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EVALUATION OF HEALTHCARE WORKER COMPLIANCE WITH THE IMPLEMENTATION PROCESS OF INFECTION PREVENTION AND CONTROL PRACTICES AT THE GA WEST MUNICIPAL HOSPITAL

BY

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THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF MONITORING AND EVALUATION IN PUBLIC HEALTH (MSc) DEGREE

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DECLARATION

I hereby declare that excluding precise references which have been duly acknowledged, this submission is my own work towards my MSc dissertation and that, to the best of my knowledge, it contains no material previously published by another person nor material which has been accepted for the award of any of any other degree of the University or elsewhere.

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DEDICATION

I dedicate this work to my dear parents Mr. John Kofi Atta and Madam Regina Amedze, and in loving memory of the late Mr. E.W.K. Korkor.

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My heartfelt gratitude goes to the Almighty God for His unfailing love, care and grace towards me throughout this programme and for the success of this dissertation.

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ABSTRACT

Background: Hospital-acquired infections affects greatly many healthcare settings. Globally, Hospital – Acquired infections affects millions of patients every year, particularly in developing countries with an estimated occurring rate of 15.5 episodes for every hundred (100) patients. An effective Infection Prevention and Control (IPC) practice reduces the cost of healthcare on patients, health institutions, and also on the nation. The study aimed at evaluating healthcare worker compliance with implementation process of infection prevention practices at the Ga West Municipal Hospital.

Method: A facility-based cross-sectional descriptive study involving all healthcare workers, housekeepers and cleaners at the Ga West Municipal Hospital. The study was conducted in August, 2020. A mixed-methods approach was employed with self-administered questionnaire and observational guide to collect data from respondents. Stratified Random Sampling method was used in selecting eighty-eight (88) participants for the study.

Results: Findings of the study indicates healthcare workers' knowledge in IPC was high, with 78% having high knowledge and 22% having moderate knowledge in IPC. The "always" availability of materials/resources to workers at the facility was 59.3%. Overall compliance with IPC at the facility was high, 83%. Lack of IPC materials, lack of access to materials, lack of supervision, and self-efficacy were identified as leading factors that prevented compliance with IPC practices at the facility.

Conclusion: The overall level of Compliance with the Implementation process of Infection Prevention and Control practices among healthcare workers at the Ga West Municipal Hospital was high. However, additional education and in-service training on infection prevention, especially waste management must be organized periodically by the IPC committee, In-service training and Environmental units for healthcare workers to ensure new staff members and permanent staff on rotation are updated and well equipped promoting compliance at the Ga West Municipal Hospital.

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LIST OF ABBREVIATIONS

CHPS	Community-based Health Planning and Services
GHS	Ghana Health Service
GWMH	Ga West Municipal Hospital
GWMHD	Ga West Municipal Health Directorate
HAIs	Hospital Associated Infections / Health care Acquired Infections
HCWs	Health Care Workers
HCWM	Health Care Waste Management
ICD	Institutional Care Division
IP	Infection Prevention
IPC	Infection Prevention and Control
MOH	Ministry of Health
PPE	Personal Protective Equipment
SOP	Standard Operating Protocol/Procedure
WHO	World Health Organization
WHO/AFRO	World Health Organization Regional Office for Africa

DEFINITION OF TERMS

TERM	DEFINITION
Adequate knowledge	Being well informed about the policy and guidelines on infection prevention and control.
Aseptic technique	Practices that decrease the risk of post-procedure infections caused by microorganisms during clinical procedures.
Availability	The accessibility of logistics, materials and supplies for infection prevention.
Compliance	Going strictly according to lay down rules pertaining to infection prevention and control.
Contamination	A process by which contaminants spread from one place to another.
Decontamination	A process for the removal of pathogenic microorganisms from objects and equipment in order to make them safe for handling.
Disinfection	The use of chemical or physical agents to eliminate virtually all disease-causing microorganisms, but not bacterial spores, on objects and surfaces to a level that is normally harmless.
Detergents	Anionic, cationic, amphoteric, and non-ionic detergents used in cleaning and disinfecting objects and surfaces.
Healthcare-associated Infections	Hospital acquired or nosocomial infections which are not present or incubating at a time a patient presents to the health care facility but is acquired at the health care facility.
Healthcare facility	Any of the categories of hospitals, clinics, health centres, CHPS compounds, and all other healthcare delivery points.
Landfill	A physical facility designed for the disposal of waste in a manner that protects the environment from contamination.
Micro-organisms	The microscopic causative agents of infections that include bacteria, viruses and fungi that lives almost everywhere in the hospital environment.
Segregation	A systematic separation of different waste streams according to characteristics, the type of treatment, and final disposal applied.

Standard precautions	These are precautions (system of actions) meant to reduce the risk of transmission of blood-borne and other pathogens (germs) from both recognized and unrecognized sources within healthcare settings (e.g. hospitals) to a patient.
Storage	The isolation of waste with the intent of retrieval for processing and disposal.
Treatment	Operations intended to minimize health hazards and damage to the environment by altering the characteristics of the waste.
Waste	An excess but unwanted material that is discarded by an individual or organization.
Waste Segregation	Separating generated waste into various categories; example general waste, infectious waste, etc..

CHAPTER ONE

INTRODUCTION

1.0 Background

Hospital-Acquired Infections (HAIs) are problems of great significance in all healthcare settings. Globally, hospital-acquired infections affects millions of patients every year, particularly in developing countries with an estimated occurring rate of 15.5 episodes for every hundred (100) patients (Labi et al., 2019; Qiao, Huang, Mbbs, & Yin, 2018). Over the past two decades, hospital-acquired infections have been recognized as potential indicator of quality health care to patients (Ministry of Health-Ghana, 2009) and its associated cost to patients and other relevant stakeholders (Peter, Meng, Kugler, & Mattner, 2018).

A nosocomial (Healthcare-Associated) infection is one occurring in a patient in a hospital or other healthcare facility in whom the infection was not present or incubating during the period of admission. This includes hospital acquired infections which appears after a patient is discharged, and all occupation related infections among healthcare workers (Khan, Baig, & Mehboob, 2017; World Health Organization, 2002). Different varieties of bacteria, fungi, viruses and parasites are the causes of nosocomial infections (World Health Organization, 2002). Pathogens may be passed on either directly or indirectly from one person to another at any point in time, resulting in about 10% of in-patients contracting nosocomial infections (Mbim, Mboto, & Agbo, 2016).

Recent analysis shows that HAIs occurs more often in healthcare settings with limited resources than in developed countries. The prevalence of healthcare-associated infections in low- and middle-income countries changes with time between 5.7% and 19.1% (Khan et al., 2017; Mbim

et al., 2016; World Health Organization, 2018a). The average prevalence of HAIs is significantly higher (15.5%) in high quality studies than that of low quality studies (8.5%) (World Health Organization, 2018a). Furthermore, the rate of occurrence of infections resulting from the use of central lines, ventilators and other invasive devices, in some developing countries, may be 19 times more, compared to that of Germany and United States of America (Bello, Emannuel, Adegoke, & Bello, 2011; Efstathiou, Papastavrou, Raftopoulos, & Merkouris, 2011). Supervisors in many healthcare settings are most concerned with the sources of spread of infections, especially in overstretched healthcare systems found in developing countries (Bello et al., 2011). HAIs varies between the rate of 1% and 40% or more in developed countries and developing countries (including Sub-Sahara Africa), respectively. Surgical site infections (SSI), urinary tract infections and lower respiratory tract infections are some of the identified forms of HAIs in some developing countries (Khan et al., 2017). In considering the general population of patients, surgical site infection is the highest form of infection in countries with limited resources, affecting 2% - 5% of operated patients and with a frequency nine times higher compared to those in developed countries (Khan et al., 2017; World Health Organization, 2016b).

The difficulty to completely destroy HAIs from healthcare settings increases patient length of stay at the health facility(Avachat, Phalke, Zambare, & Phalke, 2013; World Health Organization, 2002) and thus increasing amount of time spent in bed by patient and overly use of scarce resources serving as a challenge to management of the facility. Healthcare-associated Infections (HAIs) can be prevented through effective IPC practices, thus, putting into practice standard precautions, specifically best hand hygiene practices which is most effective since undiagnosed infections are common (World Health Organization, 2016b).

Healthcare workers as well as patients are exposed to infections through inadequate IPC practices at various health facilities (Avachat et al., 2013) and it is against this background that the Ministry of Health in Ghana developed a policy and guidelines to train healthcare workers in infection prevention and control (IPC) practices. The policy's primary purpose is to provide healthcare personnel and clients with standardized infection prevention and control measures within healthcare settings in order to ensure the safety and the protection of patients and healthcare providers respectively (Ministry of Health-Ghana, 2015).

1.2 Problem Statement

A 0.07% and 1.0% of admitted patients at hospitals in developed and developing countries respectively, end up acquiring one form of Healthcare-Associated Infections (Khan et al., 2017). The overall prevalence rate of Hospital Associated Infections in Ghana is at 8.2%. HAIs ranges between 3.5% and 14.4%, with the secondary and tertiary healthcare facilities having higher records on infections (Labi et al., 2019).

In Ghana, several approaches have been introduced/implemented in the health sector to promote a secure working environment as well as a thorough and an effective IPC practices in healthcare settings. The development of procedure manuals and guidelines, training materials, and training programmes in different parts of healthcare are measures to promote infection prevention. This notwithstanding, an assessment report of the Institutional Care Division (ICD) on IPC in 2005 indicated healthcare personnel compliance with standard infection prevention measures was disheartening. This was observed in ways of disinfection and sterilisation in healthcare facilities – cleaning procedures, healthcare waste management, and other aseptic procedures (Ministry of Health-Ghana, 2015).

A similar study by (Hayeh, 2012) at Ridge Regional Hospital stated an inadequate level of knowledge and skills in IPC among health personnel. In addition, an online report by Paul Adepoju indicates "Ghanaian hospitals not implementing infection policy" (Adepoju, 2019) which is similar to healthcare workers non – compliance with professional ethics of healthcare waste management (Oyekale & Oyekale, 2017). The provision of healthcare results in the generation of waste, requiring proper management and disposal in order to protect healthcare workers, clients (patients, caregivers and visitors) and the environment from potentially disease-causing waste materials (Ministry of Health-Ghana, 2006). Also, poor healthcare waste management creates serious environmental problems in cities and local communities, exposing residents to foul odour, smoke, air pollutants, contaminated water, and toxic ash from surrounding healthcare facilities (Asante, Yanful, & Yaokumah, 2014). The improper handling of healthcare waste potentially exposes all stakeholders to infections, toxic effects and injuries, and risks polluting the environment. It is important that all generated healthcare waste are properly collected, stored, treated, and disposed of safely (Chuks, Orji, & Ugbogu, 2013).

Healthcare worker's failure to follow the standard procedures on IPC may lead to loss of revenue, and increased morbidity and mortality due to infections. Noncompliance would also promote the spread of infections generally within communities since patients and care providers would carry microorganisms into the communities where they live, thus, increasing the burden of infections(Kondor, 2018; Ministry of Health-Ghana, 2015).

From literature, lack if time, unavailability of resources, behavior of healthcare workers, self – efficacy, culture, lack of knowledge, training, and competency amongst many others are factors influencing noncompliance with infection prevention (Kondor, 2018; Zaidi et al., 2005).

Inadequate environmental hygienic conditions and waste disposal, absence of guidelines and policies, inadequate knowledge and the application of basic IPC measures, understaffing, etc. may put patients at risk of infection within a healthcare setting (World Health Organization, 2016b).

An effective Infection Prevention and Control (IPC) practice reduces the cost of healthcare on patients, health institutions, and also the nation. Hence, this study seeks to evaluate healthcare worker compliance with the implementation process of Infection Prevention and Control practices with emphasis on healthcare waste management at the Ga West Municipal Hospital.

1.3 Justification

Despite the rise in contagious infections, infection prevention practices are unknown among HCWs especially those in developing countries. Although the trend of infection at the study site is unknown, the national prevalence rate of infection is 8.2%. The Ga West Municipal Hospital (GWMH) has a goal to reduce infections through proper waste management at the facility level hence, this study. Findings from the research may lead to a client-centred care and increase safety against infection in all groups of healthcare workers, clients and communities. The outcome of this study may provide decision makers with information on the state of compliance of healthcare workers with the IPC practices (healthcare waste management) at the Ga West Municipal Hospital. Also, findings may help management of the facility to know if the set goal of reducing infections through proper waste management can be achieved.

1.4 Research Questions

The study seeks to answer the following questions:

1. What level of materials for IPC are available at the health facility?
2. How is waste collected and segregated into various categories at the health facility?
3. What type of waste treatment and disposal methods is being practiced at the health facility?
4. What is the healthcare workers' level of knowledge in infection prevention and control practices?
5. What are the factors that influence non-compliance with IPC practices at the health facility?

1.5 Study Objectives

General Objective

To evaluate healthcare worker compliance with the implementation process of Infection Prevention and Control practices at the Ga West Municipal Hospital.

Specific Objectives

1. To assess the availability of IPC materials at the health facility.
2. To assess the collection and segregation of waste into categories at the health facility.
3. To describe the type of waste treatment and final disposal method practiced at the health facility.
4. To assess healthcare workers level of knowledge in IPC practices.
5. To explore factors that influence non-compliance with IPC practices at the health facility.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter provides information on published existing knowledge in Infection Prevention and Control. The review is discussed under the following sub-headings; The burden of Hospital – Associated Infections, Sources and spread of infections in hospitals, Infection prevention and control, Healthcare waste management, Knowledge in infection prevention and control, Resource (material) availability for infection prevention and control, Waste collection and segregation, Waste treatment and final disposal, and Factors influencing non-compliance with infection prevention and control standards.

2.1 The burden of Health Care-Associated Infections (HAIs)

Nosocomial infections, also called "hospital-acquired infections", are infections acquired during hospital care which are not present or incubating at the time of admission. Infections occurring 48 or more hours after admission are usually considered nosocomial (World Health Organization, 2002). Healthcare – Associated Infections (HAIs) are potential sources of harm for patients and place a significantly great responsibility on health care institutions and health care systems (Peter et al., 2018).

Healthcare is provided in tertiary, secondary, and primary facilities which are well equipped with advance technological tools and basic health equipment respectively. Although the public health and hospital care has seen an improvement, there is a continuous diagnosis of infections in admitted patients, which may negatively affect healthcare workers at the facility. At a given time

period, seven (7) and ten (10) patients in developed and developing countries respectively, may get infected with one form of healthcare-associated infections (Khan et al., 2017). 10% of the affected patients dies as a result of the infection. In the United States of America, the prevalence of HAI is 4.5% contributing to 99,000 deaths each year (World Health Organization, 2016b). Surgical wound infections, urinary tract infections and lower respiratory tract infections are common occurring HAIs. The intensive care units, acute surgical and orthopaedic wards records the highest prevalence rate of HAIs (World Health Organization, 2002). Rates of infection are higher among vulnerable patients which may be due to old age, chemotherapy, or underlying health conditions, (World Health Organization, 2016b). Also, prevalence of HAIs differ across hospitals and within each hospital type. The prevalence rate of HAIs in tertiary hospitals, secondary hospitals, and primary hospitals as at the time of literature review were 9.2%, 9.5%, and 5.2% respectively (Labi et al., 2019).

The significance of HAIs goes beyond records on its impact on morbidity and mortality in any country, but the profound economic consequences (Bello et al., 2011). Considering the general patient safety issues, HAIs comes with additional physical and high financial cost of care for patients and their families. Prolonged hospital stays, long-term disability, increased resistance to antimicrobials, financial burden for health systems, high costs for patients and their family, and unnecessary deaths are some negative effects of infections (Bello et al., 2011; Khan et al., 2017; World Health Organization, 2002). Financial costs resulting from healthcare-associated infections in low- and middle-income countries are poorly and variably reported. For instance, the direct medical cost of hospital-acquired infections in the United States of America ranges

from USD 35.7 to USD45 billion the per year whiles that of Europe is as high as EUR7 billion annually (World Health Organization, 2016b).

In Ghana, prevalence rate of HAIs is not known due to inadequate surveillance and studies in the country. However, prevalence of HAIs is estimated to be high though it is hardly addressed (Kondor, 2018). Many factors promote infection among patients on admission at the hospital or any other health facility. These factors may include "decreased immunity among patients; the increasing variety of medical procedures and invasive techniques creating potential routes of infection; and the transmission of drug-resistant bacteria among crowded hospital populations, where poor infection control practices may facilitate transmission" (Mbim et al., 2016).

2.2 Sources and spread of infections in hospitals

In the community and hospital settings, bacteria and viruses are found in the environment. Majority of these organisms are not pathogens and may even have to play beneficial roles in human lives (World Health Organization, 2002). The organisms in their natural environment may serve as a reservoir from which infections may be passed on to other patients (Khan et al., 2017). Nonetheless, there are so many reservoirs, the one from which infections arise is usually called the source. Knowing the right source of infection is essential to prevent spread of the virus (Hayeh, 2012; Mbim et al., 2016). Patients, staff, or visitors may serve as the source of the agent causing the infections (Khan et al., 2017).; including individuals with the active disease, individuals in the incubation phase of disease, or individuals who are described as carriers (Ministry of Health-Ghana, 2015). Infecting microorganisms can also be found on patient's endogenous flora, which may be difficult to control, and contaminated inanimate environmental

objects, including equipment and medications (Ministry of Health-Ghana, 2015). The groups at high risk of acquiring infection as a result of lessened defences require additional protection particularly, in healthcare settings where there are enhanced invasive procedures (World Health Organization, 2002).

Three (3) basic elements is required to facilitate the spread of infection; a source of infection causing microorganisms, a susceptible host, and a means of transfer. Microorganisms are transferred in hospitals through distinct routes, with the same microorganism been transferred through various routes (Ministry of Health-Ghana, 2015). The courses of transfer may differ between pathogens where the choice of IPC measures is influenced by the mode of spread of identified infections (Beuvink & Hackett, 2018). The main known modes of the spread of infections are:

i. Contact transmission

This is an important and most frequent mode of transmission of nosocomial infections. The mode of transmission can be direct and indirect.

a. Direct contact transmission involves "direct contact between two body surfaces, and physical transfer of microorganisms between a susceptible host and an infected or colonized person" (Ministry of Health-Ghana, 2015). This happens during healthcare delivery requiring direct personal contact between client and service provider. Direct transmission can also occur between two patients, with one being the source of the infectious microorganisms and the other a susceptible host (Ministry of Health-Ghana, 2015).

b. Indirect contact transmission on the other hand involves "contact of a susceptible host with a contaminated intermediate object, usually inanimate, such as contaminated instruments, needles, or dressings, or contaminated hands that are not washed and gloves that are not changed between patients".

ii. Droplet transmission

This form of transmission occurs when droplet containing microorganisms generated from the infected person are moved through the air a (within a short distance) and placed on the host's conjunctivae, nasal mucosa, or mouth. For a successful transfer to occur, the source of infection and the susceptible host need to be within approximately a metre of one another (Ministry of Health-Ghana, 2015).

iii. Airborne transmission

Airborne transmission occurs by "the distribution of either airborne droplet nuclei of evaporated droplets containing microorganisms, which remain suspended in the air for long periods of time, or dust particles containing the infectious agent". Microorganisms carried in this manner can be dispersed widely by air currents and may be inhaled by a susceptible host within the same room or a long distance from the source patient, depending on environmental factors (Ministry of Health-Ghana, 2015). Microorganisms transmitted by airborne transmission include Mycobacterium tuberculosis, rubella virus, and varicella virus. Airborne transmission is the most difficult type to control, as it requires control of air flow through special ventilation systems (Ministry of Health-Ghana, 2015).

iv. Common vehicle

Common vehicle transmission are microorganisms transmitted by contaminated items such as food, water, medications or intravenous solutions, blood, equipment and devices. These may transmit infections to multiple host, resulting in an uncontrollable outbreak (Reid, 2001).

v. Vectorborne

Vectorborne transmission applies to transmission by insect vectors – where mosquitoes, flies, rats, and other vermin transmit microorganisms. This is prevented by appropriate healthcare facility construction and maintenance, closed or screened windows, and proper housekeeping.

2.3 Infection Prevention and Control (IPC)

Infection prevention and control (IPC) is universally seen as an important aspect of all health systems since it affects the health and safety of both patients/clients and healthcare givers (Khan et al., 2017; World Health Organization, 2002). Although essential, infection prevention is often times not given the required recognition and support as part of the infrastructure for healthcare delivery. Infection prevention and control is a major make-up of practice for all health professionals, not only for their health, but also to reduce HAIs, improving patient and worker safety (Hayeh, 2012). Infection prevention is a field that is rapidly growing with increasing regulated requirements and emerging global public health concerns, such as Ebola and Zika (Vassallo & Boston, 2019).

Globally, the World Health Organization Regional Office for Africa (WHO/AFRO) and the Commonwealth Regional Health Community Secretariat (CRHCS), National Institute of Health and Care Excellence (NICE) developed a "Manual of Infection Prevention and Control policies and guidelines" in response to a need to provide patients with safe and quality care and also to

prevent the acquiring and/or transmitting of infections in the healthcare environment. Its purpose is to give managers, supervisors and healthcare workers the standards and criteria against which to measure safe practice in infection prevention within all healthcare facilities and settings (National Institute for Health and Clinical Excellence, 2003; Reid, 2001). In Ghana, the updated IPC policy and guidelines designed by the Ministry of Health addresses concerns about the deficient IPC procedures in all healthcare settings (Ministry of Health-Ghana, 2015). The primary purpose of the document is to give clear directions to healthcare workers and clients in the prevention and control of infections within healthcare settings, ensuring the safety and protection of both patients and care givers. It broadly outlines policies and guidelines required for standardized IPC practices acceptable in healthcare settings, nationally (Ministry of Health-Ghana, 2015; National Institute for Health and Clinical Excellence, 2003). The IPC policy and guidelines is to be used in healthcare settings and curative and preventive service delivery points across the country Ghana.

Standard Precautions are basic IPC practices required at work with the fundamental assumptions that all body fluids, blood, secretions in exception of sweat and the likes may contain infectious agents that is transmittable. IPC is to be applied during healthcare delivery sessions especially with exposure to body fluids, blood, and pathogens. Regardless the infectious status of patients/clients, standard precautions are recommended for their care and treatment. There are ten (10) major aspects of standard precautions – Hand hygiene; Appropriate use and removal of PPEs; Proper patient placement, staff allocation, visitors, and transportation; Processing of used items and equipment; Environmental control, cleaning, and disinfection; Handling and disposal of sharps; Healthcare waste management; Safe injection practices and aseptic techniques; Occupational health and safety; Handling textiles and laundry; Collection, handling, and

transporting of clinical specimens; and Respiratory hygiene/cough etiquette. Compliance with these laid down procedures will help prevent the spread of microorganisms among individuals (Ministry of Health-Ghana, 2015).

Although standard precautions is seen effective in IPC, studies at the La General Hospital show that compliance of healthcare workers to these measures is very low, thus, 30.7% (Kondor, 2018). It is with this background that WHO recommends the ensuring of core components of IPC for infection control are in place at the national and healthcare setting levels (World Health Organization, 2016a).

2.4 Health Care Waste Management (HCWM)

Healthcare activities ensures the protection and restoration of health and also saves lives (World Health Organization, 2018a). However, the provision of healthcare results in the generation of waste, requiring proper management and disposal in order to minimize its associated risks it exposes the health of the workers, clients and the community at large to (Ministry of Health-Ghana, 2006). Of the total amount of waste produced from healthcare activities, about 75% and 90% is general, non-hazardous waste comparable to domestic waste. The remaining 10% to 25% is considered hazardous that may be infectious, chemical or radioactive (Khan et al., 2017; Singh, Bandyopadhyay, & Sahai, 2019).

Healthcare waste management is an integral part of the healthcare that cannot be omitted.(Rajan, Robin, & Vandanarani, 2019) and it is one of the many demanding challenges facing humanity as the global population heightens, increasing the demand for health related services (Windfeld

& Brooks, 2015). Healthcare waste is made up of potentially infectious microorganisms that can infect patients, healthcare workers, and the general public (World Health Organization, 2018a). The improper handling of healthcare waste potentially exposes all stakeholders to infections, toxic effects and injuries, and risks polluting the environment. It is important that all generated healthcare waste are properly collected, stored, treated, and disposed of safely (Chuks et al., 2013). The safe management of healthcare waste can be accomplished by ensuring care in dealing with the healthcare waste. The safe management of healthcare waste ensures prevention and limitation of the concerned health risks involved through contact with the potentially hazardous material, and also preventing environmental contamination (Asante et al., 2014).

According to a World Health Organization (2018) Report and Ghana's Healthcare Waste Management Policy (Ministry of Health-Ghana, 2006) waste can be classified into nine types. These include infectious waste, pathological waste, sharps, chemical waste, pharmaceutical waste, cytotoxic waste, radioactive waste, non – hazardous/general waste, and incinerator ash/sludge and by-products of waste treatment.

i. **Infectious waste:** This is waste contaminated with blood and other bodily fluids (e.g. from discarded diagnostic samples), cultures and stocks of infectious agents from laboratory work (e.g. waste from autopsies and infected animals from laboratories), or waste from patients with infections (e.g. swabs, bandages and disposable medical devices) (Chuks et al., 2013; World Health Organization, 2016a). About 10% - 25% of total amount of waste generated is infectious (Khan et al., 2017; Singh et al., 2019). Infectious waste needs special management both within and without the facility until its

finally disposal (Ministry of Health-Ghana, 2006). Liquid infectious waste are to be disposed of down a sewerage system and others disposed of at a landfill site.

ii. **Pathological waste:** These includes amputations and other body tissues as a result of surgical operations, postmortem, and birth. Examples are internal body organs, human liquid waste, effluents from mortuaries. It is still to be considered potentially infectious waste for precautionary reasons (Chuks et al., 2013). Pathological waste requires special treatment ethical and aesthetic purposes (Ministry of Health-Ghana, 2006). The standardized practice for the disposal of pathological waste is at a landfill site.

iii. **Sharps waste:** "These are sharp-edged waste with cutting properties which may be likely to cause injuries". Examples are syringes, needles, disposable scalpels and blades, etc. (MoH, 2015). They may be contaminated with blood or blood fluids from injection rooms, surgical equipment, etc. serving as a source of disease transmission if not well managed (Chuks et al., 2013; Ministry of Health-Ghana, 2006). Sharps makes up about 1% of total healthcare wastes generated. Sharps are required to be disposed of at a landfill.

iv. **Chemical waste:** These consists of spent chemicals from analytical laboratory operations and pharmaceutical companies. Examples are acid, alkali, solvent, and heavy metals (Ministry of Health-Ghana, 2006). Liquid waste is to be diluted (neutralization) and disposed of down a drain.

v. **Pharmaceutical waste:** This is waste generated from the pharmacy. These includes expired, unused and contaminated drugs and vaccine, residues of drugs in chemotherapy that may be carcinogenic (Ministry of Health-Ghana, 2006). The standardized practice for disposal of pharmaceutical waste is at a landfill.

vi. **Cytotoxic waste:** This is waste containing substances with genotoxic properties (i.e. highly hazardous substances that are, mutagenic, teratogenic or carcinogenic), such as cytotoxic drugs used in cancer treatment and their metabolites (WHO, 2018). The standard practice for the disposal of cytotoxic waste is at a landfill site.

vii. **Radioactive waste:** These are solid, liquid, or pathological waste with radioactive isotopes of any kind. Examples are liquid-patient excreta, radium needles, gloves, cotton, etc. Radioactive waste is to be disposed of a specially designated landfill site.

viii. **Non-hazardous or general waste:** This is waste that does not pose any particular biological, chemical, radioactive or physical hazard. Waste from the kitchen or canteen and offices (papers, plastics, cardboards, etc.) are examples of general waste (MoH, 2015).

ix. **Incinerator ash/sludge and by-products of waste treatment:** This is waste produced from the burning of hospital waste which will be disposed of at a landfill site. Examples are incinerator fly ash and its residues, leachates, etc. (Ministry of Health-Ghana, 2006). General waste is to be disposed of at a landfill site or into protected pits designated for general waste

Aside hospitals other health facilities such as laboratories and research centres, mortuary and autopsy centres, animal research and testing laboratories, blood banks and collection services, and nursing homes for the aged are named as major sources of health care wastes. Averagely, between 0.5kg and 2.0kg of healthcare waste is generated per bed- per day resulting in about 0.33 million tons per year (Singh et al., 2019). Also, high-income countries generate an average of 0.5 kg of hazardous waste per hospital bed per day; while low-income countries generate an

average of 0.2 kg. However, in low-income countries healthcare waste is often not segregated into various categories making the real quantity of hazardous waste much higher (Asante et al., 2014).

Typically, healthcare waste can be obtained from two main sources: emergency relief donations and long-term health care services – to reduce health problems and reduce potential risks in developing countries. This results in the generation of waste which may be harmful to public health and the environment. Leftover relief donations create healthcare waste issue, and can be dealt with just as long-term healthcare waste is. Hence, healthcare waste management is seen as a major challenge in developing countries, especially in Africa where healthcare waste management is said to be poor (Abor, 2012; World Health Organization, 2000).

Healthcare workers has the moral responsibility to ensure hospitals are maintained as centers of cure instead of diseases. Creating awareness on public health and environmental hazards associated with improper management of healthcare waste and regular training and/or education program for all categories of healthcare workers particularly cleaners are deemed important (Rajan et al., 2019).

In Ghana, healthcare has been faced with the challenge of safe treatment and disposal of generated healthcare waste. Healthcare facilities have employed different methods (burying, burning, chemical treatment, etc.) for the disposal of waste. Healthcare waste pose as threat of high magnitude, by spreading disease from infected material (Asante et al., 2014). If pathogenic organisms are not destroyed during treatment of infectious waste, it may lead to increased breed

of microscopic agents capable of causing disease in the waste. These agents through contact, can get transmitted to people who comes into direct contact with the waste (Asante et al., 2014). With this background the Ministry of Health, Ghana in 2006 introduced the Healthcare Waste Management Policy and Guidelines to guide all stakeholders on the effective measures for waste management in healthcare settings as well tools for monitoring performance. The policy is to ensure generated healthcare waste is effectively managed in accordance with binding laws in order to promote the safety of healthcare workers, clients and the environment with regards to infections (Ministry of Health-Ghana, 2006). Hence this study seeks to assess healthcare workers' compliance with the implementation process of infection prevention and control practices for the effective management of healthcare waste at the health facility.

2.5 Knowledge in Infection Prevention and Control

It is reported that nurses and healthcare students lack knowledge with regards to Hospital Acquired Infections (Avachat et al., 2013). Healthcare providers need to know the importance of infection prevention and control since knowledge of IPC practices keeps changing and growing (Vassallo & Boston, 2019). Risks associated with HAIs can be reduced or prevented by effectively educating and training healthcare workers about standard procedures for infection prevention, as well as compliance with aseptic practices by the health workers (Avachat et al., 2013).

A study at the Ridge Regional Hospital reported that knowledge of healthcare workers on IPC at the facility was moderate, 51% (Hayeh, 2012). Also, Kondor, 2018 reported that overall level knowledge of IPC guidelines among participants at La General Hospital was high (97%) and that

could be as a result of frequent IPC trainings and educational programmes organized by the IPC committee at the hospital.

It is assumed increase in knowledge is dependent on education, but knowledge may not influence complete adherence to infection prevention practices. After critical analysis of their findings, (Lee, Lee, Lee, & Park, 2019), the inclusion of various aspects of education, monitoring, and feedback on interventions regarding IPC is recommended to improve upon behavioral change in healthcare workers, just as suggested by World Health Organization (World Health Organization, 2016b). The three – education, monitoring and feedback is required to promote efficient and effective education to achieve consistent results.

There is a need for a team of trained and dedicated professionals (IPC experts) for the provision of training, education, surveillance, monitoring adherence to guideline implementation, evaluation of effectiveness of training programmes for effective IPC practice at the facility(Kondor, 2018; World Health Organization, 2016b).

2.6 Materials / Resource availability for Infection Prevention and Control

One major factor that influence compliance with infection prevention procedures is availability of resources/materials. The availability of an appropriate environment, resources, and equipment at healthcare settings are seen as core element of effective IPC programmes (World Health Organization, 2016b). Most HAIs can be prevented with readily available and relatively inexpensive strategies (Curless et al., 2018). Investing in people, rather than equipment, is a basic resource needed to guide and optimize IPC practices. (World Health Organization, 2016b). It is required by law for employers and hospital managers in Cyprus to provide workers with

needed resources protecting the health and ensuring the safety of healthcare workers (Efstathiou et al., 2011). Unavailability of Personal Protective Clothing is seen as a barrier to compliance with IPC practices and exposes both health worker and patient to infection (Efstathiou et al., 2011). Often times the unavailability of PPEs prevent healthcare workers from complying with standard measures (Efstathiou et al., 2011).

Findings from a recent study by Vincentia Kondor, among healthcare workers at the La General Hospital indicates resources needed for IPC are mostly 'sometimes unavailable' hindering compliance with infection prevention policy. This increases the possibility of spread of infections among clients and service providers (Kondor, 2018). Timely availability and access to materials for IPC is very significant for effective and successful IPC practices in developing countries with high rate of infection (Hayeh, 2012). The provision of sufficient resources to support infection program is a means of promoting IPC practices at the hospital (Hayeh, 2012).

2.7 Waste collection and segregation

Healthcare Waste Management (HCWM) promotes practices of proper hygiene and safety of healthcare workers in all health settings, including the community. It is the social responsibility of healthcare workers to identify, separate, and dispose of biomedical waste in a safe manner. It is therefore needful and necessary to implement healthcare waste management rules globally (Rajan et al., 2019).

Also, it is important to segregate healthcare waste into various categories to determine the right methods of treatment and disposal applicable. The cost of disposal may be affected by the type

of waste generated and the method of disposal used, hence the need for the proper handling of waste. Segregations of waste is to occur at the point of generation, since non-segregated waste is seen to be infectious leading to higher management cost (Ministry of Health-Ghana, 2006). Each category of waste is to be placed in an appropriate colour-coded container – Black, Yellow, Brown and Red (Ministry of Health-Ghana, 2006). Lack of education and knowledge, storage facilities, cost, and time constraints are factors influencing segregation of solid medical waste at source (Udofia, 2016).

Source of waste, amount of waste, and quality of waste generated are to be considered to effect healthcare waste management practices (Hossain, Santhanam, Nik Norulaini, & Omar, 2011). Reducing the amount of waste produced at source of generation with the right method of sorting can be an effective solution (Hossain et al., 2011).

2.8 Waste Treatment and disposal

According to the IPC policy and guidelines, biomedical waste must be directly transported to either a disposal or treatment site within 24 hours after. Equipment used in transporting waste within the facility must be in good working conditions – odour and leak proof, capacity to contain collected waste (Ministry of Health-Ghana, 2015). Vehicles employed in transporting waste off-site should be labelled with company name and address and a biohazard symbol as well as cleanable. It is a requirement for biomedical waste to be transported on public roads by waste management experts (Abor, 2012).

Burning, sterilization, and chemical disinfection are approved methods for treating healthcare waste, whilst controlled disposal at appropriate landfill site and burying are adequate disposal

methods for treated medical (Ministry of Health-Ghana, 2015). General waste should be treated as domestic waste and disposed of at designated landfill sites; sharps, pharmaceutical, and pathological waste incinerated (Ministry of Health-Ghana, 2015). Often times it is observed microwave disinfections, sterilization using autoclaves, chemical disinfections, burning and disposal at landfill are common ways of treating and disposing off healthcare (Abor, 2012; Asante et al., 2014).

CHAPTER THREE

METHODS

3.0 Introduction

The section describes the method data collection and analysis providing information on healthcare workers' compliance with the implementation process of IPC. It discusses the study design employed, study area, study population, inclusion and exclusion criteria, study variables, sample size, sampling method, data collection techniques, quality control, data processing and management, data analysis, study limitations and ethical considerations.

3.1 Study design

The study employed a cross-sectional design in assessing healthcare worker's ability to comply with the implementation process of IPC practices. The study employed a mixed-methods approach using self-administered structured questionnaire and observational guide in data collection.

3.2 Study location/Area

The Ga West Municipal Hospital (GWMH) located at Amasaman in the Greater Accra Region is the selected site for the study. The hospital is chosen for the study because it serves as a referral point for other health facilities (7 CHPS compounds) within the municipality. The hospital provides both general and special services to the population in the community. It has a staff strength of 372 including Anesthetists, Midwives, Nurses, Surgeons, Pharmacists, Physician Assistants, Doctors, Orderlies, and other supporting staff.

3.3 Study population

All healthcare workers who are giving healthcare services including housekeepers and cleaners at the Ga West Municipal Hospital were considered as study population.

3.4 Inclusion and Exclusion criteria

Healthcare workers who were willing to participate were included in the study and other personnel who chose to opt out after their inclusion were excluded from the study.

3.5 Description of Study Variables

The Dependent variable for the research was Healthcare Worker Compliance with IPC policy and guidelines. Availability of resource / materials for IPC, Collection and segregation of waste, Method of treatment and final disposal of waste, and Level of knowledge in IPC served as Independent variables.

Table 1: Variable table showing the dependent, independent, and socio demographic variables

Variable	Type of variable	Operational definition	Scale of measure
Age	Independent	Age of participant at time of study	Categorical 20 – 30yrs 31 – 40yrs 41 – 50yrs 51 – 60yrs
Sex	Independent	Gender of participant	Binary Male Female
Educational Status	Independent	Participant's level of formal education	Categorical Basic

			Secondary Tertiary
Professional category	Independent	Category of healthcare workers participant belongs to	Categorical Medical Nursing Lab. technician Other
Work experience	Independent	Participant's years of practice as a healthcare worker	Categorical 1 – 5years 6 – 10+years
Compliance with IPC practice	Dependent	Participant going strictly according to lay down rules pertaining to infection prevention and control.	Categorical High Moderate Low Very low
Level of knowledge in IPC	Independent	Participant being well informed about the policy and guidelines on IPC	Categorical High Moderate Low Very low
Availability of IPC materials	Independent	Participant having access to logistics, materials and supplies for infection prevention.	Categorical High Moderate Low Very Low
Method of collection and segregation	Independent	Participants ability to separate waste based on characteristics, type of treatment and disposal applied.	Categorical Excellent Adequate Poor
Method of treatment and disposal	Independent	Participant's method of treatment and disposal of generated	Categorical Excellent

		waste	Adequate Poor
Non-compliance with IPC practice	Independent	Participant not going strictly according to lay down rules pertaining to infection prevention and control.	Categorical High Moderate Low Very low

3.6 Sample size determination

Sample size was calculated using the mathematical formular;

$$n = N / 1 + N(\alpha)^2$$

where,

n is the sample size;

N is the sample frame (372); and

α represents the margin of error (0.1) with a confidence level of 90%.

By substitution,

$$n = 372 / 1 + 372 (0.1)^2$$

$$n = 78.81 = 79$$

The calculated sample size (79) was adjusted by 10% as allowance for non-responsive participants, using the formula, n/1 - 0.1.

A total number of 88 participants were recruited for the study.

Considering the size of the study population to be small, a 90% confidence interval was used for the study ensuring a good participant coverage and reaching a good result.

3.7 Sampling method/procedure

A Stratified Random Sampling method was used in choosing participants from the various selected departments of the facility (proportionate stratified sample) for the study. Participants were selected based on the ratio of staff strength of each department/unit to the sample frame of the hospital with respect to the calculated sample size. Since all participants has an equal chance of being chosen, a Simple Random Sampling method was employed to select participants at random from the selected departments for the study. This ensures a representation of individuals across the entire population and also ensures a greater precision in the estimates of underlying population parameters.

Table 2: Staff strength and selected sample size per department

Department/Unit	Population per stratum	Selected sample size per department
Out Patient Department	14	4
Dressing Room	12	3
Pharmacy	21	5
Dental	7	2
General Administration	7	2
Labour ward	19	5
Emergency	20	5
Theatre	16	4
Male ward	15	4
Recovery	14	4
General ward	17	4
Gynaecology	16	4
Laboratory	6	2
Child Welfare Centre	22	6

ANC	11	3
Public Health	5	2
Environment	27	7
Laundry	3	1
In-service	3	1
Eye	7	2
Disease control	2	1
Tuberculosis	4	1
ENT	3	1
Scan	3	1
ART	5	2
CSSD	4	1
Physiotherapy	6	2
Anaesthesia	7	2
Mental health	7	2
X-ray	2	1
Health promotion	3	1
Stores	6	2
Procurement	2	1

3.8 Data Collection Techniques/Methods and Tools

Data was collected by the principal researcher using self-administered structured questionnaire from study participants and observational guides to assess infection prevention procedures at the facility. The nature and purpose of the study was made known and explained to participants with their consent given before their participation. The principal investigator ensured safety measures – wearing of nose mask, use of hand sanitizer, and practicing social distancing to prevent the spread of COVID -19.

3.9 Quality Control/Assurance

To ensure accuracy, the Principal Investigator with sufficient knowledge in infection prevention administered the questionnaire on site. Questionnaire and observational checklist were pre-tested on about 10% (9 HCWs) of a similar study population at the Achimota Hospital to validate the reliability of the tool. Also, pre testing of assessment tools was to test participants understanding and necessary modifications made in the questionnaire before its use for data collection. Data was collected over a period of six days.

3.10 Data Processing and Management

The response rate for the completed and returned questionnaires were calculated by finding the percentage of questionnaires returned (numerator) and number of questionnaires administered (denominator) to participants. Out of the eighty-eight (88) administered questionnaires, eighty-six (86) were completed and returned resulting in about 98% response rate. The collected data was coded using Excel and entered into STATA version 16 for analysis. With distribution and internal consistencies checked, incomplete responses were excluded in the final analysis.

3.11 Data Analysis

The statistical analysis was done using STATA version 16 software where both dependent variable and independent variables were measured using composite scores.

Healthcare Worker Compliance with IPC policy and guidelines were analysed with regards to number of healthcare workers who went strictly according to lay down rules pertaining to infection prevention procedures. Study participants answered 19 questions to indicate going according to standard operating procedures. Questions with an answer of 'Always', 'Sometimes', and 'Never' by respondents were graded '2', '1' and '0' respectively resulting in a total score of

38. A minimum score 70% of the expected total score was seen as Compliance (World Health Organization, 2018a, 2019).

Healthcare workers' knowledge on IPC was analysed with regards to number of healthcare workers with adequate information on IPC policy and its content – understood the purpose of the policy and the consequences of non-compliance with the policy. This was measured using a participant's obtained score from the questionnaires – knowledge on IPC – that were administered. Participants answered 19 questions comprising of 14 general questions and 5 'Yes' or 'No' questions. A correct answer to a general question was graded '1' and a wrong answer graded '0'. Out of the 14 marks, a 76% and above of the total score was described as High, a score between 51% and 75% was described as Moderate, a score between 26% and 50% was described as Low, and a score of 25% and below was described as Very low (World Health Organization, 2018a, 2019).

The availability of IPC resources/materials was analysed with regards to the availability of resources and the number of healthcare workers who always had access to these materials. In all, 6 questions were answered by participants in measuring availability of IPC resources/materials. An answer of 'Always available', 'Sometimes available', and 'Not available' were graded '2', '1', and '0' respectively. A record of 50% and above of total score depicts a moderate availability and accessibility of IPC resources. (World Health Organization, 2018b, 2019).

3.12 Ethical considerations/Issues

Ethical Approval

A research protocol was submitted to the Ghana Health Service (GHS) Ethics Review Committee for ethical clearance for the study to be carried out. An official letter obtained from the Department of Health, Policy Planning and Management, School of Public Health, University of Ghana, in addition to other official documents were submitted to the Ethical Review Committee for approval.

Permission from Study Area

Permission was obtained from the Ga West Municipal Hospital Administration and the Ga West Municipal Health Directorate to carry out the study at the selected site. An official letter was obtained from the Department of Health, Policy Planning and Management, School of Public Health, University of Ghana, in addition to other official documents were submission to respective authorities for approval.

Description of Study Participants

Participants for the study were healthcare workers of the Ga West Municipal Hospital whose activities involves infection prevention and control.

Informed Consent

Consent was obtained from participants after the purpose, process, risks and benefits of the study was explained to them. Participants were not coerced to take part in the study but encouraged to participate.

Confidentiality

Participant's identity was kept anonymous. Data collected from participants, in part or whole were kept in confidentiality where no one outside the research team had access to.

Potential Risks and Benefits

There was no harm associated with this research. Information gathered from this research will be made available to policy makers at the facility, community, regional and national levels in informed decision making.

Data storage and Usage

Completed and submitted questionnaires were coded, entered within 24 hours after collection and stored in a secured location, data was backed up to avoid its loss.

Conflict of interest

The research is mainly for academic purposes and to help satisfy the requirement for the award of Master of Science Degree, therefore the Researcher has no conflict of interest.

Dissemination and Use of Results

Findings from the study will be made available to all relevant stakeholders including the management and staff of the health facility where the research was conducted.

CHAPTER FOUR

MONITORING AND EVALUATION ISSUES OF THE STUDY

4.0 Introduction

Monitoring and Evaluation is the process of collecting and analyzing data in order to provide stakeholders particularly policymakers with relevant information towards the planning and management of programs and projects (Frankel & Gage, 2016). Monitoring and Evaluation helps program implementers ensure the most effective and efficient use of resources, make informed decisions regarding program operations based on evidence. The chapter discusses the implemented IPC Policy and guidelines, type of evaluation, study frameworks, and definitions of indicators with regards to the study.

4.1 Description of Policies and Guidelines for Infection Prevention and Control

The national policy and guidelines for infection prevention and control (IPC) in healthcare settings document by the Ministry of Health in Ghana addresses concerns about inadequate IPC practices in healthcare settings in the country. It broadly outlines policies and guidelines required as the standardized and nationally acceptable IPC practices in health settings, with the purpose of giving clear directions to healthcare workers and their clients in prevention and control of infections within healthcare settings in order to ensure the safety and protection of clients and care givers.

Again, the Ministry of Health, Ghana in 2006 introduced the Healthcare Waste Management Policy and Guidelines to guide all stakeholders on the effective measures for waste management

in healthcare settings as well tools for monitoring performance. Healthcare workers are required to follow standardized methods of handling generated waste, ensuring generated healthcare waste is effectively managed by stakeholders in accordance with binding laws in order to promote the safety of healthcare workers, clients and the environment with regards to infections (Ministry of Health-Ghana, 2006).

Institutions and companies with responsibility for treatment, transport and disposal of waste are also expected to familiarize themselves with the provisions of the Policy and Guidelines and must comply with them. The policy classifies waste into hazardous and non-hazardous waste and details steps in its handling; from generation, segregation, storage, transportation and treatment to final disposal as well as equipment and tools required. It also assigns roles and responsibilities to various stakeholders and further prescribes measures for protection of handlers. All health institutions and waste management companies are to keep accurate records on waste management activities. Every health institution have the responsibility to separate, store, label, treat, transport and dispose of all waste in the manner prescribed in this policy and other laws and regulations regarding healthcare waste management so as to safeguard the safety of its workers, clients and the environment (Ministry of Health-Ghana, 2006).

However, healthcare worker's compliance with these policy and guidelines has been reported to be challenged due to the lack of technical facilities, workload management priorities, lack of time, lack of knowledge and training, and negative influence of equipment on nursing skills, lack of supervision, lack of materials and access to available materials (Alshammari et al., 2018; Efstathiou et al., 2011; Kondor, 2018).

Having collection and segregation, storage, transportation, treatment and final disposal of waste as key components of healthcare waste management, the policies and guidelines helps in ensuring that standards of professional infection prevention practices are adhered to by healthcare workers (Ministry of Health-Ghana, 2006, 2015; World Health Organization, 2019).

4.2 Type of Evaluation

The study, "Evaluation of healthcare worker compliance with the implementation process of Infection Prevention and Control practices at the Ga West Municipal Hospital" is a Process Evaluation of the components, inputs, activities and immediate output of the implemented IPC policy. A "Process Evaluation" describes the implemented activities and services of a program as well as policies and procedures that have been put in place. Its focus is on the implementation process of a program, providing early feedback on barriers encountered during the implementation, and changes needed to improve desired outcomes (Associattes, 2007). With regards to this study, "Process evaluation" seeks to find out as to how well the IPC policy is being implemented by healthcare workers at the facility. The Logic model (Program Impact Pathway) which shows the causal relationship between inputs and the set objectives of a program (Frankel & Gage, 2016) will be used for the evaluation.

4.3 Study Frameworks

Conceptual Framework

Figure 1 below represents the Conceptual framework for the study. Level of knowledge of HCWs, Availability of resource / materials for IPC, Collection and segregation of waste and

Method of treatment and final disposal of waste will help measure healthcare worker Compliance with IPC practices.

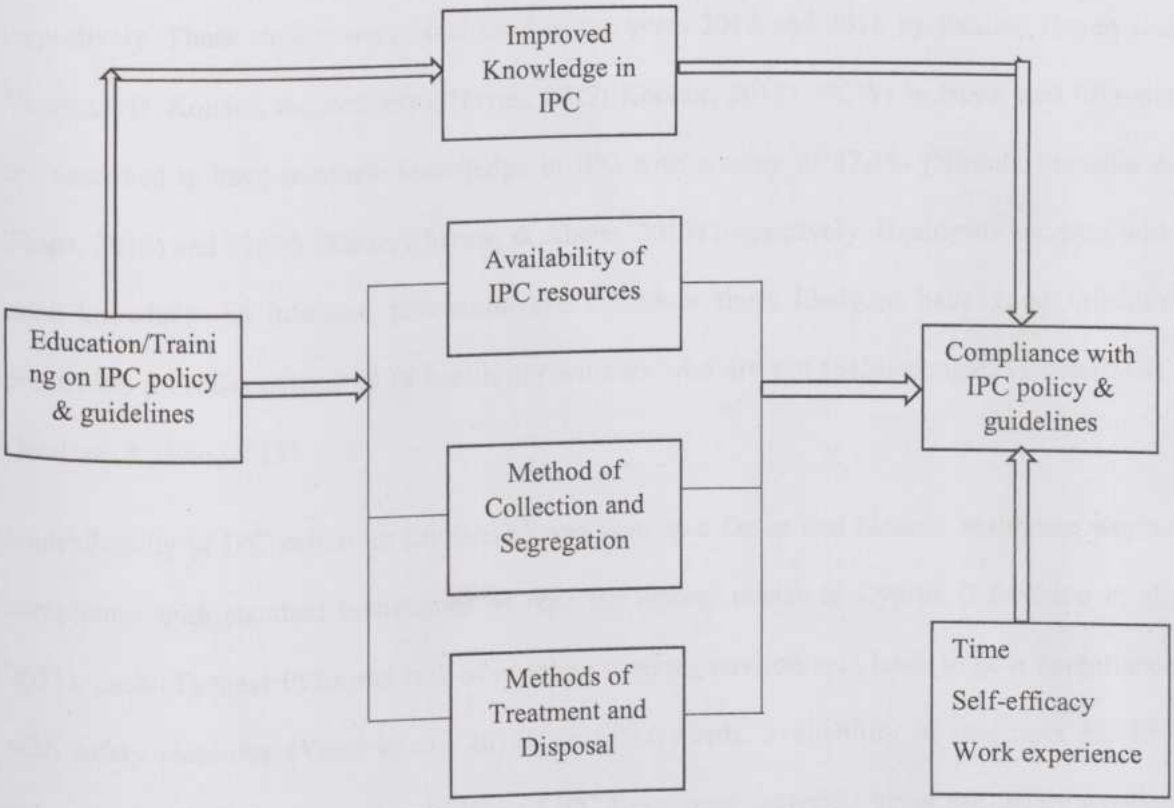

Figure 1: Conceptual framework for process evaluation of implementation of IPC

Educational interventions on Hospital-Acquired Infections (HAIs) had positive impact on knowledge and awareness of HCWs (Avachat et al, 2012). Education and training of healthcare workers about standard operating practices with regards to IPC policy and guidelines and its content is to provide healthcare workers with adequate knowledge to practice infection prevention effectively, thus, reducing the extent of risks of HAI.

Level of knowledge among healthcare workers in infection prevention from previous studies ranges across "moderate", "adequate knowledge" and "excellent". In Ghana, level of knowledge

amongst clinical health workers at the Ridge and La General Hospitals was said to be moderate with a score of 51% (Hayeh, 2012) and excellent with a score of 64% (Kondor, 2018) respectively. These studies were conducted in the years 2012 and 2018 by Paulina Hayeh and Vincentia D. Kondor, respectively ((Hayeh, 2012; Kondor, 2018). HCWs in Nepal and Ethiopia are described to have adequate knowledge in IPC with a score of 57.1% (Niraula Shrestha & Thapa, 2018) and 81.6% (Yazie, Sharew, & Abebe, 2019) respectively. Healthcare workers with good knowledge in infection prevention are 1.5 times more likely to have good infection prevention practices compared to healthcare workers who are not (Sahiledengle, Gebresilassie, Getahun, & Hiko, 2018).

Unavailability of IPC resources (materials) was seen as a factor that hinders healthcare worker compliance with standard precautions as reported among nurses in Cyprus (Efstathiou et al., 2011). Lack of proper PPEs and lack of enabling working environment leads to poor compliance with safety measures (Yazie et al., 2019). In other words, availability of resources for IPC enhance good IPC practices. Availability of IPC Resources/ materials gives healthcare workers the ability to follow the policy and guidelines.

Lack of waste segregation at source of generation, lack of color-coding of waste containers and lack of care from healthcare workers are some factors leading to non-compliance with waste management practices in hospitals (Ali, Wang, Chaudhry, & Geng, 2017). The proper collection and segregation of waste may reduce risk of infection, and reduce financial burden on the facility; enhancing good IPC practices. The proper management of healthcare waste reduces the risk involved with coming into contact with material that may be infected (Asante et al., 2014). Adherence to standard healthcare waste management ensures good infection prevention practices.

Lack of materials, time constraint, uncomfortable equipment, inadequate IPC training and conflict between providing needed care and self-protection (Alshammari et al., 2018; Efstathiou et al., 2011; Kondor, 2018) amongst many others are some factors influencing healthcare worker compliance with IPC policy and guidelines.

Logic Model

The Logic model describes the relationship between the Components, Inputs, Activities, and Output of the implemented policy. Table 1 gives a description of the Logic model for the study.

Table 3: Logic model for the study

COMPONENTS	INPUTS	ACTIVITIES	OUTPUTS
Education/ Training on IPC guidelines	Training materials Human resource Space Funds	Training of healthcare workers, housekeepers, and cleaners.	Number of trained healthcare workers, housekeepers, and cleaners.
Collection and Segregation	Waste containers/bins Colors/ markers PPEs	Color – coding waste containers	Number of color – coded waste containers
Storage	Waste containers/bins Liquid detergent Warm water Padlocks	Daily and frequent emptying, cleaning and disinfecting waste containers Covering and protecting of waste bins from rain Placing of appropriate waste bins in every	Number of Empty, clean and disinfected waste bins Number of waste bins covered and protected Number of appropriate waste bins in wards or unit External storage area

		ward or unit Site external storage area away from the reach of public Closing and locking of storage site	sited away from the reach of public Storage site closed and locked
Transportation	PPEs Vehicles	Direct transportation of waste to disposal or treatment site	Amount of waste directly transported to disposal or treatment site
Treatment	Incinerator Sterilizer(s) Chlorine compounds PPEs	Destroying waste by burning Sterilization of waste by autoclaving or dry heat Chemically disinfecting waste	Amount of waste destroyed by burning Amount of waste sterilized Amount of waste disinfected
Final disposal	Sterilizer Fuel Lighter Hand gloves Chlorine solution	Autoclaving waste Burning/burying waste Pouring of liquid waste into an outlet Thorough rinsing of outlet Decontaminate waste container and hand gloves	Amount of waste autoclaved Amount of waste burnt/buried Liquid waste poured into outlet Number of outlet(s) rinsed Number of waste containers and hand gloves decontaminated

The logic model will help assess health workers' level of knowledge in infection prevention; describe methods of waste treatment and disposal practiced; assess the level of availability of materials; and explore factors influencing non-compliance with policy and guidelines at the Ga West Municipal Hospital.

4.4 Definition of Indicators

The indicators for this study are units of data elements that will be measured or observed over time documenting change in processes and outputs. They indicate whether set objectives are being achieved.

Table 4: Indicators and modes of measurement for IPC Compliance

INDICATORS	MODE OF MEASUREMENT
Number of healthcare workers, housekeepers and cleaners trained	Measured using records for IPC training
Number of color-coded containers	Measured through Observation and records from Stores
- Number of empty, clean and disinfected containers - Number of covered waste bins - Number of waste bins in wards /units - External storage area sited away from the reach of public - Enclosed and locked storage site	Measured by Observation
- Transported waste to disposal or treatment site - Amount of waste transported to disposal or treatment site	Measured by Observation
Ashes and leftover debris	Measured by observation

- Number of rinsed outlets	Measured by observation
- Number of waste containers and hand gloves decontaminated	

CHAPTER FIVE

RESULTS

5.0 Introduction

The goal of the research was to evaluate healthcare worker compliance with the implementation process of IPC practices at the Ga West Municipal Hospital. A structured questionnaire and an observational checklist was used in collecting data from respondents at the facility. This chapter presents the analysis and interpretation of findings on personal information (socio-demographic data) of healthcare workers, availability of materials for IPC, compliance with IPC policy and guidelines, the hospital's IPC procedures, healthcare workers' knowledge in infection prevention, and factors influencing non-compliance with IPC practices.

5.1 Socio – Economic characteristics of healthcare workers

From the total number (88) of healthcare workers selected, 86 healthcare workers participated in the study. All eighty-six (86) responses were included in the analysis. 88.4% (76) of the participants were females. The ages of the participants ranged between 21 and 60 years with 21 - 30 years' group having the highest percentage of 50% (43). The mean age of healthcare workers at the facility was 32 years (SD=16.3).

About 44.2% (38) of study participants lived within the Amasaman township and its environs, and 50% (43) were married. About 95.4% (82) had tertiary level of education, and nursing was the highest category of healthcare workers with a record of 76.7%, (66). 51.2% (44) of participants spent between 1-5 years practicing as healthcare workers with 70.9% (61) spending not more than 5 years working at the facility.

Table 5: Socio demographic characteristics of healthcare workers

Characteristics	Number	Percentage (%)
Sex (n=86)		
Female	76	88.4
Male	10	11.6
Age (years)		
21 – 30	43	50.0
31 – 40	31	36.0
41 – 50	9	10.5
50 – 60	3	3.5
Education		
Basic	2	2.3
Secondary	2	2.3
Tertiary	82	95.4
Marital Status		
Single	43	50.0
Married	43	50.0
Professional Category		
Laboratory Technician	2	2.3
Medical	2	2.3
Nursing	66	76.8
Others	16	18.6
Years of Experience		
1 – 5	44	51.2
6 – 10	26	30.2
11 – 15+	16	18.6
Number of years at facility		
1 – 5	61	70.9
6 – 10+	25	29.1

5.2 Availability of materials for Infection Prevention and Control

About 97.7% (84) of health workers reported infection prevention and control guidelines were made available for use. Majority, 71% (61) of healthcare workers stated the always availability of Personal Protective Equipment (PPE). With the availability of detergents, about 80.2% (69) indicated detergents were always available for decontamination of used instruments and the floor. All healthcare workers (86) stated the always availability of waste containers for use. Whiles 96.5% (83) of healthcare workers indicated safety boxes were always available for the disposal of sharps. About 83.7% (72) of healthcare workers stated the always availability of water for use at the facility as described in Table 6.

Majority (59.3%) of healthcare workers at the Ga West Municipal Hospital always had infection prevention materials available to them as depicted in Figure 3.

Table 6: Availability of materials for Infection Prevention and Control

Variable	Number	Percent (%)
Availability of materials for infection prevention		
Personal Protective Equipment (PPE)		
Always available	61	71.0
Sometimes available	25	29.0
Detergents for decontamination		
Always available	69	80.2
Sometimes available	17	19.8
Waste containers		
Always available	86	100
Not available	-	-
Safety boxes		
Always available	83	96.5
Sometimes available	3	3.5

Water for Infection Prevention practices		
Always available	72	83.7
Sometimes available	13	15.0
Not available	1	1.2
Infection Prevention and Control Policy		
Always available	84	97.7
Sometimes available	2	2.3
Total	**86**	**100**

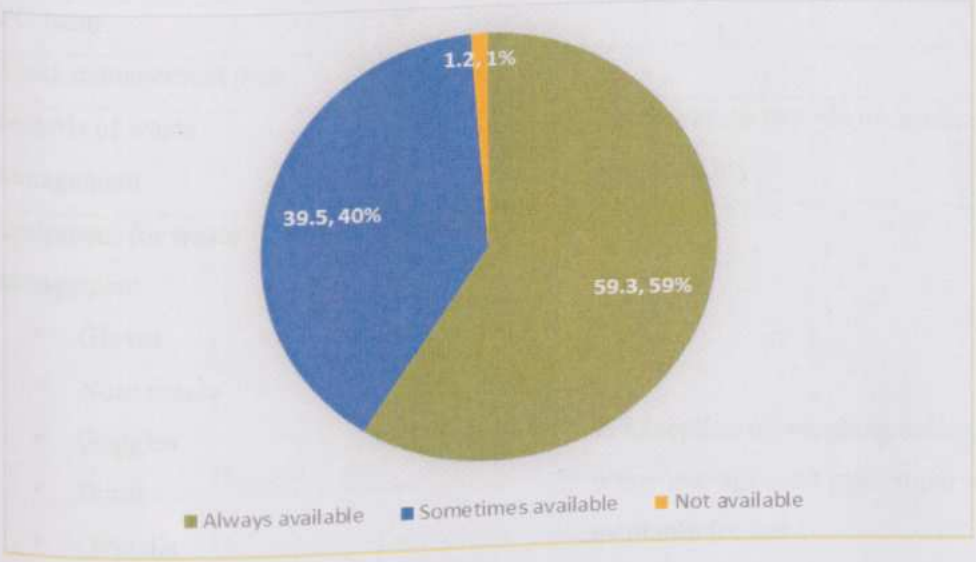

Figure 2: Perception of availability of materials for Infection Prevention and Control

Table 7: Outcome of observation on availability of materials for Infection Prevention and Control

Performance/Activity	Yes	No	N/A	Observation/Comment
Waste management policy available to staff	✓			Not individually but unit based availability.
IPC policy and guidelines available to staff	✓			Not individually but unit based availability.
PPEs and IPC materials available and accessible	✓			Available at all units but not easily accessible.
IPC committee	✓			
IPC team	✓			
Waste management plan	✓			
Records of waste management			✓	There was no records on waste management at the facility.
Equipment for waste management				
▪ Gloves	✓			
▪ Nose masks	✓			
▪ Goggles	✓			In exception of weighing scales, all other waste management equipment were available for use.
▪ Boots	✓			
▪ Overalls	✓			
▪ Aprons	✓			
▪ Weighing scale(s)			✓	
▪ Color-coded bags and bins	✓			
▪ Trolley(s)	✓			
▪ Wheel barrow(s)	✓			
▪ Dust pans	✓			
▪ Brooms	✓			
▪ Brushes	✓			
▪ Spade(s)	✓			

▪ Pick axe(s)	✓		
Treatment and Disposal equipment			
▪ Medium capacity incinerator(s)	✓		Medium capacity incinerator, waste autoclaves, and protected pits are treatment and disposal equipment available at the facility.
▪ Waste autoclaves	✓		
▪ Bio digesters		✓	
▪ Ball mills		✓	
▪ Crushers		✓	
▪ Compost pits		✓	
▪ Protected pits	✓		

5.3 Collection and segregation of waste

Waste management instruction posters were displayed at the General Administration, In-service, Emergency ward, General ward, Male ward, General ward, Gynecological ward, Dental unit, Theatre block, Laboratory, and ANC/AWC units of the Ga West Municipal Hospital. All forty-five (45) units of the hospital were provided with at least one (1) waste bin for the collection and segregation of waste. Generated healthcare waste was collected within 24 hours after generation and stored in 240 Liters waste containers placed within the premises at the hospital. These waste bins were emptied into a bigger container, washed, and disinfected at least once a day after each collection. Also, sharps containers were assembled in accordance with producers' instructions and safely placed in suitable positions for collecting infectious waste. Majority, 94.2% of healthcare workers had the ability to separate generated waste based on the characteristics, type of treatment and disposal applied.

Table 8: Outcome of observation on Collection, Segregation and Storage of waste

Performance/Activity	Yes	No	N/A	Observation/Comment
Waste management instruction posters are on display	✓			Waste management instruction posters available and were displayed on each block (General Administration, In-service, Emergency ward, General ward, Male ward, General ward, Gynecological ward, Dental unit, Theatre block, Laboratory, and ANC/AWC) of the facility.
Available color-coded waste containers ▪ Black ▪ Yellow ▪ Brown ▪ Red	 ✓ ✓ ✓		 ✓	Black color-coded waste containers were available in offices, wards, consultation rooms, out-patient department, and all 45 units within the facility. Yellow, brown and green color-coded waste containers were mostly used at the facility. Red color-coded waste containers were not available at the facility.
Waste bins are correctly labelled with additional information to users where appropriate.			✓	Waste bins at the wards, offices, consultation rooms, OPD were correctly labelled with no additional information to users. Waste containers within the premises were not with labels and additional information to users.
Waste bins are in clean condition.	✓			All waste bins were in clean condition at the time of visit to the facility.
Waste bins are foot operated and in good working order (strong, leak proof, non-transparent, impervious) and lined with the right	✓			Waste bins found in offices, wards, consultation rooms, OPD were in good working order, foot operated and lined with the right color bags but waste bins found within the premises were not foot operated and without the right color bags.

color bag.			
Waste segregated into various categories for effective waste disposal. ▪ General waste ▪ Infectious waste ▪ Pathological waste ▪ Sharp waste ▪ Cytotoxic waste ▪ Pharmaceutical waste ▪ Chemical waste ▪ Radioactive waste ▪ Incinerator ash/sludge	✓ ✓ ✓ ✓ ✓	 ✓ ✓ ✓ ✓ 	Waste is segregated into five (5) categories; general waste, infectious waste, sharp waste, pharmaceutical waste, and incinerator ash/sludge categories for effective waste disposal.
Segregation occurs at the point of waste generation. ▪ General waste into black containers. ▪ Sharp waste into yellow puncture resistant containers. ▪ Other infectious waste into yellow plastic bags and bins. ▪ Pharmaceutical and chemical waste into brown plastic bags and	✓ ✓ ✓ ✓	 	Segregation occurs at the point of waste generation and into the right color-coded containers and bags.

bins. ▪ Highly infectious waste into red biohazard plastic bags and bins	✓	
Sharps container is assembled in accordance with producers instructions	✓	Sharps containers found in ART room, Injection room, RCH, Theatre, labour ward, etc. were assembled in accordance with producers instructions.
Sharps container is safely placed in a suitable position for convenient use, but inaccessible to young children.	✓	Sharps container was safely placed in suitable position and inaccessible to patients,
Content of sharps boxes are appropriate	✓	Sharps boxes contained sharps such as used/broken needles, etc.
Content of yellow containers are appropriate	✓	Although yellow containers indoors contained infectious waste, other yellow containers at the premises contained general waste.
Content of black containers are appropriate	✓	Content of black containers were general waste.
Content of red containers are appropriate		Red containers were not available at the at the time of visit.
Content of brown containers are appropriate	✓	Content of brown container found at the laboratory was appropriate.
Waste bags/bins are securely sealed when ¾ full and correctly labelled.	✓	¾ full waste bags were sealed and labelled
Sharp containers are labelled with ward names	✓	Full sharps containers were labelled with ward names and date.

or number and dated when full		
Full sharps containers are securely tied and safely stored prior to collection	✓	Full sharps containers were tied and safely stored.
Cardboard boxes are stored flat, in a safe manner before collection.	✓	Cardboard boxes were stored flat, in a safe manner with the help of cleaners.
Bags waiting for collection are safely stored away from the public	✓	Bags awaiting collection are safely kept at temporary storage site away from public.
Waste containers covered and placed in areas protected from harsh weather conditions	✓	Although waste containers were covered, some of the waste bins outside were exposed to harsh weather conditions.
Waste containers cleaned and disinfected after use ▪ Daily ▪ Weekly ▪ Monthly	✓	Emptied waste containers were disinfected on daily basis.
External storage cite sited away from the reach of the general public	✓	External storage cite sited away from the general public.
Enclosed storage site provided with gate and lock	✓	Storage site not provided with gate and lock
Storage site inaccessible by unauthorized persons and animals	✓	Storage site easily accessible by unauthorized persons and animals.
Smooth, impervious and	✓	Storage floor partly smooth and easy to

easy to clean storage floor	clean.

5.4 Method of waste treatment and disposal

The facility practices incineration, chemical disinfection and sterilization as waste treatment methods. Medium capacity incinerator and waste autoclaves were equipment available for treatment and disposal of waste at the Ga West Municipal Hospital. With final disposal waste, the facility practices burying of waste, burning of waste, and disposal at the landfill site. General waste and incinerator ash were disposed of at a designated landfill site with the help of an outsourced waste management company, Zoomlion Ghana Limited. Sharps wastes were burnt using the incinerator. Pharmaceutical waste (solids and liquids) are buried and blood related liquid waste is disposed of through dislodgement using septic tank and soak away.

Table 9: Outcome of observation on waste transportation, treatment, and disposal

Performance/Activity	Yes	No	N/A	Observation/Comment
Waste transported directly to the disposal or treatment site within 24 hours after generation	✓			Infectious waste directly transported to disposal site within 24 hours and general waste transported every other day to treatment and disposal site.
Vehicle(s) used for the transportation of waste is/are in good working condition (leak proof, enclosed to prevent scattering of waste)	✓			Vehicles(s) used for transporting waste both internally and externally were in good working condition.
Method of waste treatment practiced at the				

facility ▪ Bio digestion ▪ Composting ▪ Incineration ▪ Chemical disinfection ▪ Crushing ▪ Neutralization ▪ Compaction ▪ Complexation ▪ Sterilization	✓ ✓	✓ ✓ ✓ ✓ ✓ ✓ ✓	Incineration, chemical disinfection, and sterilization are methods of waste treatment practiced at the facility.
Disposal method practiced at the facility ▪ Waste disposed of at designated landfill ▪ Burning of waste (incineration) ▪ Burying of waste	✓ ✓ ✓		
General wastes disposed of at landfill sites	✓		Generated general waste was disposed of at designated landfill site
Sharps, pharmaceutical, and pathological waste disposed of at a landfill site		✓	Sharp waste are burnt by use of incinerator, pharmaceutical waste such as liquids and tablets are buried.
Liquid waste diluted and disposed of down a drain	✓		Blood related liquid waste is done through dislodgement using a septic tank or soak away.
Cytotoxic waste disposed of at a landfill site		✓	

Incinerator ash/sludge disposed of at a landfill site	✓

5.5 Healthcare workers' level of knowledge in infection prevention and control

Table 10 below depicts responses on healthcare worker's knowledge in infection prevention practices. The sum of the individual average scores obtained from the sum of the various components of knowledge on IPC section was used in assessing participants level of knowledge in IPC. Majority 90.7% (78) of respondents had ever seen the policy on infection prevention and control with 64.2% (52) having knowledge of the purpose of the policy. Majority of participants (88.4%) identified contact, airborne, and droplet as known modes of infection transmission. Respondents stated the proper disposal of waste, use of personal protective equipment, and proper washing of hands (97.7%) as ways of preventing nosocomial infections. Also, most of respondents (94.2%) stated general waste can be placed in black color-coded waste containers. In general, 78% (67) of respondents had high knowledge (above 75%) in IPC and the remaining 22% (19) had moderate knowledge (between 51% and 75%) in infection prevention and control as depicted in Figure 3.

Table 10: Healthcare workers' level of knowledge in Infection Prevention and Control

Variable	Number	Percent (%)
Purpose of IPC policy		
Give directions to healthcare workers in preventing and controlling infections	52	64.2
Provide acceptable standards for the practice of IPC	25	30.9

All of the above	4	4.9
Role of IPC committee at the facility		
Ensure implementation of policy and guidelines	7	8.1
Monitor, supervise, and evaluate infection prevention activities	8	9.3
Disseminate information on infection prevention and control	1	1.2
All of the above	70	81.4
Can a healthy worker infect a patient receiving care?		
Yes	82	95.4
No	4	4.6
Mode of infection transmission		
Airborne	1	1.2
Droplet	2	2.3
Contact	7	8.1
All of the above	76	88.4
Items needed for effective infection prevention and control practices		
Soap	1	1.2
Hand gloves	-	-
Waste containers	1	1.2
All of the above	84	97.6
Knowledge of healthcare waste		
Knowledgeable	56	65.0
Not knowledgeable	30	35.0
Types of healthcare waste		
Infectious	3	3.5
General	2	2.3
Chemical	1	1.2
All of the above	80	93.0
Make up of infectious waste		
Sharps	10	11.6
Pathological waste	16	18.6

All of the above	60	69.8
Use of black color-coded waste container		
General waste	81	94.3
Sharps	3	3.5
Highly infectious waste	2	2.3
Appropriate time for waste segregation		
Segregation at source	69	80.3
Segregation not at source	17	19.7
Temporal storage of healthcare waste		
0 – 24 hours	81	94.2
25 – 48 hours	5	5.8
Prevention of Hospital Acquired Infections		
Proper disposal of waste	-	-
Proper washing of hands	2	2.3
Use of PPEs	-	-
All of the above	84	97.7
Level of knowledge in infection prevention and control		
High	67	78.0
Moderate	19	22.0
Total	**86**	**100**

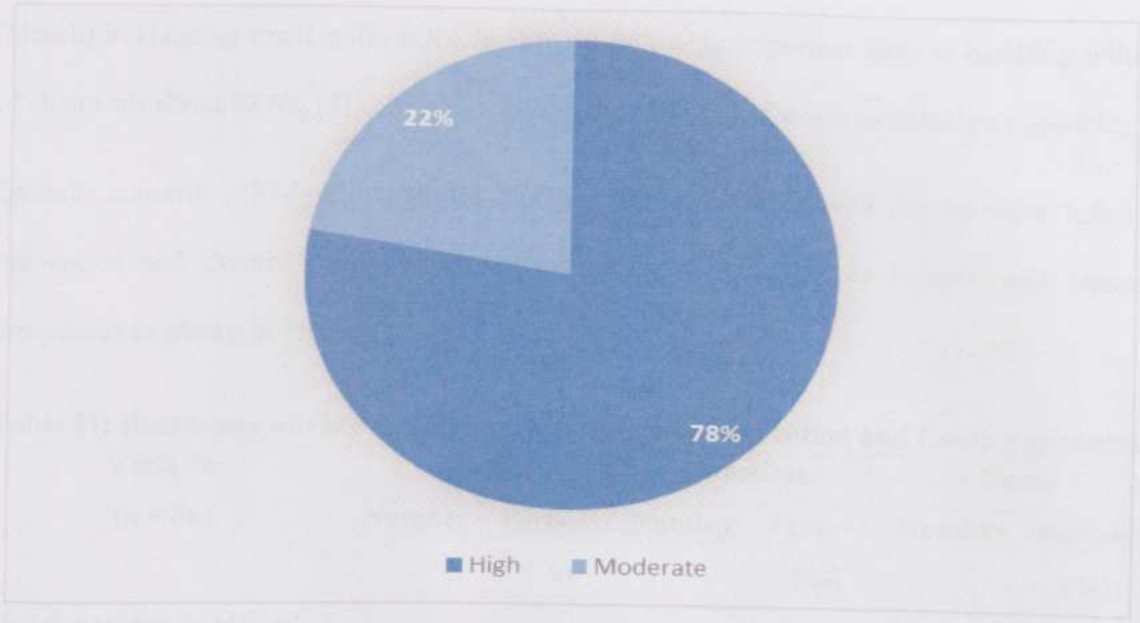

Figure 3: Overall level of knowledge in Infection Prevention and Control

5.6 Compliance with policy on Infection Prevention and Control

About the existence of an IPC committee at the hospital, majority (91.9%) of healthcare workers indicated that they were aware of the committee and 8.1% stated otherwise. From a total of 86 healthcare workers who responded to the survey, 65.1% (56) always and 24.4% (21) sometimes referred to instruction posters regarding procedure for waste management in order to be abreast with steps in healthcare waste management.

With regards to hand washing, 91.9%% (79) of the healthcare workers who participated in this study always washed their hands after handling waste. On the use of hand gloves, 96.5% (83) always took off used gloves immediately after completion of a task. For the collection and storage of generated waste, 84.9% (73) healthcare workers in the study always placed waste in appropriate color-coded container. About 74.4% (64) of healthcare workers always ensured sharps were not manipulated before disposal and 78% (67) always used cleaning solution

(bleach) in cleaning small spills at the facility. In following important steps in handling spillage of chemicals about 82.6% (71) always absorbed and disposed of waste as quickly as possible.

Overall, majority (83%) of healthcare workers were compliant with the standard Infection Prevention and Control policy whilst 17% (15) were found not to comply with standard procedures as shown in Figure 4.

Table 11: Healthcare worker compliance with Infection Prevention and Control guidelines

Variable (n = 86)	Always		Sometimes		Never	
	Number	Percent (%)	Number	Percent (%)	Number	Percent (%)
Hand washing practices						
As soon as they report	70.0	81.4	13	15.1	3.0	3.5
Before attending to a patient	58.0	67.4	22	25.6	6.0	7.0
Before and after wearing hand gloves	72.0	83.7	8.0	9.3	6.0	7.0
After close of work	75.0	87.2	8.0	9.3	3.0	3.5
After handling waste	79.0	91.9	1.0	1.1	6.0	7.0
Took off used hand gloves						
Immediately after completion of a task	83	96.5	2	2.3	1	1.2
At the point of use	42	48.8	15	17.5	29	33.7
Before touching clean surfaces	55	63.9	9	10.5	22	25.6
Use of instruction posters	56	65.1	21	24.4	9	10.5
Collection and Storage of waste						
Placing waste in appropriate color-coded container	73.0	84.9	11.0	12.8	2.0	2.3
Separate waste at point of						

generation	61.0	71.0	18.0	21.0	7.0	8.0
Internally store waste within 24 hours after generation	50.0	58.1	20	23.3	16	18.6
Sharps not manipulated	64.0	74.4	18.0	20.9	4	4.7
Cleaning with bleach	67.0	78	14	16.2	5.0	5.8
Handling spillage						
Containing spillage to prevent spread	61.0	71	14	16.2	11	12.8
Preventing exposure of staff	67.0	78	13	15.0	6	7
Preventing exposure of persons in the area	63.0	73.3	14	16.2	9	10.5
Absorbing and disposal of waste as quickly as possible	71.0	82.6	7	8.1	8	9.3
Decontamination of affected area	69.0	80.3	10	11.6	7	8.1

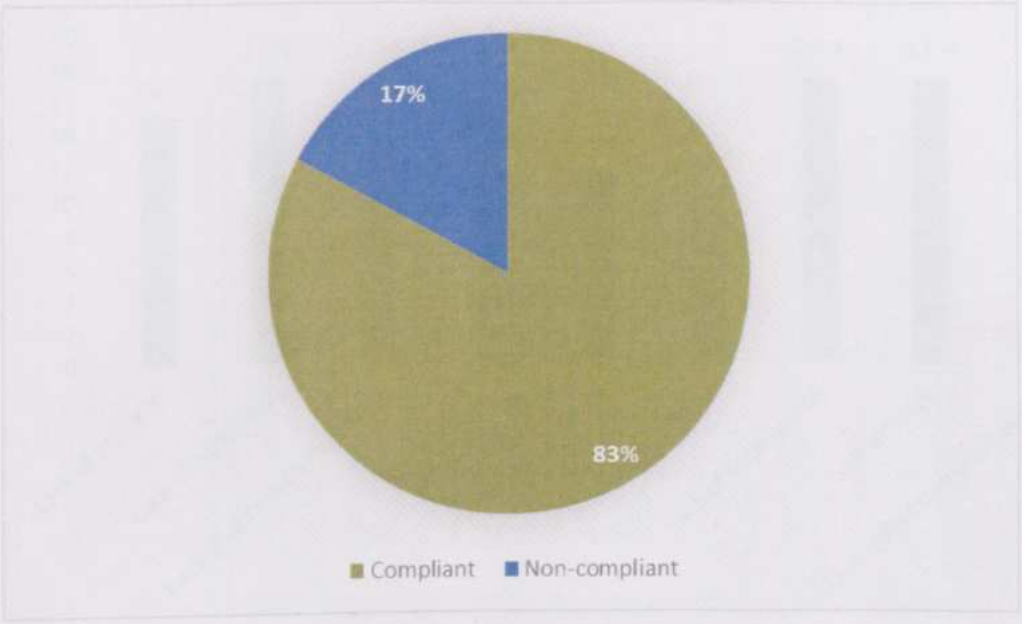

Figure 4: Overall level of compliance among HCWs

5.7 Factors influencing non-compliance with IPC practices

With non-compliance, healthcare workers who responded to this survey reported lack of training, lack of time, lack of supervision, lack of materials, lack of access to materials, self-efficacy, behavior of healthcare workers, attitude of patients, and uncomfortable equipment as factors that always influenced healthcare workers' non-compliance with standard IPC procedures. Healthcare workers stated lack of materials, lack of access to materials, lack of supervision, and self-efficacy were identified as leading factors (17.4%) that always prevented healthcare workers at the Ga West Municipal Hospital from following standard infection prevention procedures. This is presented in Figure 5 below.

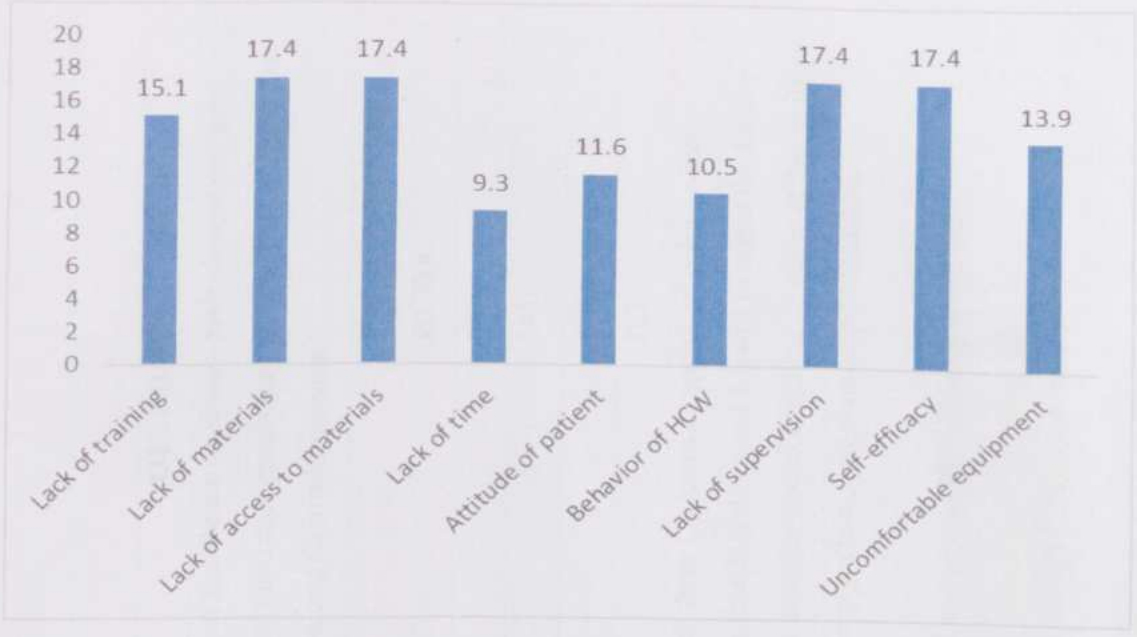

Figure 5: Factors influencing noncompliance with IPC practices

5.8 Outcome of Indicators for IPC compliance

Table 12: Outcome of indicators for IPC compliance

INDICATORS	MODE OF MEASUREMENT	OUTCOMES	
Number of healthcare workers, housekeepers and cleaners trained	Measured using records for IPC training	All cadre of healthcare workers – both clinical and non-clinical staff had the opportunity to be trained in Infection Prevention and Control measures.	
		Year	**Number of trained HCWs**
		2017	68
		2018	141
		2019	150
		2020	261
Number of color-coded containers	Measured through Observation and records from Stores	There were three (3) kinds of approved color-coded containers (black, yellow and brown) in use at the facility. There was no color-coded container in stores at the facility	
- Number of empty, clean and disinfected containers		Zero (0) empty, clean, and disinfected containers.	
- Number of covered waste bins	Measured by Observation	A hundred and seven (107) covered waste bins.	
- Number of waste bins in wards /units		A hundred and ten (110) waste bins in units	

- External storage area sited away from the reach of public - Enclosed and locked storage site		External storage area sited away from the reach of public Storage site not enclosed and under lock.
- Transported waste to disposal or treatment site - Amount of waste transported to disposal or treatment site	Measured by Observation	Waste transported to treatment or disposal site Amount of waste transported to disposal or treatment site is unknown since there's no records on generated waste.
Ashes and leftover debris	Measured by observation	Ashes from incinerated infectious waste collected and buried in a protected pit at the storage site.
- Number of rinsed outlets - Number of waste containers and hand gloves decontaminated	Measured by observation	Twenty-eight (28) outlets across the various units were thoroughly rinsed Thirty (30) pairs of re-usable hand gloves decontaminated

From the indicator table, the outcomes of the observed indicators for compliance with IPC at the facility were encouraging, with the year 2020 having the highest records on number of healthcare workers, housekeepers and cleaners trained in IPC practices.

For the promotion of segregation and temporal storage of waste at the facility black, yellow, and brown color-coded waste bins are used at the various units. There was zero (0) number of color-coded containers in store as the time of visit. Although generated waste was transported to designated treatment and/or disposal site as required, the amount of waste generated, treated or disposed of was unknown due to unavailable records on waste. About thirty (30) pairs of re-usable hand gloves were decontaminated and twenty-eight (28) outlets rinsed on daily basis. It was observed ashes and leftover debris from incinerated infectious waste were collected and buried in a protected pit at the storage site.

CHAPTER SIX

DISCUSSION

6.0 Introduction

Infection prevention and control practice is a basic foundation for quality of care and deemed important in protecting the health of workers, clients, and members of the community from the risk of contracting nosocomial infections. The study was conducted to evaluate compliance with Infection Prevention and Control (IPC) practices at the Ga West Municipal Hospital. This section gives detailed description of findings based on set objectives; assess availability of materials, assess the method of collection and disposal of waste, describe the method of treatment and disposal practiced, assess healthcare workers' level of knowledge in IPC, and explore factors influencing non-compliance.

6.1 Level of availability of materials for infection prevention and control

Unavailability of resources for infection prevention is one of the factors preventing healthcare workers' compliance with standardized IPC procedures. The availability of IPC materials such as detergents, water, waste bins for use at the Ga West Municipal Hospital was moderate, 59.3%. Findings indicated about 59.3% of health workers agreed the always availability, 39.5% agreed to sometimes availability, and 1.2% agreed to the unavailability of IPC materials. This was different in the findings of Kondor, (2018) which reported a 31.4% always availability and 68.6% sometimes availability of materials at the La General hospital. About 29% of HCWs did not have personal protective equipment such as hand gloves, face masks, and aprons always available to them for use. This was evident in an observation where a cleaner at the facility was cleaning a spillage without wearing hand gloves. Upon enquiry he said "although hand gloves were made available to the supervisor, it is mostly difficult for him as a junior staff to have it".

The most available material at the facility was waste containers for the collection and disposal of waste (100%).

6.2 Collection and segregation of waste at the facility

Despite waste management instruction posters were displayed at vantage points on each block at the hospital, 10.5% of the health workers never referred to the posters regarding procedures for waste segregation. Generated healthcare waste placed into color-coded waste bins per standard requirements (Ministry of Health-Ghana, 2015) and just as done in similar institutions in other developing countries (Ali et al., 2017; Windfeld & Brooks, 2015). There were no records on the composition and quantity of generated healthcare at the hospital which is similar to findings by (Ali et al., 2017). Safety boxes were assembled in accordance with producers' instructions and safely placed in suitable positions for use, but out of reach to children. This ensured sharps were not manipulated before final disposal which is evident in participant responses (74.4%). The collection and segregation of waste among healthcare workers at the facility was described as adequate compared to findings from similar health facilities in other developing countries which was described to be poor by Ali et al., (2017).

6.3 Methods of waste treatment and disposal

The facility practices incineration and sterilization as waste treatment methods which is in line with recommended waste treatment options for healthcare settings (Ministry of Health-Ghana, 2015). Medium capacity incinerator and waste autoclaves are equipment available for the treatment and disposal of waste at the facility. With final disposal waste, the facility practiced burying of waste and disposal at a designated landfill site in accordance with recommendations (Ministry of Health-Ghana, 2015). Records on the amount of waste disposed of was not

available, contrary to findings by (Windfeld & Brooks, 2015), where records on disposed of waste was available. In addition, open burning which is the fastest, effective and less expensive way of minimizing waste may be detrimental to the health of workers, clients/patients, and the environment as a whole, especially unborn fetus, infants and children (Cogut, 2016). General waste is disposed of at a designated landfill site with the help of an outsourced private waste management company, similar to findings from studies across other hospitals by (Ali et al., 2017) and (Adu, Gyasi, Essumang, & Otabil, 2020). Sharps waste was burnt using the incinerator and residue disposed of into a protected pit within the storage site. Pharmaceutical waste (solids and liquids) were buried and blood related liquid waste were disposed of through dislodgement using septic tank and soak away.

6.4 Level of knowledge in Infection Prevention and Control

From the study 72% of healthcare workers who participated in the survey had training in Infection Prevention and Control which is higher than 11.2% of health workers at Bir hospital in Nepal and 51% of participants at the Ridge hospital in Ghana as found by Niraula and Thapa (2018) and Hayeh (2012) respectively; but lower than that of 94.1% of health workers at the La General hospital in Ghana as found by Kondor (2018). About 64.2% of health workers stated correctly the purpose of the IPC policy. Majority (95.4%) of study participants had knowledge of the possibility of a healthy healthcare transmitting infection to a patient receiving care. About 88.4% stated contact, droplet, and airborne as known modes of infection transmission. Almost all the health workers (97.7%) indicated proper disposal of waste, proper washing of hands, and use of PPEs were ways HAIs can be prevented as well as named items needed for effective IPC practices.

With regards to healthcare waste management, 65% of healthcare waste were able to define healthcare waste correctly, 93% stated correctly the various types of healthcare waste, and 69.8% correctly described the make-up of an infectious waste. About 80.2% of study participants had the knowledge of waste segregation occurring at source of generation. General waste placed in black color-coded container must not be kept at temporal storage site after 24 hours, 94.2%.

Assessing the overall level of knowledge in IPC policy at the GWMH, more than half of healthcare workers (78%) were highly knowledgeable and remaining 22% were moderately knowledgeable with IPC practices. This was contrary to findings from similar studies among healthcare workers in Nepal (57.1%), Addis Ethiopia (55.4%), and Ghana (51%) as reported by Niraula and Thapa, (2018); Sahiledengle et al., (2018); and Kondor, (2018) respectively. However, it was lower compared to findings from studies conducted at Debre Markos Referral hospital (84.7%) and Gondar University Referral hospital (81.6%) as found by Desta et al., and Yazie et al., respectively in the year 2019. The high level of knowledge in infection prevention exhibited by healthcare workers at the GWMH could be attributed to the educational level (95.4% had tertiary education) attained as well as training sections and awareness created about infection prevention at the facility.

6.5 Compliance with Infection Prevention and Control procedures

From findings of the study, 17% of healthcare workers were found not to be compliant with Infection Prevention and Control policy whilst 83% of healthcare workers were compliant. This is contrary to findings by (Beyamo, Dodicho, & Facha, 2019) which showed that 65% of healthcare workers were compliant with standard IPC practices. Differences in compliance rate could be attributed to healthcare workers' level of knowledge in IPC policy and the availability and accessibility to infection prevention materials such as policy guidelines and protocol.

The highest compliance to infection practices at the hospital was handwashing. It is important noting about 91.1% of healthcare workers at the GWMH always washed their hands after handling waste minimizing and/or preventing the spread of infections amongst HCWs and clients. This good practice with handwashing could be attributed to the presence of the novel COVID-19 pandemic which required frequent and effective handwashing. And with the use of gloves, he highest compliance practice was health workers taking off used gloves immediately after completion of a task (96.5%). About 48.8% of health workers took off their gloves at point of use; this was the least practiced compliance measure at the Ga West Municipal Hospital.

6.6 Factors influencing non-compliance with Infection Prevention and Control policy

Exploring factors that influenced non-compliance, the study identified lack of training, lack of time, lack of supervision, lack of materials, lack of access to materials, self-efficacy, behavior of healthcare workers, attitude of patients, and uncomfortable equipment as factors that always influenced healthcare workers' non-compliance with standard Infection Prevention and Control procedures at the GWMH. This confirms the findings of a study that examined factors that influenced nurses' compliance with standard precautions in Cyprus by (Efstathiou et al., 2011). Healthcare workers identified lack of materials, lack of access to materials, lack of supervision, and self-efficacy as leading factors (17.4%) that always prevented healthcare workers at the Ga West Municipal Hospital from following standard infection prevention procedures. The influence of Lack of materials (17.4%) on non-compliance with IPC practices is lower compared to findings from a similar study by Niraula and Thapa (2018) at Bir Hospital in Nepal, 34.7%. However, lack of supervision at the facility influenced non-compliance with IPC at a higher rate compared to findings by Niraula and Thapa (2018), 7.1%.

6.7 Outcome of indicators for IPC compliance

About 70.2% (261) of both clinical and non-clinical staffs at the GWMH had the opportunity to be trained on infection prevention, which is about four (4) times the number of HCWs trained in the year 2017. This significant change may be attributable to measures put in place by management in fighting the spread of the novel covid-19 pandemic. The use of approved color-coded waste bins will promote the practice of waste segregation at the point of waste generation improving on methods of waste management at the facility. Also the daily disinfection of outlets and decontamination of waste management equipment such as re-usable hand gloves will help improve upon infection prevention at the facility. Burying of ashes and leftover debris from incinerated infectious waste in a protected pit at the storage site prevents further exposure and harm to the public.

However, the lack of records on waste management activities at the facility is contrary to policy requirement (Ministry of Health-Ghana, 2006). This will pose difficulty in assessing the amount of waste generated at a given point in time. Similar to findings in a previous survey in other health facilities in Ghana (Ministry of Health-Ghana, 2006), storage site at the facility was unenclosed and not under lock making it accessible to unauthorized persons and animals, and may serve as breeding place for flies.

6.8 Study Limitations

The study employed a cross-sectional design which may limit the cause and effect assumptions. It is possible that research participants may have changed their behavior towards IPC from their regular practices during study time. For example, HCWs who do not place waste in the required color-coded bin were forced to do that when being observed. Participants were reluctant in filling questionnaires, and this may affect response rate. Also, the study was carried out in a single

health facility, making it impossible to generalize findings at a national level. However, with observational studies participants become less sensitive with a prolong period of observation thus minimizing the biases that occurred. The statistical analysis employed in this study was robust enough to generate reliable results.

CHAPTER SEVEN

CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

The study concludes that the overall level of Compliance with the Implementation process of Infection Prevention and Control practices among healthcare workers at the Ga West Municipal Hospital was high, which could be attributed to the high level of knowledge in IPC practices and the availability of IPC policy and guidelines for use at the facility. Also, findings indicated the availability of IPC materials/resources for use was moderate. Incineration, sterilization, burying, disposal at landfill site were waste treatment and disposal methods practiced. Lack of IPC materials, lack of access to IPC materials, lack of supervision, and self-efficacy were leading factors which influenced non-compliance with IPC practices at the Ga West Municipal hospital.

7.2 Recommendations

The following recommendations are made based on findings from the study at the Ga West Municipal Hospital:

1. IPC committee, supervisors, and general staff at various units of the facility are encouraged to maintain their effort in promoting effective compliance with IPC practices;
2. Additional education and in-service training on infection prevention, especially waste management must be organized periodically by the IPC committee, In-service training and Environmental units for healthcare workers to ensure new staff members and permanent staff on rotation are updated and well equipped.

3. Adequate education and training must be offered to all categories of healthcare workers to ensure an understanding of the risks associated with wastes, how to protect self from infections, and also on proper waste management;
4. Management of the facility, IPC team and supervisors at various units are to ensure the adequate availability and accessibility of materials to healthcare workers for effective IPC practices;
5. The Environmental unit and the IPC committee must ensure the external storage site is enclosed, provided with gate and under lock when not in use. This is to prevent the site from being accessed by unauthorized persons and animals; and
6. The Environmental unit must ensure to keep records of waste management, thus, type and amount of waste generated as well as amount of waste transported to treatment and/or disposal sites. This will help assess realization of the set goal of reducing infections through proper waste management at the facility in the near future.

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APPENDICES

Appendix A: Participant Information Sheet and Consent Form

PARTICIPANT INFORMATION SHEET

Title of Study

Evaluation of healthcare worker compliance with the implementation process of Infection Prevention and Control practices at the Ga West Municipal Hospital.

Introduction

I am **ATTAH MAVIS ASIWOME**, a resident of AIMS EXECUTIVE at **Obeyeyie – Amasaman** and telephone number 054 172 6869. I am a student from the Department of Health Policy, Planning and Management, School of Public Health, College of Health Sciences, University of Ghana. I am the Principal Investigator for this study and I can be also be contacted via email at jessicamavis1@gmail.com.

Background and Purpose of Study

Healthcare-associated infections are a major problem in healthcare settings, affecting millions of patients worldwide every year, especially in developing countries where there is an estimated prevalence of 15.5 episodes per 100 patients. In the last two decades, healthcare associated infections have been recognized as potential indicator of quality health care to patients and its associated cost to patients/clients, healthcare facilities and governments. An effective Infection Prevention and Control (IPC) practice carries the benefit of reducing the disease burden on patients, health institutions, and the nation as a whole. Hence, this study seeks to evaluate healthcare worker compliance with the implementation process of Infection Prevention and Control practices with emphasis on healthcare waste management at the Ga West Municipal Hospital.

Nature of Research

The study which will be conducted within the Ga West Municipal Hospital is to assess healthcare worker compliance with the implemented policy on Infection Prevention and Control practices. All healthcare workers who are giving healthcare services will be participants for the study. In all, 193 participants will be interviewed.

Participants involvement

Accepting to participate will take about twenty-five (25) minutes of participant's time in answering the questions. The research will include answering forty (40) questions from a structured questionnaire on Infection Prevention and Control practices. Participants will not be compelled to take part in the study since this is purely for academic purpose. Also, there will not be any harm associated with the study.

Benefits

There will not be any monetary or material benefits for participants in the study. Information gathered from this research is to help policy makers at the facility, community, regional and national levels in informed decision making.

Cost

Participant(s) will not incur any monetary cost since the study is being carried out at the facility.

Compensation

There will not be any compensation for the loss of time for participating in the study.

Confidentiality

Data collected from participants, in part or whole will be held with confidentiality where no one outside the research team will have access to. Names of participants will not be needed in this study. Collected data will be destroyed after a period of three (3) years after the study.

Voluntary participation/withdrawal

No participant is forcefully asked to partake in the study; participation is based on willingness. You may opt out at any point in time where deemed necessary. Your choice of withdrawal will neither affect you nor the institution in any way. In spite of that, your full participation will be appreciated, for the success of the study.

Outcome and feedback

Data collected from participants will be analyzed in order to achieve the goal of the study. Results of the research will inform knowledge in infection prevention and control and overall compliance with the implementation process of infection prevention and control practices among

healthcare workers at the facility. Feedback on findings from the study will be made available to participants through the Authorities of the Ga West Municipal Hospital.

Funding

The study will be exclusively funded by the Researcher.

Sharing of Participants Information/Data

Information gathered from study participants will be exclusively owned by the Principal Investigator. Collected information will be shared with the Research Supervisor should there be a need.

Provision of Information and Consent for Participants

A copy of the Participant Information Sheet and Consent form will be made available after it has been endorsed to the participant for keeps.

Before taking Consent (Participant)

Do you have any question(s) or clarification with regards to the study?

Yes No

If yes, kindly indicate .....

.....

.....

Contacts for further clarification/questions

Where there is a need for further clarification regarding this study, kindly contact the following for assistance;

1. Mavis Asiwome Attah
   Department of Health Policy, Planning and Management
   School of Public Health
   University of Ghana
   Contact: 0541726869 / 0205276824
   Email: jessicamavis1@gmail.com

2. Dr. Patricia Akweongo
   Department of Health Policy, Planning and Management
   School of Public Health

   University of Ghana

   Contact: 024 313 8376

   Email: akweongo@gmail.com

3. Nana Abena Apatu

   The Administrator

   Research and Development Division

   Ghana Health Service Ethics Review Committee

   P. O. Box MB 190

   Contact: 050 353 9896

APPENDIX B: CONSENT FORM

STUDY TITLE: Evaluation of healthcare worker compliance with the implementation process of infection prevention and control practices at the Ga West Municipal Hospital.

PARTICIPANTS' STATEMENT

I acknowledge that I have read or have had the purpose and contents of the Participants' Information Sheet read and satisfactorily explained to me in a language I understand, English. I fully understand the contents and any potential implications as well as my right to change my mind, thus, withdraw from the research even after I have signed this form.

I voluntarily agree to be part of this research.

Name or Initials of Participant.....

ID Code .....

Participants' Signature / Thumb Print .....

Date .....

INVESTIGATOR STATEMENT AND SIGNATURE

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

Researcher's name .....

Signature .....

Date .....

Appendix C: Structured Questionnaire and Observational Checklist

Appendix I: Structured Questionnaire

UNIVERSITY OF GHANA

COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF HEALTH POLICY, PLANNING AND MANAGEMENT

The goal of this study is to assess the implementation process of IPC practice at the facility to help policy makers in the health sector in decision making. This research is mainly for academic purpose. Therefore, answers given will be treated as highly confidential and an honest answer will contribute to the success of the study.

Thank you for your time and cooperation.

Instruction: Tick or Circle where suitable and provide where required the correct answers to the following questions.

Date of interview: .....

Questionnaire Number: .....

Personal Information

1. Sex
   a) Male b) Female

2. Age
   a) 20 – 30years b) 31 – 40 years c) 41 – 50years d) 51 – 60 years

3. Place of residence .....

4. Marital Status
   a) Married b) Single c) Divorced

5. What is your highest level of Education?

   a) Basic b) Secondary c) Tertiary

6. What category of healthcare workers do you belong to?

   a) Medical b) Nursing c) Laboratory Technician d) Other

7. What is your current rank? .....

8. What is your working hours per day?

   a) 6 hours/day b) 8 hours/day c) over 8 hours/day

9. How long have you been practicing as a health worker?

   a) 1 – 5years b) 6 – 10years c) 11 – 15years d) 16 – 20years e) Over 20years

10. How long have you been working with the Ga West Municipal Hospital?

    a) 1 – 5years b) 6 – 10years c) Over 10years

Knowledge in Infection Prevention and Control (IPC)

11. Have you ever heard of Infection Prevention and Control?

    a) Yes b) No

    If yes, what is IPC about?

    a) identifying hazards and minimizing risks

    b) educating and training healthcare workers

    c) practicing basic IPC measures

    d) all of the above

12. Which is your source of information on IPC?

    a) training b) guidelines c) colleagues d) others

13. Is there an IPC committee at the health facility?

    a) Yes b) No

14. What is the role of an IPC committee at the hospital?

    a) to ensure the implementation of IPC policy and guidelines

    b) monitor, supervise and evaluate IPC activities

    c) disseminate information on IPC

    d) all of the above

15. Have you ever seen the IPC policy?

    a) Yes b) No

If yes, what is the purpose of the policy?

a) give directions to healthcare workers and clients in preventing and controlling hospital acquired infections

b) provide acceptable standards for the practice of IPC

16. Have you ever had any training on IPC?

a) Yes b) No

If yes, how long has this been?

a) About 6 months b) About 1 year c) Over 1 year

17. Can a healthy Healthcare worker transmit infections to a patient whiles receiving care?

a) Yes b) No

18. What is the known mode of infection transmission?

a) Contact b) Droplet c) Airborne d) all of the above

19. How can Healthcare Associated Infections be prevented?

a) Proper disposal of waste

b) Proper washing of hands

c) Use of personal protective equipment

d) All of the above

20. Name items needed for effective IPC practice?

a) Soap b) hand gloves c) waste containers d) all of the above

21. What is healthcare waste?

.....

.....

.....

22. What are the types of healthcare waste?

a) Infectious waste b) General waste c) chemical waste d) All of the above

23. Infectious waste is made up of

a) Sharps b) Pathological waste c) All of the above

24. Waste segregation is supposed to occur at the source of generation?

a) True b) False

25. What category of waste can be place in a Black colour-coded waste container?

a) General waste b) Sharps c) Highly infectious waste

26. How long can healthcare waste be stored at a temporal storage site?

a) 0 – 24 hours b) 25- 48 hours c) 49 – 72 hours

Availability of resources (materials) for IPC

27. Is IPC guidelines made available for use at the facility?

a) Always available b) Sometimes available c) Not available

28. How available are PPEs at the facility?

a) Always available b) Sometimes available c) Not available

29. How available are detergents for decontamination of used instrument and floor?

a) Always available b) Sometimes available c) Not available

30. Are waste containers available for disposal of waste at your convenience?

a) Always available b) Sometimes available c) Not available

31. How available is water for IPC practices at the hospital?

a) Always available b) Sometimes available c) Not available

32. Are safety boxes available for the easy disposal of used sharps?

a) Always available b) Sometimes available c) Not available

Compliance with IPC policy and guidelines

	Always	Sometimes	Never
b) How often do you wash your hands at work?			
a) as soon as I report to work	[ ]	[ ]	[ ]
b) before attending to a patient	[ ]	[ ]	[ ]
c) before and after wearing hand gloves	[ ]	[ ]	[ ]
d) after close of work	[ ]	[ ]	[ ]
e) after handling waste	[ ]	[ ]	[ ]
c) When are you to take off used gloves?			
a) immediately after completion of task	[ ]	[ ]	[ ]
b) at the point of use	[ ]	[ ]	[ ]

c) before touching clean surfaces [ ] [ ] [ ]

d) How do you know the steps in healthcare waste management?

a) by referring to instruction posters regarding procedure for waste segregation. [ ] [ ] [ ]

e) How do you collect and store waste generated in the hospital?

a) placing waste in appropriate color-coded container [ ] [ ] [ ]

b) separate waste at point of generation [ ] [ ] [ ]

c) internally store waste within 24 hours from time of generation. [ ] [ ] [ ]

f) How often do you ensure sharps are not manipulated before disposal? [ ] [ ] [ ]

g) Disinfectant cleaning solution (bleach) is used in cleaning small spill at the facility. [ ] [ ] [ ]

h) Important steps in handling spillage of chemicals includes

a) Containing spillage to prevent spreads [ ] [ ] [ ]

b) Preventing exposure of staff dealing with spill [ ] [ ] [ ]

	Always	Sometimes	Never
c) Preventing exposure of persons in the area	[ ]	[ ]	[ ]
d) Absorbing and disposal of waste as quickly as possible	[ ]	[ ]	[ ]
e) Decontamination of affected area for normal use	[ ]	[ ]	[ ]

i) What prevents you from following standard infection prevention procedures?

a) lack of education/ training	[ ]	[ ]	[ ]
b) lack of time	[ ]	[ ]	[ ]
c) lack of materials/resources	[ ]	[ ]	[ ]
d) lack of access to materials	[ ]	[ ]	[ ]
e) attitude of patient	[ ]	[ ]	[ ]
f) behavior of healthcare workers	[ ]	[ ]	[ ]

g) lack of supervision	[ ]	[ ]	[ ]
h) self – efficacy	[ ]	[ ]	[ ]
i) uncomfortable equipment	[ ]	[ ]	[ ]

Appendix D: Observational checklist

The Researcher is interested in observing some of the IPC practices within the facility (internal and external) which will help in assessing logistics, documentation and performance.
Thank you.

PERFORMANCE / ACTIVITY	YES	NO	N/A	OBSERVATION/COMMENT
Collection and Segregation				
1. Waste management instruction posters are on display				
2. Available color-coded waste containers ▪ Black ▪ Yellow ▪ Brown ▪ Red				
3. Waste bins are correctly labelled with additional information to users where appropriate.				
4. Waste bins are in clean condition.				
5. Waste bins are foot operated and in good working order (strong, leak proof, non-transparent, impervious) and lined with the right color				

bag.				
6. Waste segregated into various categories for effective waste disposal. ▪ General waste ▪ Infectious waste ▪ Pathological waste ▪ Sharp waste ▪ Cytotoxic waste ▪ Pharmaceutical waste ▪ Chemical waste ▪ Radioactive waste ▪ Incinerator ash/sludge				
7. Segregation occurs at the point of waste generation. ▪ General waste into black containers. ▪ Sharp waste into yellow puncture resistant containers. ▪ Other infectious waste into yellow plastic bags and bins. ▪ Pharmaceutical and chemical waste into brown plastic bags and bins. ▪ Highly infectious waste into red				

biohazard plastic bags and bins				
8. Sharps container is assembled in accordance with producers instructions				
9. Sharps container is safely placed in a suitable position for convenient use, but inaccessible to young children.				
Storage				
10. Content of sharp boxes are appropriate				
11. Content of yellow containers are appropriate				
12. Content of black containers are appropriate				
13. Content of red containers are appropriate				
14. Content of brown containers are appropriate				
15. Waste bags/bins are securely sealed when				

¾ full and correctly labelled.				
16. Sharp containers are labelled with ward names or number and dated when full				
17. Full sharps containers are securely tied and safely stored prior to collection				
18. Cardboards boxes are stored flat, in a safe manner before collection.				
19. Bags waiting for collection are safely stored away from the public				
20. Waste containers covered and placed in areas protected from harsh weather conditions				
21. Waste containers cleaned and disinfected after use ▪ Daily ▪ Weekly ▪ Monthly				
22. External storage site sited away from the				

reach of the general public				
23. Enclosed storage site provided with gate and lock				
24. Storage site inaccessible by unauthorized persons and animals				
25. Smooth, impervious and easy to clean storage floor				
Transportation				
26. Waste transported directly to the disposal or treatment site within 24 hours after generation				
27. Vehicle(s) used for the transportation of waste is/are in good working condition (leak proof, enclosed to prevent scattering of waste).				
Treatment				
28. Method of waste treatment practiced at the facility ▪ Bio digestion ▪ Composting ▪ Incineration				

▪ Chemical disinfection ▪ Crushing ▪ Neutralization ▪ Compaction ▪ Complexation ▪ Sterilization				
Final disposal				
29. Disposal method practiced at the facility ▪ Waste disposed of at designated landfill ▪ Burning of waste (incineration) ▪ Burying of waste				
30. General wastes disposed of at landfill sites				
31. Sharps, pharmaceutical, and pathological waste disposed of at a landfill site				
32. Liquid waste diluted and disposed of down a drain				
33. Cytotoxic waste disposed of at a landfill site				
34. Incinerator ash/sludge disposed of at a				

landfill site				
Education/Training				
35. Waste management policy available to staff				
36. IPC policy and guidelines available to staff				
37. PPEs and IPC materials available and accessible				
General Requirements				
38. IPC committee				
39. IPC team				
40. Waste management plan				
41. Records of waste management				
42. Equipment for waste management ▪ Gloves ▪ Nose masks ▪ Goggles ▪ Boots ▪ Overalls ▪ Aprons ▪ Weighing scale(s) ▪ Color-coded bags and bins ▪ Trolley(s) ▪ Wheel barrow(s)				

▪ Dust pans ▪ Brooms ▪ Brushes ▪ Spade(s) ▪ Pick axe(s)				
43. Treatment and Disposal equipment ▪ Medium capacity incinerator(s) ▪ Waste autoclaves ▪ Bio digesters ▪ Ball mills ▪ Crushers ▪ Compost pits ▪ Protected pits				

Appendix E: Clearance and Supporting Letters

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

MyRef. GHS/RDIV/ERC/Admin/App/150/20.38
Your Ref. No.

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
GPS Address: GA-050-3303
Tel: +233-302-681109
Fax + 233-302-685424
Email: ethics.researchgh@gmail.org

3rd July, 2020

Mavis Asiwome Attah
School of Public Health
University of Ghana
Legon - Accra

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	GHS-ERC 025/06/20
Project Title	Evaluation of Healthcare Worker Compliance with the Implementation Process of Infection Prevention and Control Practices at the Ga West Municipal Hospital
Approval Date	3rd July, 2020
Expiry Date	2nd July, 2021
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months.
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report after completion of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

You are kindly advised to adhere to the national guidelines or protocols on the prevention of COVID -19

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
Dr. James Akazili
(Head, Ethics & Research Management Department)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra