



The Indian Experience Of ICT Utilization In Healthcare Services Provision– A Review Of ICT Initiatives In Healthcare Access And Delivery.

Hareshwar Chauhan^{1*}, Dr. Ashish Thakur²

¹Research Scholar, Centre for Public Health [UIEAST], Panjab University, Chandigarh

²Consultant QA Hamirpur HP

Citation: Hareshwar Chauhan et al. (2024), The Indian Experience Of ICT Utilization In Healthcare Services Provision– A Review Of ICT Initiatives In Healthcare Access And Delivery., *Educational Administration: Theory And Practice*, 30(4), 2973-2977, Doi: 10.53555/kuey.v30i4.1957

ARTICLE INFO ABSTRACT

The first quarter of the present century has seen growing use of information and communication technologies (ICT) in healthcare, especially in developing countries like India. In response to the improvement in public health systems made possible by more people using ICT, new technologies for providing healthcare services have been created. In order to utilize ICT in healthcare facilities, the report of the Steering Committee on Health, which was created by the Planning Commission and released for the 12th Plan (2012–2017), said that all health sub-centers, primary health centers, community health centers and district hospitals should be linked to premier tertiary care centers for telemedicine through Skype, WebEx, Google meet and other similar real time audiovisual platforms. The study's main goal is to look at how information and communication technology (ICT) has changed India's health care systems over time and how increasing their use of ICT could make them more accurate, accessible, and efficient. This paper will discuss the growing trend of using information and communication technology (ICT) to run health care systems and how we can use ICT in a smart way to make health care provision easier for everyone. The study's results will likely be used by policymakers, administrators, managers and others involved in healthcare delivery to shift people's behavior toward seeking better healthcare services and meet the growing demand for high-quality healthcare. In rural India, the primary healthcare system is structured according to population density, with one primary health center (PHC) for every 30,000 people (20000 in tribal and hilly area) and one sub-center for every 5,000 people (3000 in tribal and hilly areas). With 24,375 doctors on duty at PHCs, the doctor-to-population ratio in rural areas is 1:34,000. The global standard, established by the World Health Organization (WHO), is far lower at 1:250.

Keywords: Information and Communication Technology (ICT), Technology, Health Management Information System (HMIS), Health care, stakeholders, health care delivery services.

Introduction

The usage of information and communication technology (ICT) in healthcare has skyrocketed due to the dramatic decrease in the price of internet access, software, and hardware. This technology is currently within the financial reach of low and middle-income nations, says the OECD (2010). Various contexts have seen the implementation of digital health initiatives. However, thorough assessments of the effectiveness of such initiatives are scarce. [Melchior Lamura and Barababella, 2018].

Research on digital health systems' scalability and longevity has shown that factors like complexity, adaptability, compatibility with existing work patterns, national policies and plans have a significant impact. Participation of important stakeholders and implementation champions from the start increased technology acceptability, according to research by Ross et al. (2018). Using technology-based targeted communication is a more effective way to inform, support, and guide clients—and to instill a sense of direction, confidence, and motivation in them [WHO, 2019].

Tomasi, Facchini, and Maia (2004) state that there is a lack of research on digital interventions in primary health care, which includes prevention, treatment, and promotion in addition to the challenges of creating all-encompassing solutions.

Primary health care (PHC) is an important tactic for attaining universal health coverage (UHC) [WHO, 2018]. Primary health Centers (PHCs) should not waste any time in implementing new service delivery models supported by information and communication technologies (ICTs) in order to improve the quality, affordability, and accessibility of health care [WHO, 2018].

The timely delivery of appropriate healthcare services like health promotion, disease prevention, diagnostic & curative intervention are of the utmost importance in modern PHC. The current manual method of data management often leads to issues with wasted time and unnecessary repetition of tasks. Expanding the network and improving the physical infrastructure of primary healthcare centers are essential steps toward meeting the healthcare needs of rural, remote and outlying areas in the country. Efficient, accessible and high-quality healthcare for all, is the goal of e-Health, which involves the application of information and communication technologies for healthcare service provision. Information and communication technology (ICT) for health, in its simplest form, is the application of ICT to every aspect of healthcare.

There is now less capital needed to launch telemedicine systems that rely on satellites. A lot of messaging apps have drastically dropped their prices. Patients experiencing potentially fatal medical crises are being treated in a more secure setting, thanks to the utilization of first-ever telemedicine at the trauma unit of Delhi's All India Institute of Medical Sciences.

Ayushman Bharat Digital Mission (ABDM)

ABDM is an initiative by National Health Authority, Ministry of Health and Family Welfare and Ministry of Electronics and Information Technology, Government of India. It has been envisioned to bridge the gaps among various stakeholders in healthcare ecosystem through digital highways, their interoperability and thereby creating the necessary digital health infrastructure in the country. It creates ABHA (Ayushman Bharat Health Account) number, a 14 digit unique identity of each person for their ABHA address. This enables one to access and share one's health records digitally through ABHA App, hence, making healthcare more accessible, comprehensive, efficient and consequently empowering patients.

Manifestation of E-Health

Having access to top doctors around the clock for minimal cost is possible with just a basic laptop and free software like Skype, Webex, Google talk, which enables video chats even while not physically present in a hospital. Aiming to provide first-rate medical care to its three million annual patients, AIIMS relies heavily on information and communication technology (ICT). By generating UHIDs and allowing patients to register online, AIIMS has become the first government hospital in India to totally embrace digital technology. A hospital information system provides on-call physicians, specialists, nurses, and lab technicians with encrypted, securely accessible EMRs that are continuously updated for each patient and shared throughout the facility's resources. Online sharing of X-rays, CT scans, and MRIs is now possible because of India's pioneering image archiving and communication technology packages. For the betterment of patients and their families, we have assembled the first group of nursing informatics specialists in India and created a publicly available display system that undergoes frequent updates.

This makes it perfect for usage in less-populated parts of India, such as rural and remote areas, where access to computers is still on the rise. More people are paying attention to healthcare than ever before because of mobile data, and this time around, prevention is just as crucial as cure. Patients in the modern era have access to computers, even if they do not, they almost certainly have cell phones.

e-Hospitals

The e-Hospital application is a Hospital based Management Information System for internal workflows and processes of hospitals. This application for Hospitals connects patients, doctors and hospitals to a single digital platform. It is available to the public health Institutions linked to Central and State Government, Autonomous Hospitals through cloud based services.

There has been covert development of an accessible system by the National Informatics Centre (NIC) for some time. In the realm of electronic health records, NIC is one developer to be considered. It has near fifty hospitals as users. Particularly emphasized are the hospital's database and server systems. It is possible for patients to acquire the hospital's services through the front desk. The development of an application bundle is facilitated by IT experts. The core components of this solution include an electronic medical record (EMR), an integrated hospital system, and a number of open-source technologies.

Table 1: Each of these open-source programmes has been modified for use in rural areas

BAHMNI	Bahmni is an easy-to-use EMR & hospital system. It combines and enhances existing open source products into a single solution. There are three distinct open-source applications.
Open MRS	Maintain Health Documents through digital means
Open LIS	Oversee Laboratory Procedures and Validate and Archive Results
Odoo	Oversee Financial Accounts Managing Stock and Administrative Tasks

Telemedicine in India has evolved over the last 20 years, moving away from costly satellite systems and toward more accessible social media platforms. Going beyond the capabilities of conventional texting and video conferencing, online healthcare apps offer a myriad of services that are specific to the medical business. They take cutting-edge information and communication technology to the next level. Simply put, we are living in the age of health informatics.

It is possible for medical practitioners and labs to collaborate on electronic medical reports (EMRs). They can also quickly decipher and document images captured by a wide variety of imaging instruments, including film scanners, MRI machines, microscopes, and more. The ability to have medical consultations with doctors remotely is the main advantage of e-sanjeevani. The e-Sanjeevani service is entirely indigenous, and it understands the specific needs of Indian medicine. Its easy-to-understand Graphical User Interface (GUI) makes it suitable for users of all computer skill levels. So, it's perfect for places like rural India, where computer access is only starting to grow.

e-Sanjeevani

It is the largest telemedicine service in the world implemented in primary healthcare in India. It provides assisted teleconsultations for patients visiting Health and Wellness Centres (HWCs). It connects them to the doctors and specialists at larger healthcare facilities and institutions like Primary Health Centers, Community Health Centers, District Hospitals and Medical Colleges. Another version of it i.e. eSanjeevani OPD is a patient to health service provider platform which helps them to access health services even sitting at their homes through smartphones and personal computers.

E-Portals for Promoting Health Seeking Behaviour

This is why there is an app called M-Swasthya that aims to improve people's health and wellness. Additionally, it allows for health monitoring and keeps track of individual data of health events e.g. diabetes-related indicators such as blood sugar levels, body mass index, and more. Not only does it put people in touch with their doctors, but it also shows them where the closest hospitals and emergency services are available, get up-to-date information on all the latest health and fitness news as well. Wireless medical equipment, ever-present computers, and swappable sensors allow people to keep tabs on their own health in this modern day and age. Scientists and engineers put a focus on developing affordable, portable, and user-friendly tools for tracking and analyzing vital signs. Healthcare access to all is one of the most important public Sustainable Development Goals. Those already at a social and economic disadvantage are not immune to its effects. The lack of appropriately trained medical professionals, specialists, and staff is one of the most pressing problems. We owe a debt of gratitude to the capabilities and capacities of information and communication technology for this slow but remarkable advancement.

Hospitals, prestigious research institutes & universities, and primary care clinics all add to India's extensive health database. A functional health information system is essential for improving the quality of medical care and addressing the majority of health issues in developing countries. Despite increased global interest in the subject, it has been difficult to provide a trustworthy health information system for a variety of reasons. Planning for the delivery of healthcare depends on primary and secondary health institution data, such as that gathered at sub-centers, primary health centers, community health centers, sub district and district hospitals. Improving the standard of healthcare delivery and addressing health challenges at the community level require a robust, comprehensive, and effective health information system.

Health Management Information System (HMIS)

HMIS manages information regarding various health indicators of India related to delivery of healthcare services. The information is uploaded by and at various levels of healthcare facilities, Districts, States and Union Territories. It helps in planning and managing better health interventions, assists in making informed decisions in public healthcare systems across the country and hence enhance community health by utilizing reliable, high-quality data.

Building efficient health systems is a complex field. Even more challenging is the vast array of differences in geography, population, culture, and tradition that characterize India as a vast and multifaceted country. As a result, it is impossible to develop a flawless plan. Through in-depth investigation, the researchers in this study aimed to address the following question: "How has the rise of ICT affected healthcare in India?" In order to ascertain the intended health care systems for the countries, this study carefully examined health condition, developmental stage, and local topography.

Adapting to the ICT Empowered Health Environment

According to Melchiorre, Lamura, and Barbabella (2018), the performance and quality of HMIS data are ultimately determined by people's knowledge, skills, motivation, dedication, oversight, and the resources that are available. Other Indian studies had already found that HMIS had major performance problems. Piecet et al. (2012) you should remove any data that you think isn't good enough because there is a link between using it and its quality. An important way to improve the ability to make smart choices is to improve the quality and use of data. An effective public health manager will use reliable, high-quality data in health plans to try to make the community healthier. For this study, the goal was to emphasize upon the accuracy of HMIS data in district

hospitals, community health centers (CHCs), primary health centers (PHCs), and sub-centers, which are the different levels of the public health care system.

Integrated Health Information Platform (IHIP) for Integrated Disease Surveillance Programme (IDSP)

IHIP is web based platform that provides information on health surveillance from across the country. It is an information portal of IDSP which is a decentralised method of disease surveillance that intends to promote efficient, effective and prompt public health response. It places particular focus on the practical integration of monitoring components of several vertical programmes. Through this program, disease surveillance will be improved, providing more information for health management, evaluation, and control strategies.

By creating a decentralised state-based surveillance system for epidemic-prone diseases and health events, the comprehensive mission of the programme [IDSP] is to enhance disease surveillance in the state. This system will detect early warning signals, allowing for effective and timely public health actions to be taken in response to health challenges at the district, state, and national levels.

In order to discover disease as potent epidemic through early warning signals (EWS), the IDSP's real-time and daily surveillance efforts are focused on outbreak potential through daily reporting on the Integrated Health Information Platform (IHIP) Portal. Three tiers of daily reportings are available on the IHIP Portal.

1. 'S' (Syndromic)
2. 'P' (Presumptive)
3. 'L' (Laboratory confirmed)

The program's primary axes are as follows:

- (i) The creation of surveillance units at the federal, state, and local levels; this will allow for the decentralisation and integration of surveillance operations.
- (ii) Human Resource Development - Encouraging the training of medical and paramedical professionals, as well as state and district surveillance officers, on the principles of disease surveillance.
- (iii) ICT utilisation - for gathering, organising, constructing, analysing, and sharing data in real-time.
- (iv) Enforcing better standards in public health labs.

Conclusion

With the growth and development of conducive ecosystem for ICT adoption in healthcare sector in India, as across the world i.e. the availability of ever increasing bandwidth of internet consequent to technological advancements like ultra-high speed fiber optic, 5g wireless technologies, various programs, software and apps, as discussed in the paper, increasing understanding of their application with time, newer technologies like IoT, Augmented reality, Artificial Intelligence, simpler to complex ICT systems in healthcare sectors are paving the way for universal healthcare access to all and availability of advance/cutting edge quality healthcare interventions to more and more people at the same time. For instance the Large Fiber-Optic National Knowledge Network connects India to other countries and has a very high capacity. With NKN's incredibly fast speeds and data carrying ability of more than 1 GB/sec, sending huge amounts of data is faster and more efficient. These organizations create many fresh ways for progress, collaboration, teamwork, and instruction. With the growth and expansion of the virtual hospital's networks, ICT application in health systems is leading the way in removing and overcoming geographical, social, cultural, financial and technological barriers in accessing healthcare.

Utilizing computers, information and communication technology in telemedicine for sending, receiving and analysing patient information and medical care over long distances is becoming convenient day by day. Global telemedicine is less limited to medical services these days, it is now widely used in teaching, training, study and healthcare information management. Indians are very good in both computer & software and healthcare knowledge & practice, as is evident through the fact that most of the computer and software engineers and doctors in the west are of Indian origin and have proven their prowess in their respective fields, but the confluence of these two fields and their practitioners are still in evolutionary stages in India, especially in the public health field.

References

1. Bajpai, N., S. Goyal, Primary Health Care in India: Coverage and Quality Issues. Working Papers Series Center on Globalization and Sustainable Development, CGSD Working Paper June 2004; 15. [cited 2019 Feb 8]. Available from: (2004) <http://csd.columbia.edu/files/2016/10/Health-Coverage-and-Quality-Issues-in-India.pdf>.
2. Black, A.D., J. Car, C. Pagliari, C. Anandan, K. Cresswell, T. Bokun, et al., The impact of eHealth on the quality and safety of health care: a systematic overview, *PLoS Med.* 8 (1) (2011) e1000387.
3. Faujdar, D.S., S. Sahay, T. Singh, H. Jindal, R. Kumar, Public health information system for primary health care in India: a situational analysis study, *J. Family Med. Prim. Care* 8 (11) (2019) 3640–3646.

4. Melchiorre, M.G. G. Lamura, F. Barbabella, I.E. Consortium, eHealth for people with multimorbidity: results from the ICARE4EU project and insights from the "10 e's" by Gunther Eysenbach, PLoS One 13 (11) (2018) e0207292.
5. OECD (2010-06-30), "The Information and Communication Technology Sector in India: Performance, Growth and Key Challenges", OECD Digital Economy Papers, No. 174, Available from OECD Publishing Paris <https://www.oecd-ilibrary.org/docserver/=5km4k7mf6b41en.pdf?expires=1563456069&id=id&accname=guest&checksum=E6EF10FFFDC6DD2AB71781FAB5AB865B>.
6. Piette, J.D, K.C. Lun, L.A. Moura Jr, H.S. Fraser, P.N. Mechael, J. Powell, et al., Impacts of e-health on the outcomes of care in low- and middle-income countries: where do we go from here? Bull. World Health Organ. 90 (5) (2012) 365–372.
8. Ross, J., F. Stevenson, R. Lau, E. Murray, Factors that influence the implementation of e-health: a systematic review of systematic reviews (an update), Implement. Sci. 11 (1) (2016) 146.
9. Ross, J., F. Stevenson, C. Dack, K. Pal, C. May, S. Michie, et al., Developing an implementation strategy for a digital health intervention: an example in routine healthcare, BMC Health Serv. Res. 18 (1) (2018) 794.
10. Sahay, S., P. Nielsen, D.S. Faujdar, R. Kumar, A. Mukherjee, Frugal digital innovation and living labs: a case study of innovation in public health in India, Thirty Ninth International Conference on Information Systems, San Francisco, 2018 Available from: <https://aisel.aisnet.org/icis2018/innovation/Presentations/10/>.
11. Tomasi, E., L.A. Facchini, M.F. Maia, Health information technology in primary health care in developing countries: a literature review, Bull. World Health Organ. 82 (11) (2004) 867–874.
12. Veeckman, C., D. Schuurman, S. Leminen, M. Westerlund, Linking living lab characteristics and their outcomes: towards a conceptual framework, Technol. Innov. Manag. Rev. (2013) 6–15.
13. World Health Organization, WHO Guideline: Recommendations on Digital Interventions for Health System Strengthening, Geneva, [cited 2019 May 12]. Available from: (2019) <https://apps.who.int/iris/bitstream/handle/10665/311941/9789241550505-eng.pdf>.
14. World Health Organization, United Nations Children's Fund, Primary Health Care: Report of the International Conference on Primary Health Care, Alma-Ata, USSR. Geneva, 1978 [cited 2018 Sep 25]. Available from: <https://apps.who.int/iris/handle/10665/39228>.
15. World Health Organization, Technical Series on Primary Health Care. Digital Technologies: Shaping the Future of Primary Health Care, Geneva, [cited 2019 May 10]. Available from: (2018) https://www.who.int/docs/default-source/primaryhealth-care-conference/digital-technologies.pdf?sfvrsn=3efc47eo_2.
16. World Health Organization, World Bank, Monitoring Progress Towards Universal Health Coverage at Country and Global Levels: Framework, Measures and Targets, Geneva, [cited 2019 May 15]. Available from: (2014) https://apps.who.int/iris/bitstream/handle/10665/112824/WHO_HIS_HIA_14?sequence=1.
17. Zayyad, M.A., M. Toycan, Factors affecting sustainable adoption of e-health technology in developing countries: an exploratory survey of Nigerian hospitals from the perspective of healthcare professionals, Peer J. 6 (2018) e4436.
18. Web references
19. Website ABDM - <https://abdm.gov.in/>
20. Website IHIP IDSP - <https://ihip.mohfw.gov.in/idsp/#!/home>
21. Website HMIS - <https://hmis.mohfw.gov.in/#!/>
22. Revolutionizing Healthcare: Digital Innovations in India's Health Sector (Ministry of Electronics and Information Technology)