

ENSIGN COLLEGE OF PUBLIC HEALTH-KPONG,

Eastern Region

**POTENTIAL FOR USE OF mHEALTH RESOURCES IN IMPROVING
MATERNAL HEALTH AT TEMA GENERAL HOSPITAL**

BY

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**A thesis submitted to the Department of Community Health in the Faculty of Public Health
in partial fulfillment of the requirements for the degree**

MASTER OF PUBLIC HEALTH

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DECLARATION

I hereby declare that except for reference to other people’s work, which I have dully cited, this project submitted to the Ensign College of Public health, Kpong is the result of my own investigation, and has not been presented for any other degree elsewhere.

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ABSTRACT

Patient-provider communication is a major challenge in resource-limited settings with large catchment areas. mHealth, which is the use of mobile communication devices, such as mobile phones, tablet computers and personal digital assistant (PDAs), for health services and information interventions is being used internationally and in Ghana to improve health communication challenges. This study seeks to explore the potentials for the use of mHealth by patients and health professionals to improve maternal health at the Tema General Hospital. A descriptive qualitative research approach was employed; focus group discussions with pregnant and postpartum women and in-depth interviews with health professionals from different specialties: obstetricians, general practitioners, midwives, dieticians, physiotherapist and pharmacists. The interviews were transcribed and coded into emergent themes and the thematic analysis framework was used to analyze the data.

The main themes identified relating to the current maternal health service challenges were high patient load, financial challenges and difficulties in implementing primary prevention. Participants noted phone calls as the main function of current mobile phone use. The expectations of mHealth use are to: improve accessibility to health information; provide reminders of appointments; save time, money and travel; and improve service delivery. Perceived barriers to mHealth were noted as: fear of mobile phones negatively affecting physicians' roles, perceived behavioural control and lack of technical support, fear of radiation and the need for physical consultations.

There are three main potential uses of mHealth in this population: (a) as an educational tool to improve health education; (b) to optimize the use of limited resources by overcoming the problem of inadequate access and financial constraints; (c) to improve use of healthcare by providing appointment and treatment reminders. Successful mHealth design, which takes barriers into account, may complement current practice and optimize use of limited resources.

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DEDICATION

To my dear husband; Nana Obrempong-Owusu

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LIST OF ACRONYMS

| | |
|---------|--|
| mHealth | Mobile health |
| PDA | Personal digital assistant |
| SMS | Short message service |
| GSM | Global system for mobile communication |
| MMR | Maternal mortality rate |
| MDG | Millennium development goals |
| UN | United Nations |
| MHS | Mobile health services |
| EHealth | Electronic health |
| SRHR | Sexual and reproductive health and rights |
| TAM | Technology acceptance model |
| PEOU | Perceived ease of use |
| FGD | Focus group discussion |
| IDI | In-depth interview |
| MDNet | Mobile Doctors Network |
| GMA | Ghana Medical Association |
| SIM | Subscriber identity module |
| ANC | Antenatal clinic |
| HIV | Human Immunodeficiency Virus |
| AIDS | Acquired Immune Deficiency Syndrome |
| GSMA | Global system for mobile communication association |

HIPAA

Health insurance portability and accountability act

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the study

mHealth, definition used at the 2010 mHealth Summit of the Foundation for the National Institutes of Health (FNIH) was "the delivery of healthcare services via mobile communication devices"(United Nations, 2015). Many health providers believe that mHealth has the potential to shift the paradigm on when, where, how and by whom health services are provided and accessed (Medhanyie *et al.* 2012).

The use of mobile phones has grown exponentially in the last decade, including some of the most remote and low-resource regions of the world. With the geographic expansion of mobile phone use, information and communication technology for development (ICT4D) was born (Aranda-Jan, Mohutsiwa-Dibe and Loukanova, 2014). For the year 2017, the number of mobile phone users globally is forecast to reach 4.77 billion with more than 600 million mobile phone users in Africa, applying mobile phones in healthcare is increasingly prioritized to strengthen healthcare systems and also improve maternal health on the continent (Smith *et al.* 2015).

Recent examples include the “mHealth for Safe Deliveries” program in Zanzibar in 2012; the Zanzibar Ministry of Health and Social Welfare (MOHSW) helped with the use of mobile phones equipped with a pregnancy screening and care application by lay community health workers and traditional birth attendants to screen and refer high risk pregnant women to health facilities. As of July 2012, a total of 629 registered women delivered healthy babies and a striking 70 percent of these births took place in health facilities (Lund *et al.* 2014). Others include the Tanzania (Wired Mothers), the United States (Text4Baby), and Serbia (Beba Dolazi) where gestational period-specific text messages are sent to women and are provided with educational materials. These

approaches have provided evidence that mHealth is effective in improving maternal health (Cormick *et al.* 2012).

A cross sectional study on health workers experiences, barriers, preferences and motivating factors in using mHealth forms by Medhanye *et al* (2015) in Ethiopia concluded that both health extension workers and midwives found mobile phones useful for their day-to-day maternal health care services delivery. A usability study of a mobile health application for rural Ghanaian midwives by Bloomfield *et al* (2014) concluded that the use of mHealth can provide mechanisms for improving the efficiency and effectiveness of care provided by midwives by supporting clinical decision making and providing information resources while reducing their administrative burdens.

The Grameen Foundation has also implemented two mobile health solutions in Ghana; the ‘Mobile Midwife’ that sends targeted SMS or audio messages to pregnant mothers according to their stage of pregnancy with information around key behaviors critical during pregnancy (Bloomfield *et al.* 2014). A study conducted by the GSMA reviewing almost 700 mHealth services showed that, mHealth significantly impacts health outcomes; but there were barriers to its implementation including fragmentation of service delivery, lack of scale across the full reach of mobile networks, limited replication and misalignment of the value proposition between mobile and health stakeholders(Sultana, 2013)

A lot is being done globally and locally to incorporate mHealth into practice but there is the need for more research in the area of the feasibility for its use in different parts of the country.

1.2 Statement of problem

Maternal health improvement i.e. improving the health of women during pregnancy, childbirth and the postpartum period is of great concern to the world. At the fifteenth anniversary of the population and development conference, the Secretary-General of United Nations said ‘all people benefit’ when maternal health care is improved (United Nations, 2015). Despite ongoing efforts to improve maternal health in developing countries, morbidity and mortality rates remain much higher than in developed countries (United Nations, 2015). Women in developing regions face a lifetime risk of maternal death of 1 in 160 compared to 1 in 3700 for women living in developed regions (United Nations, 2015). This inequality is driven by many causes such as: limited access to preventive health care services which are linked to low antenatal care, maternal and perinatal mortality and lack of health information or health education (Bloomfield *et al.* 2014).

One Millennium Development Goal (MDG) that has made some progress in Ghana (albeit slow) is MDG 5: improved maternal health. The two targets for assessing MDG 5 are reducing the maternal mortality ratio (MMR) by three quarters between 1990 and 2015, and achieving universal access to reproductive health by 2015. According to the UN estimates, in 2013, 3100 women died in Ghana due to the reasons related to pregnancy or childbirth (Ghana Statistical Service, 2014). The Tema Metropolitan Directorate of Health Services recorded 35 maternal deaths in the Tema metropolis in 2014, with severe haemorrhage identified as the major cause of all deaths (Ghana Statistical Service, 2014). Sixteen of these deaths were a result of reasons poor provider/patient communication. If the current trend continues, the maternal mortality in Ghana in 2015 will be at 358 per 100,000 live births; considerably higher than the MDG 5 goal of a maternal mortality rate of 190 per 100,000 live births (Albeit slow, 2010).

Despite the above figures, maternal health care has improved over the past 20 years, even though the pace has been slow, and extra efforts are required for Ghana to achieve the MDG 5. Institutional maternal mortality rate has reduced from 216 per 100,000 live births in 1990 to 164 per 100,000 live births in 2010 with a distance of 110 to target of 54 per 100,000 in 2015 (Ghana Statistical Service, 2014). The implementation of various interventions has helped improve maternal health in Ghana; mHealth has played a vital role in improving maternal health in various parts of the country (Bloomfield *et al.* 2014). The adoption of mHealth among health providers and patients although slow, is an inexorable reality. This research seeks to investigate the potentials for the use of mHealth resources by patients and health professionals in improving maternal health care at the Tema general hospital.

1.3 Research questions

The research questions are:

- Is there a possibility for the adoption of mHealth among maternal health providers and patients at the Tema General Hospital?
- Will mHealth help to improve maternal health services at the Tema General Hospital?

1.4 Objective of study

General objective

To assess the potential for the use of mHealth to improve delivery of maternal health services at Tema General Hospital.

Specific objectives

The specific objectives are to explore:

1. current mobile phone usage among patients and health professionals at the Tema General Hospital
2. knowledge of mHealth
3. extent of mHealth application in current services, and
4. concerns about mHealth usage.

1.5 Profile of study area

The Tema District has over 40 health facilities where maternal health services are offered. The biggest health facility is the Tema General Hospital, a government hospital and the main referral center for the Tema Metropolis. The hospital is located at a very strategic area within the Greater Accra Region, serving major towns such as Ada, Dodowa, Ashaiman etc. The hospital has been

overwhelmed by the number of people visiting the facility to seek medical care; stretching the limited resources.

The Labor Ward, according to statistics, is the third busiest in the country, after the Korle Bu and Komfo Anokye Teaching Hospitals. The maternal health (obstetrics and gynecology) department has 3 obstetrician/gynecologist, 10 medical doctors, 16 nurses and other helping staff.

Lately, concerns have been raised about the quality of maternal health services at the hospital. It has been reported that the hospital has a high mortality rate; 16 women died due to pregnancy-related complications at the hospital between January and April, 2015. The authorities of the hospital are keen to explore ways to improve maternal health service delivery at the hospital. It is against this background that this study was conducted.

1.6 Significance of the study

With mHealth emerging as a new contributor to the strengthening of healthcare systems and improvement of maternal health care, there is the need to estimate and describe the potential for mHealth usage in the various health sectors. This study is aimed at investigating the potential for the adoption of mHealth resource into maternal health practices at the Tema General Hospital. The findings from study can assist policy makers to design appropriate health policies to help implement the numerous evidence-based mHealth interventions to reduce the burden of maternal morbidity and mortality in Tema and Ghana as a whole. This study will serve as a reference for researchers to further research on this topic, especially in Ghana.

1.7 Organization of the study

This thesis is divided into six chapters. The first chapter gives general background information on the use of mHealth in improving maternal healthcare; it also presents a statement of the problem, objectives of the study, scope, limitations and significance. Chapter 2 summarizes the literature related to the concept of mHealth and its use. Chapter 3 addresses the research method and study design, selection of experts interviewed, and collection of data from study participants. Chapter 4 discusses the methods used for the analysis, tables and information deduced from the analysis, the results and interpretation of these tables and information. Chapter 5 discusses results obtained from the study. The last chapter 6 contains conclusions and recommendations.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Theoretical literature review

2.1.1 Concept of mobile health

The advancement of wireless networks and mobile devices have driven the emergence of mobile health services (MHS), which can be described as a variety of healthcare services, including health consulting, hospital registering, and location-based services delivered through mobile communications and network technologies (Istepanian *et al.* 2006; Ivatury *et al.* 2009).

Mobile health (mHealth) is a component of electronic health (eHealth). mHealth refers to the use of mobile communication technologies to promote health by supporting healthcare practices e.g. health data collection, delivery of healthcare information, or patient observation and provision of care (Weinstein *et al.* 2014).

The use of mHealth services has the potential to improve affordability of interventions for health promotion, increase health education and disease prevention (Mitchell *et al.* 2009). The “always on” status and data transmission are the qualities of mobile phones that have made them reach a larger population than computers and the internet (Van De Belt *et al.* 2014). Moreover, telecommunication technologies may also reduce time, distance and cost of information delivery, and dominate the “mobile for development” market (Van De Belt *et al.* 2014). The term “mHealth” has come to refer to the use of mobile phones and other technological portable devices in health including the use of mobile communication channels for health messaging (Mehl G, 2014) and for community health worker support and data collection (Leon, 2012) The appeal of mHealth is in its ability to reach wide audience relatively cheaply and to convey tailored, appropriate health

information to individuals. mHealth is promoted as offering many benefits, including: a means of more easily providing people with health information and thus enhancing disease prevention; new forms of data accumulation for research and disease surveillance; decision-making aids provided to support clinical service delivery; regular reminders that helps patients manage their own health conditions to enhance treatment compliance, and augment access to health care services by connecting patients and providers through mobile phones and through supporting front line health workers (Mehl G, 2014). mHealth can potentially provide solutions for health challenges and for health systems that struggle with limited point-of-care services, low staff, patient ratios and lack of access for remote patients (Heek, 2006), as well as for sexual and reproductive health and rights (SRHR). For example, in maternal and child health, mHealth interventions (such as mobile phone-based information messaging) “shows a great promise for empowering and enabling health workers to collaborate with pregnant and parenting women to improve the delivery of maternal and child health care and support health providers to offer cost-effective services (Mehl, 2014). In developing countries, mHealth could offer solutions for healthcare systems challenges such as inadequate finances, poor health information systems, scarce resources and limited trained staff, particularly in countries with rapid growing number of mobile phone subscriptions(de Tolly K, 2014)

2.1.2 Mobile health technology acceptance theories

Technology acceptance is regarded as one of the most important areas in information systems (IS) research (Venkatesh *et al.* 2003). It engages in understanding the variety of factors that determine users’ intentions to adopt a technology and their actual technology usage behaviours. Among these theories, technology acceptance model (TAM) is most influential (Davis, 1989). According to this

theory users intention to adopt a new technology is determined by two key beliefs, namely perceived usefulness and perceived ease of use. Perceived usefulness (PU) refers to the degree to which a person believes that using a particular system would enhance his or her job performance whilst perceived ease of use (PEOU) refers to the degree to which a person believes that using a particular system would be free of effort (Davis,1989). This theory is derived from a more general theory to explain individual behaviour, the theory of reasoned action (TRA) (Fishbein *et al.* 1975), which argues that individual behavioural intention is determined by two key factors: attitude, which describes an individual's positive or negative feelings (evaluative affect) about performing the target behaviour and subjective norm, which captures the person's perception that most people who are important to them think they should or should not perform the behaviour in question (Fishbein *et al.* 1975). Attitude is formed based on an individual's beliefs about consequences of particular behaviour (e.g. behavioural beliefs), and subjective norm is formed based on an individual's perceptions of social normative pressures (e.g. normative beliefs). The two important factors in TAM can actually be regarded as two beliefs resulting in attitude. Obviously, subjective norm is not considered in TAM (Davis, 1989).

2.1.3 Health behaviour theories

To differentiate the acceptance behaviour of mobile health information technology from other technologies, researchers need to pay attention to adapting the model specifically to the health care context (Holden *et al.* 2010). Therefore, despite the technology acceptance theories, the health behaviour theories also need to be taken into account.

There are four major theories used to explain health behaviours: health belief model (HBM), protection motivation theory (PMT), subjected expected utility theory (SEU), and theory of reasoned action (TRA) (Weinstein *et al.* 2014). HBM (e.g. Becker 1974) believes that a person

makes a decision on whether or not to take a health-related action based on his/her evaluations on the perceived threat of not taking the action and the net benefits of taking the action. Specifically, perceived threat is assessed according to perceived susceptibility (i.e. one's opinion of chances of getting a condition) and perceived severity (i.e. one's opinion of how serious a condition and its consequences are) (Becker 1974). PMT (Rogers 1975) proposes a series of factors similar to HBM to explain health behaviour. Specifically, PMT uses perceived vulnerability, perceived severity, response efficacy, and response costs to represent perceived susceptibility, perceived severity, perceived benefits, and perceived barriers in HBM; it includes a new factor, self-efficacy, to capture the degree to which one has the ability to perform the advised action (Weinstein *et al.* 2014). Further, PMT classifies these factors into two categories according to individuals' decision making stages: the threat appraisals, including perceived vulnerability and perceived severity, and the coping appraisals, including response efficacy, response costs, and self-efficacy (Holden *et al.* 2010).

2.2 Empirical literature review

Literature suggests that cell phones can contribute in reducing the lapses in care giving of pregnant women. A cluster-randomized controlled trial on the use of mobile phones as a health communication tool to improve skilled attendance at delivery in Zanzibar (Lund *et al.* 2014) showed a significant rise in skilled delivery in women residing in the urban areas. A randomized controlled trial (Jareethum *et al.* 2008) on the satisfaction of healthy pregnant women receiving short message service (sms) via mobile phone for prenatal support showed higher satisfaction and confidence levels with lower anxiety level in the antenatal period among women who received SMS compared with the general antenatal care group; the intervention markedly increased the

proportion of pregnant women attending the prescribed 4 antenatal care visits and saw a rise in the number of preventive health service as more women with complications were discovered and referred. (Mushamiri *et al.* 2015) showed that the intervention, rural extended services and care for ultimate emergency relief (RESCUER) increased the number of deliveries under trained personnel and increased referrals to health units (Mushamiri *et al.* 2015). Mobile phones enhanced access to information and reduced response time to difficult cases, enhanced communication networks among the health workers, and the more efficient data collection strengthened referral system(Sun and Wang, 2013)

2.3 Other issues

2.3.1 Applications in public health:

A growing body of pilot projects show a positive impact of mobile health applications on public health outcomes and efficiency (Vital Wave Consulting, 2009). Mobile devices are currently used in public health for: a) delivery of health and wellness educational information (Evans & Wallace, 2012); b) community outreach and disease prevention efforts, particularly targeted toward vulnerable groups, such as teens, low-income groups, and at-risk populations (Bourne *et al.* 2011); and c) collection of public health data, disease surveillance, and epidemic outbreak tracking (Vital Wave Consulting, 2009). Researchers at the National Latino Research Centre (NLRC) at Cal State San Marcos evaluated the impact of Text4Baby, a free mobile health service that provides maternal, fetal, and new born information to pregnant women and new moms via text messages (National Healthy Mothers Healthy Babies Coalition, 2011).

The researchers demonstrated a positive impact of the intervention on health outcomes, including high satisfaction with the service and an increase in user's health knowledge, improved interaction

with healthcare providers, improved adherence to appointments and immunizations, and increased access to health resources (NLRC, 2011).

(De Tolly K, 2014) demonstrated the potential of short message services to influence the uptake of HIV counseling and testing in South Africa and the importance of appropriate message content. In Switzerland, Haug et al. (2012) showed that a smoking cessation intervention via text messaging (SMS) was efficacious for adolescents and young adults. Australian women and heterosexual men benefited from SMS reminders to improve re-screening after chlamydia infection (Grad *et al.* 2012).

2.3.2 Migration to mHealth

mHealth, the application of mobile or wireless communication technologies to health and health care (Oyeyemi and Wynn, 2015) barely existed 5 years ago; it has since emerged as a multi-billion dollar industry (Workman, 2013). Recent data suggest that 90,000 consumer smartphone health applications are now available for download; few of these have been the subject of scientific study, including their potential risk (Wolf *et al.* 2013). According to estimates from the Pew Internet & American Life Project, in 2012 nearly one third of mobile phone owners and more than half of smartphone owners used their phone to look up health information—a rate that has nearly doubled since 2010 (Fox and Duggan. 2012). In Pew’s general population survey, mHealth use was more common among individuals 50 years old, Latinos, African Americans, and those with higher socioeconomic status (Weinstein *et al.* 2014).

mHealth has exploded onto the scene in the past few years with the mass marketing of smartphones. Mobile health apps provide the software infrastructure for the digital patient engagement. Current uses of apps on mobile devices include the direct provision of care, real-time monitoring of patient vital signs, delivery of patient information to practitioners and (where

appropriate) clinical researchers, and collection of community healthcare data (Wolf and Moreau, 2013). Specialized sensors and devices that work as accessories to multiple health apps are also seeing tremendous growth and innovation. In addition, because of the advantages of size and mobility, the integration of telemedicine and mobile health as one entity is emerging (Weinstein *et al.* 2014).

2.3.3 “Virtualization” of healthcare industry

What is rapidly evolving is that app-enabled mobile health is emerging as the driver for next-generation telemedicine and telehealth (Weinstein *et al.* 2014). This could be the forerunner of a major restructuring of the healthcare industry worldwide, as envisioned by Topol and other thought leaders (Bauer *et al.* 2014). Patient-enablement health and digital patient empowerment become foundational for the new order in healthcare delivery as patients are encouraged to accept greater responsibility for their own healthcare either individually or with their healthcare navigators (Dorsey *et al.* 2009). Progress is being made to bring mHealth into the mainstream. Electronic medical records are now implementing portals that allow access via mobile health by both providers and patients (Weinstein *et al.* 2014). Mobile devices have advanced software, hardware safety and security to allow such access. Health Insurance Portability and Accountability Act (HIPAA) regulations are still evolving to adapt to the rapid changes and advancements in mobile security and technology, and progress is being made (Sultana *et al.* 2013). It is estimated that 25-50% of all transactions in the healthcare industry will be electronically outsourced by 2020; 25% of all patient encounters with healthcare professionals could be by mobile health, using smart phones or smart wrist watches (Sultana *et al.* 2013).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

This chapter considers the methods used to collect data for the research. It highlights the research design, sources of data and specific tools used. It also identifies the target population for the study, the sample frame and how data obtained was analysed.

3.2 Research method and design

The research adopted a descriptive qualitative research approach, with focus group discussions and in-depth interviews with pregnant and postpartum women and in-depth interviews with health professionals.

3.3 Study population

The target populations were pregnant and postpartum women attending antenatal and postnatal clinics at the Tema General Hospital. Participants were randomly selected from among women attending antenatal and postnatal clinics.

To ensure that views from a broad range of health professionals were included, the following categories were purposively sampled for the in-depth interview: obstetricians, general practitioners, midwives, dietitians, physiotherapists and pharmacists.

3.4 Quality control

To ensure a more comprehensive view of the phenomenon being studied, multiple data sources were used i.e. data from health professionals, pregnant women and women in their postpartum period. To enable the research question to be addressed appropriately, participants included trained health professionals who offer maternal health services and women who receive these services.

3.5 Participant recruitment

The study conducted 7 group discussions and 12 in-depth interviews. Inclusion criteria included pregnant and postpartum women currently receiving antenatal and postnatal care at the Tema General Hospital, and selected health care professionals working at the same hospital.

Active recruitment took place in person; the women and health professionals were invited to participate in interviews or focus groups via written or face-to-face invitations. Scheduled patients were given reminder calls a day prior to their focus group session to reconfirm participation and answer any questions. Light refreshments were served at the start of each focus group.

3.6 Data collection process

Focus group discussions were conducted with the pregnant women and women in their postpartum period. For the purpose of confidentiality, all members of the focus group discussion were given the following codes; W1, W2, W3, W4, W5, W6. A total of 6 persons were selected for each the focus-group discussion team. The focus group discussions took the form of a round table discussion in a serene room at the Tema General Hospital. The discussions were facilitated by the

researcher, and the means to record the sessions was explained to the groups. mHealth was explained with the help of visual diagrams, including text messaging, social networking, voice messaging, websites, and health professional interaction was used to provide a guide to direct the discussions. Depending on the expressed preference of the group, discussions were conducted in Akan, Ga or English language, and each discussion took 20 to 30 minutes to complete. The discussions were recorded with a tape recorder and later transcribed into English.

The In-depth interviews with health professionals were conducted using standardized interview guides. Potential respondents in this study were contacted and consented. Arrangements were made with participants for the interviews to be conducted within the hospital. Each interview took between 30 to 40 minutes to complete; interviews were conducted in English and recorded with a tape recorder. The interview-only methodology with health professionals was chosen for pragmatic time-related reasons.

The content of the interview guides was informed by literature. Semi structured and structured questions to elicit women and health professionals' views, expectations, and concerns around mobile phones and mHealth, as well as their thoughts on other interventions were investigated with the interviews and focus groups. Common areas explored included mHealth's suitability, mHealth inclusion in antenatal care, barriers and facilitators to mHealth development and implementation. In addition, socio-demographic and background data were collected from all participants.

3.7 Sources of data

The data in this study was primary data, collected from the respondents using focus group discussion and questionnaires.

3.8 Data management and analysis

Data immersion, coding, category creation, and thematic analysis were used to find patterns of meaning across data sets. Data collection, management and analysis were done concurrently. All interviews were recorded and transcribed verbatim after repeatedly listening to the recordings. An inductive approach was used to derive themes through interpretations of the raw data. The transcripts were coded, guided by the objectives of the study, and the coding process involved a critical review (line-by-line) of each transcript to identify emerging themes and sub-themes from the data. Coding categories and subcategories were allocated and the congruence was assessed. Discrepancies were discussed, resolved and the final category system was accepted as being representative of the data.

3.9 Ethical consideration:

Ethical approval was obtained from the Ghana Health Service Ethical Review Committee of the Research and Development Division. Institutional approval was obtained from the Tema District Health Directorate and the Tema General Hospital. Written informed consent was obtained from each participant prior to being interviewed. The moderators of the interviews read and translated the consent forms into the local language preferred by the participants. All participants were

informed about the purpose and procedure of the study, their right to refuse or withdraw from the study and the confidentiality of the information collected.

3.10 Privacy/ confidentiality

Interviews were conducted in an enclosed place to ensure privacy and confidentiality of information collected from participants. Soft copies of data collected were coded and saved on a secure computer under a password known only to the principal investigator.

3.11 Compensation

No compensation was given to individuals for participating in this research.

3.12 Limitations

The absence of focus group discussion among health professionals is acknowledged as a potential limitation. There was some indication that the hospital staff and the patients perceived the researcher to be a health care professional and this may have affected their behavior or willingness to share information.

CHAPTER FOUR

4.0 RESULTS

4.1 Background information of respondents

In all, 8 focus groups and 12 in-depth interviews were conducted. Forty eight pregnant and postpartum women took part in the focus group discussions and 12 health workers were interviewed. Two health professionals were selected from each of these categories: obstetricians, general practitioners, midwives, laboratory technicians, physiotherapists, and pharmacists. Majority of the respondents (60.4%) were aged between 18-38 years. The mean age was 28 years. Majority (83.3%) of the women had some form of formal education, the highest being senior high school level (25%). Majority of the women were artisans and traders (79%), married (66.6%), Christians (43.8%) and peri urban residents (58.3%).

4.2 Current experiences and challenges of maternal health services

4.2.1 High patient load

Most participants were of the view that the maternal health department of the hospital was often overcrowded, leaving physicians and other health workers very little time to spend with each patient; this is due to the numerous referral cases the department receives each day. The physician participants revealed that the staff strength was weak, and the department lacked infrastructure and logistic and cannot cater for the high patient load.

We've always had a problem with the number of referrals that flow in here from other hospitals these referred cases give us a lot of extra work to do, mid last year we recorded about 16 maternal deaths which is grave though we can say that most of these cases were not patients we were seeing, they were referred from neighbouring clinics and hospitals

(In-depth. interview-Medical Officer).

4.2.2 Financial challenge

Poverty and other financial issues were highly prevalent amongst the patients and a key contributor to most of the patients not accessing maternal health services. Considering the catchment areas of the hospital, majority of the participants travelled from far to access care at the hospital and payment for basic services rendered at the hospital become a challenge.

Who wouldn't access the best of care if she had money, poverty is the main issue in most cases, the pregnant woman knows pregnancy related illness is a matter of life and death but then even money for transportation and feeding becomes a problem

(FGD-37 year old pregnant woman).

4.2.3 Difficulties implementing primary prevention

Health workers believed that most of the patients are not bothered about primary prevention and are unlikely to implement lifestyle changes and adhere to medication regimes given to them until

an acute event occurs. For this reason, they stated that secondary preventative measures are more effective for patients but most of them report to the hospital at the late stage of their ailments. Patient participants implied that poor patient disease knowledge is the primary cause for this.

Most of these patients address the doctor in the last stages after they have tried so many failed options, when they feel frightened, that is when they come in the middle of the night. Even though we have health education at every antenatal and postnatal meeting, it's ineffective. They're not actually very much informed (IDI- Obstetrician).

4.3 Communication means and its effectiveness

Majority of the patients and health workers indicated that currently there were no effective means of communication between patients and the health workers.

Health workers were of the view that the main problem with communication was among the health workers within the hospitals in Tema and its environs. They mentioned that communication failure during inter hospital transfers make it impossible to make preparations before the patients arrives and this contribute to the mortalities in the department.

I think the problem has to do with the clinics and hospitals that refer their patients here, if they could at least call or give prior notice it would help. We take time to keep details of patients' conditions like blood group and sickle cell status so that in emergency situations we can act fast by just communicating these things among us as health workers. I don't really think patient provider communication issues in this hospital is a major contributing factor its rather inter institutional communication (IDI-Obstetrician).

I don't think the problem is with the patient provider communication to me the problem is with the hospitals in Tema and its environs. Let's say if a patient is being referred from one of the clinics around and proper communication is not established and the patient gets here and finally dies I don't think it's the fault of the patient (IDI-Medical Officer).

I think they have said it all. There are no means of contacting anyone, the least complaint you have, you have to come back here and join the long queues just to ask a simple question (FGD-29 year old pregnant woman).

4.4 Current mobile phone use practice and literacy

4.4.1 Phone calls

Making phone calls was reported as the primary function of mobile phones. Most of the respondents reported that communication between patients and health workers was informal and unregulated. In most cases, only patients requiring more specialized care, such as patients being referred to bigger hospitals, will have their physician's contact number.

The main reasons given for mobile phone communication between health workers were for following up on referrals and in emergency situations. Communication between health workers can involve calling superiors for advice and patient referrals. All the medical doctors are currently using the Mobile Doctors Network (MDNet)/Medicare line program which provides free mobile-to-mobile voice and text services to all the physicians in Ghana currently registered with the Ghana medical association.

I use my mobile phone a lot, I happen to be the only senior medical officer in this department and when I'm not on duty I'm virtually on calls. The junior house officers call me at any time and I'm always calling other hospitals to follow up on most of our referred cases, my phone never goes off. I carry my modem with me, I'm always online looking up new things and reading new health researches (IDI-Medical Officer).

I believe issues concerning blood transfusion should be treated as an emergency but it usually depends on the doctor. Most of the doctors don't mind using their phones to call when the hospitals intercom isn't working and we respond fast knowing the importance

(IDI-Laboratory technician).

4.4.2 Text messages

Text messages were used infrequently. Even though most of the health workers were concerned that patients who were literate only in the local languages would struggle to send and understand text messages on mobile phones which only accommodate the English alphabets, majority of the participants reported the ability to read and write basic English. Most of the patients receive and know how to open and access SMS messages.

I would be very glad because I have broken the ignorance. This is a quick and a comforting way to talk to us and a clear sign that they care for us. If I get the message I will call a supporter to read for me the message (FGD-37 year old postpartum woman).

Currently I'm on the Tigo network and they constantly send health information, my son activated it for me but the problem is I can't read and understand the English well

(FGD-40 year old pregnant woman).

4.4.3 Ubiquity of mobile phones

All participants reported cell-phone ownership, and they have become a necessity in daily life. Most reported multiple cell phones in their household. Nearly half of the participants said they use more than one cell phone carrier by way of owning multiple subscriber identity module (SIM) cards.

Most participants reported access to cell phones, 24-hours per day. The most common period without access was after sunset, when a few of the participants shut off their phones. All respondents reported access to their phones seven days per week.

When these patients talk about financial constraints I find it difficult to believe them because most of the patients, everybody, young or old has a mobile phone (IDI-Midwife).

4.5 Expectation and concerns about mHealth

4.5.1 Perceived usefulness of mHealth

a) Improve accessibility to health information

Almost all the participants shared the view that mHealth resources offered by mobile phones could potentially benefit patients and health workers by improving accessibility to health information.

First, in response to the high risk pregnancies among the population, mobile phones can be used to disseminate health advice to support and motivate patients going through challenging pregnancies and other health issues..

I'm here with a condition they call gestational diabetes and it's not my fault that I have this condition but if the doctor I come to see every 2 weeks has my number he could just send me some helpful information on my phone to help me understand my condition better

(FGD-34 year old pregnant woman).

Secondly, health workers could improve their own clinical knowledge, as well as access decision-making information whenever and wherever they may require it. This removes the geographical and time restraints that are often encountered in busy, remote health centers.

Making a consult with my phone is easier because then otherwise you have to ask the patient to come again. I can ask the patient to wait for some time and I contact a senior or the prescriber on my phone and get a response immediately, and advise them as they say

(IDI-Hospital Pharmacist).

b) Provide reminders

Most of the participants reported the potential benefit of receiving reminders about important aspects of their health care, such as antenatal and postnatal appointments, medication and healthy lifestyle changes.

Before I was referred here, I attended antenatal clinic in a private hospital in Tema where the hospital sends reminders on appointment dates and time. Well, I'd like to say if a system like that existed here it will be beneficial but with the patient load here I don't know if it will be feasible (FGD-26 year old postpartum woman).

C) Saves time, money and travel

Although some of the participants expressed the concern that cumulative use of mobile phones is costly, they focused on the potential cost-saving opportunities mobile phones could offer.

If I have to see a doctor to ask a simple question, I have to travel to the hospital join a long queue. So the time, the cost, the travelling, all that will be saved with the mobile phone

(FGD-32 year old pregnant woman).

4.5.2 Perceived barriers to mHealth use

a) Potential negative effect for physicians

Physicians and obstetricians expressed negative concerns toward the use of mobile health. With busy work schedules, they were concerned that increased use of mobile phones will become a

disturbance to their work and personal lives. Unregulated phone usage may appear unprofessional and pose a threat to patient care. They suggested that having a middle person who will regulate their phone calls and text messages would be ideal.

But for the doctors I think that maybe their job will be affected. Sometimes the call may be coming when they are with another patient (IDI-pharmacist).

I wouldn't have a problem if the communication is with a doctor or a nurse but with the kind of patients we have here their constant calls or messages will be a bother. Patients contacting me through a nurse will be fine; having the middle person will take away intrusion in that if there was a way of them going through the facility that will be fine, I have had very bad experiences (IDI-Medical Officer).

b) Need for physical consultation

Most of the health professionals were of the view that physicians still need patients to attend physical consultations at the health center, rather than virtual consultations using a mobile phone. Increased mobile phone use may result in fewer patients attending appointments and hinder the need for physical patient examination.

If you keep asking them about medicines and all on the phone then its fine, but I think they will not turn up to the proper medical care. You can't believe whatever they say and most doctors base their diagnoses on physical examination of the patient

(IDI- Physiotherapist).

c) Radiation fears

Most of the patients mentioned that the effects of radiation act as a barrier to mobile phone use. They were concerned about mobile phone overuse and the unintentional harm it may cause to the body.

Mobile by the ear it is near the head, in the pocket it is near the heart, in the pants it is near the man parts! We worry about this bad radiation. It is not good, we hear it can cause cancer

(FGD-39 year old postpartum woman).

d) Perceived behavioral control and lack of technical support

Almost all the health professionals expressed concern about reliability and security of the device, and were particularly concerned about dependency on the device as a substitute for clinical thinking. Fear of losing the device or the information stored on it were considered as an indication that self-efficacy constitutes an important element when accepting and using mobile technology in healthcare.

They were of the view that the interest to adopt a system does not only rely on their own self-efficacy, but also on their perception of how much their organization is self-efficient and able to provide them with technical capabilities, including providing technical and computer assistance, training and technical support. In addition, technical issues such as poor connectivity were perceived as barriers of adoption, and health professionals believe that supported technical improvement would improve their adoption intention and/or actual use.

Mobile health will be good I know but won't these young doctors be using their machines for everything instead of applying what they have been taught in medical school? What if they don't have their phones with them in an emergency situation and have to use their brains?

(IDI-Midwife).

I believe a pilot study should be done first and also constant training that is in-service training of the staff and patient education as well (IDI-Laboratory Technician).

e) Privacy and confidentiality issues related to health communication

Most of the participants especially the patients specifically expressed fear of breach of privacy related to cell phone text messaging about their health

The problem might come to couples who have not disclosed everything about their health to each other this might cause a conflict if the other partner sees the message. We have many friends who can easily pick your phone, check your inbox, and get to know your private information. It would be good to delete the SMS after reading (FGD- 34 year old postpartum woman).

When asked what the clinic could do to ensure confidentiality of the cell phone communication system and the use of a personal identification number system to protect health-related messages, majority responded positively; the remaining cited challenges about remembering the password and unnecessary inconvenience because they had disclosed everything concerning their health to their partners and family members and therefore declined the need for increased privacy measures.

4.6 Intention to adopt mHealth resources and its ease of use

Participants acknowledged the need to know how to use the different functions of mobile phones in order to reap any potential benefits that mHealth has to offer. Experience was addressed at several levels: years of healthcare practice, experience with internet, and experience with mobile devices and systems. All the participants expressed their willingness to use mHealth and its resources if implemented at the hospital. Overall, almost all the women were interested in finding out about mHealth information regarding pregnancy and newborn health, especially including prenatal and infant dietary information, activities/things to avoid during pregnancy, when to call a doctor during pregnancy, lactation counseling, and infant skin care.

Yes I will use mHealth, I know it will be very resourceful and I won't have a problem using it (FGD-23 year old pregnant woman).

Age was considered to play an important role. The younger participants expressed their eagerness to use mHealth and deemed more accepting of mobile phones and more knowledgeable about its various capabilities. A few older patients and midwives were resistant to the use of mobile devices

but responded that they would like to receive phone calls instead of text messages with information regarding prenatal, postnatal and other forms of care.

The elderly patients are not aware of the function of the mobile phones, especially those above forty or fifty, so they might not use it but the younger ones wouldn't have a problem using it, they're virtually on their phones all day anyway (IDI-Physiotherapist).

4.7 Health worker/patient attitude

Most of the patients/participants reported that poor attitudes and behaviours, or perceptions of health workers were important barriers to seeking antenatal care and delivery. At the hospital, many women did not attend ANC because of poor communication and disrespectful treatments by providers. In a focus group discussion, one woman narrated:

“She [patient] was vomiting throughout the night, the following morning the husband decided to take her to the health centre but she refused ...she had not yet got an antenatal care card. She feared the nurses because if she goes to complain about the vomiting, she will be asked of the card and without it they [nurses] will tell her all salty words (FGD-20 year old pregnant woman).

CHAPTER FIVE

5.0 DISCUSSION

This study investigated the factors among health care professionals and patients that could influence their acceptance and adoption of mobile health technology in improving maternal health services at the Tema General Hospital. All stakeholders agreed on the potential of mobile phones as an educational tool for healthcare consumers and providers by improving patient disease knowledge and supporting health workers clinical knowledge. Utilization of existing mobile phone functions such as phone calls, text messages and internet, or the introduction of novel methods, such as health apps, could increase the accessibility and quality of information available. Interestingly, apps were not mentioned in any of the interviews, despite their increasing acclaim in the developing world (Payne *et al.* 2015). mHealth also offers opportunities to save time, money and travel, facilitating the optimization of limited resources. The unique possibility of providing remote care at minimal cost has been echoed in a literature review of mHealth applications along the cancer continuum.(Davis and Oakley-girvan, 2014)

The results show that access to multiple cell phones and multiple SIM cards was common in this study population. Developers of cellular phone messaging applications for mobile health care communication could leverage these features to increase uptake and usability of these platforms. This strategy might increase rates of successful patient communication by overcoming challenges related to network reliability, phone battery charge, and shared phones. One resulting challenge will be restricting information to the intended recipient. PIN code access to messages and/or coding messages might provide a solution if it proves feasible in practice.

Physicians are the leading opposition to mHealth implementation; this was revealed during physician interviews. Concerns over radiation are also of note, but current evidence is inconclusive; a review of the available epidemiological evidence states that mobile phone radiation is ‘probably’ carcinogenic (Dagli and Hans, 2015). Until definitive evidence on the effects of mobile phone radiation emerges, it is likely to remain a barrier to its use.

The usability of mobile phones in relation to age must be acknowledged. A generational division is highly likely to exist in adoption of mHealth and seems intuitive given that younger generations have higher sense of self-efficacy and technical skills with using mobile devices, which could eventually lead to lower resistance. In fact, Garritty *et al.* (2006) have previously summarized many surveys indicating that age and practice specialty may influence physicians and other health care professionals’ adoption behavior; they found that younger physicians and health workers and those working in large and hospital-based practices are more likely to use mHealth resources (Decker & Sisk, 2012).

The majorities of the women in this study had access to and were open to receive SMS text messages and cell phone calls with educational information regarding pregnancy and infant health. According to the findings, women would be willing to be enrolled in a mHealth messaging program at their antenatal and postnatal visits and receive information via text message and phone calls. The findings are similar to others who have queried patient acceptance of cell phone communications in resource poor settings.

A survey of 300 patients in Durban found nearly universal acceptance (96%) for text message communications from HIV providers (Crankshaw *et al.* 2010); the most preferred approach was

for women to be able to choose when and how frequently they would receive text messages. Since majority of women in our study own cell phones and reported interest in receiving educational information via mobile phones, pregnant women and postpartum women could benefit from an mHealth program. A potential drawback to implementing a text-messaging program is that it requires the recipient to have an adequate level of literacy, marginalizing groups who could potentially benefit from the intervention.

In our study population this could be a problem for women with no or incomplete primary schooling. User guidelines need to be established for mHealth programs to help manage privacy and security issues especially considering mobile phones are often shared among family and community members (Srinath *et al.* 2005).

Owing to the low access to internet via cell phone, it did not appear to be a good option for communicating with this population.

Elderly midwives' perceptions of usefulness of mHealth were higher than their perceptions of ease of use. The latter may be attributed to the elderly midwives' low technical self-efficacy and reinforces the need for hands on training in general technology in addition to the mHealth resources itself (Bloomfield *et al.* 2014). Moreover, a substantial body of literature on technology acceptance suggests that perceived usefulness more strongly predicts intention to use and actual use of technology than perceived ease-of-use.

Using a modified technology acceptance model to evaluate healthcare professionals' adoption of a new tele-monitoring system, Gagnon *et al.* (2012) found that facilitating factors such as certainty with using the technology, technical assistance, systems support and interoperability were significantly associated with acceptance and use, and were the most powerful factors among

healthcare users, and hence the most important variable to consider for increasing doctors' and nurses' intention to use the new technology. This finding is similar to the results of our study that shows the positive effect of organizational support on mobile service adoption. Perceived performance expectancy and facilitating conditions constitute the most salient factors in adoption and can be explained by understanding the nature of the clinical practice.

There are several reasons why the success of potential mHealth use may lie in its ability to complement, rather than replace, existing methods of healthcare delivery. Evidence from the developed world has shown that mobile phones can be an effective complement to usual health service delivery (Liu *et al.* 2014).

Complementary methods would help to facilitate the acceptability of mHealth in a setting where mobile phone technology is a relatively recent innovation; outright replacement of conventional healthcare methods may deter instead of encourage apprehensive users, as is evident from our interviews. For moral and ethical reasons, mHealth should avoid perpetuating socioeconomic health inequalities. Those who cannot afford a mobile phone should not be subjected to a lower standard of care than usual; thus, mHealth should not replace usual care. Finally, as reflected in the physician and patient interviews and supported by results of a similar study on HIV/AIDS in Uganda (Chang *et al.* 2013) the importance of face-to-face patient-physician contact in disease management must not be forgotten. Without this, certain signs and the underlying context which might be crucial to diagnosis and management may be difficult to ascertain.

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This chapter summarizes the entire study; the findings of the study and recommendations by the researcher.

6.2 Conclusion

mHealth may be a feasible way to target the current communication challenges and improve maternal health services at the Tema General Hospital. The widespread availability and low cost of mobile phone technology use makes it a promising medium to improve health related communication in resource-limited settings with large catchment areas like the Tema General Hospital.

This study showed that high patient load, financial issues and other structural barriers make prenatal and postnatal clinic return visits difficult for many patients; a mobile health system will be useful to prioritize return for sick patients and could help optimize patient and clinical resources.

Development of future uses of mHealth must address the barriers put forward by physicians and the other health professionals at the hospital in order to gain further support for its implementation. Mechanisms to balance patient and provider privacy with fidelity of communication will be important for implementation.

Lastly, the design of usable mHealth systems in Ghanaian hospitals and around the world requires input and feedback on needed functionality and an in-depth understanding of the realities of day-

to-day clinical practices. However, careful and thoughtful design is essential for successful implementation, scalability, and long-term sustainability.

6.3 RECOMMENDATIONS

Following the analysis of the results, a set of recommendations to advance the mHealth science and practice are presented below:

1) **Development of simply mHealth applications:** mHealth adoption is related to the benefits being provided to users more than to the sophistication of the technology. To retain active participation, vendors are encouraged to consider designing simply and easy to use mHealth applications, to improve adherence and outcomes. The simpler the use of the application provided, the faster its adoption. Other forms of health communication could be considered in the future such as toll-free numbers allowing women to express their questions or concerns.

2) **Training programs:** Continued awareness and training programs in the hospital environment, alongside technical support, is expected to increase adoption especially among health professionals. During training sessions, the targeted groups should be the older and less tech-savvy population. When doing so, it is important to consider the socioeconomic background of the population, the generational divide, and the years of experience of the health care professionals. Understanding the characteristics of the professionals would help in engaging them in designing the change process and the applications requirements, based on their work practices.

3) **Pilot study programs:** The full potentials of mHealth use can be assessed through creating a hospital-based mHealth pilot initiative at the maternal health department of the Tema General

Hospital. Eagerness to use mHealth is not enough; there is the need to combine interest with proper planning and field testing, coupled with systematic follow-up from mHealth provider.

- 4) **Effective policy formulation:** Effective policy may become increasingly important as the field of mHealth matures after possible implementation. Data security is a particularly important issue to address within the area of policy. Legitimate concerns were raised about the security of citizen information by programs using mobile health technologies. In particular, message transmission security and data storage security can put citizen information at risk if the necessary precautions are not taken. Policy-makers and program managers need to be made aware of security issues in the mHealth domain so appropriate policies and strategies can be developed and implemented.

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APPENDIX

APPENDIX I

Focus group discussion/ interview guide questionnaire

Dear respondent,

I will like to take a little time with you to answer these questions. You are assured that the answers you give will be strictly confidential and would not be held against you.

Answers you give will be strictly confidential and would not be held against you.

| | |
|---|-------|
| Name of interviewer | |
| Name of respondents | |
| Date of interview | |
| Hospital | |
| Questions | |
| <ul style="list-style-type: none">• What do you think are the current challenges in maternal health services at the hospital?• What are the communication challenges between patients and maternal health providers?• Do you have means of communicating with or contacting your patient/provider?• Is the current means of communication effective?• Do you think lack of proper communication means contribute to the maternal morbidity and mortality at the hospital?• Do you use mobile phones for health related purposes? | |

- Knowledge of mHealth
- What advantages do you see in mHealth use?
- What disadvantages do you see in mHealth use?
- Would you use mHealth if it is introduced into the services?
- Which area of care would you want mHealth to be used? E.g. antenatal care.
- How would you contribute to the sustainability of mHealth if it is implemented?
- Will mHealth interfere with other work/health related process?
- What concerns would you have about mHealth usage based on
 - a) Access to mobile phones
 - b) Medico legal issues
 - c) Confidentiality
 - d) Interest and ease of use
 - e) Educational background
 - f) Cost of mobile phone usage

Appendix II: Informed consent form

Project title: The potential for the use of mHealth resource in improving maternal health at the Tema General Hospital

Background

My name is Dr. Mercy Obrempong-Owusu, a student from the Ensign College of Public Health, Kpong. I am conducting a study on the potential use of mHealth resource in improving maternal health at the Tema General Hospital.

Procedures

The study will involve a one-on-one interview and focus group discussions on the feasibility of incorporating mHealth into maternal health practices. The discussions will be recorded with a tape recorder in order to provide access to nuances of the discussion and the ability to replay sessions during analysis. No coercion will be used to obtain response from participants. It will be appreciated if you could participate in this study. This is purely academic research which forms part of my work for the award of a Master's Degree in Public Health.

Risks and benefits

Both the study population and the society stand to benefit from this study. Concern about using mobile phone in health practices will be addressed. Also estimate the potential for mHealth use in improving the lives of women. Subsequently, programs can be instituted to promote the use of mHealth, education on prevention of maternal deaths with the use of mHealth devices. This can help reduce the incidence and prevalence of maternal morbidity and mortality at the Tema General Hospital. This research will pose no potential risk to study population or the society.

Confidentiality

All data will be de-identified and will be kept private. Your identifiable data such as name or date of birth will not be used in documents, reports, or publications related to this research. I will keep all documents secured and under lock. When typing your survey responses into the computer, all data will be entered without any information that will make it possible for your identity to be known. The information you provide will be kept strictly confidential and will be available only to persons related to the study (myself and my supervisors). The Office of Ethical Review Board of Ensign College may also have access to study records upon their request.

Your responses will not be shown to other participants or community members. The original paper survey forms will be destroyed once data entry and all analysis is complete.

Voluntariness and withdrawal

Your participation in the study is completely voluntary and you reserve the right not to participate, even after you have taken part, to withdraw. This is your right and the decision you take will not be disclosed to anyone. It will not affect the care that will be offered to you at the health facility now or in future. You are at liberty to withdraw from the study at any time. There will be no negative consequences if you choose not to participate in the study. Please note however, that some of the information that may have been obtained from you without identifiers, before you chose to withdraw, may be used in analysis reports and publications. You can opt not to have me use it.

Cost/compensation

Your participation in this study will not lead to you incurring any monetary cost during or after the study.

Who to contact

This study has been approved by the Institutional Ethics Committee Review Board of Ensign College and Ghana Health Service. If you have any concern about the conduct of this study, your welfare or your rights as a research participant or if you wish to ask questions, or need further explanations later, you may contact me, Dr. Mercy Obrempong-owusu (0548150751) of Ensign College of Public Health, my supervisor Dr. Frank Baiden of the Ensign College of Public Health (0244 59 11 81). You may also contact the administrator of the Institutional Ethics Committee of

the Ensign College of Public Health at +233 245762229.

Dissemination of results: A possible durbar, including hospital staff, patients and other stakeholders of Tema General Hospital, will be held at the hospital to disseminate the findings of the study at the hospital. A copy of the study will be kept in the hospital as reference.

Before taking consent

Do you have any questions you wish to ask about the study? Yes/No

If yes, please, indicate the questions below

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Voluntary consent

I have read the information given above, or the information above has been read to me and I understand. I have been given a chance to ask questions concerning this study; questions have been answered to my satisfaction. I now voluntarily agree, and also voluntarily agree for my relative to participate in this study knowing that I have the right to withdraw and also withdraw my relative from this study at any time without affecting future health care services.

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|---------------------|-----------|------------|-------|
| Name of participant | Signature | Thumbprint | Date |
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|-----------------|-----------|------------|-------|
| Name of witness | Signature | Thumbprint | Date |
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|--------------------|-----------|------------|-------|
| Name of researcher | Signature | Thumbprint | Date |
| | | | |

Interviewer’s statement

I, the undersigned, have explained this consent to the subject in English language/ Twi/ Ewe, and that she/he understands the purpose of the study, procedures to be followed, as well as the risks and benefits of the study.

The participant has fully agreed to participate in the study.

Signature of Interviewer

Date

Address

SIGNATURE

DR. MERCY OBREMPONG-OWUSU

(STUDENT)

.....

DR.FRANK BAIDEN

(SUPERVISOR)

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