Nairobi CBD Campus

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An Integrated Information Decision Support System to Manage Maternal Morbidity and Mortality Rate in Kenya

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Background of the study

Introduction

Worldwide, there is great interest in application of computer applications and system thinking in health service provision, health information and education that is, using broad understanding of the health system's operations to identify important relationships and factors that affect the delivery of most essential and basic health services. By understanding the health systems' building blocks holistically, system thinking identifies the following; system success areas, break downs and the type of integration approaches towards strengthening the overall health system, thus improved health care.

The whole process of designing, implementing and evaluation of approaches and interventions that strengthen systems are directly relevant to the maternal health care programmes. Reducing maternal mortality is the health-related millennium development goal (MDGs) in whose progress has been slow ("the most disappointing") to date.

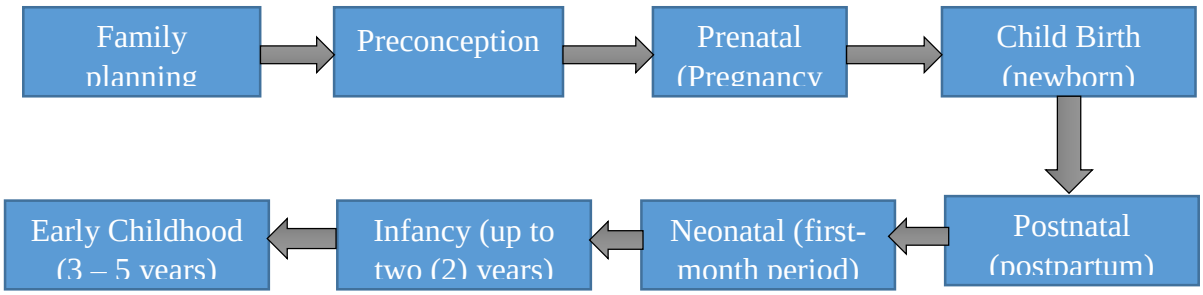
Maternal health refers to the wellbeing (health) of women during pregnancy, childbirth, and the postpartum period. This encompasses a chain or an approach of health care dimensions of family planning, preconception, prenatal (during pregnancy), and postnatal (during and after child birth and recovery period) care in order to ensure a positive and fulfilling experience and in most cases reduce maternal morbidity and mortality.

Prenatal care, also referred to as antenatal care, is a preventive healthcare whose goal is to provide regular check-ups that allow doctors or midwives to treat and prevent potential health problems throughout the pregnancy period and to promote healthy lifestyles that benefit both mother and the unborn child.

Postpartum also referred to as postnatal period refers to the period just after delivery. The postnatal begins immediately after the birth of a child and where the mother's body, including hormone levels return to a non-pregnant state. The terms puerperium or puerperal period, or immediate postpartum period are commonly used to refer to the first six (6) weeks following childbirth (WHO, 2018).

Maternal health is a very critical component in a health system, it is a chain, covering family planning, preconception, prenatal (or during pregnancy), postnatal (postpartum), neonatal (mostly first month of child's birth), infancy (period between birth to two (2) years) to early

childhood (three (3) – five (5) year). Maternal health therefore, offers the foundational wellbeing of the child and assurance to the health of the mother thereafter.



Maternal mortality or maternal death is defined by World Health Organization as the death of a woman while pregnant or within forty two days (42) days of termination of a pregnancy or delivery irrespective of site or pregnancy duration from any cause to pregnancy, or its management but not from accidental or incidental causes. Maternal mortality therefore refers to the rate of death while maternal morbidity refers to the rate of incidence and both focus on a population.

According to United Nations Population Fund (UNFPA) estimated that 289,000 women died of pregnancy or childbirth related causes in 2013. These causes range from severe bleeding to obstructed labour, complications of unsafe abortions, infections, haemorrhage and high blood pressure, all of which have highly effective interventions (Khan, Wojdyla, Say, Gülmezoglu, & Van Look, 2006). As women have gained access to family planning and skilled birth attendance with backup emergency obstetric care, the global maternal mortality ratio has fallen from 380 maternal deaths per 100,000 live births in 1990 to 210 deals per 100,000 live births in 2013.This has resulted in many countries halving their maternal death rates.

My particular interest lies in the specific and alarming challenges facing Kenya - a country where maternal health and development obstacles remain exceptionally acute both in rural and urban areas. According to a survey report (Survey, 2014) on the maternal mortality rate in Kenya as of 2010 is at 488 out of 100,000. This thus makes Kenya one of the most dangerous countries for a woman to give birth. It indicates that high rates of maternal deaths are attributed to obstructed labour, complications of unsafe abortions, infections, haemorrhage high blood pressure and high number of unskilled personnel involved in delivery, attributed by cultural believes and practices. These however do not explicitly identify the causes of the deaths. Other indicators can be lack of sufficient data and information on the domain which has led to poor

maternal health care policies, planning and risk mitigation, resources accumulation and distribution to manage the mortality and morbidity rate.

According to the latest quarter sector statistics report for the financial year 2017/2018 by the Communications Authority of Kenya (CA), covering July to September 2017, the number of mobile subscription stood at 41.0 million. From this statistics, more than the half of population has access to a cell phone. This makes easy, economical for implementing mobile based programs, innovation due to its vast coverage and accessibility. Mobile health is also on rise in Kenya

Most of maternal mortality and morbidity indicators, for example policy formulations, planning, risk mitigation and resource distribution which attributed to lack sufficient data, in instances where data is available information management systems such as decision support system (DSS) can be used.

Decision support system refers to a set of related computer programs or applications that analyse data and presents it to end users in a manner that will facilitate decision making activities in any business or organisation. Therefore integrating (or utilizing) several set of computer programs or application, data warehousing, geographical information system and online analytical processing programs can play a big role in collection, storage and use of maternal health data thus assisting in identification of hidden patterns that can be used to predict probability of occurrence of maternal deaths. The patterns can be distributed across; during pregnancy, prenatal, postnatal up to when the child is at the age of five (5) years.

The accumulation of big chunks of maternal health, mortality and morbidity data by use of integrated set of computer programs to collect and store in compatible format can result to much needed “Big Data” for analysts.

Big data and big data analytics in general healthcare has a lot of positive and life-saving outcomes. But on the domain of maternal health care, there is scarce and unreliable data to be processed thus making it hard to carry out any analytical process to come up with remedies and prescriptive approaches for controlling maternal mortality in Kenya and the world at large. Surveys have, and are being done, studies and reports on the same given but results given are not dynamic enough to accommodate the diversified nature of attributes and factors relating to the high mortality rate.

Integrated maternal health care information decision support system can be referred to as a semi-autonomous system to support the whole chain of maternal health care and neonatal care (the first days and weeks of the new born child) which is very critical to the future health and survival of a child. This will capture, store, analyse data, create a knowledge base and disseminate information to all the stakeholders in the maternal health care.

RESEARCH AND PROJECT OBJECTIVES

General Objective

In this study, maternal and child health are selected as a focus area from the health sector. From a viewpoint of "how Information Technology and Decision Support System can be utilized to improve in reduction of maternal mortality rate in Kenya"

This study aims to propose, implement and evaluate an integrated information Decision Support system and to develop a maternal health care indicators dashboard. It also aims to evaluate the hypothesis that interdisciplinary work between medicine and information technology is essential to develop an effective obstetrical and neonatal software and data/survey collection tool and platform.

Specific Objectives

- Identify the maternal health indicators – this will be done through consultation with the Ministry of Health MOH and the health facilities.
- Design electronic tools for the data collection and conducting surveys – Using the indicators identified, create a mobile application (android mobile application) and a web portal replicating the same for the community health volunteers, clinicians and other health workers.
- Design and create a database and data warehouse – This will be used to store all collected data, responses to all surveys conducted and other maternal health data relevance to the domain, both transactional and informative data in its raw format.
- Create an interactive backend system – this will be the core system for data processing, trends and patterns identification and information representation. This will provide information for decision making.
- System access control and access roles/rights – health data is private and confidential in nature, thus, needs some level of access control. This is a system mandatory requirement feature which will be part of implementation.
- Prototype installation for tests - Installation of a prototype to be tested in the maternity hospital and to be integrated to the other electronic management systems existing in that health facility.
- System notifications and alerts – create a module for short message service (sms) for conveying information to clients/patients, community health volunteers, community

health workers and clinicians and other relevant stakeholders, send reminders to clients/patients. Also integrate it with an email platform for ease of communication.

- Creation and release of reports - Both individual and collective, for internal and external disclosure of the indicators of birth care in this public healthcare service, making it possible to improve the quality of care management, performed transparently and shared with its authors.

Literature Review

In maternal health care, especially in developed countries, the use of different types of information technology (IT) has progressed considerably since the beginning of electronic patient registration, leading to improvements in the interfacing and fusion capabilities of a large variety of computer and telecommunication technologies. Such evolution has led to improvements in quality of care, and expenditure control, in both the public and private sectors.

The computerization of medical records in hospitals and health clinics; the use of the Internet for communication and information exchange; the development of magnetic cards for user identification; electronic scheduling systems for appointments, examinations and hospital admissions; and computerized protocols for diagnosis and treatment support are just a few examples. Health IT has facilitated access to health literature, both to online journals, books and databases, and offline to informational CD-ROMs, that support practising professionals.

In developing countries there is a great penetration of internet and they are being opened up to the world. Kenya been one of the developing countries and the most connected country in Africa is still to implement a maternal health care information system. Some of maternal systems implemented either on fully or pilot have shown positive impact in maternal health care management and reduction in maternal mortality and morbidity rate. Some of the case studies includes;

Mobile Midwife in Ghana

Mobile Midwife is a part of the Mobile Technology for Community Health (MOTECH) project. The purpose of the intervention is to improve antenatal care services and neonatal care services in rural poor areas, and empower women to manage their own health. Pregnant women and their families obtain relevant health information through voice or text messages during their pregnancy period. The voice or text messages every week encourage them to take antenatal care services. After deliveries, they obtain health information about immunization against infections and serious diseases for their children. The health information was translated into some local languages used in Ghana. Community health workers keep electronic records and gather patients' information with their mobile phones.

This intervention sends messages to pregnant women as well as people who support their decision-making, such as their father and mothers-in law, which could contribute to the

improvement of maternal and child health care services. That the regional characteristics are reflected in the message is considered to be important in promoting behavioural change.

Health Education and Training (HEAT) in Ethiopia

Health Education and Training (HEAT) launched the HEAT programme in collaboration with the Ethiopian Federal Ministry of Health, African health experts, UNICEF and the African Medical and Research Foundation (AMREF) in 2011. The objective is to improve the skills of health extension workers who provide community health services in rural areas. The HEAT programme, therefore, can lead to a reduction in the Maternal Mortality Ratio (MMR) and the under-five mortality rate.

The programme is providing training composed of 13 modules, such as maternal and child health, immunization, nutrition and hygiene, and this training uses the internet. The HEAT programme has been implemented in Ethiopia as well as Ghana, Rwanda, Kenya, South Africa, Nigeria, South Sudan, Uganda, Tanzania and Zambia.

UAMUZI BORA, MCH-EMR Pilot Project in Nyanza Province

Uamuzi Bora is a Maternal and Child Health – Electronic Medical Record (MCH-EMR) which uses open source software called OpenMRS. The OpenMRS has been introduced in Kenya, and it was applied for the MCH in this pilot project. The project had been implemented in five health facilities in Kisumu West district from April to June of 2013. 926 pregnant women, 194 deliveries, 301 children and 66 women who received ART were registered in the MCH-EMR by the end of June 2013.

Although in health facilities information about pregnant women and children had been recorded, it had been difficult to follow up specific patients before the pilot project, because the majority of the patient records had not been written per patient. The MCH-EMR is an electronic maternal and child health handbook managed in health facilities. Hence, health care providers can find patient records easily, and access patient information.

This pilot project could not contribute to an improved maternal and child health situation, as the period of this pilot project was short, and the project focused on the feasibility of entering data and the quality of data entered. The possible functions of the MCH-EMR are SMS reminder services for antenatal care clients and mothers with infants, and clinical reminder services for health care providers in order to provide necessary care for patients.

Using Cell Phones for Obstetric Emergencies

This project was implemented by Ifakara Health Institute (IHI) in cooperation with mobile phone company Zain and district councils to improve access to emergency care for Tanzanian women.

From 2011 to 2013, the Maternal Health Task Force (MHTF) has supported this project.

This project is expected to facilitate consultations, counselling, referrals and resupply services in remote areas. Moreover, the aim of this project is to evaluate how mobile phones and service plans are provided with mid-level health care providers who might improve communication between those providers and senior medical staff to improve the health situation at the district level

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