



# **A Fishbone Analysis of the Use of Electronic Health Records (EHR) in a Primary Healthcare Setting: The Case of University of Cape Coast Hospital**

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## **ABSTRACT**

The scientific investigation was conducted at the University Health Services of the University of Cape Coast (UCC), which is a 70-bed capacity primary healthcare setting. The objective was to examine the reasons for the poor use of Electronic Health Records (HER) by Health Professionals in a University healthcare setting. The appropriate scientific method employed for the investigation was the Ishikawa or Fishbone diagram. The fishbone analysis is a tool for analyzing the organisational processes and its effectiveness. The analysis showed that the causes for poor use of EHR in the University healthcare Facility were due to factors related to the Facility Management, the healthcare professionals, the computer systems, the methods applied, the environment, and the materials. The investigations did not cover areas like sequencing the cause and also how to put more emphasis on the causes of higher magnitudes.

## **General Terms**

Fishbone, Electronic Health Records (EHR), Primary Healthcare Setting, University of Cape Coast.

## **Keywords**

Fishbone, Electronic Health Records (EHR)

## **1. INTRODUCTION**

The history of clinical documentation is based on paper based records, and they are cumbersome and ineffective, and have restrictions in allowing a global vision of the patient's health conditions [1]. An Electronic Health Records (EHR) system instead, aims to gather health data, potentially generated by different sources at different times, and share those data with relevant healthcare systems [20]. It consists of a repository of information concerning the health status of individuals, within which health records are created and managed in digital formats [9]. An EHR of a patient can contain medical history including operations, hospitalisations, medications, past diagnostic follow-up, laboratory results, radiology reports, and relevant health care information [25]. The sharing of healthcare information between providers using EHR has led to improved outcomes of care and reduced clinical errors [9]. Adoption of EHR systems by hospitals and clinics has been driven by the belief that these systems can support the provision of efficient and high-quality care and improve the efficiency, quality and safety of healthcare delivery [6]. The

main goals of EHR include providing a secure, reliable, and efficient way to register, gather and process all the clinical data related to the patient. Also, it supports the actions related to the clinical practice and patient treatment, and its ability to share information electronically provides a boost in quality healthcare delivery and management [30].

However, a number of implementation barriers have impeded or affected widespread use of such systems [18]. To guarantee the success of an EHR system implementation, it is therefore essential to have a good understanding of the factors that constrain the use of EHR. The paper was set to examine the reasons for the perceived poor use of EHR by health professionals in a primary healthcare setting, with the University of Cape Coast Hospital as the case setting. In that regard, the study specifically investigated the type of EHR used at the primary healthcare Facility, and the individual characteristics and factors that contributed to that phenomenon. In line with the Fish bone diagram the paper sought to find out the reasons for the poor use of the EHR with respect to variables such as policies/regulations, the people, the machines, the methods, the environment, or materials available.

## **2. SCIENTIFIC APPROACH AND METHODOLOGY**

### **2.1 The Ishikawa or Fishbone Diagram**

The scientific method adopted for investigating the concern is the Ishikawa or Fishbone diagram. Fishbone diagram (also called Ishikawa diagrams or cause-and-effect diagrams) is a graphical technique that is used to show several causes of a specific event or phenomenon (figure 1). In general, the Fishbone diagram can be used as an appropriate visual representation of phenomena that involve the investigation of multiple cause-and-effect factors and how they inter-relate ([2] [3] [10]). This causal diagram was created by [12] in the research field of management. The diagram which visually displays multiple causes for a problem helps identify stakeholder ideas about the causes of problems, and allows the user to immediately categorize ideas into themes for analysis or further data gathering. In particular, the fishbone diagram was chosen among others because it is a common tool used for a cause and effect analysis to identify a complex interplay of causes for a specific problem or event. The diagram

permits a thoughtful analysis that avoids overlooking any possible root causes for a need. Technically, the Fishbone (Ishikawa) diagram mainly represents a model of suggestive presentation for the correlations between an event (effect) and its multiple happening causes. The design of the diagram looks much like the skeleton of a fish. Comprehensively, the fishbone analysis is considered very effective tool to find out the causes of problems. A clear concise statement of the need was generated, and referred to as the Effect. A horizontal line; usually the "spine" of the fish was drawn along the page of the paper. The need was written along the spine on the right hand side, and the overarching categories of causes of the need identified. For each category of causes, a line ("bone") at a 45 degree angle from the spine of the fish was drawn and labelled. The factors that could be affecting the cause and/or the need were identified, and each reason why was clustered around the major cause category it influences on the diagram.

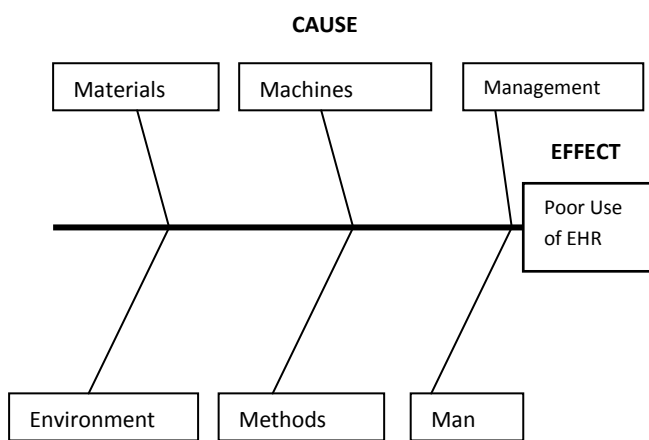


Figure 1: Fishbone diagram analysis

### 3. MODE OF ANALYSIS

The fishbone diagram and analysis typically evaluates the causes and sub-causes of one particular problem and therefore assists to uncover all the symptoms of any business or organisational problem. There are six classic categories of a fishbone diagram which are categorized as the main causes of any problems of business process. These include; people, equipment, materials, environment, management and methods. The analysis of these six variables reveals the reasons of a problem irrespective of its type or severity [11].

A general fishbone analysis was done by drawing the first fish bone with the six classic categories identified in theory. Afterwards the major problem was detected and the second and most important fishbone analysis was done by putting that into the head of the second diagram.

### 4. FINDINGS AND ANALYSIS

A Primary Health Care (PHC) setting is an important health care setting made universally accessible to individuals and families in a community, by means conventional to them and at an affordable cost to the community and country. It remains the primary point of call for individuals, family and catchment communities in line with national health care system and strategies [19]. The scientific investigation was conducted at a seventy (70) bed capacity Hospital licensed as a primary healthcare Facility by the Health Facility Regulatory Agency (HeFRA) of Ghana. It is a University Hospital and therefore a member of the Quasi-Government Health Institutions (GAQHI). The academic health care Facility caters for the health needs of the University students, staff and their dependents, as well as the general public. It is a sub-metro of the Cape Coast Metropolitan Health Directorate (CCMHD) with four (4) functional CHPS zones namely; Amamoma, Kwaprow, Akotokyir, Duakor and OLA. The case study is a service organization and its implementation of EHR consisted of the creation of health records of a patient that entails the medical history including operations, hospitalizations, medications, patient admission, past diagnostic follow-up, laboratory results, radiology reports, inventory management, and all other process that required running the Hospital smoothly.

Practically, the Fishbone analysis; which is a great tool to go inside and establish the root cause, was applied to determine the causes of the poor use of EHR by Health Professionals of UCC Hospital as the effect. The need was written along the spine, and the overarching categories of causes of the poor use of EHR were classified as Management, Man, Machines, Methods, Environment, and Materials. The factors that could be affecting the cause and/or the need were identified, and all possible causes of the problem or effect selected for analysis (figure 2).

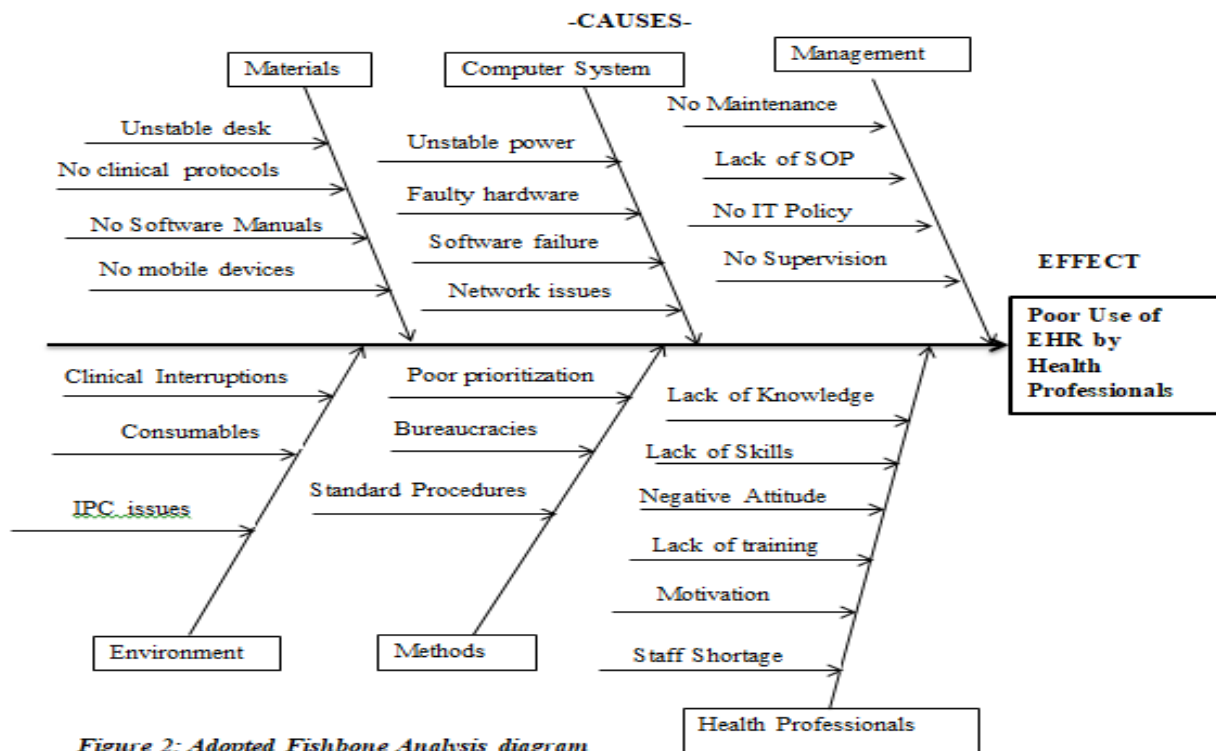


Figure 2: Adopted Fishbone Analysis diagram

Figure 2: Fishbone diagram analysis

The findings and evaluation of the case study has been done under the six classic categories of the fishbone diagram and analysis (Ishikawa, 1990). The diagram in figure 2 shows the main effect as the poor use of EHR by health professionals at the primary Facility, with some of the possible causes of that effect classified into six (6) categories; Management, Man (Health Professionals), Machine (Computer systems), Method, Material, and Environment. The possible causes of these categories have been evaluated in the following subsections, in reference to some preceding literature related to the implementation of EHR.

#### 4.1 Management

Management outlines the strategies and action plans for every set of actions in products or service operation of an organisation. They are expected to be ultimately responsible for the effective and efficient implementation of any organisational system that the Facility have acquired, and further demonstrate maximum control over the system implementation. Organisational factors can include lack of a clear vision of change; ineffective reporting structure, rapid staff turnover; low staff competency; lack of full support from higher management; confusion on roles and responsibilities; inadequate resources; failure to benchmark existing practices, and inability to measure success [15]. Lack of financial resources also affects training and maintenance of computer systems, internet and software purchases [23]. Increased staff workload, poor staff involvement and training, and absence of logistic support to keep the system running [34], are major challenges due to lack of supervision. The fishbone analysis (Figure 2) showed some possible causes of poor use of EHR by staff of the Facility. The Management related causes established included; lack of IT policies/rules, lack of Standard Operating Procedures (SOPs) on the system,

financial constraints, lack of maintenance schedule and ineffective supervision of users of the EHR.

#### 4.2 Computer Systems

[26] relates that the low level of EHR use could be explained by lack of available computers, which may affect the use for all clinical tasks in a uniform manner. The literature provides that acquiring most suitable computer system is always crucial for successful implementation of any electronic system. What is the consistency of the EHR implemented at the Hospital? It was established that the provision of computer systems are inconsistent at the Hospital because of unstable power, faulty hardware, software failure, network system break downs (cabling), lack of backups (switches, drives, etc.) and lack of technical support. Indeed these causes affected the standards and smooth operations of the EHR, and frustrated Health Professionals in the use of the system in the Hospital.

#### 4.3 Materials

Material management is significant for ensuring smooth and high-performed electronic systems, [29]. The literature indicates that cluttered workspaces, insufficient space for a paper chart when using EHR, not enough private rooms for computer use, computer stations ill-suited to tall users, and physicians not being physically located at a computer station mitigate the use of the EHR (Ford et.al, 2006). An investigation into the case study revealed that poor use of the EHR at the Hospital was due to unstable desk for medical staff, lack of clinical protocols, lack of software manual, and absence of mobile devices like tablets, phones, etc. to support usage of EHR. Poor materials management led to the poor functioning of the system and hence poor use of the EHR by the staff.



#### **4.4 Health Professionals**

People are the lifeblood of every organization, and if they are not well-motivated and well-directed, it makes it very difficult for that organization to gain success [29]. There are also hostile cultural problems which emanate within the information systems organisation [15]. It has further been established in literature that EHR failures occur for various reasons, including lack of psychological ownership by users; organisational communication problems; technological factors (e.g. system too technology oriented); and training factors (e.g. inadequate or poor-quality training, poor timing of training, i.e. too early or too late) [16]. This study analysis showed that the possible causes of the poor use of EHR by staff of the Hospital were due to motivation, staff shortage, lack of knowledge, skills, training, and attitude of staff. As a result, they failed to effectively adhere to the use of the system, and contributed to the poor use of the EHR.

#### **4.5 Methods**

Sound methods or procedures ensure synergy and contribute towards greater organisational success in the use of systems for services [21]. The multidisciplinary methods of screens, options, and navigational aid problems with EHR usability especially for documenting progress notes causes physicians to spend extra work time to learn effective ways to use the HER [17]. The practices of the Hospital revealed that health professionals are currently undertaking inefficient and faulty methods due to poor prioritization, bureaucracies, and standard medical procedures or requirements.

#### **4.6 Environment**

The environment within which businesses are conducted needs to be conducive for high level of success [29]. But a careful analysis of the case study environment showed that the use of EHR was affected by clinical interruptions availability of a lot of medical consumables, and Infection Prevention Control (IPC) issues. Health Professionals did not seem to have the freedom at the workstations to explore the EHR as required. These reasons did not allow the medical users to stay attentive at one place to ensure effective use of the EHR.

### **5. A RECOMMENDATIONS**

The following have been recommended for consideration and further action:

#### **5.1 Short Term**

- i. Computer hardware components should be installed at all service areas of any Facility using EHR
- ii. EHR systems should be redesigned to support the workflow of clinicians in a Hospital
- iii. A maintenance schedule should be developed and agreed with software vendors for regular maintenance of an installed EHR in a Facility
- iv. Training should be done for all users of EHR systems
- v. Workstations of EHR systems should be clear of clinical interruptions in a Hospital
- vi. Regular power supply should be provided to ensure smooth operations of any HER
- vii. Communication with EHR vendors about specific needs and workflow design should be prioritized to ensure that the system is always ready for full implementation.

#### **5.2 Medium Term**

- i. A policy governing the use of EHR systems should be instituted to ensure effective use of the system
- ii. Standard operating procedures should be instituted for the utilisation of EHR
- iii. Facility software manual should be created to guide the implementation of the EHR
- iv. Clinical areas should be designed to contain minimal consumables and related medical instruments to ensure conducive environment
- v. Staff should be motivated to get them attracted to use the EHR system.

#### **5.3 Long Term**

- i. Health care organizations must be prepared to anticipate and manage changes that will accompany implementation of a new electronic system.
- ii. Network infrastructure of EHR system should be refurbished periodically to ensure smooth operations
- iii. Adequate staff should be recruited to support clinical activities and use of the software
- iv. The HER systems should be made completely paperless to minimise bureaucracies and inefficiencies
- v. A robust finance module should be put in place for the effective implementation of an EHR system.

### **6. CONCLUSIONS**

The investigations examined the poor use of EHR by Health Professionals of a primary healthcare setting, and determined the individual characteristics and factors that possibly contributed to that phenomenon. Specifically, it established that the causes for the poor use of EHR systems by health professionals are factors that are related to the Management, the healthcare professionals, the computer systems, the methods, the environment, and the materials available. Recommendations have been made for the enhancement of the use of the EHR at a primary healthcare setting.

The investigations did not cover areas like sequencing the cause and also how to put more emphasis on the causes of higher magnitudes. The areas of design of the diagram and drawing of relationships between causes of different categories and sub-categories could not be considered. The investigation did not also cover the individual characteristics of Management of the Hospital. The fishbone analysis has some limitations and requires some sorts of enhancement. It only can be done through academic and scientific researches. Further research could utilise this methodology for further analysis on effective organisational impact and developments.

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