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Significance of Health Information Technology (HIT) in Context to COVID-19 Pandemic: Potential Roles and Challenges

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Abstract. Health information technology (HIT) refers to the concept of applying cloud-based services, internet, connected network, etc. in healthcare. It mainly utilizes electronic health records, information, and data related to the patients for providing the treatment and services in a more effective and advanced manner. This study attempts to propose roles and applications and identify the impact of the concept of HIT on serving the patients during the ongoing COVID-19 pandemic period. This paper also assesses the significant impact of HIT in the healthcare sector during the COVID-19 crisis. The medical decision support, e-sign-off tools, bar-coding approach, advanced medicine dispensing, e-patient portals, etc. are numerous data-sharing and network system-based HIT services. It has many capabilities to shift the working culture of medical facilities while serving and treating patients with a higher care level and impressive satisfaction, especially so during this COVID-19 pandemic. Interoperability and tele-healthcare have also become practicable with the proposed HIT approach.

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Keywords: Health information technology; HIT roles; COVID-19; pandemic; healthcare; coronavirus.

1. Introduction

The literal meaning of the *concept of Health Information Technology* (*HIT*) is about the utility of information-based technologies, tactics, applications, etc. in the healthcare-related services. In a broad sense, HIT is an approach that utilizes cloud-based database tactics to maintain records, information, reports, etc. related to the patients for the proper and effective handling of cases (Wei *et al.*, 2020; Rab *et al.*, 2020). HIT provides the facilities to the medical personnel for managing the umpteen activities, namely; prescriptions for the patients, creation of electronic health records, testing and analysis data, etc. (Li *et al.*, 2013; Xu *et al.*, 2018; Srinivasa *et al.*, 2018; Aceto *et al.*, 2020). It further creates and develops the quality atmosphere where the technology and the healthcare can interact with each other for any possible enhancement in the patient's care and satisfaction (Deimazar *et al.*, 2018; Xu and Duan, 2019; Park *et al.*, 2020; Kogan *et al.*, 2020; Shen *et al.*, 2020).

In the present COVID-19 pandemic, where medical consultation became quite tough for everyone, and especially for the patients, HIT has emerged as a very imperative game-changer by offering its extended services to the physicians, healthcare staff, patients, etc. (Khan and Javaid, 2020; Delen *et al.*, 2020). HIT aims at offering overall health control and monitoring of the patients through a systemized channel of information based smart applications (Da Xu 2013, Da Xu, 2014; Xu *et al.*, 2014; Liu *et al.*, 2018). Privacy of records, level of care, interactive consultation, proper communication, etc. are the principal features offered with the use of HIT concept in the COVID-19 pandemic (Xu, 2000a, 2000b; Richardson *et al.*, 2011; Mohan *et al.*, 2014; Bahl *et al.*, 2020; Hernández-Orallo *et al.*, 2020). Figure 1 explores all the data management classes in employing HIT in healthcare during COVID-19.

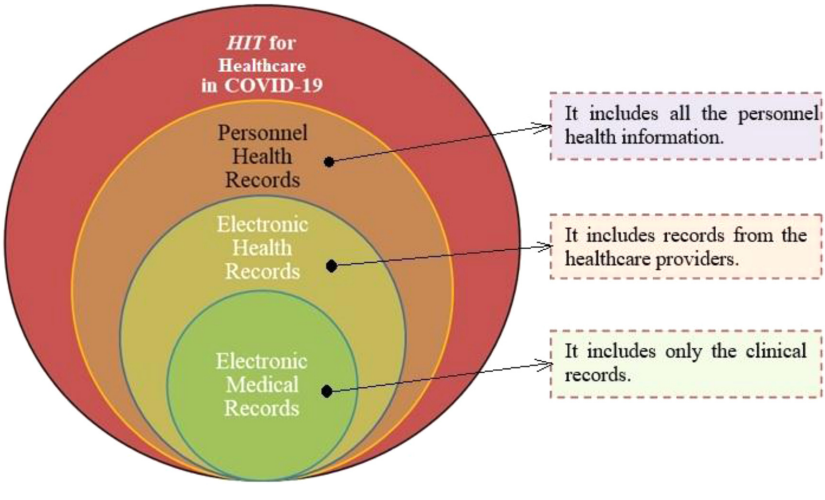

Fig. 1. Data storage and handling in HIT for healthcare during COVID-19.

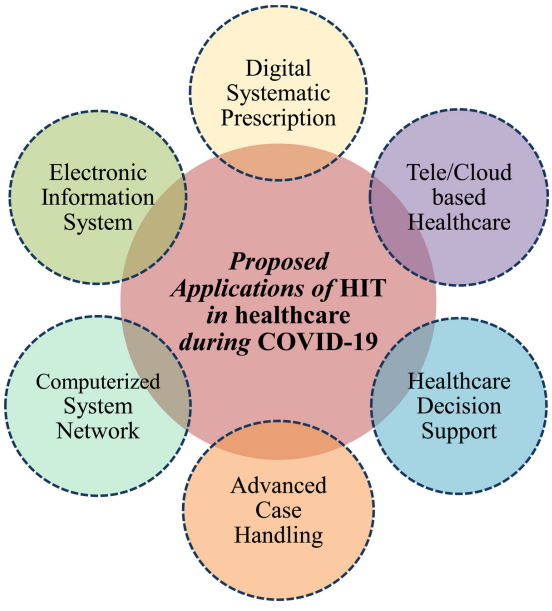

Fig. 2. Cyclic view of proposed services through HIT in healthcare.

2. Brief History and Background of *HIT*

The proposed methodology of HIT is fundamentally based upon the application of information technology for serving the healthcare and medical domain. It all started in the 1920s when the first case of medical records emerged. Other revolutions came into the picture, in the 1960s/1970s, when computer-related technologies started capturing medical professionals' attention by offering them the feature to maintain and share the healthcare records and information. The main boom had arrived in 2004 when US President Bush formed a particular Office of National Coordinator for HIT intending to harmonize HIT in the country (Xu *et al.*, 2014, 2018; Liang *et al.*, 2020; Wang *et al.*, 2020; Nishiura *et al.*, 2020; Roy *et al.*, 2020). The features and associated merits to utilizing the *electronic health records* become broadened afterwards. Furthermore, a separate act was passed for HIT for economic and clinical health (HITECH) in 2009. Figure 2 explicates about the suitable proposed applications of HIT in healthcare during the COVID-19 pandemic.

3. Need for the Present Study

The advancements in the broad domains of science, engineering, and technology have taken through several decades and are still moving on. The fundamental reason for this is serving the humankind in their daily routine life and in tough times. Therefore, we have planned this article to critically review HIT's concept and its methodology for providing extended services in healthcare during the COVID-19

Fig. 3. Proposed enhancements through HIT for healthcare in the COVID-19 period.

pandemic (Xu, 1994; Pradhan and Chawla, 2020; Gandhi and Singh, 2020). Here, tools, tactics, applications, etc. of HIT are much needed to be revealed in this epidemic time so that the patients can be supported and helped (Li *et al.*, 1991; Yin *et al.*, 2012; Suman *et al.*, 2020). HIT utilizes the advanced network-based techniques to offer services for the medical personnel, healthcare staff, patients, etc. in a more influencing manner (Qin *et al.*, 2020; Javaid and Haleem, 2020; Lite *et al.*, 2020; Sharma *et al.*, 2020; Tropea and De Rango, 2020). Figure 3 highlights the benefits of and aids in healthcare during COVID-19.

4. Process Work-Flow of HIT in Healthcare During COVID-19

The proposed HIT concept's effectiveness can be realized in healthcare during this COVID-19 time by adequately understanding its devoted process-flow chart. Figure 4 elaborates a process flow diagram for exploring the working culture/environment while implementing HIT culture in healthcare during this COVID-19 period (Singh *et al.*, 2020; Javaid *et al.*, 2020; Jung *et al.*, 2020; Smith *et al.*, 2020; Zhong *et al.*, 2020). It is all about the utility of the HIT techniques employed together to confront the epidemic more smartly and effectively.

The use of e-portals enables the survivors/patients to get all the facilities and services at the doorstep with small efforts (Khan *et al.*, 2020; Mishra *et al.*, 2020; Bahl *et al.*, 2020a; Jaly *et al.*, 2020; Vaishya *et al.*, 2020b). The upcoming and under-investigation technologies can also become an integral part or section of this process flow chart once they get settled and approved through medical association (Haleem *et al.*, 2020; Iyengar *et al.*, 2020; Vaishya *et al.*, 2020). HIT undertakes the virtual reality-based features so that the essential interaction between the medical

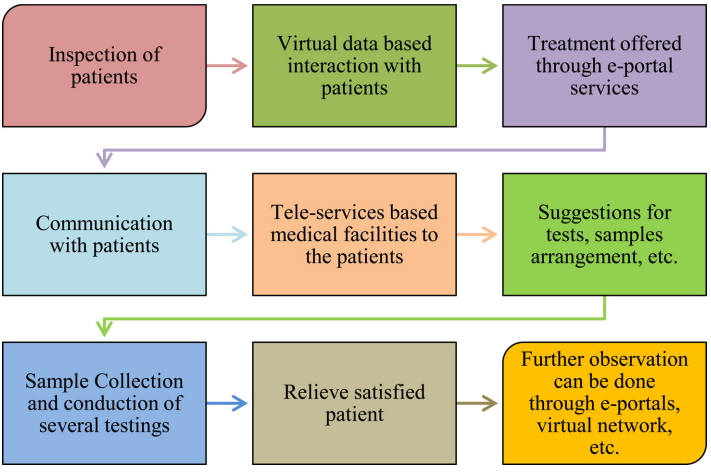

Fig. 4. Work-process flow for realizing HIT in healthcare during COVID-19.

professionals and patients can become much more accessible (Haleem and Javaid, 2019; Singh *et al.*, 2020a; MacLaren *et al.*, 2020, Baldwin *et al.*, 2020; Boccia *et al.*, 2020). It takes all work collaboratively to provide the patients with the utmost satisfaction in the tough time of the COVID-19 pandemic (Shams *et al.*, 2020; Imtyaz *et al.*, 2020).

5. Impact of HIT in Healthcare During COVID 19 Crisis

HIT concepts include various electronic-based-services, smart healthcare, EHR, etc. that enable the medical professionals, healthcare staff, and patients to come together to help and cooperate through several techniques (Jiang *et al.*, 2014; Yuehong *et al.*, 2016; Zhang *et al.*, 2019). The medical decision support, bar-coding techniques, e-portal services, etc. are a few of the majorly proposed tactics that offer specific services in healthcare during the pandemic period like COVID-19 (Spinelli and Pellino, 2020; Haleem *et al.*, 2020a; Iyengar *et al.*, 2020a; Singh *et al.*, 2020b; Yin *et al.*, 2020). In these proposed impacts of HIT, the support and services offered for remote patients are more vital and crucial. Table 1 reflects the proposed impacts of healthcare during this COVID-19 period in various ways (Zhou *et al.*, 2020; Murthy *et al.*, 2020; Liang *et al.*, 2020a; Adams and Walls, 2020; White and Lo, 2020).

6. Role and Applications of HIT in Emergency Healthcare Patient Care During COVID-19 Pandemic

In this COVID-19 period, HIT offers several roles and services in healthcare, which can be sub-categorized into different classes (Xu, 1995; Li *et al.*, 2008; Xu *et al.*, 2018; Yu *et al.*, 2020). Based on the study conducted in the USA during 2008, we identified that HIT facilities include the digital services for handling the data, reports,

Table 1. Impacts of HIT in healthcare during COVID-19 period.

Sl No.	Influences/Impacts	Description
1.	Conversion into Electronics-based Services to Patients	• Applying HIT enables the medical practitioners, staff to avail E-services, prescriptions, records, etc. in their daily routines. • Digitally save data and medical history of the patient.
2.	Medical Decision Support	• This HIT tool offers physicians to update the patient's records, information from time to time. • It ultimately helps to offer them better services to the end customers.
3.	E-sign-off tools	• This smart tool of HIT provides the facilities to share the data of the patient to another medical team, family persons, experts, etc. so that the further care of the patient can be maintained.
4.	Medication based on Bar-coding	• The bar-code-based HIT concept provides the proper identification and the verification of the medicine, treatment, etc. provided to the patient. • It works as a double-check for the facilities offered in healthcare during the COVID-19 period.
5.	Automated medicine dispensing tactic	• The automatic medicine dispensing method of HIT reduces human interaction, which is an essential need during COVID-19 time. • It also diminishes the chances of infection with coronavirus.
6.	Techniques for preventing surgical items	• HIT tactics are bar-coding, radiofrequency tagging, etc. • These techniques are becoming impressive to prevent surgical items using in healthcare. • The identification through these devices is a new research area in healthcare.
7.	E-patient portals	• During the COVID-19 period, it is better to avoid any face to face interaction. • HIT method provides online services to the patients during their appointments, information, time-to-time update, reports, analysis, etc. So, that ultimately the care for the patients becomes improved and useful too.

Table 1. (*Continued*)

Sl No.	Influences/Impacts	Description
8.	Tele-based-medicine	• In this case, HIT offers services to remote locations with the use of teleservices. • It helps the stuck patients in remote locations to help them out in offering treatment, prescriptions, information, etc. through the virtual reality application.
9.	Synchronous telehealth	• The extended use of virtual reality philosophy becomes essential here. • This virtual interactive platform enables the patients and the medical personnel to be in a communication network for any needed information and discussion. • The prescriptions, treatment, precautions, etc. can easily be given through this platform.
10.	E-incident reporting	• In collaboration with the electronic health records, electronic-based incident reporting performs it effectively when it comes to highlighting any impactful incidence that happened. • The same can be reported using a web network system by any healthcare professional, staff, etc.

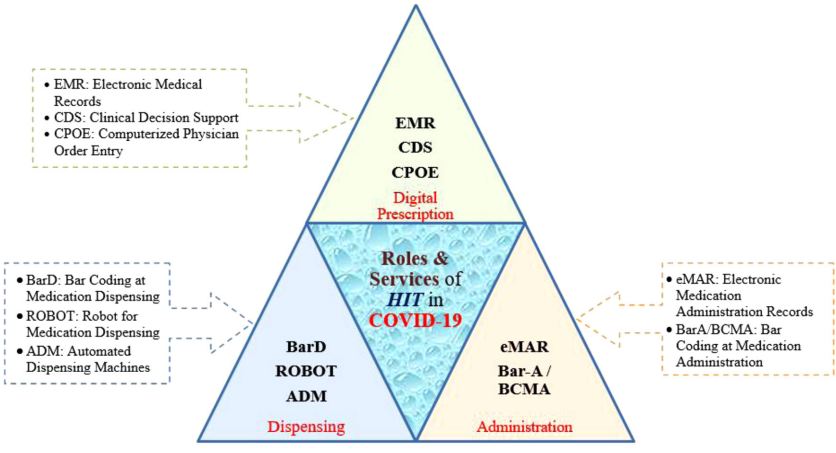

Fig. 5. Roles & services of HIT in healthcare.

information, etc. as well the advanced medical services to the patients (Zheng *et al.*, 2016; Coiera *et al.*, 2016; Ancker *et al.*, 2012). It starts with the digital prescription to the patients and moves ahead with the electronic-based medicine dispensing facilities and also covers the medical administration record handling through the properly planned network of advanced system channels (Hersh *et al.*, 2018; Askari-Majdabadi *et al.*, 2019; Jidkov *et al.*, 2019; Vaishya *et al.*, 2020a; Sayeed *et al.*, 2020). Figure 5 explicates the various proposed roles and services that enable the healthcare professionals and staff to treat patients in the COVID-19 period impressively. All these facts further make a positive environment for creating *interoperability* feature. The typical cases can be treated in collaborative terms or handed over to another physician for better treatment with proper and complete patient information sharing.

7. Contributions of the Study

This study aims to provide extraordinary care to healthcare services to patients by utilizing the advanced cloud-based network and applications during this COVID-19 pandemic time and afterward, too. The definitions, basics, fundamentals, concepts, roles, impacts, and work-flow of the health information technology approaches have been discussed and elaborated. The patient with healthcare troubles, handle distinctive challenges, as its motion is constrained due to their sickness or due to precedent operation of fractures, joint substitution, spinal and arthroscopic operation, etc. The face-to-face communication with their physicians might not be promising to evade the chances of infection and contagion with the COVID influence. The study also proposes several means to get the medical facilities for the healthcare survivors through HIT. It also takes care of all the concerns and treatment regards associated with the healthcare domain. The soreness in healthcare

sufferers is often intolerable; consequently, there is a substantial societal requirement to bring/adopt some smart system-based service and tactics; those possess the capability to heal-out and support the patients in this pandemic COVID-19 framework.

8. Challenging Issues and Future Scope of the Study

Along with several roles, impacts, and applications of the HIT concept, there are some challenging issues, when realizing this approach in providing treatment to the patients during the time of COVID-19. These issues, including global/local acceptance of interoperability culture, depend on the medical professionals and hospitals' agreement to agree upon sharing the forwarding/referred patient's records, data, etc. Smart and connected healthcare network is always challenging for implementing HIT facilities (Hemmat *et al.*, 2017; Rioth *et al.*, 2016; Massey *et al.*, 2020; Tanaka *et al.*, 2020; Guo *et al.*, 2020). Data safety and security are other points where proper safeguarding needs to be designed for the highly confidential information shared in the cloud-based channel. In offering useful instructions to the medical practitioners, the future directions should be explored to generate additional sessions for developing auxiliary medical analysis, more objectives to be set-out for remote and impoverished places in this COVID-19 time, the differential analysis for indicator localization, joint & soft tissue assessment studies, etc. Future studies should focus on developing an excellent resolution for the stretching tactics, locking tactics for spines, thoracic manipulation, e-portal based prescribing for spine-related exercise, etc. New technologies are introduced to create advancement in the current scenario.

9. Conclusion

The proposed HIT approach seems a supportive tool for the patients in the current COVID-19 period. HIT utilizes a unique system of the interacted network for gathering the data, information, and reports. It employs cloud-based data-sharing platforms, where the needed person, physician, patients, etc. can avail the facilities. It enables the poor and remotely located patients to get appropriate treatment/services by having virtual interactive sessions with their respective medical professionals, healthcare personnel, staff, etc. The e-prescription, testing, reports, etc. further aid in the patients' HIT facilities, particularly remote areas. HIT enables the *interoperability* culture in an existing healthcare trend/atmosphere worldwide, and it is much fruitful to employ it during the tough time of the COVID-19 lockdown period. Tele-based medicine facilities are also one of the best impacts of the HIT for healthcare survivors during this pandemic. The proposed concept of HIT may help in tracking and monitoring of old-patients, persons in remote locations for their medical facility requirements. The challenging issues of information safety, security, and privacy should be major concerns in future studies on HIT for its proper realization in the existing healthcare system.

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