Assessment of Data Quality and Information Use of District Health Information Systems (DHIS2) In a Developing Country: The Case of Ghana

Mohammed Najimudeen Abdulai & Richard Boateng PhD
University of Ghana Business School
University of Ghana
Legon, Accra, Ghana
+233209479672; +233248852426
mnabdulai@st.ug.edu.gh ; richboateng@ug.edu.gh

ABSTRACT

Health Information Systems provide health information that can ideally allow healthcare managers and providers to plan and monitor health services, which may translate into better health outcomes. The District Health Information Systems 2 (DHIS2 is typically used as a national health information systems tool for collection, validation, analysis, and presentation of aggregate and transactional data, tailored (but not limited) to integrated health information management activities. A high premium is placed on the DHIS2, since it is the one that provides all the information needed to inform decision making at all levels of healthcare delivery. It provides a platform for data capturing on any type of device, including desktops, laptops, tablets, smartphones and feature phones. The purpose of the research is to do an assessment of the core functions of DHIS2 data generation and reporting within hospitals in the central regional capital of Ghana to ascertain quality of data and use of information for healthcare delivery and decision making. To achieve this research purpose, the study seeks to assess the quality of DHIS2 data in terms of completeness, Accuracy, and Timeliness (CAT) of datasets, and also determine the level of use of Information of DHIS2 in Ghanaian hospitals. This research will offer feedback on policies driving successful implementation of the DHIS2 in healthcare facilities and related agencies, as it remains critical to stakeholders and partners in supporting the implementation of HIS worldwide. Practically, the research will provide guidelines to other health care settings on the implementation of DHIS2 with respect to data capture and use of information. It will further contribute to the effort of creating conducive health information systems environment for effective. This research contributes to existing literature by providing additional dimension of the implementation of health information systems in Ghanaian Hospitals or a developing country. The research methodology, data collection, analysis, and recommendations would be captured subsequently to complete the study on the assessment of DHIS2 in Ghana, with the central region of Ghana as the case setting. An overall evaluation of the DHIS2 could be considered for all regions in Ghana as future research in the area.

Key words: *District Health Information Systems (DHIS2), Assessment, Data Quality, Use of Information.*

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1. RESEARCH BACKGROUND

The World Health Organization describes Health Information Systems (HIS) as “an integrated effort to collect, process, report, and use health information and knowledge to influence policy making, program action, and research (WHO, 2003). The ultimate goal of any HISs intervention is to ensure quality data that informs effective decision making, otherwise the efforts to collect, aggregate and distribute health data are meaningless (Nguyen, 2018). It is also the aim of HIS to produce quality and timely information for evidence based decisions and interventions (Nengomasha, et.al 2018). Health Information Systems provide health information that can ideally allow healthcare managers and providers to plan and monitor health services, which may translate into better health outcomes (Bernardi, 2018). Access to health information and the quality of that information is critical to efficient and effective healthcare delivery by health professionals and to ensure quality outcomes for patients (Callen, 2016).

The District Health Information Systems 2 (DHIS2) is developed by the Health Information Systems Programme (HISP) as an open and globally distributed software platform used as national health information systems for collection, validation, analysis, and presentation of aggregate and patient-based statistical data, tailored (but not limited) to integrated health information management activities (Chikumba, 2017). Health Information Systems Programme (HISP) is a collaborative network of Universities, health institutions and individuals, with nodes in Asia, Africa and Europe (Hjemås et.al, 2017). African Countries that have adopted DHIS2 as their nation-wide HIS software include Kenya, Tanzania, Uganda, Rwanda, Liberia, and Ghana (Health Information Systems Programme, 2015). The system helps governments and health organizations in managing their operations more effectively, monitor processes and improve communication (Hjemås et.al, 2017). The software runs on any platform with a Java Runtime Environment (JRE 7 or higher) installed, and provides a platform for data capturing on any type of device, including desktops, laptops, tablets, smartphones and feature phones (Health Information Systems Programme, 2015).

In Ghana, DHIS2 has been used nation-wide as an online data warehouse since April 2012 after a national rollout was delivered to replace the previous HIS (DHIMS) which suffered from a number of different problems, both operational and in terms of the software being used (Adaletey, Poppe, and Braa, 2013). The Ministry of Health (MOH) in Ghana is expected to use DHIS2 through the Ghana Health Service (GHS) and affiliated health Facilities to distribute health information more clearly, quickly and accurately, so it can be integrated internationally. Hence, the software is expected to provide accuracy, relevance and timeliness of data captured for informed decision making (Health Information Systems Programme, 2015).

In recent years, data quality has become an important issue, not only because of its importance in promoting high standards of patient care, but also because of its impact on government budgets for the maintenance of health services (WHO, 2017). Authorities at all levels of health care, including hospitals, community health centers, outlying clinics and aid posts, as well as ministries or departments of health, should be concerned about poor data quality and the impact it has on the quality of health care. A high premium is placed on the DHIS2, since it is the one that provides all the information needed to inform decision making at all levels of healthcare delivery. It is therefore imperative that the DHIS2 produces good quality information and that the information produced is used by the producers and managers to inform decision making.

All data are subject to quality limitations such as missing values, bias, measurement error, and human errors in data entry and computation (WHO, 2017). It is important to evaluate information systems and applications that claim to improve information quality and access in order to ensure they actually support healthcare delivery and improve patient outcomes (Callen, 2016). In this regard, data quality assessments should be undertaken to comprehend how much confidence could be placed in the health data used to assess health sector performance and to understand the relative strengths and weaknesses of the data sources. In particular, it is significant to know the reliability of the DHIS2 datasets, and information derived from health-facility data for decision making and development. A good knowledge base that will underpin an understanding of the data quality and use of DHIS2 information with regards to its completeness, timeliness and accuracy is very imperative. This has underpinned this research study which is designed to asssess data quality issues and use of information regarding DHIS2 implementation in Ghana. Indeed, in a developing country such as Ghana, a research on the development and practical usage of DHIS2 is very crucial, in order to guide policy and management decisions and for improvement of the existing systems.

2. RESEARCH PROBLEM

The District Health Information Systems 2 (DHIS2) falls under the category of data collection for information management and decision-making, generally referred to as health management information systems (Dehnavieh et al., 2018). The system provides the option to enter data at the operational level, which is expected to enhance the quality, timeliness and completeness of the data captured (Al-Nashy, 2015; Kiberu et al., 2014; Poppe, 2012). Data captured at the health Facility or operational level are expected to be the primary source for assessing health sector performances, as related health agencies compile the data on regular basis to report on achievements and trends in key health performance indicators (WHO, 2017).

Existing research about Health Information Systems (HIS) provide evidence of information systems within the healthcare industry, and focus on issues such as evaluation of HIS (Nengomasha et.al, 2018), performance of District Health Information Management Systems (Ojo et.al (2017), challenges and quality of routinely collected HIS data (Monto et al. 2016; Davis et al. 2016; and Donnolley et al. 2016), evaluation of core functions of data generation and reporting within hospitals (Kihuba1et. al (2014), and assessing data quality and information use (Ndegwa, 2013).

Unfortunately, despite the potential to provide many benefits such improved quality of healthcare (Nguyen, 2015), there are also potential problems associated with its introduction, implementation and use (Kivinen and Lammintakanen, 2013). Health Information Systems specifically in developing countries have been said to be weak (Kamau et al., 2017; Khan and Edwards, 2012; World Bank, 2009) because of incomplete and fragmented information (Nengomasha et.al, 2018). Relatedly, lack of information use for decision making is one of the problems facing health systems in developing countries (Dehnavieh et al, 2018). The system sometimes produces poor-quality data (Hahn, Wanjala, and Marx, 2013, WHO, 2012; and Poppe 2012;), that generates poorly used information for decision making (Belay and Lippeveld, 2013), and often suffers from collection of irrelevant data, poor timeliness of reporting, parallel and duplication of data collected, and poor feedback (Lippeveld, Theo, and Rainer Sauerborn. 2000). According to Poppe (2012), the health sector is sometimes perceived to be managed “in the dark” without any information to back up decision making due to poor data quality and information use. Thus, information needed for decision-making could be unreliable, irrelevant, ineffective and insufficient (Karuri et al., 2014; Lungo, 2003; Wilson et al., 2001).

Data needs to be complete, timely, and sufficiently of good quality before it could be considered useful to inform effective decision making, but this seems to be a major issue in Ghana where huge data than perhaps required is collected, duplicated in some cases, and renders its quality, timeliness and completeness mediocre, with limited use of information (Poppe, 2012). An in-depth study of the quality of data and the use of the DHIS2 or its evaluation in Ghana is yet to be cited in literature. Indeed, no study has been done to evaluate the post-implementation of the system (Gathogo, 2014). This research is therefore set to do an evaluation of the quality of data generated and the use of DHIS2 information for healthcare delivery and decision making in Africa, with Ghana as the case setting. This research therefore examines the quality and the use of DHIS2 information, by focusing on three dimensions of data quality; Completeness, Timeliness, and Accuracy (CAT), and then parameters such as official dialogue, action, feedback, referral, sharing and advocacy to determine the use of DHIS2 information.

3. RESEARCH PURPOSE

The purpose of the research is to do an assessment of the core functions of DHIS2 data generation and reporting within hospitals in the central regional capital of Ghana to ascertain quality of data and use of information for healthcare delivery and decision making. To achieve this research purpose, the following objectives are outlined:

4. RESEARCH OBJECTIVE

To achieve this research purpose, the following objectives are outlined:

17. To assess the quality of DHIS2 data in terms of Completeness, Accuracy, and Timeliness (CAT) of DHIS2 datasets and elements
18. To determine the level of use of Information of DHIS2 in Ghana.

5. RESEARCH QUESTIONS

1. What is the quality of DHIS2 data in terms of Completeness, Accuracy, and Timeliness (CAT)?
2. What is the Information use practice of the DHIS2 in Ghana?

6. RESEARCH SIGNIFICANCE

In terms of policy, this research will offer feedback on policies driving successful implementation of the DHIS2 in healthcare facilities and related agencies, as it remains critical to stakeholders and partners in supporting the implementation of HIS worldwide. It may also provide evidence for decision makers to consider when contemplating the usefulness of implementing the DHIS2 especially in developing countries. Recommendations from the study could further be adopted by policy makers to include health professionals' concerns in the formulation of policies and guidelines for effective implementation of the system. In relation to practice, the research will provide guidelines to other health care settings on the implementation of DHIS2 with respect to data capture and use of information. It will further contribute to the effort of creating conducive health information systems environment for effective and efficient healthcare delivery in a developing country. This research contributes to existing literature by providing additional dimension of the implementation of health information systems in Ghanaian Hospitals or a developing country.

7. THEORETICAL FOUNDATIONS

7.1 Definition of Concepts

It is significant to review some definitions of Health Information Systems (HIS) as it remains the fundamental theme of this paper. The World Health Organization (WHO) defines a Health Information System (HIS) as a system that integrates data collection, processing, reporting, and use of the information and knowledge to influence policy-making, programme action and research (WHO, 2000). PHIN (2011), defines a Health Information System as "any system that captures, stores, manages or communicates information associated with the health of individuals or the activities of organizations that work within the health sector. It integrates human resource management information systems, laboratory information systems, hospital patient administration systems, disease surveillance systems and district level routine information systems". A Health Management Information System (HMIS) could also be described as a system that integrates data collection, processing, reporting, and use of the information necessary for improving health service effectiveness and efficiency through better management at all levels of health services (Teklegiorgis, et.al, 2016). The District Health Information Systems 2 (DHIS2) is a tool for collection, validation, analysis, and presentation of aggregate and patient-based statistical data, tailored (but not limited) to integrated health information management activities (Chikumba. 2017)

The World Health Organization (2008), indicates that "a health information system provides the underpinnings for decision-making and has four key functions that include; data generation, compilation, analysis and synthesis, and communication and use. A health information system collects data from the health sector and other relevant sectors, analyses the data and ensures their overall quality, relevance and timeliness, and converts data into information for health-related decision making".

From these definitions, it is deduced that HIS entails data collection at the lowest levels, analysing such data into useful information, to provide information for management and decision making relevant at the national level and cuts across patient management in health facilities to the international health organisations. It is also clear from the definition that HIS is not one clear cut structure, but a complete structure with mechanisms for data collection, analysis, and report using paper forms and registers to capture data at health facilities, as well as the routines and practices of the staff collecting and analysing the data, the computer systems that store that data and the procedures that guide the use of information in decision-making.

7.2 Theoretical Framework

The research adopts the Performance of Routine Information System Management (PRISM) framework (Figure 1) which consists of tools to assess Routine Health Information System (RHIS) performance, identify technical, behavioral and organizational factors that affect RHIS, aid in designing priority interventions to improve performance, and improve quality and use of routine health data (Aqil and Lippeveld 2010). It defines good RHIS performance as the production of quality data as well as documented use of information for decision making. It postulates that poor data quality and poor use of information for evidence-based decision making is not only due to technical issues but also a result of organizational and behavioural barriers that hinder the effective use of information (Belay and Lippeveld, 2013).

The RHIS performance diagnostic tool assesses the data quality of a HIS in terms of completeness, accuracy and timeliness, as well as the use of information in terms of: dialogue and actions, referral to higher levels, sharing, feedback and advocacy.

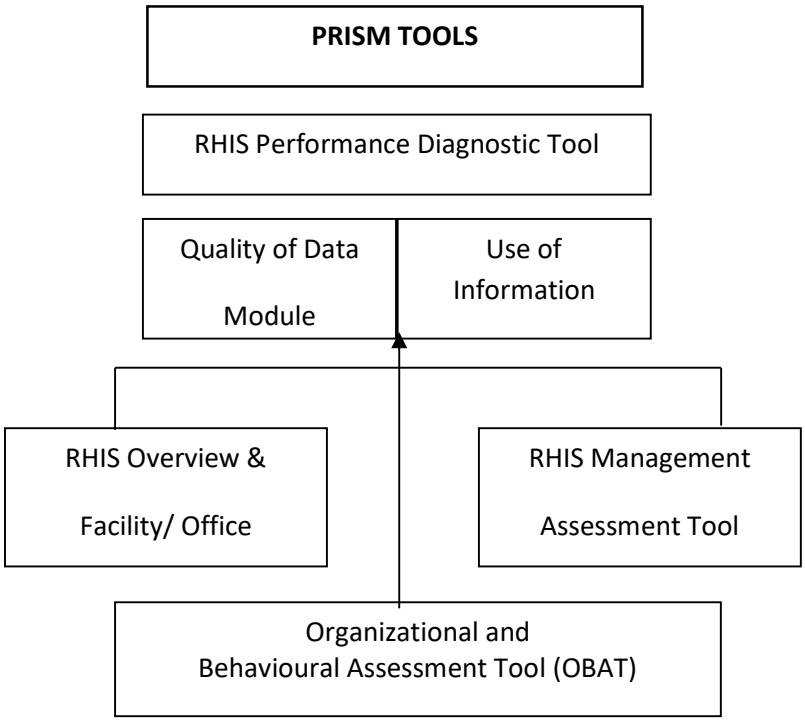

Figure 1: PRISM Tools Version 3.1. (Aqil and Lippeveld 2010)

According to Belay and Lippeveld (2013), based on the PRISM framework, a set of tools have been developed to measure the RHIS performance output, processes, and determinants as well as their relationships: (1) the RHIS Performance Diagnostic Tool; (2) the RHIS Overview Tool; (3) the RHIS Management Assessment Tool; and (4) the Organizational and Behavioral Assessment Tool (OBAT).

Performance Diagnostic Tool: As the primary component in the PRISM tool kit, this tool determines the overall RHIS performance defined by the production of quality data and information use. Data quality is measured in three dimensions: completeness, timeliness, and accuracy. The diagnostic tool assesses use of information for problem identification and solving, decision making, resource mobilization, and monitoring.

RHIS Overview Tool and Facility/Office Checklist: This tool examines technical determinants, such as the structure and design of existing information systems in the health sector, information flows, and interaction between different information systems. It allows users to understand the availability and status of RHIS resources such as staffing, RHIS supplies, equipment and infrastructure at health facilities.

Management Assessment Tool: This tool is designed to take rapid stock of the RHIS management practices and to guide the development of interventions for better management. It measures different RHIS management functions including governance, planning, training, supervision, use of performance improvement tools, and financial resources.

Organizational and Behavioral Assessment Tool: This tool identifies behavioral and organizational factors that affect RHIS performance, including data demand, motivation, confidence level, task competence, and problem-solving skills. It includes various questions used to assess the promotion of a culture of information within the health department.

The quality of the data generated through RHIS and use of the information for decision making is analyzed for all administrative levels of the health system in connection with the determining factors

8. CONCLUSIONS AND FUTURE RESEARCH

The research methodology, data collection, analysis, and recommendations would be captured subsequently to complete the study on the assessment of DHIS2 in Ghana, with the central region of Ghana as the case setting. An overall evaluation of the DHIS2 could be considered for all regions in Ghana as future research in the area.

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