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**ADHERENCE TO SAFE SURGERY PRACTICES IN GOVERNMENT HOSPITALS IN
SEKONDI-TAKORADI METROPOLIS**

SAFIATU TARL ABDULLAI

(10598771)

**THIS THESIS IS SUBMITTED TO THE UNIVERSITY OF GHANA, LEGON IN
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APPLIED EPIDEMIOLOGY AND DISEASE CONTROL DEGREE**

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DECLARATION

I SAFIATU TARL ABDULLAI, hereby declare that except for other peoples' work that have been duly acknowledged, this work is my own work, done under supervision and it does not contain any materials which have been accepted for award of any degree at any university.

.....

Date.....

Safiatu Tarl Abdullai

(Candidate)

.....

Date.....

Dr. Bismark Sarfo

(Supervisor)

.....

Date.....

Dr. Reginald Quansah

(Co- supervisor)

DEDICATION

I dedicate this work to Allah Almighty, myself and my beloved daughter Khadijah Mahrouf Yusif.

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LIST OF ABBREVIATIONS

CS	-	Caesarean Section
SSI	-	Surgical Site Infections
SSC	-	Surgical Safety Checklist
SSG	-	Safe Surgery Guidelines
STM	-	Sekondi –Takoradi Metropolis
LMICs	-	Low and Middle Income Countries
HICs	-	High Income Countries
WHO	-	World Health Organization
WHA	-	World Health Assembly
DALYs	-	Disability Adjusted Life Years
IPC	-	Infection Prevention and Control
HAI	-	Hospital Acquired Infections
UK	-	United Kingdom
KATH	-	Komfo Anokye Teaching Hospital

ABSTRACT

Background

Surgery is vital, resolving much of the global burden of disease. In spite of improvements in surgical care there are still risks of harm to patients due to non-adherence to surgical safety standards. In Ghana, data on surgery related adverse events are scanty. Few studies done in Ghana estimates surgery related adverse events at 19% and prevalence of surgical site infections (SSIs) ranges from 9.6% to 40%. Successive peer review assessments in the Western region over the past five years have also revealed a significant proportion of surgical site infections, poor infection prevention and control practices in the surgical theatres and non-usage of surgical safety checklist for patients mostly in these four hospitals in Sekondi-Takoradi Metropolis. To address this, Ghana adopted the WHO surgical safety guidelines in 2010. This study was to assess adherence of four government hospitals to safe surgery practices and associated factors in the Sekondi-Takoradi Metropolis (STM).

Methods

This was a cross sectional study with mixed method. Structured questionnaires were used to assess knowledge of theatre staff on safe surgery practices. Theatre assessment for availability of logistics and a retrospective record review of adult patients (≥ 13 years) who had surgeries involving incisions under spinal and/or general anaesthesia from January- December, 2018 were done to assess the use of WHO SSC and presence of SSIs using checklists. Six key staff were also interviewed. Quantitative data were analyzed using Excel 15.0 and STATA 15.0 and univariate, bivariate and multivariate analysis done and results presented as frequencies, proportions, p-values and odd ratios using tables and figures. Qualitative data were analysed by transcribing responses of participants word for word and thematic analysis used to analyze their

core statements. Knowledge level of respondents was categorised as poor, average and good. Adherence was assessed by rate of use and completion rate of the WHO surgical safety checklist and results scored as adherence or non- adherence.

Results

Overall, none of the hospitals was found to adhere to safe surgery practices. Overall checklist use and completion rate were 50.1% and 21.0% respectively. Mean knowledge score was 61.8 ± 14.4 . Majority (62.3%) of respondents had average knowledge. Five out of six key staff interviewed were aware of the WHO SSG. After controlling for other variables, marital status, knowledge of WHO SSG, perception of surgical checklist is a waste of time and internal training sections on Infection Prevention and Control (IPC) were significantly associated with knowledge level of respondents (p -value < 0.05). The total proportion of SSIs was 49.1% (46/381). There was a 25% increase odds of developing SSI after surgery for each day increase of the stay of patients after surgery (AOR: 1.25, 95% CI: [1.10, 1.43], p -value = 0.001).

Conclusion

None of the hospitals was found to adhere to safe surgery practices. Factors found to affect adherence were little knowledge about the guidelines, motivation for staff, workload and lack of monitoring systems in place to check the proper use of the checklist. Majority of the respondents had moderate knowledge level on safe surgery practices and proportion of surgical site infections were high. Implementation of the WHO safe surgery guidelines was not successful in STM resulting in non-adherence to safe surgery practices. This poses great risk to the safety of surgical patients as evidenced by the proportion of surgical site infections

CHAPTER ONE

INTRODUCTION

1.1 Background

Surgery is considered as an essential component of public health resolving a larger proportion of the global burden of disease (Haynes et al, 2017). Its role in cancer treatment, injury management, maternal and child health and many more, places it as one of the most critical, high stake moments for Public health in ensuring quality, safe care (Haynes et al, 2017).

In spite of the tremendous improvements in surgical care over the last two centuries – availability of anaesthesia, antisepsis and improvements in medicine in general, surgical interventions still pose a significant risk of harm to patients due to non-adherence to surgical safety standards. Much of these risks can be averted when surgical teams adhere to established patient safety standards and practices (Haynes et al, 2017). World Health Organisation (WHO) published the “Safe Surgery Saves Lives, in 2008 with various suggested practices to safeguard safety of surgical patients (Gitelis et al, 2016). The guidelines was based on established objectives that promote patient safety in the surgical environment through the use of a 19-item comprehensive checklist- WHO Surgical Safety Checklist (SSC). It is designed to lessen surgical complications and deaths through a systematic approach (Gitelis et al, 2016). The checklist has three components used at three critical stages in the surgical process. ‘Sign in’- before the induction of anaesthesia, ‘Time out’- before skin incision and ‘Sign out’- before the patient leaves the operating room (Haynes et al, 2009).

The WHO SSC is more critical in developing countries (Vivekanantham et al, 2013) due to existing vast differences between developed and developing nations with regards to healthcare budget and strategies needed to ensure surgical safety. There are also situations where surgeons

in the rural settings may carry out several operations and under conditions where there may not be specialists which may warrant the use of checklists due to possible omissions as a results of work overload and unfamiliarity of the procedures done (Vivekanantham et al, 2013).

In Ghana, assessments of the public and providers about quality of health services especially surgical safety is ‘inadequate’ and ‘suboptimal’ (Otchi, Bannerman, Larrey, Amoo & Odame, 2018). Avoidable surgical complications accounted for 2.5/ 10,000 major surgical procedures in Korle – Bu from 2003 – 2012 (Otchi et al, 2018). In the quest to improve surgical safety, Ghana, one of the WHO member States through its Ministry of Health, adopted the WHO Safe Surgery guidelines in 2010. Each health facility is expected to adopt the surgical safety checklist (SSC) and its implementation strategy through written protocols and staff training (Yeboah *et al*, 2017).

For the past two decades, the SSC has emerged as one of the most significant and broadly used novelties in ensuring surgical safety (Mahajan, 2011; Papaconstantinou et al, 2013). Following the implementation of the Surgical Safety Checklist, great benefits have been recorded which include reduction in adverse events and cost (Konstantinos et al, 2011; Vivekanantham et al, 2013) and improvement in team communication (Arfanis et al, 2011). An international comprehensive study done between October, 2007 and September, 2008 at eight pilot sites across the globe within the WHO regions with a goal of representative of a varied set of socioeconomic settings demonstrated a decrease in mortality rate from 1.5% to 0.8% and inpatient complications from 11.0% to 7.0% (Haynes et al, 2009; Yeboah et al, 2017).

1.2 Problem statement

The WHO recommends 0% surgical site infections and 0% complications of anaesthesia. Meanwhile, an estimated 13% of disability –adjusted life years (DALYs) in the world results

from surgical interventions (WHO, 2017). About half of all adverse events suffered by in-patients are surgery related and more than half of them are considered preventable (WHO, 2007; Yeboah *et al*, 2017). The reported crude mortality rate after major surgery is 0.5-5% and complications after major surgeries occur in up to 25% of patients in developed countries (WHO, 2007). Rate of preventable mortalities linked to anaesthesia in developing countries is as high as 100- 1000 times that of developed countries (WHO, 2009), revealing an absence of safe anaesthesia in surgery (WHO, 2009). According to World Bank Report, it is estimated that, about 95% of patients in Africa do not have access to safe surgery, and these patients also have double the chance of dying after surgery compared to the global average (Biccard *et al*, 2018). In Ghana, available data on surgery related adverse events are scanty. However, a study done in Wa by Iddrisu *et al* in 2017 estimated surgery related adverse events at 19%. Prevalence of surgical site infection (SSI) is projected to be 9.6% after caesarian section and 40% after abdominal surgery (Nsiah -Afriyie, 2015) in Komfo Anokye Teaching Hospital (KATH). Recent studies done at Korle- Bu Teaching Hospital by Atta, and Tema Metropolis by Osei-Boateng both in 2017 found surgical site infection rates of 9.6% and 14.8% respectively after caesarian sections (CS). Successive peer review assessments in the Western region over the past five years have also revealed a significant proportion of surgical site infections, mal- functional anaesthetic machines, poor infection prevention and control practices in the surgical theatres and non - usage of surgical safety checklist for some patients mostly in the four hospitals included in this study Sekondi- Takoradi Metropolis.

Lack of adherence to the WHO Safe Surgery Checklist may result in surgical site infections, wrong site surgery and complications of anaesthesia leading to morbidities, disabilities and

mortalities leading to high economic burden. It is therefore important to assess adherence to safe surgery practices in the surgical theatres of government hospitals in STM to reduce cost, morbidity, disability and mortality.

1.3 Conceptual framework

Ensuring patient safety in the surgical environment involves strict adherence to safe surgery and infection prevention and control practices. Globally, the major thematic areas under the “Global Patient Safety Challenges” championed by WHO, - Safe Surgery and Infection Prevention and Control Guidelines are the current and widely used approaches to promote patient safety and improve quality of surgical care through the use of the Surgical Safety Checklist. Many countries including Ghana adopted this standards and each health facility is to develop local contents based on available resources and taking into consideration the important components of the checklist. However, literature has identified some factors that can influence adherence to safe surgery practices which are grouped into three broad areas; individual factors, facility factors and organisational factors.

1.3.1. Organizational factors

A study by Syed at the Komfo Anokye Teaching Hospital in 2012 identified the important role an organization or service delivery body can play to promote adherence to safe surgery practices by providing the enabling environment and necessary supporting systems. These systems may include guidance, policies, publications, templates, strategies, action plans and regulations.

1.3.2. Health facility factors

Based on supporting systems provided by the organization, health facilities can also develop protocols and monitoring systems to help working staff to adhere to practices that will promote the safety of patients in the surgical environment. Staff training, provision of infrastructure,

equipment and supplies by health facilities are other factors equally identified to affect adherence.

1.3.3. Individual factors

Adherence to the use of a protocol or a guideline is largely dependent on the individuals who are directly involved in its implementation and use. Factors such as qualification, years of experience, knowledge and skill, workload and motivation of the staff can also affect adherence. In essence, adhering to safe surgery practices will ensure the safety of surgical patients in the operating theatre and improve quality of care. This will lead to reduction in morbidity, disability, mortality and economic burden which will strengthen health systems and enhance the health of the population at large (African Partnerships for Patient Safety [APPS] 2009).

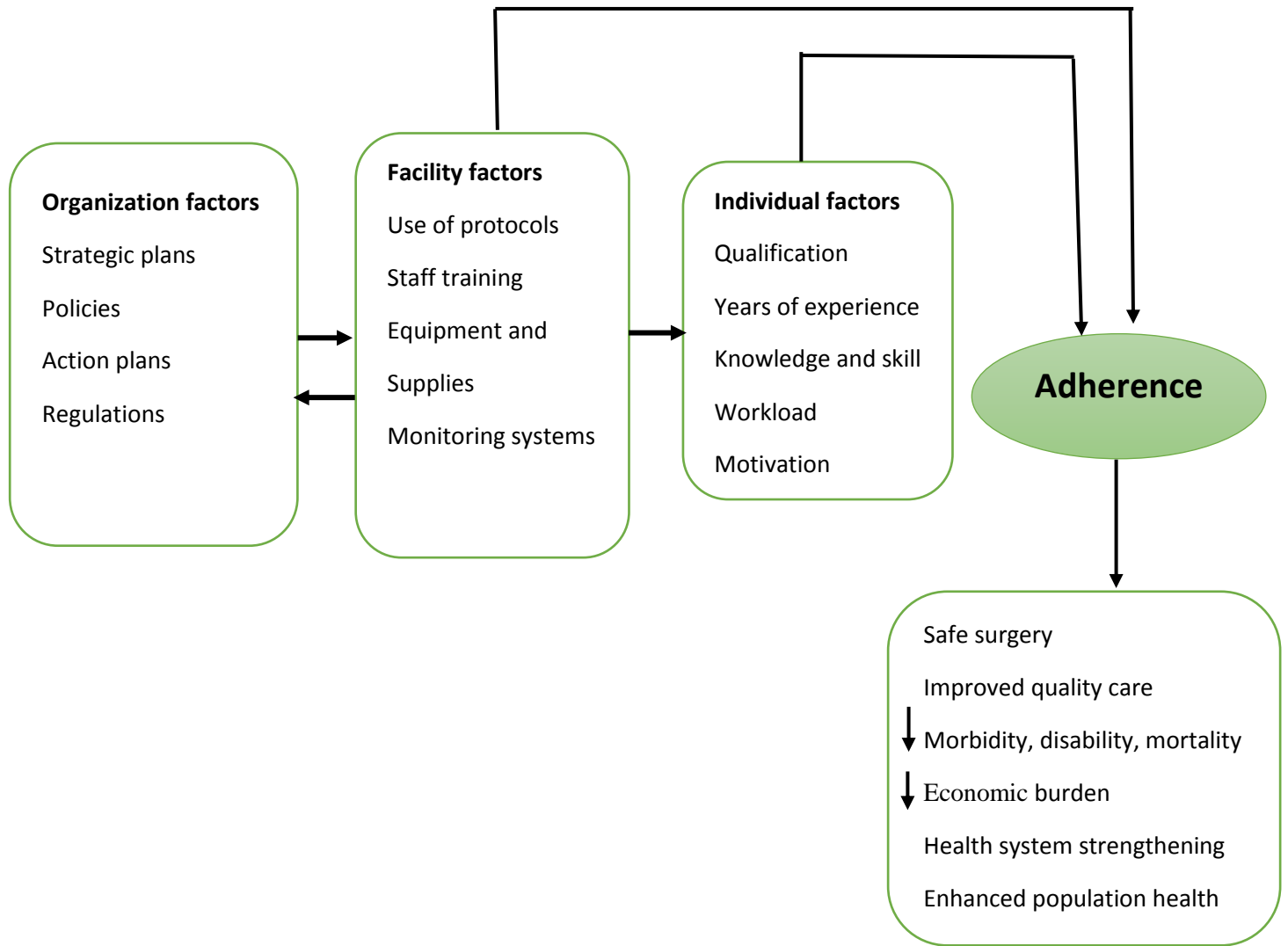


Figure 1: conceptual framework

1.4. Research Questions

1. What is the rate of use of Surgical Safety Checklists for surgical patients from January to December, 2018 in government hospital theatres in Sekondi- Takoradi Metropolis?
2. What is the proportion of completed checklist for patients who have had surgeries from January to December, 2018?
3. What factors affect adherence?
4. What is the knowledge level of theatre staff on Safe Surgery practices?
5. What is the proportion of surgical site infections from January to December, 2018?

1.5. Main objectives

- To assess adherence to safe surgery practices in government hospital theatres in Sekondi – Takoradi Metropolis (STM)

1.5.1. Specific objectives

1. To assess the use of surgical safety checklist for surgical patients from January to December, 2018.
2. To assess the proportion of completed checklist use from January to December, 2018.
3. To assess the knowledge of theatre staff on safe surgery practices
4. To assess factors that affect adherence to safe surgery practices
5. To determine proportion of surgical site infections from January to December, 2018.

1.6. Justification of the study

Sekondi-Takoradi is the administrative capital of the Western Region with significant number of major industries such as the Oil and Gas, Aviation, Harbour, Mining, Railway, Cement and

others. These sectors pose lots of risk of injuries to their workers including the general public that may require surgeries. The regional Hospital which is the only referral center in the region is also situated in Sekondi. Ensuring safe surgical care will give the injured better surgical outcomes and safe quality care. Conducting this study will provide information on the safety surgical care in these hospitals. Based on this recommendations can be made to enhance service delivery with regards to surgical care.

CHAPTER TWO

LITERATURE REVIEW

Achieving a safe intra-operative care requires a routine sequence of activities through an established frame work (WHO, 2009). These events are the preoperative assessment of patients, the surgery and preparation towards right post- operative care. These routines are associated with specific threats which can be alleviated (Haynes et al, 2009).

Moreover, a good surgical outcome depends on a number of preparations that start from the pre-operative stage- getting informed consent, confirming identity of the patient and operative site and the type of procedure, checking the integrity of the anaesthetic machine and ensuring availability of emergency drugs and adequate preparation for intra operative events are all responsive to intervention (WHO, 2003). During the operation, appropriate and judicious use of antibiotics, availability of essential imaging, correct patient monitoring, teamwork, competent anaesthetist and surgical judgement, meticulous surgical technique and good communication among surgeons, anaesthetist, and nurses promote good surgical outcomes (Weiser et al, 2008).

Subsequently, a clear plan of post-operative care, an understanding of intraoperative events and a commitment to high quality monitoring may all improve the surgical system, hence promoting safe surgery, patient safety and improving outcomes (WHO, 2006). In addition, there is no doubt that trained personnel and functioning resources such as adequate lighting and sterilization of equipment can go a long way to promote better surgical outcomes (Makary et al, 2006). Finally, safe surgery requires ongoing quality assurance and monitoring (Altpeter et al, 2007). On the other hand, issues that are of utmost concern to ensuring adherence to safe surgery practices have been grouped into three major factors and have been discussed below:

2.1. Individual factors

Staff qualification and experience: lack of adequately trained specialists in the theatre often delays the ability to achieve safe surgery for patients (Kingham et al, 2009). As a result, management of complex surgical cases that need a multidisciplinary team approach is deficient. Studies have shown paramedical staff other than doctors and qualified nurses constitute the bulk of the surgical personnel in Low and Middle Income Countries (LMICs) (Idriss et al, 2011; Taira et al, 2010). Consequently, there is lack of accessibility to the needed surgical expertise and skills to manage complex surgical case. A study by Abdulraheem et al in Nigeria in 2015 to assess health worker compliance to universal precautions showed there was an association between compliance and qualification of staff. The same study also revealed that staff who had ten or more years of working experience are more likely to comply and adhere to standard protocols and guidelines due to their higher level of awareness.

Workload: moreover, the burden associated with diseases requiring surgeries in LMICs is extensive and therefore leads to huge workload (Ologunde et al, 2014). In addition to this, meagre salaries and migration of surgeons and other healthcare professionals to seek greener

pastures in other countries also challenge the delivery of surgical services to populations who needs it the most. Stress from huge workload can results in a lot of things including anger, frustrations, and unnecessary anxieties. This may lead to poor communication among the surgical team members, and between health workers and their patients and families due to misunderstanding and sometimes may delay access to surgical services on time even when qualified professionals are present (Ologunde et al, 2014).

Staff motivation: moreover, misappropriation in the administration of resources and lack of motivation of the staff may have negative effect on surgical care improvement. Poor administration of resources in the surgical environment may influence the morale of the staff in a negative way. In some instances, financial bonuses given to staff as a form of motivation have been shown to be effective in the improvement of patient outcomes after surgery (Witter et al, 2012). Nevertheless, financial enticement for staff related to care services to patients and clients may raise ethical issues. On the other hand, decreased workload and/or working hours and addition of more days to annual leave may possibly be considered when the need arises. This strategy will have to be assessed based on the probable consequences that it might have on patient care.

Way- forward: in order to reduce cost and address the unmet burden of surgical disease and its related safe services some studies have suggested task shifting as an effective and sustainable method to some of the challenges confronting the surgical environment (Luboga et al, 2009). Testimonies from countries where successes have been recorded with the use of task shifting to address the shortage of professional experts in surgery include Niger (Sani et al, 2009), where general practitioners are given surgical skills to perform surgeries in district hospitals (Sani et al 2009). Also in Malawi, nurses and other non- physician clinical staff receive ‘on the job’ training

in surgery to perform some basic surgical procedures (Jiskoot et al, 2009). Nonetheless, this method or concept thus raises ethical concerns with regards to standards and quality of care given to the patients (Chu et al, 2009).

2.2. Facility factors

Facility-related barriers to safe surgical services are multifaceted and addressing them successfully require continuous and effective long term investments. In LMICs, economic and political limitations on health institution/facility autonomy and choice usually exposes these barriers even more (Ologunde et al, 2014). Adding to this challenges is the mismanagement of limited resources (materials, skilled personnel and finances) (Contini et al, 2010).

Infrastructure: infrastructure takes into account supplies and equipment needed to provide required and safe surgical care to all patients. Health facilities in LMICs often lack adequate and correct infrastructure to perform safe surgeries. A study done to evaluate anaesthesia capacity in 22 LMICs revealed more than one- third of the health facilities were without oxygen and anesthetic machines (Vo et al, 2012). Similarly, a study by Kingham et al (2009) in Sierra Leon revealed that hospitals whose anaesthesia machines were functional were only 20%. Another survey in Afghanistan on health facilities showed one-third of them did not have a blood bank (Contini et al, 2010). To ensure safe surgical services and better surgical outcomes for patients, it is necessary to spend in the acquisition of vital equipment and consumables needed to deliver care effectively and efficiently. Training people for their maintenance is also needed.

Use of protocols and guidelines: unsafe surgical practices in LMICs which result in poor surgical outcomes have also been identified as barriers that affect improvement in surgical capacity (Briesen et al, 2013). Achieving better patient outcomes after surgery is possible and

have been reported after successful implementation of the WHO surgical safety checklists (Haynes et al, 2009). The 19-item Surgical Safety Checklist has proven to decrease deaths and complications resulting from surgical interventions by more than one-third at eight pilot locations on the global scale (Haynes et al, 2009). By promoting the use and adherence to the safety checklist, individual associated obstacles to the delivery of safe surgical care can be decreased.

Staff training and experience: the situation of staff adherence to safe surgery practices is further aggravated by lack of continuous professional training for staff (Ologunde; Maruthappu; Shanmugarajah & Shalhoub, 2014). Continuous professional will help develop and maintain the professional skills and knowledge of staff to ensure the delivery of quality and safe surgical care to patients. Investing in the education and training of theatre staff and their retention is an essential method of ensuring a viable tactic to building capacity to deal with surgical cases. Continuous training in the acquisition of specialised skills in treating surgical cases and related diseases is predominantly important when it comes to the complex nature of diseases demanding surgical interventions in LMICs (Ologunde et al, 2014). Facilities have the responsibilities to ensure the continuous developments of the staffs' expertise and skills through workshops, presentations and in- service training activities.

Surgery is complex and requires a lot of resources- an experienced surgeon, anesthetist, a continuous stock of anesthetic, surgical devices, and a routine of constantly restocked consumables (Ologunde et al, 2014). As a matter of fact, safety of patients in the surgical environment to a large extent depends on a properly trained anesthetist (Larson, 2016) and a continuous supply of electricity that cannot be guaranteed in some of the rural areas with limited resources. Treatment of surgical cases needs a substantial amount of financial investment in

physical structures, training and governance at all stages. Additionally, it is evident that financing primary or critical surgical care ensures substantial profit in a period of time, mostly for example, in the case of DALYs prevented in the treatment of injuries (David et al, 2011). The WHO executive board organized the 135th meeting in 2014, with the objective of Strengthening Emergency and Essential Surgical Care and Anaesthesia as a Component of Universal Health Coverage (WHO, 2014). For this goal to be accomplished, it is necessary for the actors in international health such as international organizations, policy makers and surgeons to pull strengths and resources together to highlight the treatment of surgical cases within the broader aim of health system consolidation (Ologunde et al, 2014).

Monitoring systems: Above all, a good monitoring system in place to monitor the implementation and progress of use of these essentials are key to achieving safe surgical care for all in the operating theatre. In the healthcare setting, it is very important to institute good monitoring systems to monitor the use the surgical safety checklist to promote safe surgical care. A system in place to ensure staff adhere to laid down principles and protocols are necessary to promote adherence. Sometimes when staff know that there systems to monitoring their activities, adherence to use of the checklist is ensured better. Monitoring systems are also important to sometimes help review and evaluate some of the protocols already implemented to ensure efficiency and effectiveness.

2.3. Organization factors

Patient care must be carried out safely by employing safety principles built on scientific proof. Constant review of practises and procedures are vital in order to improve patient experience and well-being (Kim et al, 2009). To do so, patient safety systems should focus on building a culture of safety that inspires communication, trust, and honesty (WHO, 2015). In this process it is

pivotal to recognize that humans make errors (Kohn et al, 2015). Failures occur by choosing the inappropriate method of care or by poor execution of an appropriate method of care. Fortunately, errors can be minimized with a system of checks and balances. Establishing a medical system of checks and balances ensures that errors are more likely to be detected before they happen and that blame does not rest upon an individual (Kim et al, 2015). Errors are inevitable, but having a system in place to prevent them from occurring, and remedying them when they do occur, improves overall patient safety in the health care environment. . An effective adherence program depends on clear written policies, strategies, action plans, regulations, procedures, and standards of conducts that can be easily understood and applied by persons responsible.

Action plans: these are detailed plan outlining actions needed to reach established goals through sequence of steps and activities which must be performed well. As an organization, it is important to establish a formal plan actions for healthcare practice that will enforce adherence to ethics with regards to business operations, regulations and patient services and care. The purpose of this plan should focus on providing a blueprint to encourage the culture of adherence to standards. Action plan in the area of surgical safety will give direction to all players involved to play their parts to make sure protocols, guidelines and standards are followed to the letter.

Strategic plans: this is a way of defining strategies and directions and taking decisions on resource allocation to pursue these strategies. And their successful implementation. In ensuring safe surgical practices and care for patients, it is important to develop strategies that will the successful implementation of the safe surgery guidelines Ghana adopted fro WHO. These are necessary to help staff use the guidelines with much ease free of doubt and difficulties.

Efforts to improving patient safety in the surgical environment in Ghana started in 2009 when WHO launched the 12 action areas of Patient Safety after a resolution by member states. Since

then the surgical safety guidelines have been integrated into the curricula of trainee surgeons and perioperative nurses. However, the issue of surgical safety in practice has not received the needed attention, neither had it been reflected in most national policies. Another challenge to surgical safety is lack of adequate data in many WHO African Region including Ghana (Otchi et al 2019). Therefore the Ministry of Health and the Ghana Health Service have the responsibility of providing policies, publications, templates, guidance, strategies and action plans that will serve as standard guidelines that give directions to enable staff perform their duties without confusion. Adherence to these standard guidelines will prevent fraud, wastage of resources and abuse in in healthcare systems, thus promoting safety and quality care especially in the surgical environment.

An effort to deal with the safety of surgical patient on the global scale by WHO, the Emergency and Essential Surgical Care program was established in 2005. Subsequently, in 2008, WHO began the Safe Surgery Saves Lives initiative resulting in the development of the surgical safety checklist after Infection Prevention and Control guidelines (Haynes et al, 2009). In order to achieve improvement towards provision of safe surgical care for patients in LMICs, there is the need for collaboration between policy makers, managers and healthcare providers.

CHAPTER THREE

METHODS

3.1. Study design

3.1.1 Study type

This was a cross-sectional study with quantitative and qualitative approaches. The study examined the relationship between individual, facility and organization factors and how they interact to influence adherence to safe surgery practices. Appropriate recommendations were made to help with planning and allocation of health resources. The study was conducted in the four major government hospitals that have the capacity to perform major surgeries in the metropolis. The hospitals were Effia-Nkwanta Regional hospital, Kwesimintsim, Takoradi and Essikado District hospitals.

3.1.2. Study setting

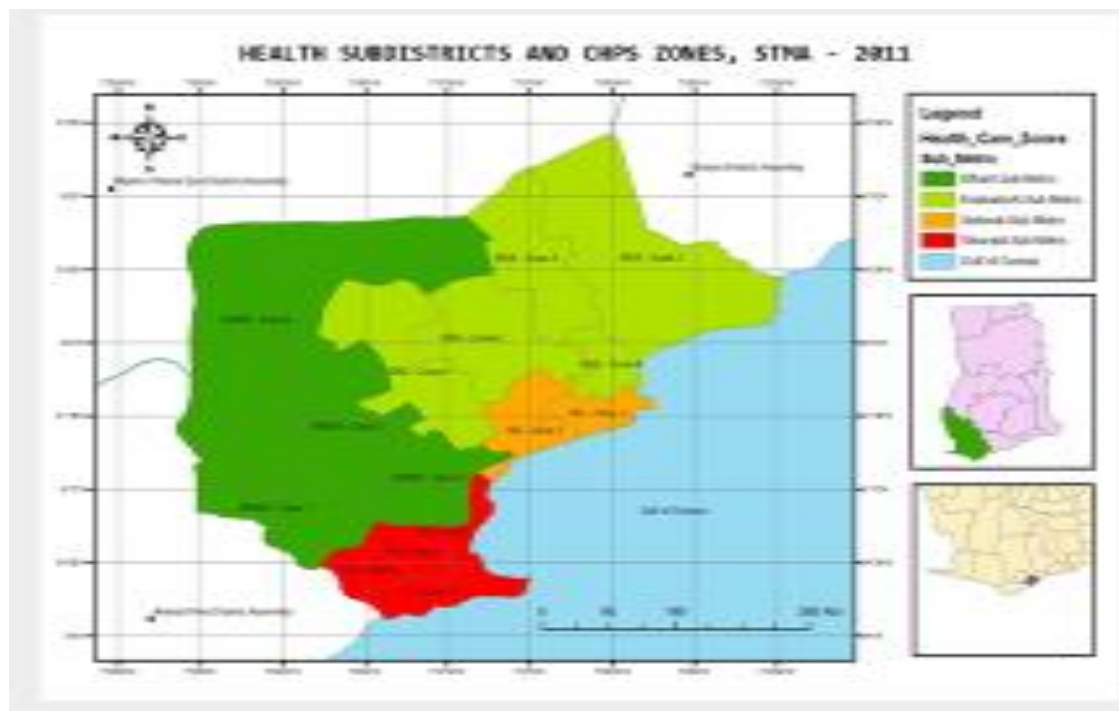


Figure 2: Map of STM

Sekondi-Takoradi Metropolis (STM) is situated at the south-eastern part of the Western Region. The Metropolis is bounded to the west by Ahanta West District and to the east by Shama District. It also shares boundaries with the Atlantic Ocean at the south and at the north by Wassa East District. STM has a land size of 191.7 km² and regional administrative capital is Sekondi-Takoradi. STM is the most developed among the 22 districts in the region although it is the smallest district in terms of land size. The metropolis has a population of 593,797. It has 4 government hospitals, 2 private hospitals 54 clinics (government and private), 2 health centers, and 9 CHPS Compounds. Fante is widely spoken in the Metropolis. The Metropolis is one of the most industrialized in the country and the most developed among the 22 districts in Western Region. According to industrial classifications, there are three major sectors in the Metropolis: Mining and Quarrying, Manufacturing (cocoa and forest products processing), and Electricity

power generation thermal. About 60% of all industries in the Western Region are located in the Sekondi-Takoradi Metropolis.

3.1.3. Study population

All four government hospitals (3 district hospitals, and 1 regional hospital) that have the capacity to perform surgeries. The hospitals were Effia- Nkwanta Regional hospital, Kwesimintsim, Takoradi and Essikado District hospitals. All theatre staff of the four selected Government hospitals in STM, folders of all adult patients (13 years and above) who had major surgeries under spinal and/ or general anaesthesia, from January to December, 2018.

3.1.4. Inclusion criteria

All theatre staff of the 4 four Government Hospitals in STM. Folders of all adult (≥ 13 years) surgical patients with incisions under spinal and/or general anaesthesia.

3.1.5. Exclusion criteria

Close reductions and diagnostic procedure requiring general/spinal anaesthesia and folders without aesthetic forms.

3.2. Study variables

3.2.1. Dependent variable:

Adherence to safe surgery practices. Adherence was measured as a binary variable as ‘Adherence or on-adherence’ considering the proportion of checklist use, proportion of completed checklist and whether checklist meets WHO standard.

3.2.2. Independent variables

Table 1: Independent variables

Demographic Factors	measurement	scale
Age	20-30, 31-40, 41-50, 50+	Categorical variable
Sex	Male or female	Binary outcome
Profession	Nursing, medical officer, anaesthesia, health assistant	Categorical variables
Specialty	Surgeon, general practitioner, nurse anaesthetist, perioperative nurse, interns	Categorical variables

Individual factors	measurement	scale
Qualification	Diploma, degree/ advanced diploma and masters'	Categorical variable
Years of working experience	Less than 1 year, 1-3 years. 4-10 years and more than 10 years.	Categorical variable
Knowledge	Poor, average or good	Categorical variable
workload	1-3 cases per shift More than 3 cases per shift	Binary outcome
Motivation	Motivated or not motivated	Binary outcome
Facility factors	measurement	scale

Protocols	Present or absent	Binary outcome
Equipment	Available or not available	Binary outcome
Supplies/consumables	Available or not available	Binary outcome
Monitoring systems	Present or absent	Binary outcome

Organizational factors	measurement	scale
Guidance	Present or absent	Binary outcome
Policies	Present or absent	Binary outcome
Publications	present or absent	Binary outcome
Templates	Present or absent	Binary outcome
Strategies	Present or absent	Binary outcome
Action plan	Present or absent	Binary outcome

3.3 Sample size

The estimated total number of theatre staff at all four hospitals is about 106 and those available and willing to participate in the study were interviewed to assess their knowledge on safe surgery and IPC practices using a structured questionnaire. An assessment checklist was used to assess all five theatres for availability of logistics that ensure safe surgery. With the help of a guide, six key staff made up of two medical officers, two anaesthetists and two peri-operative nurses from the four hospitals were also interviewed. Another checklist was used to review 381 patients' folders for use of surgical safety checklist for surgical patients. Sample size for patients' folders was calculated using the Cochran formula for sample size calculation; $n = (z^2 * (p) (q)) / d^2$ with an assumed 50% prevalence (Ma54hajan 2011), estimated combined annual volume of surgery of 3,800 (population) from all the four Hospitals, at 95% confidence level and 5% margin of error a sample size of 349 was obtained. This number plus 10% non- traceable folders (non-response) and a sample size of 384 patient folders was estimated. A proportional to size method was used based on their annual volume of surgeries of each hospital as described below:

Effia-Nkwanta regional Hospital

$$384 / 3,800 \times 2,300 = 232$$

Kwesimintsim Hospital

$$384 / 3,800 \times 500 = 51$$

Takoradi hospital

$$384 / 3,800 \times 500 = 51$$

Essikado Hospital

$$384/ 3,800 \times 500 = 51$$

NB: (non-traceable folders - sometimes folders are not traceable at the record section due to readmission of the patient or will be in use or even missing from the records).

3.4. Sampling method

All theatre staff of all four government hospitals who were available and willing to participate in the study were interviewed using structured questionnaires. The staff included medical officers, general nurses, peri-operative nurses and anaesthetists to assess their knowledge level on safe surgery and IPC practices. The estimated total number of staff of the four hospitals was 106. A systematic random sampling method was also used to select a total of 381 folders of adult patients 13 years and above who had surgeries from January to December, 2018. (In the hospital setting, 13 years and above are classified as adults). A list of all surgeries done for the period (January to December, 2018) was obtained (sampling frame) from each of the participating hospitals. At each hospital, a dice was cast to select a random k^{th} number (interval). Using the formula, $k=N/n$; where k = interval, n = required number of folders and N = total number of surgeries done from January to December, 2018. This was used to calculate for k at and every k^{th} number was then selected till the required number of folders were obtained.

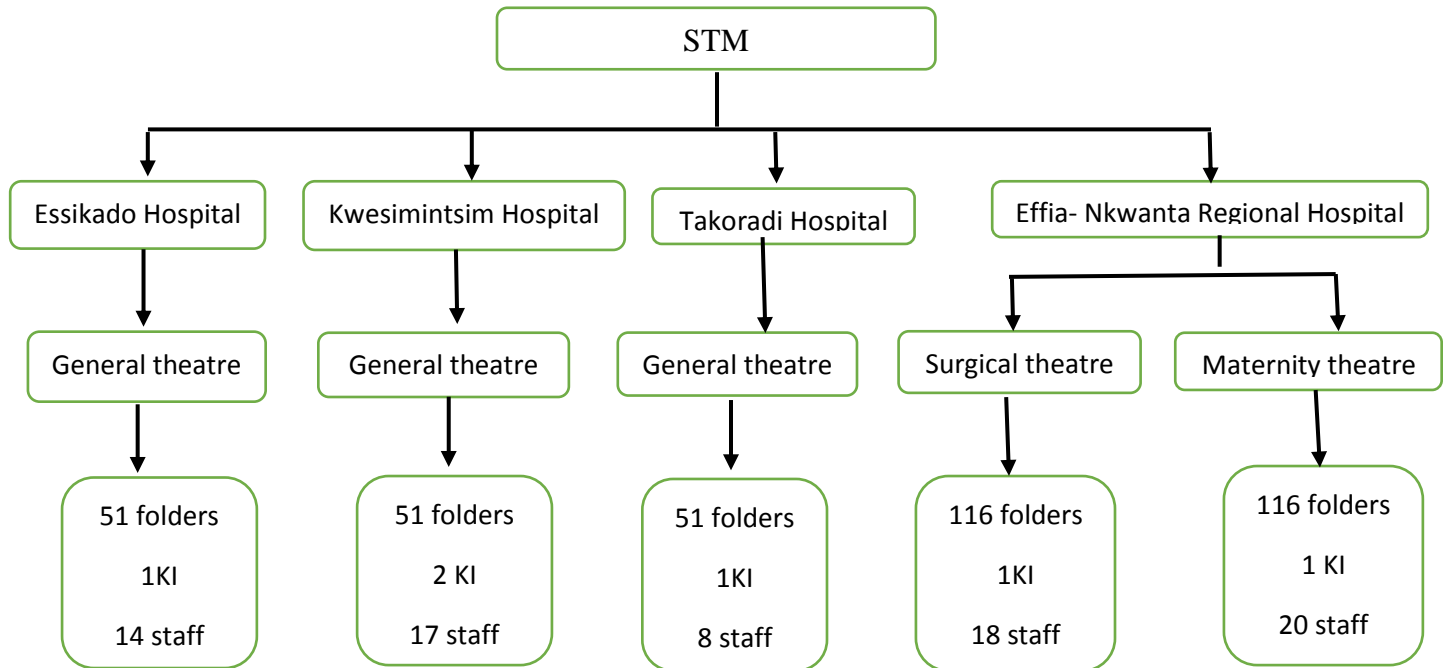


Figure 3: Sampling methods

3.5. Data collection and tools

A structured questionnaire was used to collect data on knowledge of the theatre staff on safe surgery and Infection Prevention and Control (IPC) practices based on WHO safe surgery guidelines. A checklists were used to review patient records on presence of WHO surgical safety checklist in the folder, components of the checklist, completeness of checklist, the type and presence of surgical site infections. Surgical site infection was defined as surgical wounds that got infected within 30 days after surgery and were recorded in the patients' folders.

Another checklist was also used to assess the availability of emergency drugs with their expiry dates, presence of functional emergency equipment (laryngoscope suction machine, oxygen source and others) and consumables needed to perform surgery and promote safety of patients.

With the help of an interview guide, six key staff, two from each hospital were interviewed. They were two peri-operative nurses, two medical officers and two anaesthetists to get their thoughts and experiences on safe surgery practices in the theatre.

3.6. Pretesting

A pre-test was done at Tarkwa –Nsuaem Municipal hospital to test the validity and reliability of the data collection tools. This was helpful in checking for mistakes and completeness of the questionnaires and appropriate modification and/or removal made when necessary.

3.7. Conflict of interest

There was no conflict of interest in relation to this study.

3.8. Ethical issues

Ethical approval for this study was granted by the Ghana Health Service Ethics Review Committee (GHS-ERC016/01/19) before the commencement of this study. Additional permission was obtained from the heads of the hospitals through Sekondi-Takoradi Metro Health Directorate. An informed consent was given to each respondent to read and understand before answering the questionnaires. Participation in this study was purely voluntary and respondents had the chance to withdraw from the study at any point during the study process. There was no need to translate the questions into any local language since all the respondents could read and write English.

3.9 Data management and quality control checks

Research assistants were will trained on how to administer questionnaires and review patients' records. Data entry was done by two people using Microsoft Excel 2013 merged to identify

errors that occurred. Incomplete questionnaires were excluded. Data was then cleaned in Microsoft Excel, 2013 and then imported into Stata version 15.0. Hard copies of the data stored in a drawer under lock and key and only the principal investigator had access to them. Soft copies of data was also stored with a password on a computer and only the principal investigator and her two supervisors had access to them. In ensuring privacy, names of the respondents were not required, therefore their responses could not be linked to their identities. For key informants, tape recordings of the interviews would be destroyed after transcription and the final work submitted. Confidentiality was provided to the fullest extent possible by law.

3.10. Data processing and analysis

3.10.1. Qualitative data

The principal investigator conducted the key informant interviews. The questions centered on awareness and knowledge on WHO safe surgery guidelines, its benefits, challenges to its implementation and what could be done to promote adherence to use of the guidelines. The interviewees were given on the average 15-20 minutes to express themselves to the open-ended questions. The interviews were audio recorded and responses transcribed word for word and thematic analysis used to analyze their core statements.

3.10.2. Quantitative data

The quantitative data collected was entered into Microsoft excel version 2013 and imported into STATA version 15 for further analysis. Demographic characteristics and other associated characteristics of study participants were described using frequency and percentage. Correct answers to questions on knowledge of respondents were also presented as means, standard

deviations, frequencies and percentages. The percentage score of the knowledge was further classified into three levels as described in the table below:

Table 2. Score of knowledge of theatre staff on safe surgery and IPC practices in STM, 2019

Mark	Score	Remarks
Less than 50% of answers	1	Poor knowledge
50% - 75% of answers	2	Average knowledge
Above 75% of answers	3	Good knowledge

Pearson's chi-square test of association was used to determine associations between demographic characteristics of respondents and their knowledge levels and factors that had significant associations with surgical site infections. At instances where at least 25% of the number of cells had expected count of less than 5, the Fishers' exact test of association was used in place of the Pearson's Chi-square test of association. Simple and multiple logistic regression models were used to determine the crude and adjusted odds ratio respectively for the factors influencing knowledge level of respondents and surgical site infections. A 5% level of significance was used and a 95% confidence interval estimated for all point estimates. The backward elimination model was used in selecting factors into the final model with a threshold p-value of 0.20.

Adherence was assessed by the use of WHO standard checklist, proportion of checklist use and proportion of completed checklists by the hospitals and scoring done as follows;

Table 3. Scoring of adherence

Proportion of checklist use for patients	Score	Remarks
0 – 40 %	1	Low level of adherence
41- 50%	2	Moderate level of adherence
Above 50%	3	High level of adherence
Proportion of checklist completed	Score	Remarks
0- 40 %	1	Low level of adherence
41- 50%	2	Moderate level of adherence
Above 50%	3	High level of adherence
Checklist has all three components	1	Hgh level of adherence
Checklist does not have all three components	0	Low level of adherence
Adherence	Total Score	Remarks
	0-5	Non-adherence
	5.1 - 9	Adherence

CHAPTER FOUR

RESULTS

4.1. Demographic characteristics of study participants

4.1.1. Quantitative data

Out of 106 questionnaires distributed, a total of 77 theatre staff answered the questionnaires. Majority of the respondents were female (84.4%, 65/77). About half (45.5%, 35/77) of the respondents were within the age range 31 to 40 years, 41.6% (32/77) of them were within the age range of 20 to 30 years inclusive whilst 13.0% (10/77) of them were above 40 years. Two-thirds (66.2%, 51/77) of the respondents were married and 87.0% (n=67) of them were Christians. Majority (68.8%, 53/77) of the respondents were Nurses or health assistant and majority of them were also general nurse/ enrolled nurse (55.3%, 42/77). 54.6% (42/77) of the respondents had Degree or Advance diploma as their level of education whilst 44.2% (34/77) of them had 4-10 years of practice.

Table 4: Demographic characteristics of study participants

Characteristics	Frequency (N = 77)	Percentage
Age group		
20-30	32	41.7
31-40	35	45.5
>40	10	13.0
Sex		
Female	65	84.4
Male	12	15.6
Marital status		
Married	51	66.2
Single/Divorced/Widowed	26	33.8
Religion		
Christian	67	87.0
Non-Christian	10	13.0
Profession		
Anesthesia	13	16.9
Doctor	11	14.3
Nurse/Health Assistant	53	68.8
Specialty		
General Doctor	12	15.8
General nurse	42	55.3
PON/intern	13	17.1
Anaesthetist	9	11.8
Educational level		
Certificate/Diploma	35	45.5
Degree/Advanced diploma/Master	42	54.6
Years of practice		
<4 years	28	36.4
4-10 years	34	44.2
>10 years	15	19.5
Health facility		
Essikado	14	18.2
Kwesimintsim	17	22.1
Takoradi	8	10.4
Effia - Nkwanta	38	49.4

4.2. Rate of use of the surgical safety checklist by the hospitals

Out of the 381 folders reviewed for the study, 191 folders had checklists in them making an overall use of 50.1%. Takoradi hospital recorded the highest (70.59%, 36/51) checklist use rate with Effia- Nkwanta hospital recording the least (47.84%, 109/228). Generally the ‘sign in’ components was mostly used by all the hospitals. The rate of use was 50.1% compared to ‘time out’ and ‘sign out’ which were 29.4% each. Moreover, only Essikado hospital had the standard WHO checklist. (Table 4).

4.3. Completeness of surgical site checklists.

From table 7 below, the overall completeness of 381 selected folders from all the four health facility was 21% (80/381). Essikado hospital (39.2%, 20/51) recorded the highest (39.2%, 20/51) completion rate of the checklist whiles Effia- Nkwanta hospital recorded the least percentage (15.0%, 34/227) of completeness from their selected folders.

Table 5: Rate of use and completion rate of WHO surgical safety checklist STM, 2019

	Essikado (N = 51)	Kwesimintsim (N = 51)	Takoradi (N = 51)	Effia- Nkwanta (N=228)	Total (N = 381)
	n (%)	n (%)	n (%)	n (%)	n (%)
Total checklist use	15 (29.4)	31 (60.8)	36 (70.6)	109 (47.8)	191 (50.1)
Sign in	15 (29.4)	31 (60.8)	36 (70.6)	109 (47.8)	191 (50.1)
Time out	15 (29.4)	0 (0.0)	0 (0.0)	0 (0.0)	15 (29.4)
Sign out	15 (29.4)	0 (0.0)	0 (0.0)	0 (0.0)	15 (29.4)
Content meet WHO standard	15 (29.4)	0 (0.0)	0 (0.0)	0 (0.0)	15 (29.4)
Completeness	13 (39.2)	13 (25.0)	20 (25.5)	34 (14.9)	80 (21.0)

Although rate of use and completion rate were not encouraging all key staff interviewed agreed that the guidelines offer ‘protection’ to the surgical patient from harm. It also improve communication among staff and foster teamwork which will lead to “better outcomes after surgery”. They knew the main thing about the guidelines is the surgical safety checklist that is used at three critical stages of the surgical process (pre, intra and post-operative stages). Three were of the view that the guideline will also “reduce wastage and prevent litigations”

In ensuring the safety of patients in the surgical environment, they were of the view that patients are usually identified by their names when they are received into the theatre. The patient is asked of his/her name and cross-checked with what is on the folder by the receiving nurse. A locally prepared checklist is sometimes used and in most cases patients are unaware of the site and type of procedure that are going to be performed on them. They all agreed the local checklist is inadequate and that a standard checklist is needed to ensure proper safety of patients.

“The checklist we have only identifies the patient... sometimes not even the site of the surgery. The in-charge will have to ask the patient where the site is. And sometimes some of the patients don’t also know and I think using the WHO checklist will help solve some of these things” (nurse).

“Once a while I do check the aesthetic machine and other equipment to see if they are working well, but I don’t know that I am supposed to check them before every surgery.. using a checklist will help me to remember I think”. (Anaesthetist).

4.4. Factors affecting adherence to the use of the checklist

These factor were explored through qualitative analysis. Some of the factors that came up strongly from the interview includes lack of motivation for staff, workload, little knowledge about the checklist and willingness to use the checklist by some staff. All the staff interviewed recognise the need to use the checklist to prevent adverse event and to protect the patients. However, the general perception was that it was a waste of time sometimes, considering the number of surgeries to be done especially with obstetric and gynaecological cases. The respondents also had varied views about the components of the checklist. Three out of the six think that the items on the components are plenty, whiles the others think they are ok, but the timeout could be combined with sign out and both be performed at the end of the procedure. The reasons given for using the sign in component most was that it was done before the beginning of the procedure and in most cases staff remember to do it. Respondents described motivation in the form of lunch for at least heavy theatre days when there will not little time to go and look for food to buy.

If the place is busy, it is very difficult to leave the patient to go and buy food. Meanwhile you can't also work with hunger. (Respondent).

All six of the respondents agreed that extensive training on the guidelines was needed for staff especially general practitioners. Only surgeons and peri-operative nurses learn about the guidelines in school. In Ghana, except anaesthesia, majority of staff that work in the surgical theatres are general medical officers and general nurses especially in the district hospitals. Periodic workshops and training for staff surgical safety issues in general will go a long way to improve on adherence and quality of healthcare.

Willingness on the part of the individual was one of the factors identified to affect adherence. The fact that one has awareness and knowledge about the guidelines will guarantee that the person will be willing to adhere to that. All of them agreed that a system in place to monitor and regulate the use of the checklist in all the hospitals may force significant number of staff to use the checklist.

4.5. Knowledge level of staff on safe surgery guidelines

Frequency and percentage of respondents who answered correctly to all the 21 questions on the safety surgical checklist in all four hospitals. (Table 6).

Table 6: Percentage of correct responses to knowledge questions.

Knowledge question	n (%)
A tool to reduce the risk of preventable complications during the perioperative period is a surgical safety checklist	55 (71.4)
Surgical safety list benefits the surgical environment by improving communication and reducing preventable incidents in theatre	66 (85.7)
The three parts of the surgical safety checklist are Sign in, Time out, and Sign out	42 (54.6)
During the sign in part of the checklist, the team confirm the patient identification.	48 (62.3)
During the sign in part of the checklist, the team discuss the equipment that is needed for the surgery.	36 (46.8)
During the sign in part of the checklist, the team discuss their concerns and potential critical events.	28 (36.4)
It useful to discuss potentially critical events before surgery begins because it allows staff to prepare for and be more alert to the possibility of such events	65 (84.4)
Acute blood loss and the planned action is an example of a potentially critical event that might be discussed during the perioperative period	55 (71.4)
The surgical team is responsible for ensuring patient safety in the theatre	62 (80.5)
One to two hours before incision antibiotics should be given to prevent surgical site infections	46 (59.7)
Indicator tape is used to evaluate the sterility of surgical instruments and packs	56 (72.7)
Antibiotics used for prophylaxis should be discontinued 24 hour after surgery	32 (41.6)
Shaving is not recommended as it increases the risk of surgical site infections	23 (29.9)
It is necessary to prepare the skin with an antiseptic agent before surgery	67 (87.0)
The hands and forearm be scrubbed before surgery for 2-5 minutes	8 (10.4)
Sterile dressing should be maintained over surgical wound for 24-48 hours	15 (19.5)
The strength of bleach you use for decontamination is 0.5%	48 (62.3)
It takes 10 minutes to decontaminate	54 (70.1)
Utility gloves is used to wash surgical instruments	65 (84.4)
Hand washing is the single most effective method of preventing infections	69 (89.6)
Water and soap is the preferred hand washing method	76 (98.7)
Infectious wastes are disposed of in yellow garbage bags	53 (68.8)

Sharps are disposed of in the theatre when they are 2/3 full
N (%): Frequency (Percentage).

24 (31.2)

4.5. Knowledge level of respondents.

The table below shows the distribution of knowledge level of respondents from the four hospitals in the study. The mean score of the 77 study participants was 61.8% ($\pm 14.4\%$). Most (62.3%, 48/77) of the respondents had moderate scores, 19.5% (15/77) of them had poor scores whilst 18.2% (14/77) of them had good knowledge scores. Among those who had good scores, Takoradi hospital had the highest score of 37.5% with Essikado hospital recording the least (7.1%). None of the respondents from Takoradi hospital had poor knowledge. Majority of the respondent who had poor knowledge came from Essikado hospital. (Table 7)

Table 7: knowledge level of respondents

		Knowledge level		
	Knowledge score	Poor	Average	Good
	(Mean \pm SD)	n(%)	n(%)	n(%)
Hospital				
Total	61.8\pm14.4	15 (19.5)	48 (62.3)	14 (18.2)
Essikado	56.2 \pm 14.2	5 (35.7)	8 (57.1)	1 (7.1)
Kwesimintsim	68.3 \pm 15.3	1 (5.9)	10 (58.8)	6 (35.3)
Takoradi	69.6 \pm 9.3	0 (0)	5 (62.5)	3 (37.5)
Effia- Nkwanta	59.4 \pm 13.6	9 (23.7)	25 (65.8)	4 (10.5)

4.6. Demographic characteristics associated with knowledge level of respondents

High knowledge score was 31.3% among participants within the age group 20 to 30 years inclusive with 37.5% (n=12) of them having moderate scores. For participants in the age group 31 to 40 years inclusive, 11.4% (n=4) of them had good knowledge scores and 82.9% (n= 29) having moderate scores. Moderate knowledge score among participants older than 40 years was 70% (n = 7) with none of them having good knowledge scores. The Pearson chi-square test showed that age was significantly associated with the knowledge level of respondents ($\chi^2 = 17.58$, p-value = 0.001).

Among the participants who were married, 7.8% had high knowledge scores with 72.6% of them having moderate knowledge. High knowledge score among the unmarried respondents was 38.5% (n = 10) while 42.3% (n =11) of them had moderate score. The Pearson chi-square test showed that marital status of the respondents was significantly associated with the knowledge level of respondents ($\chi^2 = 11.41$, p-value = 0.003). (Table 8)

Table 8: Association between Knowledge level and demographic characteristics of respondents.

Variables	Knowledge level			P-value
	Poor n(%)	Moderate n(%)	Good n(%)	
Total	15 (19.5)	48 (62.3)	14 (18.2)	
Sex				0.492
Female	12 (18.5)	42 (64.6)	11 (16.9)	
Male	3 (25.0)	6 (50.0)	3 (25.0)	
Age group				0.001**
20-30	10 (31.3)	12 (37.5)	10 (31.3)	
31-40	2 (5.7)	29 (82.9)	4 (11.4)	
>40	3 (30.0)	7 (70.0)	0 (0.0)	
Marital status				0.003**
Married	10 (19.6)	37 (72.6)	4 (7.8)	
Single/divorced/widow	5 (19.2)	11 (42.3)	10 (38.5)	
Religion				0.169
Christian	14 (20.9)	39 (58.2)	14 (20.9)	
Non-Christian	1 (10.0)	9 (90.0)	0 (0.0)	
Profession				0.191
Anesthesia	1 (7.7)	10 (76.9)	2 (15.4)	
Doctor	5 (45.6)	4 (36.4)	2 (18.2)	
Nurse/health assistant	9 (16.9)	34 (64.2)	10 (18.9)	
Specialty				0.02*
General Doctor/House officer	6 (50.0)	5 (41.7)	1 (8.3)	
General nurse/enrolled	8 (19.1)	27 (64.3)	7 (16.7)	
PON/intern	0 (0)	8 (61.5)	5 (38.5)	
anaesthetist	1 (11.1)	8 (88.9)	0 (0.0)	
Educational level				0.356
Certificate/diploma	9 (25.7)	19 (54.3)	7 (20.0)	
Degree/Advanced diploma	6 (14.3)	29 (69.1)	7 (16.7)	
Years of practice				0.107
<4 years	9 (32.1)	14 (50.0)	5 (17.9)	
4-10 years	2 (5.9)	25 (73.5)	7 (20.6)	
>10 years	4 (26.7)	9 (60.0)	2 (13.3)	
Health facility				
Esikado	5 (35.7)	8 (57.1)	1 (7.1)	
Kwesimintsim	1 (5.9)	10 (58.8)	6 (35.3)	
Takoradi	0 (0)	5 (62.5)	3 (37.5)	
Effia- Nkwanta	9 (23.7)	25 (65.8)	4 (10.5)	

SD: standard deviation. N: frequency. %: row percentage. χ^2 : Pearson's chi-square. ϕ

4.7. Other characteristics associated with knowledge level of respondents.

Respondents' awareness of WHO SSG, respondents willingness of using surgical safety checklist (SSC) and respondents' awareness of IPC policy in their facility were the factors that showed significant association with their knowledge scores on SSG (P-value <0.05).

The good knowledge score was 21.8% (n=12) for respondents who knew what WHO SSG is about and 9.1% (n = 2) for respondents who did not what WHO SSG is about. The percentage of respondents who had good scores was 6.5% (n=2) for those who did not have knowledge about WHO SSG and 18.9% (n=10) for respondents who knew what WHO SSG is about. Knowledge of the WHO SSG showed significant association respondents' knowledge level scores ($\chi^2 = 10.9$, p-value = 0.004).

Respondents who agreed to use SSC at all times in the surgical theatre had 19.7% (n=14) for good knowledge. For respondents who did not agree to use SSC at all times in the surgical theatre, none of them had good knowledge score on SSG. The willingness of respondents to use SSC at all times at the surgical theatre showed significant association with their knowledge level from the Fishers' exact test of association (p-value = 0.021).

20.6% (n= 14) of Respondents with knowledge on of IPC had good knowledge. None of the respondents who did not have knowledge on IPC had good knowledge. The awareness of respondents on IPC policy in their facility showed significant association with their knowledge level from the Fishers' exact test of association (p-value = 0.003). (Table 9.)

Table 9: Association between knowledge level and other associated characteristics of respondents.

Variables	Knowledge level			P-value
	Poor n (%)	Moderate n(%)	Good n(%)	
Total	15 (19.48)	48 (62.34)	14 (18.18)	
Awareness of WHO SSG				0.482
No	5 (22.7)	15 (68.2)	2 (9.1)	
Yes	10 (18.2)	33 (60.0)	12 (21.8)	
How you got to know about it				0.543
internet	0 (0.0)	3 (100.0)	0 (0.0)	
school	7 (20.0)	18 (51.4)	10 (28.6)	
theatre	0 (0.0)	1 (50.0)	1 (50.0)	
workshop	3 (25.0)	8 (66.7)	1 (8.3)	
SSG policy in my facility				0.922
No	4 (25.0)	9 (56.3)	3 (18.8)	
Yes	10 (18.9)	33 (62.3)	10 (18.9)	
Don't know	1 (12.5)	6 (75.0)	1 (12.5)	
Knowledge on WHO SSG				0.004**
No	11 (35.5)	18 (58.1)	2 (6.5)	
Yes	4 (8.7)	30 (65.2)	12 (26.1)	
Frequency of checklist use				0.615
All the time	7 (17.9)	26 (66.7)	6 (15.4)	
Most of the time	2 (13.3)	11 (73.3)	2 (13.3)	
Once a while	2 (20.0)	6 (60.0)	2 (20.0)	
None	4 (30.8)	5 (38.5)	4 (30.8)	
SSC critical to patient safety				0.377
Agree	14 (18.4)	48 (63.2)	14 (18.4)	
Disagree	1 (100.0)	0 (0.0)	0 (0.0)	
SSC is waste of time				0.808
Agree	0 (0.0)	3 (75.0)	1 (25.0)	
Disagree	15 (20.6)	45 (61.6)	13 (17.8)	
Use of SSC at all times				0.021*
Agree	11 (15.5)	46 (64.8)	14 (19.7)	
Disagree	4 (66.7)	2 (33.3)	0 (0.0)	
Knowledge on IPC				0.003**
No	6 (66.7)	3 (33.3)	0 (0.0)	
Yes	9 (13.2)	45 (66.2)	14 (20.6)	
Last training on IPC				0.777
Not trained	2 (25.0)	5 (62.5)	1 (12.5)	
<1 year	5 (21.7)	14 (60.9)	4 (17.4)	
1-3 years	8 (20.0)	23 (57.5)	9 (22.5)	
>3 years	0 (0.0)	6 (100.0)	0 (0.0)	
Internal training on IPC				0.131
No	9 (31.0)	16 (55.2)	4 (13.8)	
Yes	6 (12.5)	32 (66.7)	10 (20.8)	

SD: standard deviation. n: frequency. %: row percentage. *: P-value <0.05. **: P-value <0.01.

From the multiple logistic regression model, specialty, number of years in service, knowledge on WHO SSG, and receiving internal training sections on IPC had significant association on knowledge level of respondents (p - value < 0.05).

The odds of having good knowledge in respondents who are peri-operative nurses was 36 times as great as the odds in respondents who are not (OR; 36; 95% CI: [3.14 – 412.5], p - value = 0.018). The odds of having good knowledge in respondents who have spent 4 – 10 years in service was 6 times as great as the odds in respondents who have spent less than 4 years (OR, 5.96; 95% CI: [1.92- 18.5], p - value = 0.009). The odds of having good knowledge in respondents who have spent more than 10 years in service was 2.3 times as great as the odds in respondents who have spent less than 4 years in service (OR, 2.3; 95% CI: [0.64- 8.42], p -value = 0.009). The odds of having good knowledge in respondents who had knowledge on WHO SSG was 11.6 times as great as the odds in respondents who did not knowledge on WHO SSG (OR, 11.6; 95% CI: [3.89- 34.7], p - value < 0.001). The odds of having good knowledge in respondents who received internal training sections on IPC was 3 times as great as the odds in respondents who did not (OR, 2.99; 95% CI: [1.14- 7.86], p - value = 0.026).

After controlling for other variables, marital status, knowledge on WHO surgical guidelines, perception of surgical checklist is a waste of time and internal training sections on IPC were significant factors influencing the knowledge level of respondents (p -value < 0.05).

Respondents who were unmarried were 90% less likely to have good knowledge compared to their married counterparts (AOR, 0.1; 95% CI: [0.0 – 0.9], p - value = 0.044). The odds of having good knowledge in respondents who had knowledge on the WHO SSG was 28.3 times as great as the odds in respondents who did not have awareness (AOR, 28.3; 95% CI: [2.3- 349], p - value = 0.009). The odds of having good knowledge among respondents who disagree that SSC was a

waste of time was 60.2 times as great as the odds in respondents who agreed (AOR, 60.2; 95% CI: [1.5- 241.1], p- value = 0.03). The odds of having good knowledge in respondent who received internal training sections on IPC in their facilities was 15.9 times as great as the odds in respondents who did not receive internal training sections on IPC (AOR, 15.9, 95% CI: [1.4- 183.5], p –value = 0.026). (Table 10).

Table 10: Factors influencing knowledge level of respondents

Variables	Crude odds ratio		Adjusted odds ratio	
	COR [95% CI]	P-value	AOR [95% CI]	P-value
Marital status		0.949		0.044*
Married	ref		ref	
Unmarried	1.0 [0.4, 2.7]		0.1 [0.0, 0.9]	
Specialty		0.018*		0.118
General doctor	ref		ref	
General nurse	4 [0.9, 17.1]		6.7 [0.7, 62.5]	
PON	36 [3.1, 412.5]		26.4 [0.7, 101.3]	
Anaesthetist	10.5 [1.3, 82.2]		26.9 [2.3, 306.1]	
Years in service		0.009**		0.099
<4 years	ref		ref	
4-10 years	5.9 [1.9, 18.5]		0.4 [0.0, 6.1]	
>10 years	2.3 [0.6, 8.4]		0.0 [0.0, 1.6]	
Knowledge on WHO SSC		<0.001***		0.009**
No	ref		ref	
Yes	11.6 [3.9, 34.7]		28.3 [2.3, 349.3]	
SSC a waste of time		0.17		0.03*
Agree	ref		ref	
Disagree	5.1 [0.5, 52.4]		60.2 [1.5, 241.4]	
Will use SSC at all times		0.05		0.243
Agree	ref		ref	
Disagree	0.1 [0.0, 1.0]		0.10 [0.0, 4.7]	
Internal training on IPC		0.026*		0.026*
No	ref		ref	
Yes	2.9 [1.1, 7.9]		15.9 [1.4, 183.5]	

COR: crude odds ratio. AOR: adjusted odds ratio. CI: confidence interval. *: p<0.05. **: p<0.01. ***: p<0.001.

From the above results, some of the confidence interval are wide indicating a very small sample size of that particular variable compared to others in the study. This affect the standard error which intern has effect on the confidence interval. Therefore conclusions from this data needs to be replicated with a larger sample size.

4.8. Qualitative results

Five out of the six interviewed knew about the guidelines as “laid-down rules and regulations”, “a document” and “standard protocols” developed to “ensure patient safety in the surgical unit”. Four knew about it because it is part of their training in school while the other knew through a colleague in the United Kingdom (UK).

“Even though a colleague told me about it, I don’t know much about it because I haven’t read the entire document” (anaesthetist 1)

“No no no, I have not heard it before... not even in school or at a workshop” (anaesthetist 2)

4.10. Proportion of surgical site infections

Of the 381 folders selected from the four health facilities, 12.1% (n=46) of them had surgical site infections. Hospital B had the highest (15.7, 8/51) proportion and the least was recorded by hospital C as indicated below. (Table 13).

Table 13: Proportion of SSIs recorded by the hospitals.

hospital	Frequency	Percentage (%)
Essikado	6/51	11.8
Kwesimintsim	8/51	15.7
Takoradi	5/51	9.8
Effia- Nkwanta	27/228	11.8
Total	46/381	49.1

Among the 381 folders selected the mean number of days stayed in the hospital after surgery was 3.8 days (± 2.9 days). Among the folders selected, 3.4% (n=13) of them had history of diabetes whilst 14.4% (n=55) of them had history of hypertension. (Table 12).

Table 14: Factors associated with surgical site infections.

Variables	Frequency	Percentage
Length of stay after surgery (mean \pm SD)	3.80 \pm 2.9	
Presence of surgical site infection		
Absent	335	87.9
Present	46	12.1
History of diabetes		
No	368	96.6
Yes	13	3.4
History of hypertension		
No	326	85.6
Yes	55	14.4

SD: standard deviation.

4.11. Factor affecting the presence of surgical site infection among patients.

From the Pearson's chi-square test of association none of the factors showed significant association with the presence of surgical site infection among patients. Hospital B recorded the highest percentage of patients who had surgical site infection (15.4%) followed by Hospital D (11.9%), hospital A (11.8%) and then hospital C (9.8%). From the multiple logistics regression model (Adjusted model), Length of stay of the patient after surgery was the only factor that showed significant association with presence of surgical site infection. There was a 25% increase odds of having surgical site after surgery for each day increase of the stay of patients after surgery (AOR: 1.25, 95% CI: [1.10, 1.43], p-value = 0.001). (Table 15).

Table 15. Factors affecting the presence of surgical site infections.

Variables	Absent	Present	P-value	Multiple binary logistic	
	n (%)	n (%)		AOR [95% CI]	P-value
Total	335 (87.9)	46 (12.1)			
Length of stay (mean±SD)	3.7±2.6	4.7±4.4	0.115 [#]	1.3[1.1, 1.4]	0.001*
Health facility			0.850		
Effia- Nkwanta	200 (88.1)	27 (11.9)		ref	
Essikado	45 (88.2)	6 (11.8)		0.9[0.3, 2.6]	0.894
Kwesimintsim	44 (84.6)	8 (15.4)		1.6[0.6, 3.9]	0.337
Takoradi	46 (90.2)	5 (9.8)		1.1[0.4, 3.3]	0.863
Time antibiotic administered			0.684		
After surgery	253 (87.5)	36 (12.5)		ref	
During surgery	82 (89.1)	10 (10.9)		0.6[0.2, 1.7]	0.353
History of diabetes			0.709		
No	324 (88.0)	44 (12.0)		ref	
Yes	11 (84.6)	2 (15.4)		2.0[0.4, 10.9]	0.447
History of hypertension			0.774		
No	286 (87.7)	40 (12.3)		ref	
Yes	49 (89.1)	6 (10.9)		0.7[0.3, 2.0]	0.534

n: frequency. %: row percentage. AOR: adjusted odds ratio. χ^2 : Pearson's chi-square value. CI: confidence interval. *: p-value <0.05. SD: standard deviation. #: Welch's t-test.

4.12. Availability of logistics for all four health facilities.

All the four health facilities had functioning suction machine, Oxygen, and Pulse oximetry. Mask, Airways, Tubes and consumables were all available at the four facilities. The type of lotion used by all four facilities was Savlon or Spirit. Also all emergency drugs were available and not expired at all the facilities. Logistics in terms of consumables, aesthetic machines and other basic equipment needed to perform surgeries at ease and will eventually ensure patient safety were available in all four hospitals. (Table 16).

Table 16: Availability of logistics in the health facilities.

	<u>Essikado hospital</u>		<u>Kwesimintsim hospital</u>		<u>Takoradi hospital</u>		<u>Effia- Nkwanta hospital</u>	
	Present	Functional	Present	Functional	Present	Functional	present	functional
Suction machine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oxygen	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pulse oximetry	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mask	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a
Airways	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a
Tubes	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a
Consumables	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a
Type of lotion (Savlon/ spirit)	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a
All emergency drugs (Not expired)	Yes	n/a	Yes	n/a	Yes	n/a	Yes	n/a

n/a: Not Applicable

However, there is still more to be done. From the interviews there was a general consensus that due to the annual peer-review programs organized by the region, the hospitals are provided with a lot of what they need to perform the duties well.

Because of peer-review, management provides us with almost what we need to work... but we still need more, for example; suction tubes are supposed to be disposable, because we don't have enough, we are forced to reuse them which is not the best".(peri-operative nurse)

"Peer review has been very helpful. You make a requisition and you are sure of getting it in most cases". (Medical officer)

4.13. Level of Adherence of the hospital to safe surgery practices

Kwesimintsim and Takoradi hospitals score 4 points each indicating moderate level of adherence to safe surgery practices. Effia – Nkwanta and Essikado hospitals scored 3 points each showing low levels of adherence to safe surgery practices. This could be attributed to low level of awareness and low level of knowledge on the WHO SSG resulting from unsuccessful implementation of the guidelines. Key interviewees admitted there are challenges that hinder the use of the guidelines but had varied views about its use in the theatre especially the SSC. Some of the challenges identified were 'increased workload', 'lack of training for staff', 'lack of direction from management', 'use of checklist is time wasting' and lack of teamwork among nursing, anaesthesia and surgical staff'.

"People don't like new things... they think you want to stress them by forcing them to do the right thing. Even here, some think that going through the checklist is a complete waste of time"
(nurse)

“Well I think using the checklist is good.....it will prevent a lot of harm to the patient, but we have a lot to do, performing many surgeries a day and doing other things as well we are always in a hurry” (medical officer).

On what can be done to help the current situation, all of them proposed training of staff on the WHO safe surgery guidelines through workshops and in-service training. Sponsoring general nurses to do peri-operative nurse will also go a long way to improve things in the surgical environments

Scoring of adherence

Hospital	Checklist use		Checklist completed		WHO standard		Total score	Remarks
	Score	Remarks	Score	Remarks	Score	Remarks		
Essikado	1	low	1	Low	1	High	3	Non-adherence
Kwesimintsim	3	High	1	Low	0	Low	4	Non-adherence
Takoradi	3	High	1	Low	0	Low	4	Non-adherence
Effia-Nkwanta	2	Moderate	1	Low	0	Low	3	Non-adherence

CHAPTER FIVE

DISCUSSION

5.1. Rate of use and completion rate of the surgical safety checklist

The surgical safety checklist is expected to be used for all patients undergoing major surgeries, and they must be completely filled to prevent unforeseen adverse events. From this study, the overall rate of use and completion rates were 51% and 21% respectively. Out the four hospitals assessed, only Essikado hospital uses the standard WHO surgical safety checklist. The rest of the checklists had some elements of the “Sigh-in” components with lists of instruments and consumables counts. Important parts like the “Time-out and Sigh-out” were missing. The results of this study show the level of risk to the safety of surgical patients in the prevention of complications and promotion of better surgical outcomes in these hospitals. There were no guidelines, policies, templates and protocols directing the managers of the various theatres on the use of the standard WHO surgical safety checklists. This findings could be attributed to poor implementation strategies on the part of authorities and management of the health institutions. This finding is inconsistent with what other studies have reported in other part of the world. One such study is that of Asefzadeh et al (2017) in Iran where rate of use was 100% and a completion rate of 74% due to successful implementation of the guidelines. Moreover, the perioperative nurses and some medical officers had knowledge of the guidelines because it is part of their training but lack of initiative to introduce the standard checklist to the rest of the surgical team members in the various theatres. Peri-operative nurses are the managers of the theatres and has the responsibility of ensuring safety of their patients at all times. In another study by Fourcade et al (2011), the reported rate of checklist use at two surgical centres was 90.2% but a completion

rate of 61%. The study attributed low completions rate to 11 identified barriers to the successful implementation of the surgical safety checklist. Most of these barriers were blamed on organizational and cultural factors. In this study, some of the barriers identified from the interviews included workload, lack of motivation, lack of training for staff, lack direction from management and lack of teamwork among the different categories of staff.

5.2. Knowledge level of staff on safe surgery practices

Generally, knowledge level of respondents on safe surgery practices was below the expected as majority (62.30%) of the respondents in this study had average knowledge with only 18.20% having good knowledge. Low level of knowledge about the guidelines may lead to non-adherence to safe practices in the theatre and might put patients at risk of adverse events and complications after surgery. This finding could be attributed to inadequate training and low level of awareness of the WHO Safe Surgery Guidelines among the staff. This indicates clearly that the application of the guidelines to the Ghanaian context was unsuccessful. This confirms a response from one key informants who said that they were not aware of such guidelines and that it is not part of their training. Previous studies have reported good knowledge level among majority of staff. Such studies include; Hurtado et al (2012), Guatemala City, Dangyangs and Afonne (2016), Nigeria and Wedner-Sanchez et al (2018) in Mexico who found between 50% and 93.8% of their respondents having good knowledge leading to compliance and use of SSC to ensure patient safety in the surgical units.

Respondents' knowledge of WHO SSG, respondents willingness of using SSC and respondents' knowledge on IPC were the factors that showed significant association with their knowledge levels on SSG (P-value <0.05). Awareness and knowledge of the guidelines was through training in schools, workshops, internet and some heard it in the theatre. Having knowledge of the

guidelines translated into having good knowledge. The study in Nigeria by Dangyangs and Afonne (2016) and Guatemala City by Hurtado (2012) also reported high awareness of the guidelines among the respondents through training workshops and conferences. Supporting the majority of staff to acquire the needed knowledge required through in-service training is important to promote adherence and protect the safety of patients. For some time now, a lot has been done in the area of IPC in the country and in the Metropolis through in-service training of staff to reduce the rate of all types of infections. Therefore, having good knowledge in IPC helped some of the staff to have good scores since IPC is part of the SSG. However, despite strategies and training on IPC in the metropolis, there is some knowledge deficits; about 30% of the respondents knew that shaving is not recommended in surgery as it increases the risk of SSIs, a little over 10% answered correctly the duration (2-5 minutes) of scrubbing the hands and forearm for surgery and about 20% knew that sterile dressing is to be maintained over surgical wound for 24-28 hours.

Demographic characteristics found to have significant association with knowledge level were age, marital status and specialty from the Pearson chi-square test done (p-value = 0.001, p-value = 0.003 and p-value = 0.02 respectively). About 31% of the age group 20-30 years having good knowledge might be that they are recent graduates with fresh ideas and knowledge compared to their counterparts who are much older and married. Another significant factor of association with knowledge level was the specialty. Peri-operative nurses demonstrated good knowledge about the guidelines because it is part of their training in school. However, some of the sample sizes were too small, so generally of the findings could be made using a bigger sample size.

5.4. Proportion of surgical site infections (SSI)

SSIs is the most frequent type of Hospital Acquired Infections in LMICs resulting in deaths and financial loss (WHO, 2016). This was a retrospective records review of surgical patients from January to December 2018. The CDC guidelines of SSI developing within 30 days was adopted and folders that recorded the presence of SSI within that 30 days after surgical operation were recorded as SSI. The study also considered number of days spent after surgery and presence of Diabetes and Hypertension. The study revealed an overall proportion of 12.1% for all the four selected hospitals in the study. The individual proportions ranged from 9.8% to 15.4% across the hospitals. Although the figure is high, it is still within the limits reported across the country by other studies. Similar studies by Osei- Boateng (2018) and Abena Attah (2018) at Tema metropolis and Korle-but teaching hospitals reported SSI rates of 9.6% and 14.8% respectively after caesarian sections (CS). Moreover, this study looked at all types of surgeries including CS in the STM. Other studies from developing nations such as Nigeria and India also reported SSI rate between 12%-18%. These results are also higher than that of UK (3.1%) and the Netherlands (4.3%) (Kumar & Rai, 2017). This exposes the weaker healthcare systems and lack of adequate adherence to safe surgical practices in low and middle income countries. Among the factors that contributed to SSIs, length of stay after surgery was found to have an effect on SSI after multiple binary logistics regression (Adjusted model). There was a 25% increase odds of having SSI after surgery for each day increase of the stay of patients after surgery. However, length of stay is dependent on the type of surgery, co-morbidities and a person's own immune system. This finding is consistent with a study by Weldu et al, (2018) in Northern Ethiopia post- operative length of stay was also found to be associated with SSI (

[OR] 7.97;95% CI 1.70-37.38). Some previous studies have revealed other factors such as advancing age, nutritional status of the patient, presence of co-morbidities such as diabetes mellitus and anaemia as some of the factors that affect SSI (Yohanna & Afonne, 2016).

5.5 Limitation of the study

This study sought to interview all theatre staff who have direct involvement in the surgical process (doctors, nurses and anaesthetists). However, at the time of the study, no general surgeon was available due to transfer. moreover, as a result of their busy schedules and time constraints, two orthopaedic surgeons and gynaecologists could not also be interviewed. However, their views could not have changed the results of this study.

CHAPTER SIX

6.1 CONCLUSION

None of the hospitals was found to adhere to safe surgery practices. All the four hospitals in this study use checklists to assess and monitor patients during surgical procedures. However the standard, rate of use and completion rate are poor. Although Essikado hospital score low, it is the only hospital that uses the WHO standard checklist. Some of the factor that were found to affect staffs' level of adherence were little knowledge about the guidelines, motivation for staff, workload and lack of monitoring systems in place to check the proper use of the checklist. Majority of the respondents had moderate knowledge level on safe surgery practices and proportion of surgical site infections were high although it is still within the range reported in other parts of the country. Implementation of the WHO safe surgery guidelines was however, not successful in STM resulting in low and moderate adherence to safe surgery practices. This poses great risk to the safety of surgical patients as evidenced by the proportion of surgical site infections. Surgeons and peri-operative nurses also lack the initiative to champion the implement of the guidelines. It is important to support theatre staff to implement the guidelines to promote patient safety in the surgical environments.

6.2. RECOMMENDATIONS

- Ghana Health Service and Ministry Of Health need to pay more attention to the successful implementation of the safe surgery guidelines by;
 - Training theatre staff on the use of the guidelines
 - Providing policy and monitoring systems to direct the use of the guidelines
 - Considering it as part of the training for anaesthesia
 - Evaluate the IPC training done so far
- Western Regional Health Directorate and Sekondi-Takoradi Metro Health Directorate should establish a surveillance system on SSIs
- Similar studies should be carried out in the private hospitals with larger sample size to compare results
- Further studies is needed to determine the barriers to the successful implementation of the guidelines

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APPENDICES

Appendix 1: Information Sheet

Adherence to Safe Surgery Practices in Government Hospitals in Sekondi-Takoradi

Metropolis

Introduction

My name is Safiatu Tarl Abdullai, an MPhil student offering Applied Epidemiology and Disease Control at the School of Public Health, University of Ghana Accra. My mobile phone number is +233(0)24 412 9644 and e-mail, jummaitar130@gmail.com.

Background

My research topic is Prevalence of surgical site infection and adherence to safe surgery practices in government hospitals in Sekondi-Takoradi Metropolis. This is part of the requirements for the award of a master's degree in Applied Epidemiology and Disease Control. The study seeks to assess the knowledge of theatre staff on safe surgery practices which might influence their adherence to safe surgery practices to promote quality surgical outcomes of patients.

Nature of the study

This is a cross-sectional study using both qualitative and quantitative approaches. It involves the use of questionnaires to assess knowledge of staff on safe surgery, records review of surgical patients and assessment of availability of resources needed to ensure safe surgery and prevent

surgical site infections. Key informant interview will also be done to explore the thoughts and experiences of some key staff on safe surgery.

Direct and indirect benefits

There are no direct benefits to you that will result from your participation in this study. However, this study will indirectly provide the necessary information to improve upon the safety of patients in the surgical environment, and subsequently improve on the delivery of quality health care in Ghana.

Potential risks and discomfort

There are no known risks or discomfort associated with this study. You have the right not to answer any questions.

Voluntary participation/withdrawal

Your participation in this study is purely voluntary. You may choose not to participate and you may also redraw your consent to participate in this study at any time. You will not be penalized in any way should you decide not to participate or to withdraw from this study.

Confidentiality

We will do everything possible to protect your privacy. Your identity will not be revealed in any publication resulting from this study. You are not required to provide your name and your identity will not be linked to your responses in this study. All data will be kept under lock and key and only the principal investigator and her supervisor will have access to this information. Confidentiality will be provided to the fullest extent possible by law.

For key informants only: if we tape record your interview, apart from ensuring your confidentiality as stated above, we will destroy the tape after it has been transcribed and the final work submitted, which we anticipate will be after six months of recording.

Compensation

You will NOT receive any form of compensation be it monetary or any form of favour for your participation in this study.

Outcome and feedback

The results of this study will be published in scientific journals. You can however ask the principal investigator for a copy of the results if you are interested.

Funding information

This is a self- funded project. The principal investigator bears the full cost of this study.

Conflict of interest

Data generated from this study will solely be for the principal investigator, supervisor of the principal investigator (Dr. Bismark Safo) and the school in which the principal investigator is affiliated to (University of Ghana)(Yeboah, Mensah, & Letsa, 2017)(Division, 2011)(Pickering et al., 2013)(Opoku, 2007)(Yohanna & Afonne, 2016)(Surgical & Prophylaxis, n.d.)(Gitelis et al., 2017)(Papaconstantinou et al., 2013)(Ko, Turner, & Finnigan, 2011)(Fourcade, Blache, Grenier, Bourgain, & Minvielle, 2011)(Vivekanantham, Ravindran, Shanmugarajah, Maruthappu, & Shalhoub, 2014)(World Health Organization, 2009)(Goodstein et al., 2016)

Provision of information and consent for Participants

You are required to sign a consent form in agreement to participate in this study before the beginning of the interview. Copies of this information sheet and consent form will be given to you to send home.

Thank you.

For further clarification

Contact the principal investigator for further questions regarding this study.

Safiatu Tarl Abdullahi

Principal investigator

University of Ghana, school of public health

Department of epidemiology and Disease Control

+233(0)24 412 9644

Jummaitar130@gmail.com

Contact the Ghana Health Service Ethics Review Committee Administrator for any ethical issues;

Hannah Frimpong

GHS- Ethics Review Committee

Research and Development Division

GHS-Accra

+233 (0)50 704 1223

Appendix 2: Consent Form

Adherence to safe surgery practices in government hospitals in Sekondi- Takoradi

Metropolis

Details' regarding this research has been explained to me. My questions have been answered to my satisfaction and I understand. I may also ask further questions at any time.

I certify that I willingly agree to be part of this research and agree to answer questions on condition that no reference will be made to my real identity with regards to my contribution or participation or any be made to other persons outside this research as promised by the researcher.

I understand that I will be given copies of participant's information and signed/ thumb printed consent form for my personal record before the administration of the research questionnaires.

Respondent's signature/ thumb print

Date

INVESTIGATOR STATEMENT AND SIGNATURE

I certify that the participant has been given ample time to understand the procedures of the study and has agreed to participate. All questions and clarifications raised by the participant have been duly addressed.

Signature of person who sought consent

Date

1. How often do you use checklist to assess patients undergoing surgery?
 - a) All the time []
 - b) most of the time []
 - c) once in while []
 - d) none of the above []

2. In your opinion, what is a surgical safety checklist?
 - a) A tool to reduce the risk of preventable complications during the perioperative period
 - b) A list of equipment that will be required during surgery
 - c) A tool to ensure that all staff are prepared for an emergency situation
 - d) A document listing the roles of staff in the operating room

3. How do you think the surgical safety checklist benefit the surgical environment?
 - a) Makes operating times shorter
 - b) Help staff get to know each other better
 - c) Improve communication and reduce preventable incidents in theatre
 - d) Reduces waste in the operating theatre

4. The three parts of the surgical safety checklist are
 - a) Sign on, Time on, and Sign Out
 - b) Log in, Time on, and Exit
 - c) Sign in, Time out, and Sign out
 - d) Log in, Time out, and Sign out

5. During which part of the checklist does the team confirm the patient identification?
 - a) Time out []
 - b) Sign in []
 - c) Sign out []
 - d) Log in []

6. Which part of the checklist do the team discuss the equipment that is needed for the surgery?
 - a) Time out []
 - b) Sign in []
 - c) Sign out []
 - d) Log in []

7. Which part of the checklist do the team discuss their concerns and potential critical events? A) Time out [] b) Sign in [] c) Sign out [] d) Log in []
8. Why it is useful to discuss potentially critical events before surgery begins?
- a) It allows staff to inform patients relatives about their concern
 - b) It allows staff to prepare for and be more alert to the possibility of such events
 - c) It allows staff to relate better with patient and relatives
 - d) It allows staff to plan how the theater will be cleaned after the operation
9. Which of the following is an example of a potentially critical event that might be discussed during the perioperative period?
- a) The diet the patient will need after surgery
 - b) Acute blood loss and the planned action required if it occurs
 - c) The time patient will be discharged
 - d) The use of suture material during the surgery
10. Who do think is responsible for ensuring patient safety in the theatre?
- a) The nurse
 - b) The anaesthetist
 - c) The surgeon
 - d) The whole surgical team

How will you rate the following?

11. The use of surgical safety checklist is critical to ensuring patient safety in the theatre.
- a) Agree [] b) Strongly agree [] c) Disagree [] d) Strongly disagree []

12. The use of surgical safety checklist is a waste of time.

- a) Agree [] b) Strongly agree [] c) Disagree [] d) Strongly disagree []

13. I will use a surgical safety checklist at all times in the theatre.

- a) Agree [] b) Strongly agree [] c) Disagree [] d) Strongly disagree []

Knowledge on surgical site infections

14. When should antibiotics be given to prevent infections during the perioperative period? a) Within 15 minutes of incision [] b) After 1 hour of incision []

- c) 2 hours before incision [] d) after the procedure []

15. How do you evaluate the sterility of surgical instruments and packs?

- a) Sterility cannot be evaluated
b) Use of indicator tape
c) Use personal judgement
d) No idea

16. Antibiotics used for prophylaxis should be discontinued 24 hour after surgery.

- a) True [] b) False []

17. Shaving is not recommended as it increases the risk of surgical site infections.

- a) True [] b) False []

18. It is necessary to prepare the skin with an antiseptic agent before surgery'

- a) True [] b) False []

19. How long should the hands and forearm be scrubbed before surgery?

- a) 2- 5 minutes [] b) 3- 5 minutes [] c) 5-7 minutes [] d) 1- 5 minutes []

20. Sterile dressing should be maintained over surgical wound for;

- a) 12- 24 hours [] b) 24- 48 hours [] c) 24-72 hours [] d) 6-12 hours []
21. Are you aware of Infection Prevention and Control (IPC) policy in your facility?
a) Yes [] b) No []
22. How long ago did you have training on IPC? a) Less than 1 year ago []
b) 1 – 3 years ago [] c) 4- 6 years ago [] d) Over 6 years ago []
23. Does your unit organize internal training sections on IPC periodically?
a) Yes [] b) No []
24. What is the strength of bleach you use for decontamination?
a) 0.05% [] b) 0.5% [] c) 5% [] d) 0.3% []
25. How long does decontamination take?
a) 10min [] b) 15min [] c) 20min [] d) 5min []
26. Which type of gloves is used to wash surgical instruments? a) Surgical gloves []
b) Examination gloves [] c) Utility gloves [] d) Long elbow gloves []
27. Which is the single most effective method of preventing infections?
a) Hand washing [] b) Wearing of personal protective clothing []
c) Regular vaccination of health workers [] d) Prudent use of antibiotics []
28. Which is the preferred hand washing method? a)Alcohol hand rub []
b) Water and soap [] c) Iodine solution [] d) Water and bleach []
29. Where will you dispose of infectious waste?
a) Yellow garbage bag
b) Black garbage bag
c) Red garbage bag

d) No idea

30. When do you dispose of sharps in the theatre?

a) When it is $\frac{1}{2}$ full

b) When it $\frac{1}{3}$ full

c) When it $\frac{2}{3}$ full

d) When it is $\frac{3}{4}$ full

CHECKLIST FOR FOLDER REVIEW

Presence of checklist in folder Yes [] No []

Checklist divided into three sections Yes [] No []

Checklist has 'sign in' component Yes [] No []

Checklist has 'time out' component Yes [] No []

Checklist has 'sign out' component Yes [] No []

Content of checklist meet the WHO standard? Yes [] No []

Antibiotics given? Yes [] No []

Time of antibiotics administration a) within 1 hour before incision b) more than 2 hour before incision c) during the incision d) after surgery

Type of antibiotics given

Dosage of antibiotics given

Presence of surgical site infection Yes [] No []

Length of stay after surgery

History of diabetes Yes [] No []

History of hypertension Yes [] No []

CHECKLIST FOR ASSESSING THE AVAILABILITY OF LOGISTICS

Anesthetic machine Yes [] No []; Functional Yes [] No []

Laryngoscope Yes [] No []; Functional Yes [] No []

Suction machine Yes [] No []; Functional Yes [] No []

Oxygen Yes [] No []; Functional Yes [] No []

Pulse oximetry Yes [] No []; Functional Yes [] No []

Masks Yes [] No []

Airway Yes [] No []

Tubes Yes [] No []

Self - inflating bag Yes [] No []

Emergency drug:

Pethidine Yes [] No []; expired Yes [] No []

Diazepam /midazolam Yes [] No []; expired Yes [] No []

Ephedrine Yes [] No []; expired Yes [] Yes []

Adrenaline Yes [] No []; expired Yes [] Yes []

Lidocaine Yes [] No []; expired Yes [] Yes []

Atropine Yes [] No []; expired Yes [] Yes []

Hydralazine Yes [] No []; expired Yes [] Yes []

Frusemide Yes [] No []; expired Yes [] Yes []

Dextrose 50% Yes [] No []; expired Yes [] Yes []

Aminophylline Yes [] No []; expired Yes [] Yes []

Hydrocortisone Yes [] No []; expired Yes [] Yes []

Bupivacaine Yes [] No []; expired Yes [] Yes []

Ketamine Yes [] No []; expired Yes [] Yes []

Interview guide

1. What knowledge do you have on the WHO safe surgery guidelines?
2. What are some of the benefits of using surgical safety checklist in the surgical environment?
3. What are some of the factors affecting adherence of staff to the use of the checklist?
4. How do ensure the safety of patients in the surgical environment?
5. Do you think your facility has done enough to promote safe surgery for patients undergoing surgery?
6. What do you think can be done by all staff, facility and organization to promote and adherence to safe surgery practices in hospitals?


Appendix 4: Ethical Approval Letter

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

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

MyRef: GHS/RDD/ERC/Admin/App 197039
Your Ref. No.

Safia Tari Abdullah
Kwesimistsim Hospital
P.O. Box MC 0603
Takoradi



Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
Tel: +233-302-681109
Fax + 233-302-685424
Email: ghserc@gmail.com
7th February, 2019

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

GHS-ERC Number	GHS-ERC016/01/19
Project Title	Prevalence of Surgical Site Infections and Adherence to Safe Surgery Practices in Government Hospital in Sekondi-Takoradi Metropolis
Approval Date	7 th February, 2019
Expiry Date	6 th February, 2020
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.
 - 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. CYNTHIA BANNERMAN
(GHS-ERC CHAIRPERSON)

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

