Health Management Information System for Decision-Making in Nigeria: Challenges and Resolutions

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Abstract: Health Information System (HIS) refers to any organized effort to systematically collect, maintain and disseminate data relevant to the performance of a health system or any of its component parts. As such, any health system has potentially many health applications functioning within it. Not only are the health challenges facing developing countries (Nigeria) enormous, the health systems that addresses those challenges are struggling with limited resources, capability, technology etc. The need to find ways to strengthen health systems overall is therefore vital. The use and knowledge of HIS in Nigeria hospitals is still below what it should be. As technology seem to be advancing each day, information generation behind the health sector seem not to. Applications of IT in health are so rampant now, making it easier to treat patients and manage information about them. Information is critical in making health-related decisions. The Health Management Information System (HMIS) aims at developing a culture of information use amongst health care workers through the development of knowledge and skills in data handling in order to create locally relevant information for use in the management of district level health and service programs. HMIS does not inform policy alone but also improve care at the point of service. It involves better information management tools at the local level, data capture through routine business operations, identification of the minimum essential data sets, growth of specialized technology and providers. Etc. Challenges and reasons for the failure of HIS in Nigeria will be discussed. This study will look at one of the software tools used in health care analysis of data and how it is used for decision-making. In addition, it will look at measures that need to be set in place for HMIS to achieve its goal.

Keywords: Data, Decision-making, DHIS, HMIS, Information System

1. Introduction

The concept of Management Information System (MIS) in today's world is an integrated system, which handles the databases, provides computing, provides the information to support the operations, the management, and gives a variety of decision-making tools to the user of the system. An MIS gives information through data analysis. While analyzing the data, it relies on many academic disciplines. These include the theories, principles, and concepts from the Management Science, Psychology, and Human behavior, making it more effective and useful. These academic disciplines are used in designing the MIS, evolving the decision support tools for modeling and decision - making.

Health Information System is a set of components and procedures organized with the objective of generating information which will improve health care management decisions at all levels of the health system [1] [2]. In the past decade, there has been tremendous activity and innovation in the development of health information systems, spurred in large part by technological advances, and the interest these advances have generated in the health sector. Progress has been made in designing systems that meet the needs of patients and health workers.

IT implementations have demonstrated initial successes in improving patient outcomes, particularly around HIV patient case management, and have increased the efficiency of health services delivery as well, by improving the speed of laboratory testing, the evacuation of patients in emergency settings, or the expected cost of tuberculosis treatment. The use of Personal Health Records (PHRs), Electronic Medical Records (EMRs), Electronic Health Records (EHRs) have shown great potential in providing ways to improve and deliver changes in health behavior, patients, community, organizations, the providers, etc [3]. The use of these is noticeable in fast decision making, reduced medical errors, improved quality patient care, quick information retrieval, rapid information sharing, and the likes. Taking for instance the use of robotics and other sophisticated Artificial Intelligence gadgets use in the treatment of patients. Today, computers and advanced technologies in connection with health data are the new ways to manage diseases. Yet significant shortcomings remain.

Health care information systems that are successfully developed and implemented can improve health care efficiency and effectiveness. However, their implementation is frequently resisted and results in failures. The challenge of identifying techniques to ease the incorporation of information technology into health care organizations remains an important one. The goal of an HIS is to allow decisions to be made in an apparent way, based on proof.

The HIS has four vital functions: data generation, compilation, analysis and synthesis, and communication anduse. The HIS collects data from the health sector and any other sector that is applicable. It analyses the data and certifies their complete value, importance and timeliness, and converts the data into information for health-related decision-making [4]. Information system is not to query how people do their work rather, to assess the ability of the system to produce valid, reliable, timely, and reasonably accurate information for use by planners and decision-makers.

Health Management Information System (HMIS) covers all aspects of the health information sciences and the systems that support the information. It employs health system software tools and services to enable healthcare organizations or establishments to capture, classify and manage accurate healthcare information thereby, improving the quality of patient care.

One of the current situation in Nigeria is the multiple database issue, unprocessed and therefore, leading to errors and wrong conclusions. If data is collated and well analyzed, such will not occur. HMIS helps to focus on how data is been used to generate information which can be used and store for future reference. It is so sad that when a patient comes around for a check-up or surgery, there should be a catalog history of the patient and how long he had been on a particular drug or how long he had been treated for a particular ailments, his background in case of any hereditary diseases. However, where such seem not to exist and the information recorded manually in files are not accessible, it therefore makes difficult the accuracy of information on the patient being investigated.

The purpose of this study is to evaluate the problems related to data collection, storage, use, and information flow; to improve the health of patients through the use of the Health Information System; to determine the level of implementation of HIS in Nigeria; explore the problems related to data collected within the HIS in Nigeria and to have more understanding about HIS.

This research focuses on how efficiently Health Management Information Systemsis being used in Nigeria in getting the desired result, its management and possibilities of areas that needs to be addressed more in order to give a quality and effective service. It explores the procedures, tools and problems related to primary health care data collection, storage, use, and information flows. The study looks at ways to improve the data collection, storage, analysis, and use of information.

2. Statement of Problem

Data is not well validated and analyzed therefore, leading to poor data quality, which makes data incomplete, inconsistent, inaccurate and huge backlog of unprocessed data and multiple databases. Also, the lack of integration of independent systems that impedes the ability to share data increases the efficiency of operations or enhances the sophistication of analysis and decision-making. So long as the burdens and incentives surrounding data collection are not addressed, data quality will remain poor and this is a major problem in health institutions. This paper hence identifies the reasons for the poor implementation of HIS in Nigeria and how HIS can be effectively used to improve health care system. Therefore, the need for improvement in the use and management of health information is of the essence.

3. Related Works

A considerable portion of the literature review centered on the Nigerian situation as regards the poor performance of HMIS sights issues which include demographic diversity and cultural effects on health care, lack of support infrastructure, corruption, lack of technical support services, problems with human capital, an import-dependent economy, and the high the cost of capital in the Nigerian capital market.

According to [5], the performance of an HIS is linked not only to technical determinants such as data quality, system design, or adequate use of information technology. Other determinants are:

- 1) Organizational and environmental determinants that relate to the information culture within the country context, the structure of the HIS, the roles and responsibilities of the different actors and the available resources for HIS.
- 2) The behavioral determinants such as the knowledge and skills, attitudes, values, and motivation of those involved in the production, collection, collation, analysis, and dissemination of information.

For HIS to be effective in its application, it requires a wide Internet connectivity with a high-speed capability for data transfer and retrieval. No doubt, the absence of the implementation of HIS has deteriorated some vital and crucial aspects of patients' safety and the quality of care in Nigeria and in African countries generally. The lack of knowledgeand familiarity with electronic equipment likewise plays a major role when it comes to implementation. Poor data quality is a persistent challenge across health information systems. Data systems are usually unstructured to maintain the vanguard health care professionals in their decision-making. Instead, data collection is often mandated from "the top" – a national Ministry of Health or a vertical health program [3].

In [6], their work focused oninvestigating issues and challenges in HISimplementation for each category of HIS by using in-depthinterviews. Study conducted showed that even with the introduction of three (3) categories of HIS namely: IntermediateHospital Information System (IHIS), Basic HospitalInformation System (BHIS) and Total Hospital Information System (THIS), among Malaysian public hospitals by the MalaysianGovernment, it was gathered that Malaysian public only 15.2% of the hospitals areimplementing the system. Moreover, there is limited number of empirical studies on HIS implementation in Malaysia. Likewise from their analysis, several issues had influenced the overallHIS implementation in Malaysian public hospitals such aslimited financial sources, maintenance by differentdepartment, HIS implementation order by the MalaysianMinistry of Health, addition of new systems, confidentialityissues, low acceptance level, low satisfaction level, differentvendors, infrastructure issues, system breakdown, duplication of data, etc.

According to [7], he noted that the Bulletin of the World Health Organization (2008) stated that Nigeria has been searching for the right policy formulation in health care more than 30 years since the Alma Ata declaration of "health for all" in 1978. He opined that successive Nigerian governments have not legislated any policy on the implementation of HIS in the health care delivery of the nation hence the continued poor national health outcomes as shown by the Nigerian Ministry of Health survey in 2003. From the United Nations report, Nigeria is ranked the second highest in maternal mortality in the world.

In [8], he noted that in Mozambique, most of the health facilities are situated in remote areas where there is limited or no access to technology and infrastructure advancement. There is lack of feedback, training, and support at all levels of data collection and lack of skills to analyze data. Most of these health facilities are situated in remote areas where there is limited or no access to technology and infrastructure advancement. This has contributed to major problems in the provision of health services to the population.

[9] opined that Kenya has been in the process of implementing and scaling up the use of a web-based system (DHIS2) for managing the entire country's routine health information. He explored the numerous categories of key HIS stakeholders in the Kenya health sector by using a descriptive qualitative study in order to get a deeper understanding offactors thatwere barriers to the successful scale up and use of DHIS2 in Kenya. A total of 25 key informant interviews were conducted using unstructured, indepth and active interview approach. The aim of the study was to understand the perceived opportunities and threats thatthe system faces in view of the ongoing implementation f the devolved system of government in the country and to make recommendations on how barriers and threatscan be addressed to hasten acceptance and scale-up the use of DHIS2 in Kenya.

3.1 How Health Information System Works

An operational HIS should be able to supply series of indicators that relate to:

- 1) The health system
- 2) The health status of the population
- 3) The factors of health, which involves socioeconomic, environmental, behavioral and risk factors which includes the inputs used in the production of health.



Figure 1: The Health Information Systems Components [10]

3.2 Benefits of Hospital Information Systems

Hospital Information Systems improve workflow and increase patients' access to health care. [11] asserted that the application of ICT facilitatesabundant and instantaneous communication amid organizations and their stakeholders. It allows bothparties to achieve seamless workflow and effective methods through better interactions.

4. Proposed Work

A key component of Health Information Systems is public health surveillance whose main focus is defining problems and providing a timely basis for action. This is especially so when responses need to be urgent, as in the case of epidemic diseases. Epidemic and emergent disease surveillance produces information linked with public health action. The need for timeliness of reporting and response, and the requirement for effective linkages to those in authority with the responsibility for disease control, impose additional requirements on health information systems. The research study is informed by public health fields, health informatics and information system. A descriptive textual analysis of literature would be carried out to identify the tool that is used in the data collection, validation, and information generation for decision-making. The study would likewise do an indepth study of this tool to see how it is implemented. A major concern as well is the challenges facing health information systems in this part of the world and probable solutions or measures that can be set to resolve the challenges in Nigeria in order to improve effectively the health care system.

4.1 Apparatus /Instruments

A major importance is that good tools facilitate easy collection & collation of data.The apparatus that is considered in this research is the DHIS, District Health Information System. The DHIS is a tool that helps to improve service management to achieve better health for all by using available information and promote the decentralisation of decision-making. The DHIS enables districts/ localities to assess whether the goals, objectives, indicators and targets, based on both strategic and operational plans are being achieved. It is used for data validation and analysis. The purpose of this tool is to monitor performance (i.e. targets reached), justify decision making through planning and implementation. It also focuses on improving coverage and quality of health care services.



Figure 2: Interface of DHIS

4.1.1 The DHIS

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The DHIS is an open source database application, that is, the source code and database structure are open to individuals to change and distributed without charge. Nevertheless, open source software that is distributed without charge entails training, support, and technical knowledge. "In addition, since different versions of the software may evolve, it might be more expensive to support over the long term, thereby, making it much more intricate to set up and test upgrades. DHIS is an information system that uses the combination of forms, procedures, and analytical tools to convert routine unidentified data (i.e. data that has no names attached) into useful management information that can be used by facility managers for decision-making. In addition, DHIS facilitates the use of datasets. It collects only the must know information needed by the health facilities to monitor and evaluate local priority PHC programs. Information that is not useful to local management decisions should not be collected.

DHIS supports the different features of the information cycle including:

- Collecting data
- Running quality checks
- Data access at multiple levels
- Reporting
- Making graphs and maps and other forms of analysis
- Enabling evaluation across time (e.g. months) and location (e.g. Facilities).

The purpose of data at hospital level is to be used to calculate indicators that measure how well the hospital is performing in terms of:

- Efficient use of resources
- Quality of care

4.1.2 Analysis of Proposed Work

This phase provides the analysis and discussion of the research findings presented. The research methodology applied the use of qualitative research methods with techniques: observations in the health facilities settings interviews, reviews of online documents. In conducting this research, literature review was studied, realizing the HIS functionalities in terms of data collection, data storage, data processing and analysis, data presentation and use. Likewise, information flows across facilities, and the use of information within and across the HIS administrative structure. This research revealed that local levels of the HIS require great attention in order to be effective in using and managing Health Information System for the improvement of health care activities because, in most cases, the HIS is mostly incorporated at the highest level, whereby, neglecting the root.

Now to begin with, Primary care activities of education and research set the foundations for the introduction of HMIS but looking at it today, we face lots of problems and challenges tin its implementation even in Nigeria.

The tools used in HIS are more likely not to be in use because the expertise to make use of the software is not available. The research makes a study of a Ministry in Nigeria. Though it is being used to collate data, the officials do not really depend on the result. They still employ the manual way of storage (paper work). Also included is the training facility whereby officers equipped in the use of this software are called upon to train health workers on how to make use of the tool. In this case, most times such a person might not be available. Looking at it also, we have the problem of installation or incomplete installation, thereby leading to the negligence of the HIS tool and causing employees who wants to use the software not being able to do so. Likewise, the environment where HIS is being used really matters in that if it is not a conducive one, no access to the internet or electricity (in some developing countries, this is a major disadvantage); the output and implementation of HIS would be drastically low.

In addition, some workers are not computer oriented, hence, they find it very difficult to adjust to the use of the HIS tool. In the same vein, there exists the information gap between management and staffs, leading to conflict in the implementation of HIS. For example, managers who do not perform the daily tasks of documentation, make decisions on the system components without staff input only to find that adjustments has to be made.

We look at ways or measures to combat these challenges which will include training and training facility. This is of an utmost importance in the success of HIS in Nigeria and the government should strive more to make this feasible. One of the major components involved in successful implementation of HCIS is education. To improve primary care services and facilitate the absorption of HIS, education in both primary care and information systems is vital. It increases the information flow in organizations and provides opportunities for self-organization. Exposure to information would bring to an advantage the health care organizations and allow them to improve performance.

4.2 Result of Findings

This study is intended to carry out a descriptive research study of survey type amongst local health workers to determine their competence with the DHIS. The intended study population would be selected using simple random sampling method and a measuring instrument would be designed to be administered to the study population. A copy of the designed instrument is given to experts in the field of human computer interaction/ ergonomics to ensure the items being used for measuring the competence of respondents with DHIS is adequate. A pilot study is done using the administered measuring instrument and the reliability coefficient of the instrument is ascertained using the Cronbach alpha coefficient. On getting a reliability coefficient greater than 0.6, we proceed to administering the measuring instrument to the intended sample population. Analysis of the collected results is juxtaposed with the results of the descriptive textual analysis of available literature and afterwards, recommendations on findings will be made.

Likewise, questions on the use of the tools mentioned above are generated to actually justify the competence level of each health workers in relation to the use of the DHIS. This includes:

• Is DHIS enough for data collection and decision making in Nigeria?

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- Are the measures set in place for managing health workers education and training effective?
- Do you think wireless data transfer for mobile data collection would increase the speed and accuracy of HCS in Nigeria?
- Would a training measure be efficient enough to address challenges and timely information if administered to track health workers' training in Nigeria?

These questions are based on an exploratory study to assess the computer knowledge, attitude and skill among health workers in health care setting of a selected hospital in Nigeria.Since workers are able to access the software, it was noted that the level of use and interaction with the software was negligible, hence the measure of their competence was carried out because if competence level of health workers with the software is minute, then wrong and inaccurate decisions would be made by decision makers.

4.2.1 Management of Health Services

In Nigeria, the management and supervision of health services is done through some of the following authorities:

- Ministry of Health: The Ministry of Health, which is responsible for health policy formulation, running of national consultant hospitals, specialized hospitals and District designated hospitals. Moreover, they are responsible for workforce development and health training institutions.
- Non-Government and religious organizations: These are organizations help to provide analysis and expertise and to serve as early warning mechanism to help monitor and implement international agreements. Their rapport with offices and agencies of the United Nations system varies depending on their goals, venue, and the directive of a particular organization. They likewise advocate and monitor policies and encourage political contribution via provision of information.
- Private practice: There are doctors who run and are allowed to run their own hospitals.
- Traditional practice: In Nigeria, there seem to be so many of these traditional practices or the herbal practices that heal people with diverse ailments with the use of herbs, which has been identified to be of good worth for the body. Many people, even the learned and fond of using these drugs produced in the traditional way to cure their ailments and sometimes prefer them. Some are well recognized and well accustomed to people.

4.2.2 Challenges of HMIS

Despite the explicit demand for quality health information, Health Management Information System performance in many developing countries consistently falls short of requirements. There are several reasons why routine information systems in developing countries (Nigeria) do not provide the necessary information support for decisionmaking. Here below are some of the challenges faced:

- Data transmission and feedback challenge: The process of gathering, analyzing, transmitting, and presenting the health data is so cumbersome to the extent that by the time a report is prepared and ready for use, the data are obsolete and decisions are often made without relying on any information input. Deadlines are not met and they do not really mean much to those preparing them. In addition, the shortage of staff likewise makes the work slower than compared to the tasks that needs to be done. Setbacks in data transmission and lack of feedback, lack of reporting tools are also major problems encountered in Health Information System.
- Environmental factor: The knowledge and skills required for data processing, analysis, interpretation and problem solving are usually not given due attention, which affects the ability to use information. Data collectors and users work in specific environments and organizationalcultures, and are influenced by them. The environment might not be conducive enough for such work. More so, when it comes to the lack of necessary logistics to carry on the work i.e. inadequate means of transportation, especially in a developing country like Nigeria, it is an issue. In the same vein, electricity to carry on the work and store details of data in the system could most of the time turns out to be a great challenge.
- Lack of prudence:Pushing the limit of what is achievable at a particular point in time and thereby wasting resources that could have been employed to generate other things results from the lack of plan and foresight.
- Data quality and the poor use of information: Health Management Information Systems in most countries are insufficient to supply the necessary information support to individual care and public health activities and management of such information. Likewise, the poor use of information for evidence-based decision-making is one of the major causes of the current lack of relationship between patient care and public health systems.
- Problem of large and unnecessary data:Health workers are overwhelmed by extreme and unnecessary reporting requirements from numerous and weakly coordinated subsystems that cannot deliver timely, accurate, and complete data. Although a tremendous amount of data may be collected, only a small proportion is processed, analyzed, and used.The need for better Health Information has therefore arisen from efforts to improve accountability and ensure evidence-based decision-making.
- Training facility and strategy: This is one of the major failures of HIS. The means of sending a large group of lecturers to train users for some time and then sending participants back to the districts with minimum support of users thereafter. This is not cost effective. Some might even not be able to access the software reason arising from the issue of electricity, incomplete installation, installation problems, which could lead to the malfunction of the software and the likes. Some have little or no skill in computer and some cannot even practice what has been learnt due to the unavailability of enough computers.

4.3.3 Resolutions of HIS

- Complete reporting: For health data to be useful to the health planners and decision-makers, data reported should represent the precise situation of the health delivery services of the district giving the report. A method to ensure the report of actual data reported is to emphasize that all health facilities must give a concise and complete report.
- Coordination:Establishing a broad-based coordinating mechanism with associations to relevant ministries, technical support agencies, research institutions, NGOs etc. to ensure coordination and collaboration from each states of the country. Also, the reawakening of the agencies that are laying fallow and engaging in nothing productive other than wasting the resources of the country. The body should be charged with the duty of reaching agreement to pursue the goal and developing a national plan.
- Developing the culture of Information use: It is said that information is power. We all need information one way or the other. An information culture must be imbibed not just by those in Health Care but by all, including the government body so as to create a forum of understanding and gain insight on the goals that are to be achieved and efforts to make things better for the nation.
- Education:The incorporation of information systems education, continuing education for health care providers and computer training based on the specific needs of individual employees is crucial. The data collectors that get the data needed to generate information should be properly trained on how to go about this and how to effectively make use of the HIS. If data is collected and inputted into the HIS without generating information for the use and development of the country, then it is a waste and it is only good at stretching available resources beyond their limits without getting any positive feedback.
- Leadership:Empowering HIS depends largely upon the personal commitment and dedication of those involved particularly the senior decision makers such as government ministers and managers.
- Managerial involvement:The managers for the implementation of HIS should include developing and understanding of the capabilities and limitations of the HIS, establishing reasonable and achievable goals for the HIS and exhibiting strong commitment to the successful implementation of HIS. More so, they should be able to know what the programmes are trying to achieve by setting local targets, monitor the trends, and be able to compare programmes with others in similar catchment area. Likewise, there should be a cordial relationship between staffs, which in turn would facilitate the smooth running of health care system.

5. Discussion

It is of an utmost importance that information should be documented, analysed and used for improving the

efficiency,quality and coverage of Primary Health Care services at all levels.In addition to this, it is necessary to allocate recourses to the implementation efforts and to clearly define goals for the HIS and the organization to be achieved in the short and long time perspectives in contrast to the tremendous.

Good tools facilitate easy collection and collation of data. Nevertheless, when these tools are not efficiently used as they ought to be, then it is a waste and the time and resources in getting them is likewise the same. Planning is very crucial in making a success out of something that is to be achieved. Without proper plan, one would keep coming back to the starting point without achieving anything.

Good organization does not only include resources that are to be employed alone, but also the human resources that are engaged for the successful implementation of the Health Management Information System. Hence, the management and the country as a whole should be ready to contribute its own quota to the development of the nation for the benefit of the coming generation. Moreover, users, managements etc. should understand and come to the reality of the fact that there is no technology or in its advancements, that does not have limitation. For HIS to be operational in Nigeria, the need for a deeper and richer understanding of what it entails is of the essence.

In conclusion, routine health facility data have a potential role to play in facilitating the improvement of the use and management of information within the HIS. This as to do with the data collected from day to day and this being the key source of information for individual patient and health facility management, if utilized and managed efficiently and effectively, it can make available the needed information for decision-making.

6. Conclusion

The purpose of the study was to assess and determine the quality and quantity of reporting of health delivery services; and the benefits, challenges, failures, resolutions and conditions for implementing a HMIS in facilities in Nigeria. This research study is informed by public health fields, health informatics and information system.

In this research, it was enumerated that the ineffective use of HIS in Nigeria as regards health data being reported is that information generated was not sufficient to support an informed decision-making and health planning because some of these reports are not precise and out of date. The causes identified include incomplete, inaccurate, and untimely reporting. Also identified is the lack of resources and insufficient office space. Therefore, the study shows that the DHIS is appropriate software for the Health Management Information Systems and it is just up to the agencies to make use of it effectively to be able to make the right judgments. Information systems implementation deals with the introduction of new systems in organizations, including the organization of training and support. The core lessons are that systems are not adopted unless the user is involved during system development which is a method of bring into line IT to fit the business/ purpose, understands their purpose

and also experience improvements in their job performance [12].

Finally, in the course of the implementation of this study, it was opined that attitude and skills of health workers requires ongoing supervision, training, and self-learning in practical situations and in dealing with data gathering and decisionmaking.In conclusion, the requirement for effective linkages to those in authority with the responsibility for disease control imposes additional requirements on Health Information Systems.

7. Recommendation

The results from the project lead to the following recommendations:

- Training and education for patient handling activities should be actively encouraged as there is evidence that it transfers into the decision-making process for patient handing tasks, although the actual content of the program remains unclear.
- Problem-solving provides an indication that the training and education is being transferred into practice, with staff using the information provided to guide their manual handling decisions.

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