

**DIGITAL HEALTH INTERVENTION AND ITS BARRIERS TO UPTAKE DIGITAL
HEALTH UTILIZATION**

Mohd Ishaq, Ph.D. Scholar, Department of Social Work, Aligarh Muslim University, Aligarh, India
Dr. Mohd Arif Khan, Assistant Professor, Department of Social Work, Aligarh Muslim University,
Aligarh, India

Correspondence: Mohd Ishaq. Email: ishaqsw9518@gmail.com

Abstract

The use of digital health has increased worldwide but its increased uses associated with risk of digital divide and health inequality is caused by accessing ICTs services, socio economic and cultural determinants of health. In this paper various components (Telemedicine, mobile health, health information technology) of digital health system and barriers associated with it have been discussed. Mobile health, telemedicine and health information technology are the opportunities for universalization of health coverage and they have also helped in achieving the of sustainable development goals (SDGs). Telemedicine is one of the effective ways to disburden hospitals and enhance the utilization of health sector sources but it does not mean that it can cure all the health related problems.

There are some significant barriers like socio-economic, language, cultural, low digital literacy, policy and legislation and digital infrastructure are the creating hindrance in the path of digital health intervention. Age, gender, socioeconomic position, and location are just a few examples of many variables that might affect an individual's technology –oriented behavior so this kind of discrepancy is called digital divide. The health systems transformation from traditional to digital technological cannot be see only through a technological lens. Individual attitude, motivation and knowledge towards technology can affect the adoption of digital health. So digital health in a complex society may have positive and negative and mixed impacts on health care services. It is becoming more and more important to know the digitization of health care system is an opportunity for health system or it widen the health gap

Key words: Digital health, Telemedicine, Mobile health, ICTs, barriers, HIT

Introduction

The economically developing society has been demanding the excellent quality and scalable availability of healthcare services. Many problems are creating obstacles in the path of universalization of healthcare, such as high cost, substandard quality, and inequalities in terms of accessibility of healthcare services that are adverse to the current healthcare system. In this reference, the adoption of information and communication technology (ICT) is increasing in the healthcare sector to provide a solution to limited access to high-cost services. So, the healthcare system uses ICT services such as telemedicine, telehealth, and electronic and mobile health [1]. Information and Communication Technology (ICTs) is significant for achieving the Sustainable Development Goals, which has increased in developed and developing countries [2]. WHO adopted a resolution on digital health in the 71st World Health Assembly, acknowledging the ability of ICTs to enhance the accessibility, quality, and affordability of health care services; with this resolution, many countries are promoting the utilization of digital health services

Digitization of healthcare is happening at a tremendous rate, and a large section of society expects that the process of healthcare digitization will reduce the gap in the healthcare sector. But it may be left socially and economically marginalized and vulnerable people who do not access reluctant to use digital health [3]. Numerous studies have shown that people who lack health literacy cannot effectively use digital health solutions. Patients with low socio-economic status were unfamiliar with using the internet for information about health [4]. The adoption of digital health in low- and middle-income countries offers excellent prospects to enhance the availability, affordability, and coverage of essential health services and information for underserved groups. The

upward and downward accountability of the health system can be improved by digital health implementation [5]. The Sustainable Development Goals (SDGs) and the pledge to leave no one behind have been made possible by these opportunities. However, the effects of digital health on health services in a complex social environment may be diverse and can be both positive and harmful [6].

Technology usage also depends on individuals' behavior, so an individual's technology-oriented behavior can be influenced by many parameters such as age, gender, socio-economic status, and geographic location; this kind of disparity is called the digital divide. When the researcher examined the behavior of older people toward technology, it was observed that older people show less interest than the general population because they face difficulties in use, but it can be overcome by the instrumental support of relatives [7].

Definition of Digital health:

Several academicians have made consensus that digital health is using different healthcare technology to administer healthcare services to enhance the patient's health. In addition, Sonnier and Bauman have defined digital health as it helps in monitoring the patient's health not only to improve patient health condition but enable families to help in the monitoring of patient health [8, 9]. Robinson defines digital health as the use of digital media to change the delivery of healthcare services. In order to improve the effectiveness and efficiency of the delivery of healthcare services using technological tools and techniques such as information and communication technology, phone technology, and wireless facilities, it can also be defined as the electronic exchange of health information through connectivity. Examples of the digital health system include electronic medical records, medical journals, and video and audio conferencing for doctor's appointments or connecting to send feedback and transfer test results to doctors [10].

Components of a digital health system:

- **E-health:** E-health is application of the internet and communication technology to provide healthcare services.
- **M-health:** M-health uses mobile and wireless devices for health services.
- **Telemedicine:** Telemedicine uses information and communication technology for diagnosis and delivery services.
- **Public health surveillance:** It utilized for collecting data and information related to a particular population's health and area to make decisions regarding particular populations' health [11, 8].
- **Health promotion strategies:** The process of helping individuals to maintain and control over own health and family members is what is meant by this term.
- **Self-tracking:** Patient can monitor their health status like B.P, sugar level, heartbeat, calorie burn, etc., by adopting a different kind of health technology.
- **Mobile connectivity and bandwidth:** It makes it easier for medical providers to integrate their digital health technology to deliver ongoing care.
- **Social networking:** Healthcare professionals and patients can use social networking platforms to share health information [11, 12, and 13].
- **Health and wellness apps:** It is a mobile application used to provide health information to patients in order to make it easier for them to manage their own medical issues.
- **Electronic health records:** These records contain all the patient health information from past doctor visits, which can be provided to the health care professional(clinical and non-clinical) for making decisions about patient health.
- **Electronic medical records** are digital files that gather, store, and transmit patient data. Additionally, it improves the availability of patient health records and can aid in better emergency decision-making [13.14].
- **Health information technology:** Information and communication technologies are applied in the field of health (ICT). Processing, storing, retrieving, exchanging, and utilizing health-

related knowledge and information for healthcare services is dealt with by computer hardware and software.

- **Privacy and security:** It should ensure that specific guidelines and operational systems will protect patient health information

Mobile health:

Mobile health usually stated as the application of portable equipment to boost the delivery of health care services from distances to monitor and enhance the patient's health condition. These services differ from conventional health services in that they offer accessibility to healthcare services for all people, individualized healthcare, prompt health services, and location-based information [15]. These unique features of m-health facilitate faster delivery and provide relatively lower cost than the traditional model, ensuring wider accessibility of health care facilities. A has found that convenience and monetary factors strongly influence the user to utilize digital health services, including mobile health [16].

There are several challenges m-health has been facing, like legislation, conflict among stakeholders, and technological limitation. Due to these barriers, service providers face problems with how to initiate mobile health in the health sector. Healthcare service providers have been focusing on advanced technology, which is provider-oriented rather than user-oriented [17]. The perception, attitude, and behavior of mobile health users should be understood and changed according to their perception and behavior because people do not become familiar with new things, and trust does not develop easily [18]. In order to understand the behavior of the user, we have to do health behavior research because anything utilized by people, such as m-health and telemedicine, are activities that promote, protect, and maintain the users' health. These services are involved in the process of transformation from traditional model to progressive health management.

Telemedicine:

Patients now have great expectation for health care services as medical needs rise daily. Health care disparities between rural and urban areas and insufficient health resources are major global issue. In order to address it Western and some Asian countries have been adopting telemedicine technology. It makes high quality healthcare available to all, through communication and IT [19]. Telemedicine is defining as the delivery of health care services and exchange of health information across distances. In other words it includes most healthcare services such as diagnosis, treatment, prevention of disease and education of healthcare professional and patient. So, it can change the equity and efficiency of healthcare services, and patient can access the specialist for a particular problem. Generally they are unavailable in remote and semi –urban areas [20]. Telemedicine is one of the effective ways to disburden health care provider and enhance the optimum utilization of health sector resources. It does not mean that telemedicine can cure all health related problems

Telemedicine has been divided into store-and-forward, remote patient monitoring, and real-time interactive services. Store and forward telemedicine, store medical data and then transfer it to a healthcare professional at different distances and times. In remote monitoring, medicine specialists monitor a patient at a distance by the application of digital video or other devices. It primarily monitors chronic diseases such as heart disease, asthma, and diabetes. Real-time interactive services are defined as the direct communication between doctor and patient through video conferencing, in which patients are required to visit the neighbourhood telemedicine health facility [21]. Teleconsultation lowered 80% of referrals and nearly 45% of transportation costs, according to a 2009–2010 study done in a rural Brazilian state. Several other studies have also reinforced that telemedicine can reduce healthcare cost and waiting time. According to Chauhan et al [23] application of telemedicine and software assists in the following

- Decrease the time taken in the diagnosis and treatment initiation
- The close follow-up of the patient who is monitored from their home is only possible with telemedicine

- Unnecessary movement of patients would be reduced so they can abstain from intra-hospital infection
- Support the coordination between healthcare professionals, agencies, and institutions at a distance location
- Help in spreading information to ordinary people through video conferencing
- Healthcare professionals and other people can be trained through virtual software during the pandemic and in everyday situations.

As the adoption of telemedicine would increase in middle –income and low–income countries at a large scale then, we would see the migration of health care from hospitals and clinics to homes and mobile devices, just like the internet moving bank away from the bank [24]. One strategy to control the COVID-19 pandemic is telemedicine, which aims to stop person-to-person contact and maintain ongoing follow-up by lowering the risk of virus transmission. Telemedicine and virtual software platform like Microsoft teams, Zoom, Google Meet, Skype, and Facebook, what's up and other virtual application that overcome the physical barriers between the physician and patient with sustaining the treatment of outpatient during the pandemic [25].

Health Information Technology:

Health Information Technology uses information-based technology, methods, and applications in the healthcare sector. In other words, it is an approach that utilizes cloud-based database technology to keep patient health records efficient and effective treatment. The main objective of HIT is to provide complete health control and monitoring of patients through a systematized channel of information-based innovative applications. Many features are provided through HIT, such as privacy of records, level of care, proper communication, and interactive consultation. The components of Health Information Technology are as follows:

- **Electronic health records (EHRs)** - It allows doctors to keep tracking patient health information and enable patients to see their health status data when they have a problem, even if the clinic is closed. It is easy for doctors to share a person's health information with specialists for diagnosis and treatment [26].
- **Personal health records (PHRs)** - It is very much like EHR, except in PHR, you have control over what type of health information will go into it. You can keep track of health information from the doctor's office, but it also has information about your healthy lifestyle outside the clinic, such as what diet you have been taking, sugar and blood pressure levels, and how much you exercise [26].

The usability and human factors issues with HIT have been reported in previous studies and articles. Several studies show the positive outcomes of implementing health IT, but we cannot just hope that positive results of the HIT will come. We must remember that adverse consequences may also occur that can harm patients like medical errors that frustrate health care professionals (burnout). We have to be watchful and proactive to get the benefits of HIT and avoid negative outcomes. Presently, researchers and healthcare professionals are paying attention to the impact of poor HIT application on patients and clinicians. Unbearable demands for clinical documentation and poor HIT design application and workflow integration are the EHR- related factors that contribute to healthcare professional burnout. A survey was conducted with sample size of more than 5000 physicians across all specialists in US and revealed that healthcare professionals' utilization of HER and CPOE technology have low satisfaction in clerical tasks and burnout issues[28]. In a survey whose sample size was 4197 physicians had experienced the challenges and stressful impact of HIT, 64% of the clinicians was agreed or strongly agreed that EHR contributes to everyday frustration. Healthcare professionals feel that they have been putting so much time and effort into managing and supporting the technology; instead, technology should reinforce them in providing health care services [27]. The current literature about human factors and organizational aspects of HIT has been giving information on usability problems, poor workflow integration, and negative impact on patient safety and healthcare professional outcomes. It motivates us how to make more functional and safer HIT designs.

Digital health intervention:

Digital and mobile technologies are used as part of digital health interventions (DHIs), which support the delivery of services by the healthcare system. Digital health is now viewed as incorporating modern computing, genomics, and artificial intelligence. Digital health is described as "the field of research and activity linked with the development and use of digital technologies to promote health" in the context of the World Health Organization (WHO) global plan 2020–2025. The starting point for categorizing the different digital health intervention being used to overcome defined health challenges is provided by WHO's classification of digital health intervention [37].

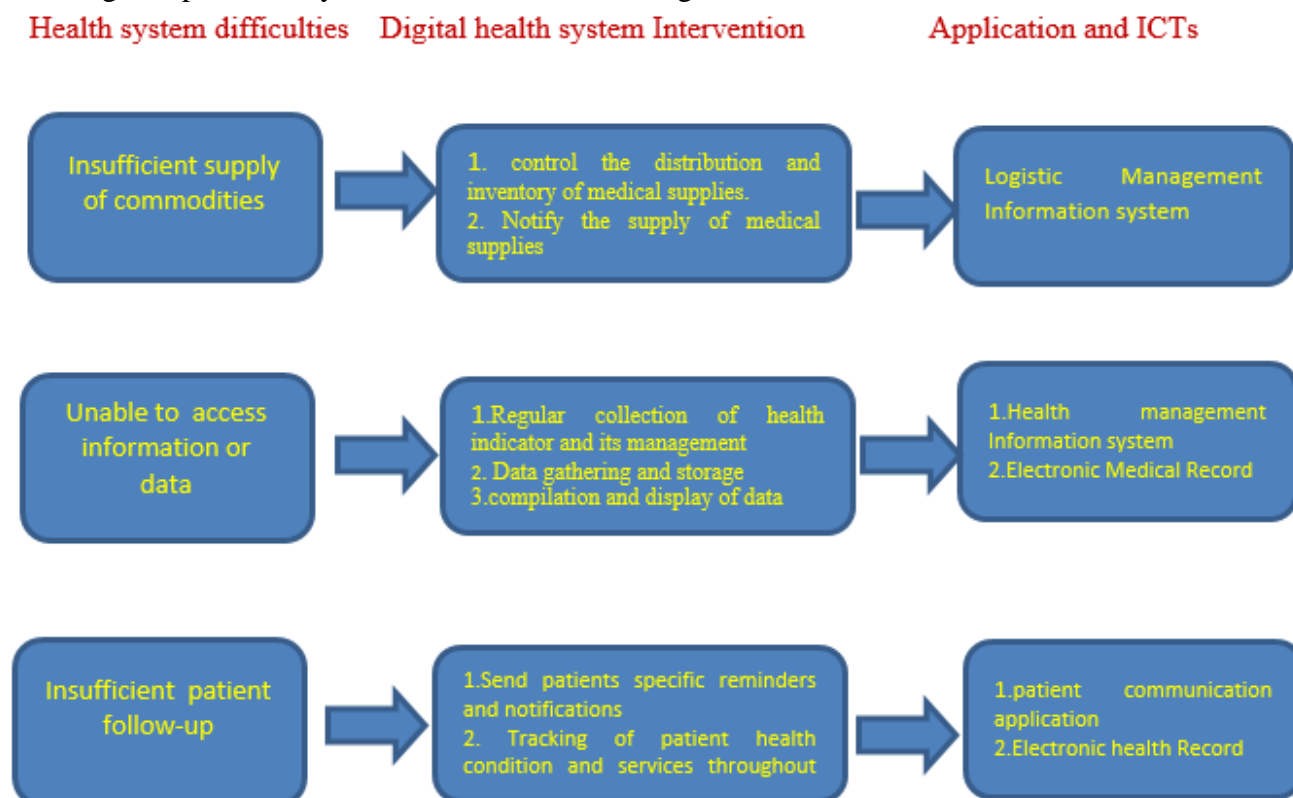


FIGURE1- (Digital health intervention address health system challenges)

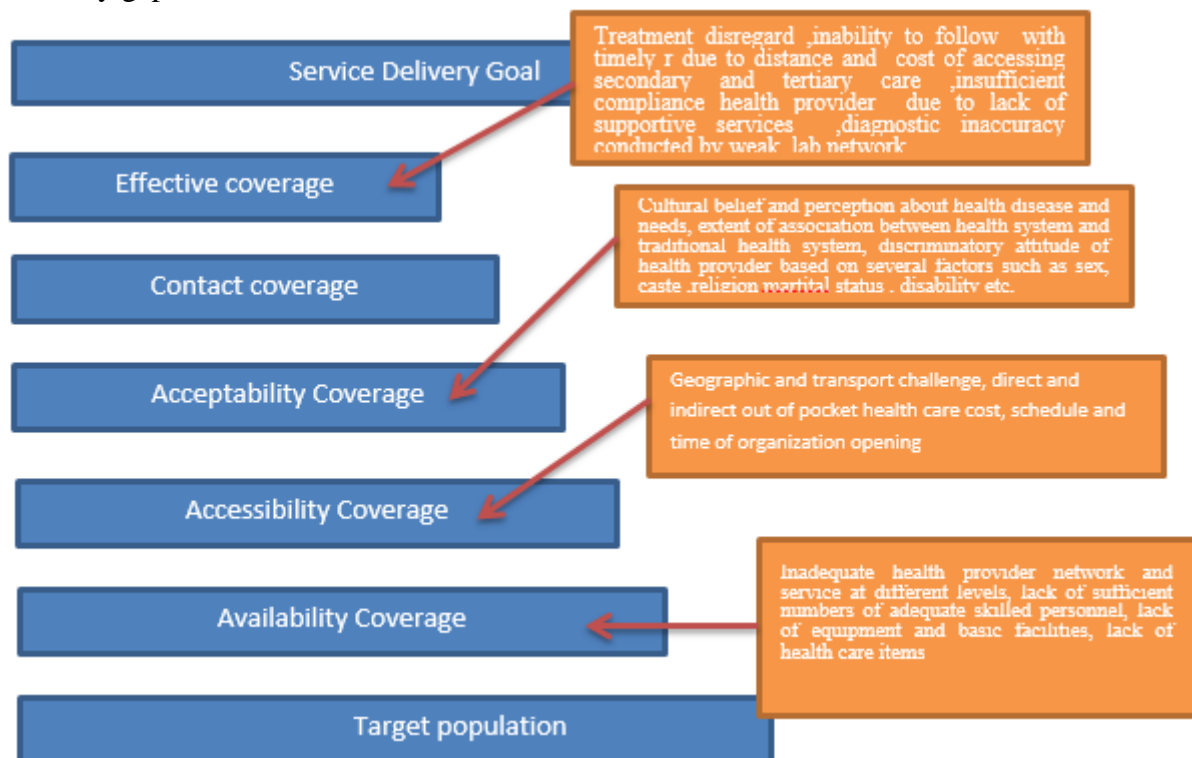
Digital health can positively influence health equity:

The SDG's emphasis on health is unavoidable, and we as a global society reiterate the need to leave no one behind. Lack of awareness, lack of access, and lack of affordability are the three main causes of health disparities in India, so they can be resolved by digitization of health. Healthcare services, particularly telemedicine and home health care diagnostic services, are improving access to high-quality healthcare for underprivileged and marginalized communities in rural and small-town India. Metro cities are where most of the available medical professionals and infrastructure are located, but most of the population lives in rural India. Rural and marginalized populations can be covered through digital health services, telemedicine, e-pharmacies, and remote monitoring.

Assessment of barriers to effective coverage with healthcare system:

The WHO's Tanahashi framework, which was first published in 1978, offers a tried-and-true framework for comprehending gaps in the health system performance and they prevent expected level of service coverage, quality, and affordability. This cascading model demonstrates how health system lack in performances just because of difficulties at progressive levels each level does dependent on the lower strata. A number of factors that the effectiveness of the health system, such as geographic barriers, low demand for services, delays in care delivery, a lack of adherence to clinical guidelines, and cost to individual and patients, add up over time. The potential to attain UHC

is undermined by the deficiencies, which make it difficult to reduced coverage, quality, and affordability gaps [37].



Barriers to the uptake of digital health utilization:

Digital technology has been facing multiple barriers, especially in the healthcare sector; within this section, six types of barriers have been found and discussed based on the literature review: technological, organizational, behavioral, financial, legal, and structural barriers.

a) Socio-economic status and digital health

Research conducted in the past by developing and developed countries have indicated the components related with the accessibility of digital health, Socio-economic gap is the main obstacle to digitizing health services. A Jordanian research discovered that not having internet accessibility impacts the uptake of electronic MCHH [29]. A cross-section study in Japan has investigated mother and pregnant women's attitudes towards digitizing the Handbook of Maternal and Child Health. The study shed light on a socio economic disparity and found that women with higher socio-economic status favor the digitization of MCHH. Mothers and pregnant women with lower socio-economic status did not prefer MCHH in comparison to women with higher SES [30].

b) Infrastructure and technological barriers

The existing literature on digital covered technological barriers in its implementation at different levels, ranging from the IT infrastructure of a country to the process of services delivery, find out one problem is a lack of interoperability among new and legacy system due to missing. The healthy adoption of digital health care depends on the availability and reliability of technology such as the internet, ICT infrastructure, and sufficient electric supply. Insufficient data is responsible for poor data integrity and quality, resulting in low reliability and poor data services [31]. Developing countries have poor internet connectivity, unreliable electricity, insufficient ICT infrastructure, lack of digital health infrastructure, and high cost of telecommunication equipment. All the above barriers hinder telemedicine utilization [32].

c) Organizational barriers

They are associated with the process and structures at organizational level. Stamatian, studied on those barriers which come from the workflow deficiency, it affect the decision making process that exclude the users of the services. Due to these barriers lack of integration in the

clinical work is possible which will become difficult for user instead of reducing workload. Organization hierarchical deficiency like lack of top management support, low change management, scattered key roles of individuals with in organization do not fix accountability towards their duty [33].

d) Behavioral barriers

Individual attitude, motivation, and knowledge toward digital health technology have affected the adoption of digital health. A negative attitude towards innovative technology often stems from a lack of incentives, especially in an elderly patient, low perceived usefulness, and confidence in the technology. Fear turns out to be a barrier in the health sector, especially in transparency about healthcare services and information associated with the user. Low motivation to explore new technology is another barrier to digitizing health [34].

e) Awareness of Digital Health Services

The expansion of digital health depends on stakeholders' knowledge and awareness, such as policymakers, health practitioners, and health authorities. They should recognize the importance and role of telemedicine to minimize the barriers to digital health implementation. Many previous studies have revealed that lack of knowledge and awareness related to telemedicine and digital health are obstacles in the path of digital health. Digital health care technology has been affected by digital literacy and sufficient trained personnel in digital health [34].

f) Lack of digital health policy and poor regulation

In developing countries, digital health policy guidelines related to e-health do not exist or are not in a comprehensive form, which affects the implementation of telemedicine and the digital health ecosystem at all levels. The government should make digital health frameworks like security, privacy, patient protection, medical data ethical, and electronic health guidelines [36].

g) Societal and cultural barriers

The health system's transformation from traditional to digital technologies cannot be seen only through a technological lens. It should be affordable and easy for the growing and aging population. Generally, the population does not accept any changes in the existing system because they doubt the privacy loss, security and credibility of the new system. One important factor that influences the acceptance of digital health is government regulation and legislation. So many uncertainties about digital health policies and legislation prevail in society, like who will be accountable if any wrong event happens. Lack of digital health literacy in the general population, especially among women and the elderly, is also a significant barrier in the path of digital health. Therefore, substantial efforts are needed to make digital health easy at the community level, like training and developing professional and general population skills through educative initiatives [35]. The quality and inclusivity of digital health care services for all can be achieved by the support of the next generation of digital technology, which ensures the broader adaptation of digital health [36].

Enhance the utilization of digital health at three levels:

To increase the prevalence of digital health technology in the current healthcare sector. Policymakers and healthcare providers can utilize the previous studies and reduce the barriers at three levels to accessing health related data and information, manage individual and community health conditions, and preventing from chronic disease.

- Micro level (patients and caregivers)

The continuous assessment of the current and future health needs of the community accessing services like digital health literacy and social determinant of health. Patient and caregiver participation should be defined throughout the programs and health initiatives to make them culturally relevant and significant [37].

- Mesolevel (community)

The community's attitude toward digital health must be evaluated before implementing the new digital health services. Community-based participatory action research should be used to know the diverse and holistic perspective of the community about practical digital health needs.

- Macro level(education and health system)
Health care providers, administration, community leaders, and technology developers could play an essential role in understanding the community's needs with different social determinants of health. Health service providers and trainees should get opportunities to become knowledgeable about potential obstacle and cultural concern by learning from multicultural patients and community population [37]

Conclusion:

Health is no longer a domestic concern for any one country in the today's globalized world. Digital health is quickly becoming most significant developments of this decade along with have a significant impact on geopolitical and socioeconomic realities in the future. It is essential to support multicultural populations during the transformation of the health system to adopt digital technology innovation in order to prevent the contradictory development of health inequities for those who faced difficulty in using digital tools to obtain health information or services. This paper has emphasized on the component and barriers related to digital health system. In order to address the most pressing concerns, the findings highlight the necessity to break through linguistic and cultural obstacle and encourage community for involvement in the transformation of health care system.

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