sustained to 70%. Many studies associate Hand Hygiene compliance to HAIs rate, but not yet conducted in A&E and we recommend to start the study that associate the Hand Hygiene compliance with the rate of HAIs to show the effectiveness of Hand Hygiene process.

As we initiated playing voice audio record Managers should think also to display video which help more to practice Hand Hygiene and ensure reminder posters kept displayed. To initiate a quantification system that help to calculate soap, paper towels, Alcohol based hand rub per staff.

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APPENDICES

Appendix 1: Self-administered questionnaire

Hand Hygiene department

FOR OFFICE USE ONLY	
Questionnaire Number	
Date	

INTRODUCTION

I'm NAMBAJE Juvenal, a post graduate student in Masters of Hospital and Healthcare Administration (MHA), College of Medicine and Health Sciences, University of Rwanda. To accomplish my post graduate studies, a Capstone has to be done. Therefore, I would like to collect data from you related to my study entitled: **"Improving Hand Hygiene compliance among Healthcare workers in Accident and Emergency Department at University Teaching Hospital of Kigali".**

I kindly request you to give as much information as possible to the best of your understandings
If you have questions you may ask them now or contact me on the following address.:

Tel: 0788611670 **E-mail**: njuvenal2020@gmail.com

INSTRUCTIONS

You are in direct contact with patient on a daily basis and this is why the researcher is interested in your opinion on hand hygiene practices and healthcare associated infection

1. The questionnaire is anonymous, please do not mentioned your name.
2. The questionnaire must be answered individually.
3. It should take about 10-15 minutes to complete this questionnaire.
4. Please read the questions carefully and then respond spontaneously. Your answers are anonymous and will be confidentially kept.
5. Tick the appropriate response by using (□) or fill in box or empty space as mentioned.
6. Your honesty is strongly appreciated.

SECTION I

SOCIO DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

QI: Gender of respondents

1	Female	
2	Male	

Q2: Age of Respondents

Q3: Qualification of respondents

1	Master's degree holder Nurse	
2	Bachelor's degree holder Nurse(A0)	
3	Advanced diploma holder nurse(A1)	
4	Secondary school diploma holder nurse(A2)	
5	General practitioner	
6	Specialist	

Q4: Years of working experiences

Q5: Did you receive any in-service training in Hand Hygiene in the last three years?

1	**YES**	
2	**NO**	

SECTION II

Q6: PERCEPTION ABOUT HAND HYGIENEAND HEALTHCARE INFECTIONS.

For each statement in the table below, Please tick one answer according to your opinion:

Statements		(1) Strongly Disagree	(2) Disagree	(3) Undecided	(4) Agree	(5) Strongly agree
Perceived susceptibility and perceived severity of healthcare associated infections						
6.1	Healthcare workers, patients and patient relatives are at risk of acquiring healthcare associated infections					
6.2	Healthcare workers are more vulnerable than other healthcare workers to contamination with health care associated infections since they are mostly in contact with patients					
6.3	Contaminated healthcare worker's hands impose the greatest risk of transmitting healthcare associated infections to patients, patient relatives and to oneself					
6.4	Health care associated infection is globally a major problem in hospitals					
6.5	Health care-associated infection is a major cause of preventable deaths and disability worldwide					
6.6	Health care associated infection is associated with prolonged patient hospital stay					
6.7	Health care associated infection causes high costs for the health systems					
6.8	Health care associated infection causes emotional stress for patients and their families.					
6.9	In general, the impact of health care-associated infection on a patient's clinical outcome is high					

Statements		(1) Strongly Disagree	(2) Disagree	(3) Undecided	(4) Agree	(5) Strongly agree
Perceived benefits of Hand Hygiene						
6.10	Hand Hygiene is the primary measure for preventing and reducing health care-associated infections					
6.11	Hand Hygiene is an economical method for reducing healthcare associated infections					
6.12	Hand Hygiene practices helps control epidemics in health-care facilities					
6.13	Hand Hygiene is cost-saving					
6.14	Hand Hygiene practice before touching a patient interrupts microbial transmission to the patient					
6.15	Hand Hygiene practice before a clean/aseptic procedure interrupts microbial transmission to the patient					
6.16	Hand Hygiene practice after touching a patient interrupts microbial transmission to the health care- worker					
6.17	Hand Hygiene practice after body fluid exposure risk interrupts microbial transmission to the health care- worker					
6.18	Hand Hygiene practice after touching patient surroundings interrupts microbial transmission to the health care- worker					
6.19	In general, the effectiveness of Hand Hygiene in preventing health care-associated infection is high					

Statements		(1) Strongly Disagree	(2) Disagree	(3) Undecided	(4) Agree	(5) Strongly agree
Your barriers for Hand Hygiene						
The following barriers interfere you with optimal Hand Hygiene:						
6.20	Perceiving Hand Hygiene as not convenient					
6.21	Lack of material (soap, paper towel)					
6.22	Allergic reactions with Hand Hygiene product					
6.23	Being too busy					
6.24	Forgetfulness					
6.25	Belief that when using gloves no need for Hand Hygiene					

THANK YOU VERY MUCH FOR YOUR TIME

Appendix 2: INFORMED CONSENT

I have read all the information about this study and I have gotten the opportunity to ask question about unclear question to me and any question I asked have been answered to my satisfaction.

I voluntary consent to participate as participant in this study.

Participant name …….

Participant signature……..

Date (day/month/year)…….

Statement by researcher and person taking consent: I confirm that the participant was given an Opportunity to ask unclear question about study, and all asked question were answered correctly.

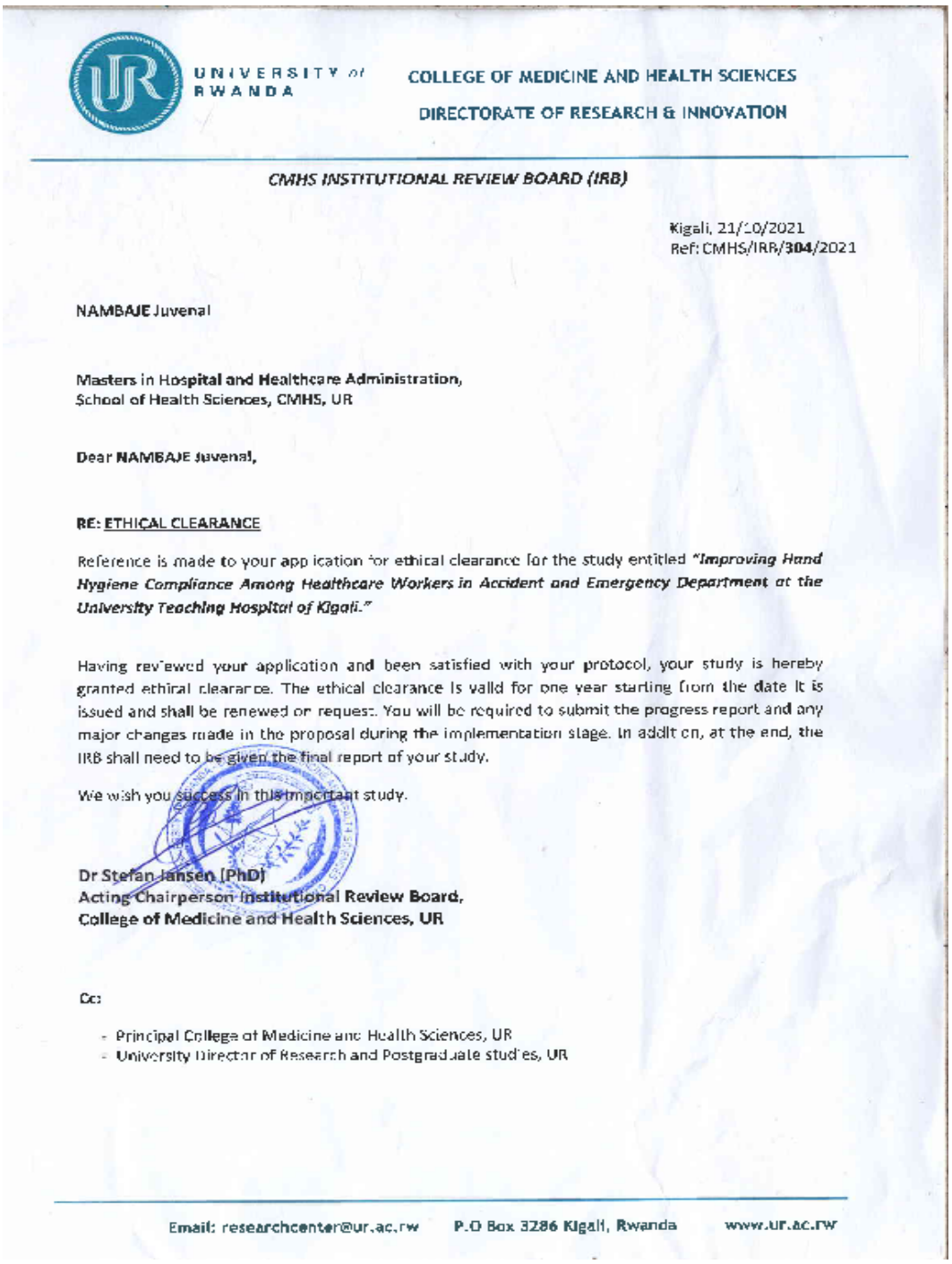
I confirm that the individual has not coerced into giving consent, and the consent has been given freely and voluntarily.

Researcher name:……

Researcher signature……

Date(day/month, year)……..

Appendix 3: ETHICAL CLEARANCE



UNIVERSITY of RWANDA

COLLEGE OF MEDICINE AND HEALTH SCIENCES

DIRECTORATE OF RESEARCH & INNOVATION

CMHS INSTITUTIONAL REVIEW BOARD (IRB)

Kigali, 21/10/2021
Ref: CMHS/IRB/**304**/2021

NAMBAJE Juvenal

Masters in **Hospital and Healthcare Administration,**
School of Health Sciences, CMHS, UR

Dear **NAMBAJE** Juvenal,

RE: ETHICAL CLEARANCE

Reference is made to your application for ethical clearance for the study entitled ***"Improving Hand Hygiene Compliance Among Healthcare Workers in Accident and Emergency Department at the University Teaching Hospital of Kigali."***

Having reviewed your application and been satisfied with your protocol, your study is hereby granted ethical clearance. The ethical clearance is valid for one year starting from the date it is issued and shall be renewed on request. You will be required to submit the progress report and any major changes made in the proposal during the implementation stage. In addition, at the end, the IRB shall need to be given the final report of your study.

We wish you success in this important study.

Dr Stefan Jansen (PhD)
Acting Chairperson Institutional Review Board,
College of Medicine and Health Sciences, UR

Cc:

- Principal College of Medicine and Health Sciences, UR
- University Director of Research and Postgraduate studies, UR

Email: researchcenter@ur.ac.rw P.O Box 3286 Kigali, Rwanda www.ur.ac.rw

Appendix 4:Ethical approval

CENTRE HOSPITALIER UNIVERSITAIRE
UNIVERSITY TEACHING HOSPITAL

Quality Health Care Training & Research

Ethics Committee / Comité d'éthique

5th Nov,2021 *Ref.:EC/CHUK/119/2021*

Review Approval Notice

Dear Juvenal NAMBAJE,

Your research project: ***"Improving Hand Hygiene compliance among healthcare Workers in Accident and Emergency department at University Teaching Hospital of Kigali "***

During the meeting of the Ethics Committee of University Teaching Hospital of Kigali (CHUK) that was held on 5th Nov,2021 to evaluate your request for ethical approval of the above mentioned research project, we are pleased to inform you that the Ethics Committee/CHUK has approved your research project.

You are required to present the results of your study to CHUK Ethics Committee before publication by using this link:www.chuk.rw/research/fullreport/?appid=474&&chuk.

PS: Please note that the present approval is valid for 12 months.

Yours sincerely,

Prof. Florence MASAISA
The Vce Chair, Ethics Committee,
University Teaching Hospital of Kigali

ETHICS COMMITTEE
CHUK

Scan code to verify.

" University teaching hospital of Kigali Ethics committee operates according to standard operating procedures (Sops) which are updated on an annual basis and in compliance with GCP and Ethics guidelines and regulations "

Web Site : www.chuk.rw ; B.P. 655 Kigali- RWANDA Tel.: 00 (250) 252575462. E-Mail: chuk.hospital@chuk.rw

Appendix 5: LETTER TO CHUK ETHICS COMMITTEE

NAMBAJE Juvenal

University of Rwanda,

College of Medicine and Health Sciences

Master of Hospital and Healthcare Administration
Tel : +250788611670
E-mail: juvenal2020b@gmail.com
28th October, 2021

Through Co-Supervisor:

Mr. Lauben RUBEGA
Assistant Lecturer
Master of Hospital and Healthcare Administration
School of Health Sciences
UR-College of Medicine and Health Sciences
Tel: 0788747781

To: The Chairperson of Ethics Committee (CHUK)

Dear Sir,

Re: Request for approval to conduct Pre and Post intervention study- Quality improvement research project

I hereby request for approval to conduct Pre and Post interventional study at CHUK. In fact, I am a student at University of Rwanda, College of Medicine and Health Sciences, Masters of Hospital and Healthcare Administration and my pre and post interventional study is titled **"Improving Hand Hygiene Compliance among Healthcare Workers in Accident and Emergency Department at University Teaching Hospital of Kigali".**

The study will be conducted at University Teaching Hospital of Kigali in the Department of Accident and Emergency. For more details, find the copy of my Ethical Clearance and other documents related to the study on attachment.

I will be very grateful Sir if my request is put to your highest considerations.

Sincerely,

NAMBAJE Juvenal

Appendix 6: Hand Hygiene observation tool

CENTRE HOSPITALIER UNIVERSITAIRE
UNIVERSITY TEACHING HOSPITAL

QUALITY HEALTH CARE
TRAINING & RESEARCH

Hand Hygiene Observation Form

Department: _____ **Date:(dd/mm/yy)** ___ /___ /___ **Observer:** _____

Service/Ward: _____ **Start/End time: (hh:mm)** ___/___ : **Page N°:** _____

Prof.cat:			Prof.cat:			Prof.cat:			Prof.cat :		
Opp.	**Indication**	**HH Action**	**Opp.**	**Indication**	**HH Action**	**Opp.**	**Indication**	**HH Action**	**Opp.**	**Indication**	**HH Action**
1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
4	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	4	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	4	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	4	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
5	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	5	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	5	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	5	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
6	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	6	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	6	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	6	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
7	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	7	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	7	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	7	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
8	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	8	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	8	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	8	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves

Keys: **bef.pat:** before touching a patient
bef.asept: before clean/aseptic procedure
aft.b.f: after body fluid exposure risk
aft.pat: after touching a patient
aft.p.surr: after touching patient surroundings

HR: hand hygiene action by hand rubbing with an alcohol-based formula
HW: hand hygiene action by handwashing with soap and water
Missed: no hand hygiene action performed

Infection Prevention and Control Unit *Page 1*

CENTRE HOSPITALIER UNIVERSITAIRE
UNIVERSITY TEACHING HOSPITAL

QUALITY HEALTH CARE
TRAINING & RESEARCH

Hand Hygiene Observation Form – Basic Compliance Calculation

Department:				Service/Ward:				Month/Year:								
Session N°	Prof.cat.			Prof.cat.			Prof.cat.			Prof.cat.			Total per session		
	Opp (n)	HW (n)	HR (n)	Opp (n)	HW (n)	HR (n)	Opp (n)	HW (n)	HR (n)	Opp (n)	HW (n)	HR (n)	Opp (n)	HW (n)	HR (n)
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															
Total															
Calculation	Act (n) = / Opp (n) =			Act (n) = / Opp (n) =			Act (n) = / Opp (n) =			Act (n) = / Opp (n) =			Act (n) = / Opp (n) =		
Compliance															

Instructions for use:

$$\text{Compliance (\%)} = \frac{\text{Actions}}{\text{Opportunities}} \times 100$$

1. Define the setting outlining the scope for analysis and report related data according to the chosen setting.
2. Check data in the observation form. Hand hygiene actions not related to an indication should not be taken into account and vice versa.
3. Report the session number and the related observation data in the same line. This attribution of session number validates the fact that data has been taken into count for compliance calculation.
4. Results per professional category and per session (vertical):
   - 4.1 Sum up recorded opportunities (opp) in the case report form per professional category: report the sum in the corresponding cell in the calculation form.
   - 4.2 Sum up the positive hand hygiene actions related to the total of opportunities above, making difference between handwash (HW) and handrub (HR): report the sum in the corresponding cell in the calculation form.
   - 4.3 Proceed in the same way for each session (data record form).
   - 4.4 Add up all sums per each professional category and put the calculation to calculate the compliance rate (given in percent)
5. The addition of results of each line permits to get the global compliance at the end of the last right column.

Appendix 7: HAND HYGIENE POLICY

CENTRE HOSPITALIER UNIVERSITAIRE

UNIVERSITY TEACHING HOSPITAL

QUALITY HEALTH CARE
TRAINING & RESEARCH

POLICY NUMBER: **65/2010**

HAND HYGIENE

RATIONALE

To promote Hand Hygiene thus ensuring prevention and control of cross infection and protection of patients.

POLICY STATEMENT

All clinical staff must adhere the five moments (***Annexure A***) of correct hand washing which are:

- before touching a patient,
- before clean/ aseptic procedure,
- after body fluid exposure risk,
- after touching a patient and
- After touching a patients' surrounding.

Note: wearing gloves is not substitute of hand washing.

All non-clinical staff must wash their hands after every visit to the toilet, before eating and whenever visibly dirty.

PROCEDURE

Routine hand wash

1. Roll up sleeves if wearing long sleeved outfit
2. Remove watch, rings and any other jewellery worn on the hands and wrists.
3. Inspect the hands for any cuts
4. The technique for hand washing is as follows**:**
    a. Turn on the tap
    b. Wet hands and forearms below the elbow
    c. Apply sufficient (enough to form a good lather) of liquid soap to hands
    d. Rub hands vigorously as illustrated on the chart attached ***Annexure B***.
    e. Rinse hands thoroughly
    f. Do not close the tap if not elbow-controlled tap
    g. Dry hands with paper towel
    h. Close the tap using dry paper towel.
    i. Cover all cuts prior to patient care
    j. Throw the paper towel in the appropriate pedal bin

When performing an aseptic procedure continue as follows:

1. Refer to steps a-f above
2. Close the tap using the elbow (where applicable otherwise leave tap running and ask colleague to close tap)
3. Use a generous amount of hand disinfectant spray containing a 70% alcohol
4. Apply evenly to all surfaces of both hands as directed on chart in ***Annexure C*** until they are dry.

The average time for this procedure is 40 to 60 seconds.

This policy must be read in conjunction with policy No: 80/2010; 254/2010

DR OLIVIER MANZI

CHAIRPERSON INFECTION PREVENTION & CONTROL COMMITTEE

PROF THÉOBALD HATEGEKIMANA, MD

DIRECTOR GENERAL

ISSUE DATE: February 2019

ISSUE NUMBER: 4

REVIEW NUMBER: 3

REVIEW DATE: January 2021

P & P CIRCULATION TO ALL STAFF WITHIN SERVICES & DEPARTMENTS

ACKNOWLEDGEMENT

We, staff members of _____do herby certify that we have read, discussed (where applicable) and understood the content of this policy No. _____.

We commit ourselves to abide by its spirit and shall strive to comply and make it complied with.

No.	Staff Names & Title	Rank/Designation	Staff Signature	Date
01				
02				
03				
04				
05				

I, responsible manager of the service/department indicated above, do herby certify that, all the staff as indicated above has discussed the policy as indicated hereto.

_____ _____

SERVICE/DEPARTMENT HEAD **DATE**

Appendix 8: Certificate of research

Human Participation in Research Assessment Results for Juvenal Nambaje

---

100 % (100 points correct out of 100 possible)

Scroll down to the bottom to read more details.

Questions you answered incorrectly are highlighted in red.

Question 1: Humans who participate in research should be treated with respect and should not be subjected to unnecessary risk. Humans who participate in research should know what their participation will entail, should give voluntary, non-coerced consent, and should have the opportunity to withdraw if they wish to stop participating in the research.
Correct Answer: True
Your Answer: You answered correctly.
Answer Explanation: These are the basic tenets for using humans as subjects of experimental research. They seem evident. It has been through dramatic violations of these standards that Federal and institutional roles and regulations regarding research that involves human participation have developed.

Question 2: Beneficence is the ethical concept that embodies the idea of causing minimal risk to subjects and society while bringing about the maximum benefits.
Correct Answer: True
Your Answer: You answered correctly.
Answer Explanation: Beneficence is the act of doing good. The IRB is charged with considering the balance of risk to human participants against the degree of potential benefit to society.

Question 3: It is ethically acceptable for one group of people to bear risks in research, such as not being treated for their disease, if the result is greater understanding that will benefit all of society.
Correct Answer: False
Your Answer: You answered correctly.
Answer Explanation: Exploitation of one group, particularly a vulnerable population such as a racial minority, violates the ethical concept of justice. Justice ensures that risks and benefits are divided equally among different groups in society.

Question 4: According to Federal regulations, the use of human participants in research should be reviewed by the Institutional Review Board whether the potential subjects are living or dead.
Correct Answer: False
Your Answer: You answered correctly.

Answer Explanation: The IRB must review research protocols involving living individuals about whom a researcher obtains (1) data through intervention or interaction or (2) identifiable private information.

Question 5: Securing data in a locked cabinet or electronic storage area is all that is usually necessary to guarantee confidentiality.

Correct Answer: False

Your Answer: You answered correctly.

Answer Explanation: The answer is false. In addition to locking data, it should be held separately from participant identifiers, and the research team members must all participate in protecting the confidentiality of materials.

Question 6: As long as a researcher has a research participants signature on a consent form, one can assume that the subject has given informed consent.

Correct Answer: False

Your Answer: You answered correctly.

Answer Explanation: A signature is not the same as informed consent. Informed consent requires that participants truly understand, from their perspective, rather than the researchers, what will actually happen to them through their inclusion in the study. Framing informed consent from an independent observers perspective provides an easy-to-apply publicity test: If someone were to ask participants what they are doing and why and what the conditions are regarding their participation, they should be able to answer those questions.

Question 7: When asking for consent to participate in a research experiment, it is often enough for the researcher to note that the potential participant did not object to the details of the study.

Correct Answer: False

Your Answer: You answered correctly.

Answer Explanation: The answer is false. A research participant must assent to the studys procedures.

However, failure to object is not equivalent to assent. Assent means the participants agreement to participate. For this reason, researchers must be careful when selecting vulnerable populations such as children, the elderly, prisoners, students, and employees because they may consent to participate in research due to pressure, perceived expectations, or the promise of compensation.

Question 8: Before conducting research involving human subjects, investigators are required by Federal law to have a signed consent form from each participant (or participants guardian).

Correct Answer: False

Your Answer: You answered correctly.

Answer Explanation: Participants signatures on consent forms are not required when identifying themselves as participants unnecessarily adds to the participants risk. In addition, signed consent forms are not required in normal educational or observational situations in which participants are not identified.

Section Six: Human Participation in Research

of the

Online Research Ethics Course

On this Day

04/21/2021

Have an Ethical Day

Question 9: Children may be subjected to the same degree of risk (with guardian consent) as adult participants. **Correct Answer:** False

Your Answer: You answered correctly.

Answer Explanation: IRBs must balance the amount of risk to the child participant against the prospect of direct benefit to that child. Adult participants may voluntarily choose to put themselves at significant risk with little prospect of direct benefit, but adult guardians may not choose that for potential child participants.

Question 10: With regard to the case study accompanying this section, students or employees within a research lab are considered vulnerable populations. The IRB will want to know how the PI is protecting the privacy of those who provide blood for the control group and what safeguards the PI has put in place to ensure that giving blood is truly a voluntary act.

Correct Answer: True

Your Answer: You answered correctly.

Answer Explanation: With regard to the case study accompanying this section, students or employees within a research lab are considered vulnerable populations. The IRB will want to know how the PI is protecting the privacy of those who provide blood for the control group and what safeguards the PI has put in place to ensure that giving blood is truly a voluntary act.

Use your computer's printer to print this page for your records.

Close this Window and Return to the Course

C O N G R A T U L A T I O N S

Juvenal Nambaje

Has Successfully Completed

Appendix 9: Gantt chart

Task	People Responsible	Timeline and Sequence						
		Nov 2021	Dec 2021	Jan 2022	Feb 2022	Marh 2022	Apr 2022	
Meeting with Managers and team.	Researcher and Managers							
Written script to record	Researcher and Customer care Officer (journalist)							
Recorded script in voice audio	Researcher and Customer care Officer (journalist)							
Recorded voice audio displayed	Researcher and Customer care Officer (journalist)							
Prepared reminder posters	Researcher and IPC Officer							
Reminder poster displayed	Researcher and IPC Officer							
Education/ Trainings preparation	IPC managers Researcher							
Invited trainers	Researcher &Managers							
Prepare training materials	IPC Officers							
Invite participants	Managers							
Training provision	IPC managers Researcher							
Assigned staff IPC in each ward	Accident and Emergency managers							
Monitoring of HAND HYGIENE Practice	Researcher&IPC officers							
Evaluation of HAND HYGIENE compliance	Researcher&IPC officers,IPC links							

Appendix 10: Recorded Script of HAND HYGIENE in Kinyarwanda and English versions

KINYARWANDA:

MPESHAKURAMA, BARWAYI NAMWE BARWAZA MURAHO,

NIMUCYO DUKOMEZE UMUCO WO KUNOZA ISUKU Y' INTOKI ZACU DUKARABA AMAZI MEZA N'ISABUNE CYANGWA DUKORESHEJE UMUTI WABUGENEWE WO GUKARABA INTOKI (HAND SANITIZER). NI RYARI UMUNTU AGOMBA GUKARABA INTOKI? TWAVUGA NKA

1. MBERE NA NYUMA YO GUKORA KU MURWAYI
2. MBERE YO KUVURA UMURWAYI
3. MU GIHE UKOZE KU MATEMBABUZI AYO ARIYO YOSE AVA MU MUBIRI
4. MUGIHE UKOZE KU BIKORESHO BIRI AHO UMURWAYI ARI
5. IGIHE CYOSE UVUYE MU BWIHERERO NDETSE N'IGIHE CYOSE IBIGANZA BYAWE BYANDUYE

IBYO BIZATURINDA GUHEREREKANYA MICROBI ZITERA UBURWAYI BUTANDUKANYE BUSHOBORA GUSHYIRA UBUZIMA BWACU NDETSE N'UBW'IMIRYANGO YACU MU KAGA.

ENGLISH VERSION:

GREETINGS TO YOU,

DEAR HEALTHCARE PROVIDERS, PATIENTS AND NEXT OF KINS LET'S ALL CONTINUE A CULTURE OF HAND HYGIENE BY WASHING OUR HANDS WITH PURE WATER AND SOAP OR BY USING HAND SANITIZER.

WHEN HAND HYGIENE? WE CAN SAY:

1. BEFORE TOUCHING A PATIENT
2. BEFORE CLEAN OR ASEPTIC PROCEDURE
3. AFTER BODY FUILD EXPOSURE RISK
4. AFTER TOUCHING A PATIENT
5. AFTER TOUCHING PATIENT SORROUNDINGS
6. AFTER USING SANITATION AND WHENEVER YOUR HANDS ARE NOT ON THE CLEANLINE.

THESE MEASURES WILL PROTECT US AGAINST HAMFUL GERMS TRANSMISSION THAT MIGHT CAUSE DIFFERENT DISEASES WHICH CAN PUT OUR HEALTH AS WELL AS OUR FAMILY'S IN DANGER.

APPENDIX 11: Approval for submission in UR-CMHS Library.

Date :18/10/2022

Note

The Study Entitled "IMPROVING HAND HYGIENE COMPLIANCE AMONG HEALTHCARE WORKERS IN ACCIDENT AND EMERGENCY DEPARTMENT AT THE UNIVERSITY TEACHING OF KIGALI"is approved by the Directorate of Research and Innovation for submission in UR_CMHS Library . The plagiarism report is 15% with the following parametters :

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Sincerely

Emile Nisingizwe

Research and Innovation Officer,CMHS