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# Practices of Healthcare Information Exchange in the Emergency Department of a Sudanese Hospital

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**ABSTRACT**

It is a common aim among countries, to augment the health of their populations and to increase the quality of healthcare. With the advent of ICT, countries have increased funding in the healthcare area in this study, "Practices of Healthcare Information Exchange in the Emergency Department of a Sudanese Hospital" (PHIEEDS), we argue that the use of new ICT systems and technology will improve health care services, and will increase patient satisfaction; bearing in mind the advantages of ICT facilitation and systems in public Sudanese hospitals have not yet been utilized. It is critical to making information available and accessible for the decision making process. This paper is an extension of  the  previous contribution to  Healthcare Information Infrastructures among Public Hospitals in Sudan (Atta & Elmajeed, 2017) The primary objective of this study (PHIEEDS) is to investigating ,analyzing and developing  the current situation of healthcare information infrastructure, if any, for exchanging and circulating the patient's information within and among Sudanese public hospitals. Methods: Ethnography studies for more than ten months were carried out to understand the current practices in the Emergency Department ED involving the workaround.

*Keywords:- CSCW, Emergency Department ED, tasks-coordination, electronic Patients record EPR, Health information exchange HIE. EHR.*

## I.      INTRODUCTION

Health information exchange has been devolved in many countries especially in Europe (Johnson et al., 2011),(Rudin, Motala, Goldzweig, & Shekelle, 2014),(Annals Of, Medicine, & Org, 2017). In Sudan, hospitals are divided into three healthcare providers that can be summarized as follows: Public hospitals, private hospitals, and non-governmental hospitals NGOs (Atta & Elmajeed, 2017) All these hospitals are 'promising beneficiaries' and essential for use in our study. There is a need for (PHIEEDS) in Sudan; with the overall number of Sudanese citizens, approximately more than thirty-three millions person who are potential beneficiaries of the Sudanese public hospital's services. Unfortunately, these hospitals do not use a computerized system to manage the patients' requirements; it is obvious that the current systems of public hospitals in Sudan do not meet with the reporting requests of recipient population. So we investigated this situation at Al-Rabat University Hospital, specifically, in the Emergency Department (ED), to analyze the current situation of their work, and how the information may be exchanged to understand how the current system works. We found that there are a lot of issues related to such systems, for instance, including:

•      Imperfect administration of clinical data.

•      Lack of doctor-patient communication.

•       Unavailability of information concerning patients' rights.

•      Queuing.

•      Time-consuming process.

•      Lack of data storage and absence of information.

A successful Information System must be capable of maintaining institutional memory, where the information regarding beneficiary doctors or patients, are simple to access and retrieve.

Automated systems, such as Electronic Exchange of Healthcare Information (EEHI) knows how to address such issues and give advanced services for order and reporting of Hospital Information Systems (HIS) (Shapiro, Kannry, & Kushniruk, 2007),  (Everson et al., 2016), (Downing et al., 2016) and  (Atta & Elmajeed, 2017).

What are the current problems for the hospital department in terms of handling patient information?

A number of challenges are facing most of Sudanese hospitals currently. Also, we describe and analyzed the current situation of healthcare systems to specify the major challenges in term of handling patient information within ED and its circulation in the hospitals.

After that we specified these problems as follows:

1) In Sudanese hospitals, there are no direct connection channels between the laboratory and the radiology department.

2) There is no direct link between the physicians and radiology department and the laboratory inside the ED.

3) Computerization of patient's files not done.

4) There is no link between the registration office and other ED units.

5) Finally, today in Sudan, there is no guarantee that any patient will receive high-quality care for any specified disease the aim of this study is to find solutions for the above issues; in result we did an ethnography study for this purpose, Also, to find answers to the following questions:

1. What information is registered about the different kinds of patients as they are classified in the registration office?

2. What type of information is used and produced by the doctors in the triage process?

3. What kind of information is sent to the other hospitals' units? (E.g. wards, surgery, ICU, laboratory, pharmacy, etc.).
4. What information is registered when patients are discharged home?
 To answer these questions, two methods were used including Ethnography studies from the field of Computer Support Cooperative Work (CSCW) among other methods such as: interview, observation, and so on.

## II.     RELATED RESEARCH

Nowadays, people are becoming more reliant on information and communication technology as it has invaded most of disciplines and businesses around the world, and healthcare organizations are not an exception (Kodner & Spreeuwenberg, 2002) This includes technology such as electronic health record HER and health information exchange HIE networks (Nugus et al., 2010) , (Nugus et al., 2010), (Polanco, Zabalegui, Irazusta, Solinís, & Del Río Cámara, 2015) and other ways to circulate the Patient information between emergency rooms (ER) within hospitals and among other hospitals, in order to share Patients' information that is needed by physicians (Govindhan, Pratap, Balaji, Gurumoorthy, & Khudhrathulla, 2018), not only to treat the immediate symptoms but also to have a knowledge of previous treatment and disease. This is essential to making decisions about whether to admit or discharge to the hospital wards, in other words it is offering the information for the decision makers to help them in the decision making process. The call for action has been headed by the researchers who began to study the implementation of EHR, EPR and HIE networks in the ER, which will result in better care for patients inside ER especially in challenging situations, where time constraints oblige physicians to make a rapid decision (Haux, 2006). For example (Ben-Assuli, Shabtai, & Leshno, 2013), (Everson et al., 2016) they describe the types of data that might enhance the decision making process in the emergency department ED, Also, one of their objectives is to evaluate the influences of different information components that were retrieved from electronic health record EHR and health information exchange HIE system on the physicians' decision to admit or discharge patients from ED. The authors used data from health maintenance organization HMO in Israel which linked seven hospitals that shared secure EHR through interoperable HIE system. They employed statistical tools as a method on log-files and used the same information system HMO. They found that using EHR consisting of previous hospitalizations, chronic diseases, past vital signs, past blood pressure significantly affects the physicians' decision in a positive way, especially in critical contexts where the time factor is essential in the process of decision making. (Nugus et al., 2010) They used complex adaptive systems (CAS) to understand the interconnections among the units and services in ED departments. The term interconnection is labeled as "integrated care" in the academic literature (e.g. (Kodner & Spreeuwenberg, 2002), (Hewett, Watson, Gallois, Ward, & Leggett, 2009)(Nugus et al., 2010). Also, the World Health Organization (WHO) has promoted the concept "integrated care" to illustrate the coordination of care among professional and ED services.

Methods: They undertook ethnographic studies over one year to collect data through observations, compromising 110 hours of observations and generated up to 800 pages of field work, handwritten field work. 56 structured and semi-structured interviews were conducted with nurses and physicians. They found that CAS approach to be noteworthy for analyzing integrated care in the ED because the operation of classification diagnoses and discharges were mainly correlation services.
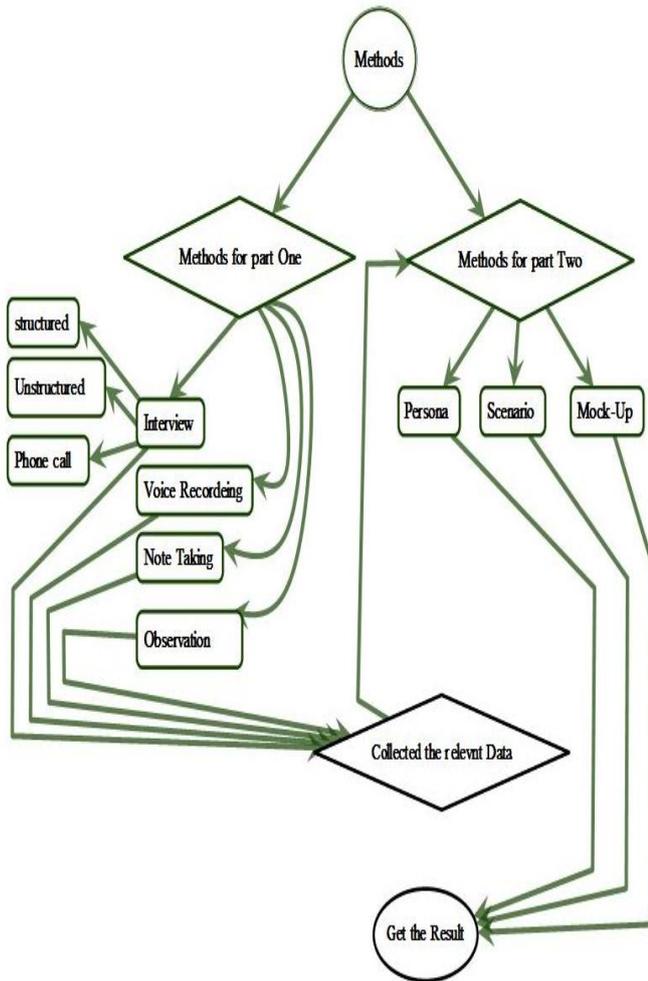
## III. METHODS

A.     Methods for part one:
Ethnography studies were carried out to understand current practices in the Emergency Department ED at AL-Rabat University Hospital (RUH) involving the workaround and the ED procedure. Also, interaction with the practitioners' in the ED deeply analyzes the environment and culture of the ED from the perspective of workers. We carried out extensive interviews with most employees in the RUHED, both structured and unstructured (Petrakaki, Klecun, & Cornford, 2014) including by phone, all accompanied by voice recording and note-taking. We also undertook observations to see the emergency response in the RUHED to get an idea of the present state of ED response to implementation of electronic exchange of healthcare information within and among hospitals.
B.     Methods for part two:
We formulated a thesis of the critical challenges and we designed a Persona for multiple patients' journeys through the ED as represented in information using new software called Mind-Maple.   We also developed a Persona concerning those involved in the emergency department response, as well as the Doctors, administration office, services, triage, laboratory, and pharmacy. Then we created

a scenario for the new map of healthcare information infrastructure among public hospitals (Atta & Elmajeed, 2017).



## IV.     FINDINGS

The Emergency Department ED at Al-Rabat University Hospital (RUH) receives patients from various. The first source is home; the patient comes directly from their home to ED. The second source is patient transferred from another hospital in a different state; the third source is public accident which is the patient could be a victim of car accident, and the fourth source is that the patient could be transferred from another special or public hospital (see figure 2). The only entrance to the hospital for all sources is through the registration office in the ED.

In the registration office, the employees classify the patients into two types: 1) type one is assigned to the police officers and their family members who have health insurance. The second one is known as the normal citizen (called investment) or those who do not have a police health insurance.

• The question that arises here is that what information is registered about different kinds of patients as they are classified in the registration office?

The information which is registered in the registration office can be summarized as follows:   Name, Age, demographic data, and contact information. All this information is recorded in the patient's "Short Stay File" which is personally devoted to every patient. The demographic data has a particular concern, because it could be used to verify epidemic diseases in a specific area. The medical history of a patient is essential to see if she/he has a chronic illness; it's critical to the diagnosis process and also for prescribing suitable drugs.

The work environment in the ED:

The Emergency Department consists of 16th rooms filled with high tech equipment plus one Trauma room, and there are more than fifty staff members who are divided as follows:
• Two emergency specialists.
•Seven doctors.
• Twelve technicians.
• Ten nurses
• Ten patient assistants.
• Six laboratory technicians
• Two pharmacists
• Seven employees for cleaning.
 The services offered by The Emergency Department are:
 Al-Rabat University Hospital (RUH) provides a number of services for arrival patients in The Emergency Department which include:
1) Radiation services:
The hospital offers many radiation treatments that involve X-Ray radiation, CT scan, MRI and ultrasound.
2) Laboratory services:
The Laboratory provides three categories of services: a) Blood disease b) Chemistry c) Microradiograph.
3) ECG Electrocardiograph.
4) Asthma room services.
5) Trauma room services.
 6) Dental department Services.
7) Pharmacy services.

## V.     DISCUSSIONS

This study has found that in the Emergency Department the doctors used a triage process. In order to determine the clinical situation of the patient, because some patients need urgent care, others require attention within four hours, other patients need care within twenty four hours, and some patients need middle (non-emergency) care. Moreover, the doctors are triaging the patients into two types.
1- Hot cases: this means the patient needs urgent attention or rapid intervention.
2- Cold cases: the patient can be listed on the waiting list for a period of time that might exceed four hours.
3- In some instances, the patient arrives at the Emergency Department after death, in this case, the corpse will be referred to the morgue.

• The next questions that arise here are what kind of information is used and produced by the doctor in the triage process?

These questions are answered by the senior manager of the RUH ED who said that, "Some of the information used by the doctor in the triage process comes from the patient's "Short Stay File" which includes the following information:

- The patient's personal information; patient name, insurance card number, date, phone number, age, address, police rank or citizen, if it's not a police officer, but he/she is sponsored by a police officer who is the name of sponsor." As far as the information produced by the doctor is concerned, it is essential that it is written down in the "Short Stay File";  the main symptoms of the patient's disease, reasons for seeking the emergency department services and the history of the disease in connection with the main complaints. Also, the doctors have to pay  special concern to the outcomes of the Routine investigation to examine the vital signs of patients, including PR/min, SPo2,  PEF, RR/min, BR , AVPU and write down the results of the routine investigation  in the "Short Stay File"  for every specific patient.

• Another question that remains unanswered here is that what kind of information is sent to the other hospital units? For example, wards, surgery, ICU, laboratory, pharmacy etc.  In the triage process, the doctor makes a routine investigation including the vital signs and other checks, such as kidney function test, urine examination, blood inflammation and diabetes. In accordance with the results of this investigation, he or she divides the patients into two types as we mentioned earlier:  type one is Hot Cases or dangerous cases for those patients who need urgent intervention grounded upon the investigation. For example, patients who suffer from heart attack and need to be moved rapidly to the intensive care unit ICU Room; another category are those   patients who have Asthma attack and need to be moved to the Asthma Room; and the patients t who experience fainting or victims of road traffic accidents (RTA) who will be moved to the Recovery Room. Type two is called Cold Cases: which do not need urgent intervention. They are categorized as a normal clinic; the patients can wait for four hours and are classified according to a specific unit of disease, such as the patient who comes with a malaria disease will be assigned to the Internal Medicine Specialist. Finally, all those patients move with their "Short Stay File" to a specific doctor or specialist, no matter if they are Hot Cases or Cold Cases. After treatment they will be referred to:

1) Hospital wards, 2) or the surgery, 3) to the intensive care unit ICU 4), middle care unit 5) Asthma Room. 6) Trauma Room 7) Dental department 8) discharged from the hospital to home.

•The question which arises here is what information is registered when a patient is discharged home?

If the patient need more care and followed up; she or he will stays in the hospital wards. If she or he does not need the doctor's help the patients will not stay at the hospital, but the patient's Short Stay File will be kept in the ED registration office as a patient for the future need.

The current situation for public hospitals system in Sudan can be improved by the new design of health integrated information technology to exchange the patient's information in a convenient way. According to (Axelsson & Axelsson, 2006) integration in the public hospitals, field demands an inter-organizational collaboration among all hospital units. See figure (3).

• How can the current situation be improved?

Improving the health care system has become a priority for all health sector organizations and providers (Cox, Roberts, & Stevens, 2002) in order to achieve the primary objectives for health which they are: enhancing the quality of healthcare systems and increasing patient satisfaction.

• The functions that the new information and communication system  ICT will offer include:

1) Security and Privacy:
User-name and password will restrict accessibility to private patient information, and availability of patients' information for the beneficiaries and authorized people such as Doctors, lab technician, administration office employee. for security purposes.

2) Wait time reduction:
 The proposed ICT will reduce the waiting times for all services and minimize the triage process.
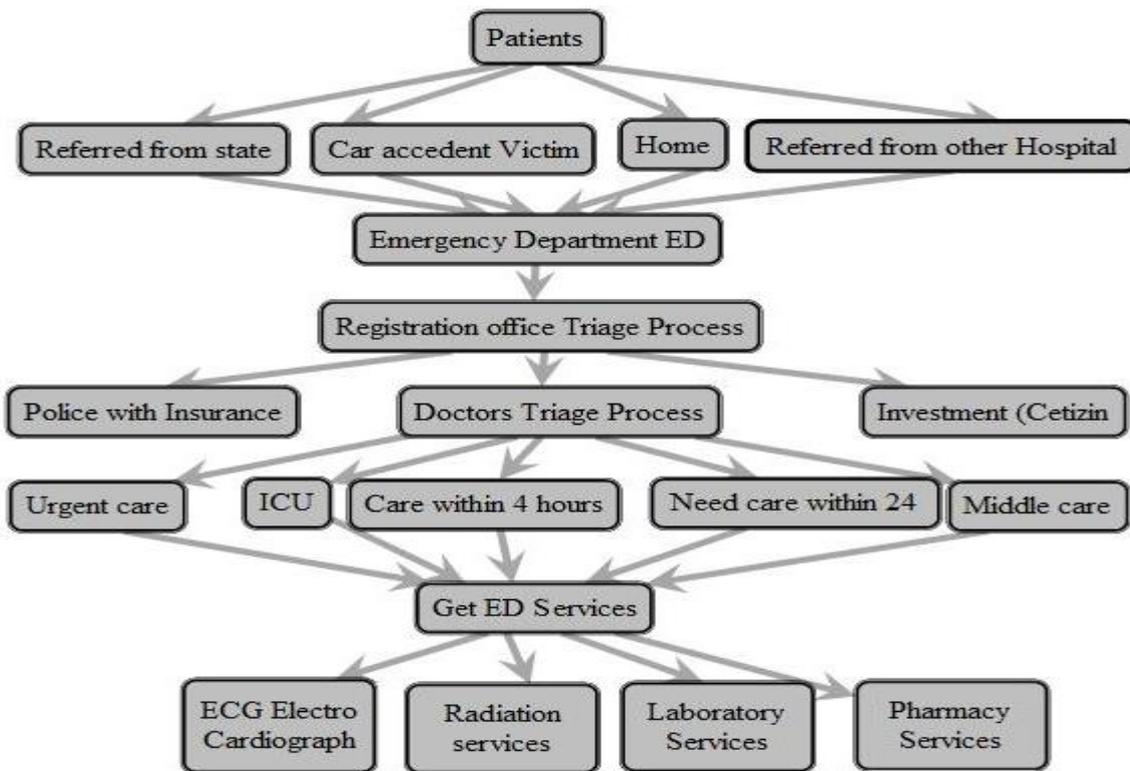
3) Information:
The information about the patient will be available and accessible on time across all hospitals' units, for instance in the laboratory and radiology units.

4) Administration:
The procedures of check-in and check-out will be easy for the administration office employees.

5) Communication:
The new ICT will build channels for Communication across the ED units, as it is an integrated system. See figure (3).
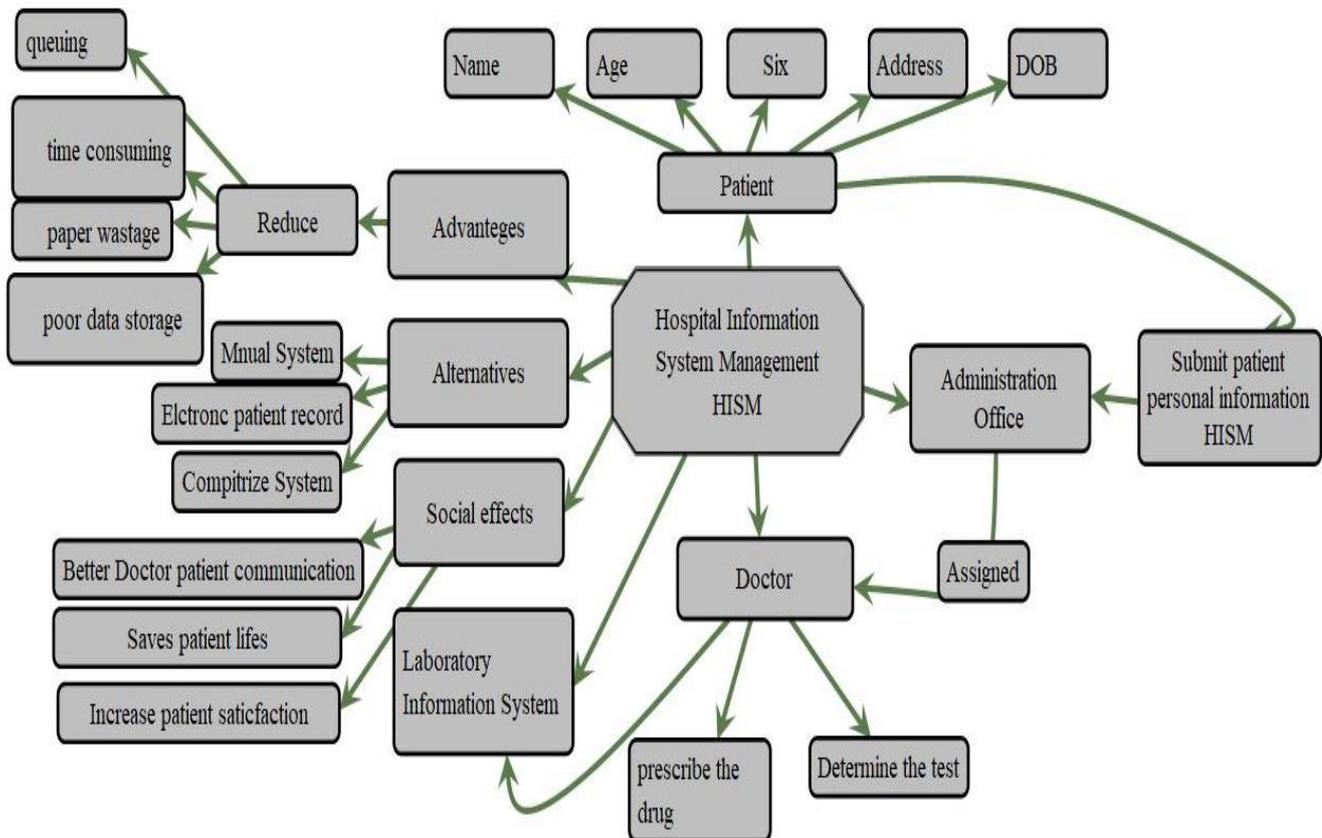
(**Figure 2 Patients journey through the ED**



**Figure (3) new Information Technology System**

# VI.    CONCLUSION

The use of information and communication technology will continue to dominate all businesses around the world (Coiera, 2006). The use of electronic health record (EHR) combined with HIE has been explored at the interface of primary care and hospital-based professional services. In this study, "Practices of Healthcare Information Exchange in the Emergency Department of a Sudanese Hospital" , we argue that the use of new Information and Communication Technology systems will improve health care services, and will increase patient satisfaction; bearing in mind the advantages of ICT and its facilitation for computerize systems in public Sudanese hospitals have not been utilized yet. We carried out an ethnography study (Fitzpatrick & Ellingsen, 2013), (Blomberg & Karasti, 2013) for more than ten months to understand the situation of health information exchange in Al-Rabat Hospital ED involving structured and unstructured interviews, observations, and the collection of documents. We argue that the use of Information and Communication Technology offers powerful tools and equipment for restructuring health care organizations and its services. Finally, we are convinced that the use of the proposed Information and Communication Technology system will increase the communication channels and reduce waiting times in the Emergency Department.

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