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Short Communication

How Can We Develop a Standard Interface That Easily Integrates with HL7, Boosting EHR Interoperability?

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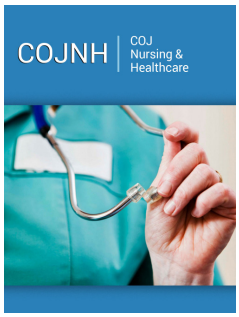

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Abstract

Background: It appears that a systematic strategy that includes the basic underpinnings of health care, from systems and technologies to clinical understanding and workflow processes, is required to achieve the next great leap in improving quality and safety. To make meaningful progress, health-care systems integration is essential. However, to provide interoperability in EHR, systems must support all versions of HL7. Software companies and healthcare organizations are still having trouble integrating HL7 with multiple interfaces. Thus, a standard interface or platform is required that easily integrates with HL7 boosting EHR interoperability.

Methods: Basic Modelling Interface (BMI) interoperability standards will be the focus of this research. The research plan proposes a qualitative research approach that includes clinicians' interview and a panel discussion to characterize the information flow models. Qualitative research using a thematic analysis of semi structured interviews will be conducted in the proposed research plan.

Results: Gaining the HL7 standard is insufficient for integrating EHR with diverse apps or software in use, thus clinicians' willingness to adopt a common interface is critical. Medical practitioners and software vendors agreement required to develop an API that tackles HL7 integration issues and EHR interoperability. Planning techniques for dealing with HL7 issues and doing coordinated testing can help identify and install HL7 standard interfaces successfully.

Conclusion: The proposed research plan will help us to create a standard interface for HL7 integration which will benefit clinicians, healthcare professionals, and groups such as patients, healthcare authorities, and EHR vendors. Lastly, reducing or eliminating healthcare concerns will help the economy, ecosystem, and society in both concrete and qualitative ways.

Keywords: Electronic health record; Interoperability; Software; Healthcare; Information systems

Abbreviations: EHR: Electronic Health Record; HL7: Health Level Seven; IHE: Integrating the Healthcare Enterprise; V2: Health Level Seven Version 2; API: Application Programming Interface; CDA: Clinical Document Architecture; R-MIM: Refined Message Information Model; HIE: Health Information Exchanges; LOINC: Logical Observation Identifiers Names and Codes; TAM: Technology Approval Model; PHI: Protected Health Information; COVID-19: Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2); PU: Perceived Usefulness; PEOU: Perceived Ease of Use; A: Product's Attitude; BI: Behavioural Intention; GP: General Practitioner

Background

Despite a growing awareness of risk across the health-care system, advancement in quality of care has been limited. The majority of quality improvement attempts overlook a broader opportunity to improve and rethink the health-care ecosystem. To make the next great jump in enhancing quality and safety, it seems that a systematic approach that encompasses the basic foundations of health care, from systems and technologies to clinical understanding and workflow processes, is required. To make significant advances, a systems integration in health care is required [1]. Interoperability of health-care information systems is a key topic in medical informatics. It is vital to increase life expectancy, decrease medical errors, and provide more medical information to medical staff. Standardized communication is required

to achieve interoperability of healthcare information systems [2]. Having access to reliable epidemiological, medical, and laboratory data early in an epidemic is critical for enhancing public health decision-making [3].

Interoperability is aided using established standards that define the syntactic and semantic meaning of data. Consistent, implementable standards improve health technology development initiatives by lowering risks, costs, and timelines. Despite the efforts of organizations such as Health Level Seven (HL7) to promote some integration in healthcare, general interoperability has yet to be created. Despite significant resources spent to date by business and territorial health institutions across the globe, the goal of healthcare interoperability has remained unknown [4]. By allowing access to all relevant information now of diagnostic decision-making, EHR implementation is expected to improve care quality. On the other hand, by enhancing productivity and minimizing test duplication, it is also intended to improve the efficacy and efficiency of the entire healthcare system. Standards interface are required to ensure technological interoperability because EHR needs compatibility between several heterogeneous distributed systems. For semantic and functional compatibility, a framework for applying standards must be designed. As a result, the Integrating the Healthcare Enterprise (IHE) Act was enacted. IHE employs a system in which healthcare providers address the main interoperability difficulties, and healthcare vendors and information technology experts agree on a solution based on defined standards for each highlighted interoperable obstacle [5].

Research Question

Researchers from across the world have been focusing on HL7 standards and attempting to solve interoperability issues within the Electronic Health Record (EHR), which could be valuable in these rare COVID-19 situations. The specifications of interoperability standards are usually imprecise, which can lead to application variances. It's vital to test for compliance and interoperability to ensure that data is shared correctly. The issue becomes more challenging since there are several standards for each level of interoperability in the EHR sector, as well as the fact that healthcare circumstances are substantially more intricate.

HL7 is required in healthcare informatics to achieve cost-effectiveness and efficacy. There are various types of HL7 standards, the most common of which being V2. However, to provide interoperability in EHR, systems must support all versions of HL7. HL7 has a lot of advantages and is quite useful, but it also has a lot of drawbacks. It is possible to generate meaningful answers to the challenges with proper planning and strategy in place. Users must produce HL7-CDA (Clinical Document Architecture) implementation guidelines, text documents that act as scenario-standards by constraining the Refined Message Information Model's standard (R-MIM) to the particular scenario, to allow interested parties to understand the final structure of a CDA document. Now, HL7-CDA may provide entities with partial syntactic and semantic compatibility [6]. However, software companies and healthcare organizations are still having trouble integrating HL7 with multiple interfaces. Because of HL7's flexibility, which allows various contexts to use different versions and elements of the protocol, connecting across unrelated systems can be problematic. For HL7 to function properly, software platforms must have a limited interface with data gathered from electronic health records and kept in them. Each application that interacts with the upgraded version will be affected if interfaces are added or removed. This may cause the system's operation to be disrupted. By modifying each endpoint for the upgraded app, proper HL7 implementation may be facilitated. Additionally, all software suppliers with app-related interfaces should upgrade or change their endpoints [7].

The research question is: "How can we develop a standard interface that easily integrates with HL7, boosting EHR interoperability?"

As a result, this study addresses several different sub-questions, including:

A. Is creating a pilot standard interface the best way to achieve smooth HL7 integration? What design approaches might a pilot standard interface take?

B. Is there any indication that clinicians will be accepting the standard interface?

C. What data gathering mechanisms are available for the standard interface's design?

Methods

Basic Modelling Interface (BMI) interoperability standards will be the focus of this research (e.g., Logical Observation Identifiers Names and Codes [LOINC], Health Level Seven [HL7] standards). The interview will be conducted by steering the conversation into BMI standards that are more important for receiving clinical information systems' high-level interoperability [8]. This will aid us in deciding on elements to consider while designing a standard interface that is compatible with HL7. The research plan proposes a qualitative research approach that includes clinicians' interview and a panel discussion to characterize the information flow models.

One or more of the following ways will be employed in the methods I propose to collect data from clinicians:

a) To collect data, share and promote the HL7 research project through networks of the healthcare industry, healthcare bodies, and universities with an interest in EHR.

b) Data to be collected in an electronic format-Emails will be delivered to specific groups, as well as electronic notifications, publications, and personal invites to participate in local health resource communities.

c) Interview-Data will be collected through interviews with physicians and General Practitioner (GP) offices.

d) Presentations-The study will employ a variety of presentation techniques, each of which will be provided in a unique way.

e) Social Media-The research will use social media platforms and Twitter accounts will be used for promotion.

The usage of social media will prove to be the most effective way of data collection. The HL7 logo attached to electronic communication format, on the other hand, will be distributed to clinicians, promoting data collection more than the other ways. To encourage practitioners to use these data collection methods, the government and other healthcare organizations should conduct more study in this field of interoperability of HL7. The project's findings will show me things that will aid me with my research. One is that physicians will become more knowledgeable about the technology available to them, such as EHR, HL7 and how to use them to collect and submit patient health information to healthcare organizations. Furthermore, this project was not created with the intention of collecting and analyzing data from a single element of health informatics. Instead, it was designed to be thorough by gathering HL7-related healthcare data and improving EHR interoperability.

Results

Clinicians are more inclined to accept and use HL7 applications in receiving and collecting data if the technology is perceived to be simple to use, according to research. When clinicians think that technology is without effort, they achieve ease of use. Earlier studies reveal the same findings of ease of use of HL7 in EHR. The clinicians achieve this because the use of interoperable technology improves the collection and reporting of health information, which influences standard interface acceptance. Finally, gaining the HL7 standard is insufficient for integrating EHR with diverse apps or software in use, thus clinicians' willingness to adopt a common interface is critical. Clinicians who have a positive attitude towards adopting standard interface for reporting and collecting health data are more likely to use it. This is an approach that has been suggested. After the research is completed, precise statistics and numbers will be gathered.

Discussions

I plan to do qualitative research using a thematic analysis of semi structured interviews [9]. This method is best for studying Health Information Exchanges (HIE) demands and processes where there has been minimal prior research since it is more likely to cover the entire range of relevant themes [10,11]. Clinicians' acceptance and use of software applications should be assessed and measured. The analysis and measuring of doctors' level of adoption of HL7 technology used a variety of theoretical analysis methodologies. There are a variety of models available, but I chose the Technology Approval Model (TAM) for my study because it has the highest user acceptance across the healthcare field [12]. TAM has been evaluated and proven to be effective after being used to assess user acceptability of mobile and software applications [13]. For similar experiments, UTAUT can be utilized instead [14]. TAM is primarily for individuals, although it can also be used in organizational contexts, whereas UTAUT is only for organizations.

There is few research on the use of TAM in the context of EHR interoperability. On the other hand, using TAM as a guiding framework in the analysis, allows researchers to learn more about the elements that influence physicians' adoption of the standard interface for collecting and receiving health data. Perceived technology usefulness, perceived usefulness, and attitudes towards use are all proposed in the TAM theory [13]. Two major variables in the TAM model determine an individual's acceptance of information systems [15]:

A. Perceived Usefulness (PU)-It's the extent to which a person believes that employing a specific system will improve his or her job performance [16].

B. Perceived Ease of Use (PEOU)-It's the degree to which a person believes that using a specific system will be effortless [16].

These two characteristics, in turn, have an impact on the product's attitude (A) towards use. Their attitude has an impact on their Behavioral Intention (BI) to utilize the instrument. In the end, all these criteria come together to decide the tool's real utilization.

The usage of interface engines as an HL7 integration solution is prevalent, although they have drawbacks. Interface engines necessitate the storage of PHI in a separate database, which can put data security at risk. Using healthcare APIs is one of the most effective approaches to cope with HL7 issues. The combination of an EHR and an API enables electronic data sharing without jeopardising PHI protection [7]. Using real-time APIs and a consistent model to standardize data integration will help manage the issues. API properly controls the HL7 interface, which shortens the HL7 implementation procedure and eliminates the waiting period [7]. Both Medical professionals and software vendors should come to an agreement on an API solution that addresses HL7 integration difficulties and EHR interoperability. The successful deployment of HL7 interfaces can be achieved by planning strategies for dealing with HL7 difficulties and conducting coordinated testing. End-user workflow can be improved by using such interfaces, which reduces the likelihood of duplicate data entering.

Conclusion

Clinicians, healthcare professionals, and groups such as patients, healthcare authorities, and EHR vendors will all benefit from this research. The findings can be utilized to effectively communicate healthcare concerns and epidemiological dangers to clinicians, healthcare providers and the government. The findings reduce or avoid epidemic diseases in some circumstances, while also increasing EHR interoperability in our healthcare industry. Reducing or avoiding healthcare concerns will boost the economy, ecosystem, and society in both concrete and qualitative ways. This study will add to the body of knowledge in the field of health information studies by examining the information and technology demands of clinicians, and software vendor groups, which have gotten little attention in the current literature.

Clinicians will have access to essential health information regardless of which EHR system they use. According to current literature, the healthcare industry collects a lot of data on EHRs, a collaborative pilot standard interface system, and technology tools (online applications or mobile apps) will let clinicians access essential health data wherever and whenever as per necessity and furthermore it will also help us addressing the security concerns

with EHR data more tactfully. We will gain a better understanding of clinicians' demands and how technology affects the healthcare environment by observing how they use technology tools. The evaluation's findings have the potential to serve as a future analysis for other health ecosystem research on health data and interoperability. In addition, this study will look at how clinicians accept, understand, and use technology, as well as how they respond to innovation. The healthcare industry is particularly interested in "research and development" in the field of HL7 and EHR, thus it is expected that this research project will pique their attention.

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