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A Review Of 28 Years Of Health Information Exchange Research: Achievements,Challenges And Future Work

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ABSTRACT
HIE as afield has been developed collaborative systems since its early days in the healthcare field. Many of the countries in the planet have a widespread aim, namely, to augment the health of their populations and to increase the quality of healthcare. In addition, most countries pay attention to make the health of their population better, even though it is very costly. Especially With the introduction of the ICT and its facilities, these countries make a huge effort to develop their healthcare services and to make certain that their citizens will have better quality of care. For this reasons these countries need to guarantee and assess the value of their investments, and intelligently assign the healthcare resources. It is critical to make the information about patients available for decision making process. CSCW research also, has been reviewed. We reviewed the literature from the HIE, CSCW, EPR, EHR journals and related conferences for the past 28 years. Were the CSCW and HIE papers are published. We focus on the contributions that have been presented by these fields and also, we reflects on challenges of CSCW and HIE in regards to implementations, design and use. We also reflect the lights on the health information infrastructure in the Republic of Sudan.
Keywords:—*HIE, CSCW, coordination, Electronic Patients record EPR, , Electronic Health Record EHR.*

I.   INTRODUCTION

Computer-Support-Cooperative-Work (CSCW) research has been started many years ago [1], [2] In this study we reviewed the literature for the past twenty-eight 28 years of CSCW research in healthcare including EPR, EHR and HIE. We did an investigation and a systematic study to understand the CSCW, HIE and their contributions into the healthcare sectors also we investigate the challenges in the healthcare related to work-follow from CSCW lenses. To practically achieved and designing a Frame Work for the HIE among Sudanese Hospitals and also design assistant prototype systems to support that work.

II. THE STUDY QUESTIONS AND ACADEMIC STATE-OF-THE-ART

This study revolved around two main questions: 1) what are the contributions of the the CSCW and HIE in the healthcare in the past 28 years 2) what are the existing practices of information exchange among hospitals in Sudan?

III.   LITERATURE REVIEW

This study outlines and produces a strategy for Health Information Infrastructure for integrating the public hospitals in Republic of Sudan and implementing Health Information Exchange system among them [3], [4],[5]. We also, defined a number of factors those are essential in the process of the Information Infrastructure for hospitals and the patients information and its circulation [6], including 1) EPR. 2) EHR. and methods including: 3) HIE System. And some important concept in the HIE such as: 4) Interoperability.

1. WHAT IS AN ELECTRONIC HEALTH RECORD HER?

EHR is a computer based solution, or platform, [7], [8], [9], [10], . That provides integrated information about the people in a single set or Record about individuals in all hospitals those engaged in the specific HIE system [4], [11] ,[12]. This record is used by the beneficiaries who they are physician and their team.

1.1. KEY benefits for PATIENTS:

- The patients will not need to repeat their health story every time they visited hospitals.
- EHR will be very useful especially for the people who cannot talk by them self. For example people who have a diabetic Coma.

1.2. KEY KEY benefits for clinician:

- Reduce the cognitive load from the clinician.

- Better information at the moment of care result in good decision making about diagnosing and avoid misdiagnosing and error.

1.3. WHAT IS AN ELECTRONIC PATIENT RECORD EPR?

An EPR allows people to communicate their symptoms, preferences and experiences as a 'health story'. It will collect and present existing health information into a single Record view accessible to consumers, carers and decision-makers [13], [14],[15],[6].

1.4. WHAT IS INTEROPERABILITY?

It describe the ability of two or more HIE systems to adapt and function together inside and across organizational boundary. In order to develops effective and advance healthcare system for individuals and societies [16], [17]. Interoperability describes the extent to which two systems and devices can circulate, share, and exchange the data [18], [17], [19]. The two systems must be able to access and exchange that data such that may be understood by a people [20], [21].

In healthcare, it describe the ability of two or more heterogeneous systems with different IT platform to communicate, share, exchange data together and use of this data [22], [23].

IV. PART ONE: HIE ,EPR AND EHR THROUGH THE CSCW LENSES:

Healthcare Information Infrastructures HII for Public Hospitals in Sudan is an essential step for civilizing health in our nation. It well requires a mutual effort and work by public and private health organizations[24][25],[20],, and intended by the Sudan government, the ministry of health. Change for the better health is what we call for our population, our children, our neighbors, or families, our friends and nation and for everyone over the planet. Its turn out to be matter of being for the people in developing countries, in Africa. However, it's not matter of quality of life for our nation in Sudan. It's a matter of stability and happiness within our communities, better health may outcome with improved and increased the productivity of industry and the satisfaction of the healthcare employees. The call for initiative was headed by the researchers who began to look at carefully for information infrastructure for health care sector, for instance, [26] Argued that humanizing health in our world demand strengthens four major domains for healthcare systems; which are: managing the personal health, delivery of the care, public healthcare and related research in health. [26], [23] declared lots of impediments results in lack of quality, as well as the difficulties of accessing the data, information and knowledge.

All those impediments and shortcoming can be eliminating by the implementing of a National Health Information Infrastructure because it is offer the connectivity and knowledge management facilities. NHII is defined as "There is an information and communication infrastructure to connect users with information and analytical tools and to enable management and generation of knowledge" [26] ,[14],[27] It is a method to mechanize every part of the manual work and shift from paper based system to computerize assisted integrated system, which can get better quality of health data, information and knowledge. Why Sudan should develop HIE? Information infrastructure is a foundation tool for any data intensive industry heath care industry, an incorporated infrastructure allows the beneficiaries to distribute and share the information about the patients among hospitals. New ICT system supposed to be built through shared efforts between private and public health organizations and investment. [26] argued that, building a framework for the security and privacy is the crucial factor for information infrastructure, in addition to the standards, incentives and funding [28][19]. Without hesitations, the Republic of Sudan must take the opportunity of the beginning of ICT and the internet facilitation. And begin building the HII for public hospitals i.e. Many researchers around the planet put the spot light on EHR or EPR because their significance as a major element in the process of exchange among hospitals. For instance [29],[30] presented a reviews paper in the literature of EHR area, included several questions as follows: 1) how EHR are defined? According to ISO "International organization for standardization" EPR can be defined as a warehouse on which patient information can be stored in electronic form and later exchange securely, and accessible by multiple authorized users. EHR contains historical, current, future information about the patients; the main purpose of this information is to offer continuing support for the decision maker people in healthcare when its need it effectively and efficiently and timely. To reduce the cognitive load and help in integration process of the hospitals work[30],[29].

EHR content and structure are classified into three types:
1. Time oriented EHR: on this type the data is given according to arranging time.
2. Problem oriented HER: on this type the notes are taken according to the problem,
3. And source oriented record: the content of the record depends on the method such as X-Ray.

EHR used in tertiary and secondary and primary healthcare organization. And accessed by number of users in the healthcare professionals such as physicians, laboratory technicians, nurses, administration office employees. There is number of data component recorded in the EHR [31]system where used and studied in this review paper includes referral, medical history in the past, present disease, life style, diagnoses, physical examination and tests e.g. laboratory test or radiology, procedures, treatment, medication and discharge. 6) What is the purpose of research in this field? the purpose of this studies reviewed is to identify the success factors of

implementing information system according to [32] there are six success factors are the system and it is quality, the information quality, user satisfaction, information use, organizational impact, individual impact and. This study has added to our knowledge: a general idea of the types of information built-in HER, an overview of the content of HER. As well, the role of nurse's IS. In the 21th century many developed courtiers started to build their own information infrastructures system in the healthcare sector, For instance, [33] used a mixture of literature review plus interview with experts from seven industrial countries to evaluate the condition of health information technology and decide the key factors for implementation of health information exchange HIE in seven countries: Canada ,United States (U.S.), Netherlands, Germany, United Kingdom (UK), New Zealand (NZ) and Australia. In this research, they defined HIE as" the interchange of clinical information such as clinicians' notes, problem lists, or other critical medical information from one hospital to another". According to this definition they beginning to collect the related data by searching the literature by using expressions such as "EPR", "HIE" "computerized records", "EHR" and also they searched Google-Scholar and other search engines. They were be able to contacted leading government experts managing the implementation of HIE. The findings showed that, implementing HIEs among seven-industrial nation is not complete yet. The result showed that exchange clinical information and health information is remains at a low level in each country. This study showed that most courtiers are in the beginning of implementing successful health information technology or heath information exchange. Many countries have beginning to employ information technology to guarantee and get better patient safety, and to get better quality of health care services. Canada not exception, Canada one of those countries, [34], [2] conducted a qualitative study to recognize the success of different face of the Canadian plan and Ways to enhance and improve the execution of EHR. In past decades Canada Health Infoway reveals a plan to carry out a national system of electronic exchange for health record among regional. They review ten years history of Canada's electronic-health plan via case study to evaluate the E-health in Canada as well as to evaluate its usefulness and efficiency and to detect ways toward the adoption of EHR in Canada. In this study they used structured interviews and case study approach. Also, they used questionnaire to gather the relevant data. The study found that, the patient registration and digital imaging as a significant achievement of health plan. In our conclusions, we think Canada has implement a national plan to electronically exchange of health care record by establishing a model for successful exchange health information among provinces to allow collaboration work among hospitals and making national framework, in the future Canada looking for establishing E-health policy-plan on the way to guide the implementation of health IT. On the road to address the key strategic priority of healthcare remedy and to make enhancement and to promote for electronic exchange of EPR

and clinical information toward these challenges, polices are needed to: (1) smooth the progress of sharing the clinical data among hospitals. (2) To make PHR accessible. Many countries have started EPR to guarantee and increase patient safety, to develop the quality of health services and to decrease the readmission to the hospitals. This may result in decrease the USA one of those countries, for instance, [35] they argued that the readmission to the hospitals is widespread and costly in the USA. To solve these issues the authors utilize HIE as a solution for readmission by facilitates the access to the patient clinical data and get better communication. The data were gathering via (RHIO) and exchanged through web based technology [35]. The study showed that the readmission after discharge is for the same cause within 30 days. And to assess the outcome of this experiment they use HIE as a primary independent variable. In conclusion, this research takes a sample of 6807 discharged patients the financial saving subsequent to using HIE in USA approximately about $605 472. The use of an electronic record exchange through HIE it decreased the readmission to the hospital and financial cost. Make use of of HIE system make the information about the patients obtainable, complete in time and complete medication lists. At the present, in Sudan there is no e-health to manage the health organizations services and there is no connection among Sudanese hospitals. This study showed that implementing HIE in hospitals can rescue a lot lives and decrease the relevant cost. Also, accessing the patient's data from external hospitals result on enhancing the care of patients in the emergency department, For instance, [36],[23] argued that in the fragmented healthcare system the medical employees strive to entrée to patient data from outside the hospital [37] In the emergency department which was treated in another hospital timely. They used information from big academic medical center toward achieve their objective and to access the full information about patient they were used HIE. The findings showed that, there is no direct link among the data retrieved from HIE to ED, but using HIE is more rapidly to access the patient data from outside organization. [37] Conducted research in Northern California comprises eleven hospitals that use common EHR vender (Epic Systems) and it is related HIE platform (Care Every-where). The eleven hospitals engage in this study be used (Care Every-where). They gathered the relevant data from two sources; (1) Self-reported data that is collected from chief medical information officers and other leaders (2) from eleven collaborative hospitals. In conclusion the applying of auto-querying without patient permission in HIE can have a significant influence on the HIE by rising the exchange degree. [38] Argued that there is abroad agreement that HIE is intended to transferring electronically the patent health information across organizations to enable better and more efficient care. On this study they used data from different hospitals in the USA to assess the relation between the hospitals that involved into HIE and the market dominance by EHR in the period of time from 2012 and 2013. The study showed that there is a relationship between EHR and HIE, also there is a great

agreement that EHR is fundamental component for HIE. So the results came as concerns of policy maker about the relationship of EHR vendor's dominant and their ability to facilitate or impede the diffusion of HIE. Also, the results showed that the hospitals that used system of dominant vendors (Epic) engaged more in HIE, conversely the hospitals that doesn't. [39], [23], [40] Argued that Electronic exchange of HI across organizations is expected to improve and enhance the quality of care and reduce the relevant cost. The important element to achieve this is interoperability. Interoperability is defined as the ability of healthcare organizations to exchange the heath information electronically among them. A number of factors play role on that including concerns about security of exchanged information. The tension between expected benefits of interoperability of health information and breaching of patient information, the research proposed an information security control theory to explain this tension. They used qualitative research approach as method. Also,. Semi-structured interviews are conducted personally. Documentations are also gathered as well as various version of the security policy. The result showed that the proposed theory offers a useful framework through which to realize the information security policy. In our conclusion: interoperability in health-care information among health organizations and vendors becoming crucial to get better quality of the. However, the secure of health information is vital to successful of HIE and will rise the participation of health organizations and the patients. Like many other people based professions communications skills are essential to medical practice employees also. For instance , [41] spots the light on the new interaction modes and software that capable of interpreting and recognize the face expression, emotion and voice to be use in soft skills training in the medicine field, in order to make better doctor patient communication. This is crucial for the cure process and to better treatment, so more subtle social skills are needed. The primary focus of this study is to use E-simulation to develop social skills in the medical context. However, according to the recent study undertaken by European consortia to inclusion media supported social skills in the medical care this requires both theoretical and case study framework to assist their development (Anderson et al., 2017). Soft skills are to enhance communication exchange between medical staff and patient by using learning devices to train soft skill. The planned Marina and top-staff projects were used affective computing. [42] Has defined affective computing as the types of computer applications that deal with emotion. [43] Raised the awareness that emotion can interfere with mental performance and learning. There is strong need for the communicative mode from the point of view of practical and scientific to increase the effectiveness and communication between medical staff and patient, to have positive impact between patient health and recovery, to help the patient to get realistic about what will happen to them in the future and to the reduce cost of medical instruction. According to top-staff project there is challenges of communicative between the medical staff and the patients'

interaction, such as clinical protocol need to be appropriate managed, the time span on communication is unpredictable and also there are a number of pedagogical issues. The overall objective of E-simulation development is to provide software or learning system for training soft skills focusing in the healthcare context [41]. In conclusion soft skills training is strongly recommended for the physician and nurse practitioner with particular focusing on communication and emotion management skills because it's vital to cure process and patient satisfaction. The use of ICT application for to training individuals for managing their emotions in interpersonal communication [44].

V. PART TWO: CHALLENGES OF "HIE" FROM THE CSCW LENSES

Information Infrastructure has been recognized as a potential problem in the workplace that deserves serious attention. As far back as [45],([2]have- argued that healthcare is making huge investment in information system and IT like Picture Archiving Communication Systems (PACS) and Radiological Information Systems (RIS). In-fact, to implementing such systems in hospitals has been problematic [46], [47], [48], [19] and where the hospital information systems are in use the benefits gained from them are low and far below what has been expected. They identify a number of challenges and problems related to hospital information systems and to deal with those problems [49], [35]), [2], [46]they consider it as "work oriented infrastructures" (EPR) has been since the sixties, but are still not working well even in the developed countries, especially in the large hospitals due to the problems of standardisation, because the standard is much needed. For both work oriented and the kind of infrastructure. The aim of this study is to get better understanding of the design challenges that associated with implementing (PACS) and (RIS) systems. Bearing in mind that, the complexity of interdependency between technology and medical practice in increase by existence of new medical technology and new illness. To reach their aims they used ethnography studies which has becoming widely used in the information system (IS) and Computer Support Cooperative work (CSCW) fields. Several research methods used also on this study for data collection including, workplace video recording, interviews, unstructured interviews, observations and an integration, social interaction. [15] found that there are a major challenges for design of information infrastructure including the following: 1) Standards: The standard means that, in the network that linked to other network the operation must operate smoothly and in convergent and aligned way, and share the same communication protocol. This means that, the designing infrastructure required defining standards protocol including communication protocol and coordination artefacts'. 2) Momentum and Irreversibility: The great number of actors in the workplace within the great number of components is more important for standard, in other hand when implementing standard in larger networks makes it harder to change the networks, because the networks are linked with the

same sharing standards. 3) Installed base blowing and gateways as its starting point [45] . According to [45] the design of HIS has lot to learn from development of classical infrastructure. They are also argued that defining shared standard for exchange the medical information is strategy for building work oriented infrastructures that has proved to be very problematic. As we pointed above there is challenges related to design of information infrastructure [50] ,[51]. [52] had studied the coordination and cooperative and they pointed challenges of designing related to collaborative work by discussing the relationship among representation and information using Ethnographic study as a method. One of the authors conducted ethnographic fieldwork at the ward over a period of two months, 28 days of five to six hours of fieldwork observation was carried out. Interviews were conducted lasting 40 hours with 20 nurses and 12 physicians. Also, notes were taking using hand written and wrote out in the prose.

The researchers found that, from their analyses for the hospital wards, there is a number of issues such as: redundant of data, decoupling of representation of information, linking and blending the digital and physical world Linkage, bringing the 'Object of Work' back to the real world and privacy issues [51] access and sharing data is issue across various technical platforms [46], institutions, disciplines and across long periods of time. [51] Explored another barriers related to the system design included the complexity of using the system, they reviewed the types of interventions that been implemented in hospitals settings in order to enhance the clinical communication. They discover some proof that employees recognizes improvements in communication interventions,

given the serious nature of the communications technology designed to enhance communication among clinician's, outcome measures should include measures of patient-oriented outcomes and efficiency for physicians. In conclusion they used comprehensive methods such as reviewing references lists and searching for related articles to ensure articles were included in their research. Yet, the quick evolution and adoption of new ICT could result in delay and time consuming in the Implementation, evaluation and publication of relevant studies as well. There may be publication bias as they restricted to peer-reviewed articles. However, given that their findings showed a general lack of high quality evidence it is unlikely that unpublished or non-peer reviewed articles would change these findings.[53] They spot the light on the persistent challenges and new strategies for HIE in United State of America such challenges include; patient safety [54],[7],[55],[56] and quality problem when the patient is handoff among the health providers that they are failed to share the patient information. The policy creator, researchers and industry professional identify that information exchange (HIE) as solution to this problems. The authors addressed history problems and their subsequent lessons of (HIE) for increasing the probability of successful meaningful (HIE). 1. Community health management information system History: The Hartford Foundation started (CHMISs) through the donation to seven cities and states in 1990. However, CHMISs

had two problems the primary one is that the lack of affordable and effective technology, CHMISs occurred before the advent of new and cheap reliable high-speed internet technology, also CHMISs had a security problem and privacy concerns. The second problem is that the integration between hospitals was never achieved, the lesson learned from this problem is that the need for a clearly defined purpose and effective political support.

2. Regional Health Information Organization History: RHIO is Facilitate the interoperability of data among service providers within a geographical area to achieve more efficient and efficacies health care (Joshua R Vest). The problem of RHIOs is that the main barrier to increasing the number of HIE and RHIOs is the lack of a sustainable business model despite of the new technology the RHIOs steel need for data integration, strong security, data storage, database for administration and provide technical support. RHIOs may require upwards of $12 Million for development and $2 to $3 Million in annual operating costs. The lesson learned from these problems is that the technology progress doesn't solve the problem of sharing the information automatically. 3. Strategies: Obama administration office has envisions making the healthcare services in lower price and high quality they discuss the concept of PHR and they considered the PHR has appeal as eliminates the cooperative work and because its handoff valuable information for educational directly to the patients. If the PHR application is hosted by RHIOs then there will be no doubt that all the barriers will disappear and complete venders will participate even if the PHR is maintained by third party such as Google or Microsoft. Another strategy is to consider the PHR as public goods. In conclusion they suggest the following strategies for continues development of HIE in US health services, First adopt and improve business model and keep those that are primarily focused on incremental cost savings to providers. Second do not separate the public health benefits from healthcare benefits, third insure that HIE used the best and secured technology for the information exchange and Fourth with federal government collaboration and back hearten the US to be the primary geographic unit for HIE activities. The call for action was headed by the researchers who began to study the issues and barriers that impede the progressing of information infrastructure in healthcare. For example, [57], [58] argued that the infrastructures phenomena has been explored by the field of science and technology studies(STS) [57] the infrastructure exists in the background it's invisible. In addition, the large-scale information infrastructure projects or the Cyber-Infrastructure aims at supporting the community digital services but this type of projects has two main associated issues the first one: sharing the information in the sense of public good this might lead to breaching the privacy [52], [57]. The second issues are the idea of sustainability of supporting research over the long time. Although heterophony in Cyber-infrastructure development is major issue related to the system access, information exchange, redesign, update and maintenance of the system. Another issue rose by [42]and they considered as

design problem is that how to build ontology (build ontology means gathering the domain knowledge and translate this knowledge to machine knowledge) and how to describe data with metadata. By the existence of the internet new issues of information infrastructure become visible noticeable issues include: issue of data and resource sharing, issues of database query, community standards and data spaces, domain knowledge repository and ontology's ontology's [58] [57]. Since 1960 the healthcare field and its organizations has been seeking for establishment of integration information infrastructure with multiple objectives and aims For example, to decrease the redundant information, seamless integration of artefacts' to raise the efficiency and effectiveness of care. [58] They analyzed the infrastructure in healthcare using ethnography studies and combined methods by including observation, semi structured interview, and documents as a methods to generate the study data. They described the challenges evolving information infrastructure and found that standardization and integration is the major and central challenges. Also they found new form of errors emerge by Appling Electronic Medication Module including transmission errors, and sometimes clinician uses each other's login [52];[34], [60] argued that it's very hard to implementing a new technology in the healthcare settings diverse and locally located. They point to the several ways in which new technology results in purposed and unintended organizational consequences. In short, planning achievement and using technology include complex socio-technical defy and the CSCW field has made a contribution in mapping out the complexities of coordinating daily activities and documentation practices among health-care staff. However, the healthcare encompasses many of professional groups and services this added complexity to the coordination. However, [61] argued that the starting point for this special issue on CSCW and dependable healthcare systems is the recognition of 'dependability. In conclusion they found that most of contributions could be categorized as workplace studies and that the majority of design prototypes are focused on smaller scale interactions, though most studies do offer implications for design. However, despite significant development and efforts bring this right has demonstrated to be a challenging mission. The causes of the issue are ganglion and diverse. Although many software products have been built and acquired from heterogeneous sources during a long period of time and the systems have differences in implementation technologies and architectures. Generally, CSCW has strongly concentrated on the rolled up protocols of comprehension cooperative work and designing material to support that work. The amount of CSCW in healthcare studies is that they share a healthy understanding of the skilful situated practices in the delivery of healthcare. However, these studies resulted respectively in the design and deployment of a new planning system. They argued that moving to (EPR) in hospitals, tuning is one of the reported features of the (EPR) is the chance to catch the data in more construct formats and to backing standardized clinical workflows. However, However, there is

a problem with information that does not fit into the official electronic record. They argued that one of the main contributions of CSCW research into health care is attention drawn. Expanding contexts of healthcare work poses challenges for integration and standardization and larger-scale vendor driven initiatives. Care is also expanding out of clinical settings into people's homes, bringing yet further challenges. However, expanding contexts can also refer to the expanding scale of ICT implementations. They argued that one of the key performance indicators and CSCW research contributions in health care is the benefit derived. Develop the situation of healthcare work demonstrate issues for integration and standardization and larger-scale vendor driven initiatives CSCW problem [62]. Self-evidently, society's dependence on computer-based systems continues to increase while the systems themselves embracing humans [62],, computers and engineered systems become ever more complex. Workplace studies typically focus on a single setting making it difficult to assess the generalizability of the finding. People routines models and ranking systems are an integral part of processing information such as computers Ethernet cables and web protocols [58].

VI. ANALYTICAL AND METHODOLOGICAL APPROACHES

Methods for this study include Ethnography Study [34],[60], an interviews and observations, surveys. We did an observation study and an interview with the relevant actors that will be involving in our future project and we observed the emergency response in Republic of Sudan in order to get an idea of the present state of emergency response to implementing electronic exchange of Healthcare information among public Sudanese hospitals. Also we formulate a thesis of key challenges. And we wrote a scenario concerning those involved in the emergency response professional as well, as doctors and registration employees and laboratory technician. Then we did developed a new scenario for the new map of HIE.
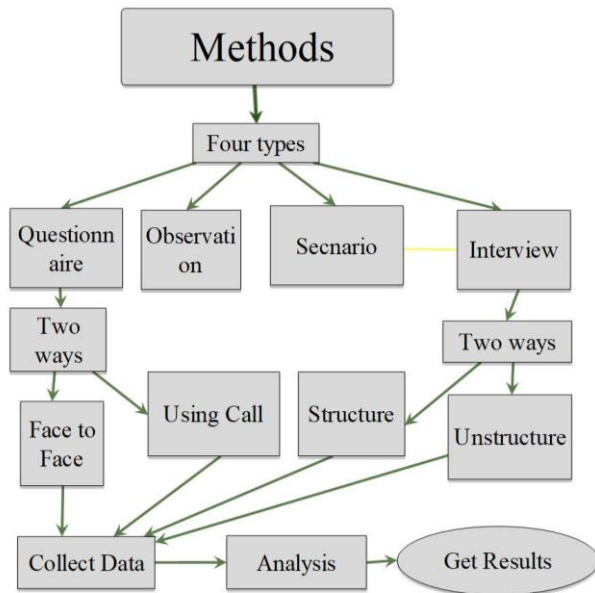
FIGURE 1 RESEARCH METHODS

VII.   ACCESS TO THE FIELDWORK SETTING

In term of entrée to the fieldworks setting, we contacted appropriate actors in the area of healthcare and Ministry of Health in Republic of Sudan. Some of actors' are doctors ,hospitals managers, technician and finally nurses, all those actors are alert of our aim and are now awaiting more information for further development.

VIII.   ETHICAL CONSIDERATIONS

All moral and ethical considerations will be in accordance with the existing guidelines of the (SUST) Sudan University of Science and Technology. This includes ensuring the quality and integrity of our study in seeking informed consent and respecting the confidentiality and anonymity among our interlocutors.

IX.   FINDINGS AND DISCUSSIONS

The previous researches say that; (HIE) can increase the effectiveness, efficiency and quality of the healthcare services. And it can provide help for the medical staff and improve the medical process. Now a day's the adoption of HIE is increasing and HIE is diffusion around the world. However, the previous studies say that the implementation of (HIE) is not complete yet in any country in the world. However, there are a number of countries they have started the a doption of (HIE) compared to the situation in the republic of Sudan which is an African country and its classified in the area of developing country, the work of implementing (HIE) has not started before this study. The purpose of this study is to fill the gap in the literature of (HIE) in the republic of Sudan and to

design a plan or "frame work" for the adoption and implementation HIE among public Sudanese hospitals.

- CHALLENGES:

The study found that one of the Challenges that will face the adoption of HIE in republic of Sudan is that: some people think sharing the patient information between hospitals it will leads to privacy breaching of the patient's information. But in other hand it's necessary to share the patient information between hospitals because it cans safe patient's lives. The ethnography study through observation in Republic of Sudan showed that the medical staff are agreed it's difficult to find the patient's medical record for two reasons: the first one is that it's difficult to search about patient in the manual system and the second reasons is that: some patient doesn't have patient record at all and this is an opportunity for our new proposed project HIE. Because it's main purpose is to make the patient information timely accessed, available and secured.

Bearing in mind that. On one hand, the loss of medical records leads to medical errors. in other hand HIE will make it easiest for the medical staff to retrieving the information about the patient from computerize database quicker. The challenges will be how to convince the Sudanese government to support and adopting HIE to improve the healthcare services and increase its efficiency and effectiveness and also reduce the cognitive load from medical staff.

X.   CONCLUSION

In our conclusion, computer-based patient records and the systems in which they function are becoming an essential technology for healthcare[63] , [64],[19] because the information management challenges faced by healthcare professionals are increasing daily. It is important to understand the potential influence that HII for Public Sudanese Hospitals (HIE) can have on medical staff daily activities and work. Many studies indicates that the quality of HIE systems including attributes such as effectiveness and control and reliability provide complete and accurate information about patients for medical staff. It seems that using (HIE) helped administrators, doctor and laboratory technician to identify and eliminate ineffective activities involved in the patient process and supported medical staff' daily practice, by providing complete essential data to support optimal patient care. Unfortunately in our country Republic of Sudan we do not have an Information System to mange and store the populations' information. As we mentioned this study aims to build HII for Public hospitals in Sudan HIE. For this reasons we made a systematic review in the literature using key words for search like "HII" , "electronic patient record", "electronic health record" and HIE" to find answer for our research questions. Also, we will use ethnographic study in two parts, for part-one we used questionnaire, interview, observations, and

investigations, note-taking and recording interview. On part-two we used the design methods (e.g. personas/scenarios and Mock-up) Also, we well use ethnographic studies in the future work as a main method to achieve the study goals.

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