
ACCELERATE
TO THE DIGITAL STATE
d-HEALTH

CONTENTS

EXECUTIVE SUMMARY

Digital health - a growing industry, is bringing numerous benefits to people across the world. Both public and private sectors are taking part in deploying and reaping the positive outcomes of digitalizing the provision of health services. While developed economies are much more advanced in implementing technology in health services, developing countries are eagerly trying to follow. Several advantages starting from easier and faster access of services, to creating electronic data collection and sharing of medical history, creating efficiency in the health service delivery to reducing the cost of building infrastructure, from generating awareness to improving general health, the outcome of digital health is proving to be quite beneficial in improving the overall quality of life.

Just like other developing economies, digital health can play a vital role to help address key issues of the health sector in Pakistan. Pakistan's health sector is faced with challenges of poor infrastructure, acute shortage of medical professionals, inadequate medical facilities in rural areas, high cost of health services and low government spending in the sector. Digital health can help reduce inefficiencies in healthcare delivery, improve access, reduce costs and increase quality of life.

This report is a result of findings of primary and secondary research of the health sector in Pakistan. The study aims to determine the high-level health challenges in Pakistan, identify digital health best practices from around the world and propose recommendations to address challenges in health sector through information and communication technologies. This report also briefly discusses how developing countries like India, Kenya and Uganda are making use of digital health to bring changes in the lives of people and improve their health indicators. It also briefly talks about the practices and priorities from Europe where the health system is comparatively in better shape.

Digital health is still in its infancy in Pakistan. Many pilots are not followed by full-scale implementation due to a lack of sustainable financing, high risks for individual stakeholders and long time-to-market for commercial solutions. There is no one standard implementation model, which can be considered a one-stop-shop solution for Pakistan's healthcare issues. Government resolve, development of a comprehensive digital health strategy, a pro-active mindset and an effective Public-Private Partnership model are the areas to be explored to address the health sector problems through emerging technologies.

d-HEALTH

1. About Digital Health

Digital Health (d-Health) is a broad term, and refers to the use of information and communications technologies (ICT) in providing healthcare. d-Health is the intersection of Information Sciences, Computer Science, Information Technology and Healthcare. It deals with various approaches used in storage, retrieval, and transfer of information in healthcare and biomedicine. This includes computers as well as networks for the provision of health services, for example, the use of internet for managing and storing medical records without using paper files. d-Health not only refers to the role of ICT in healthcare, but also to a way of thinking, a state of mind, and a commitment to improve the standard of health care being provided worldwide by using ICT.

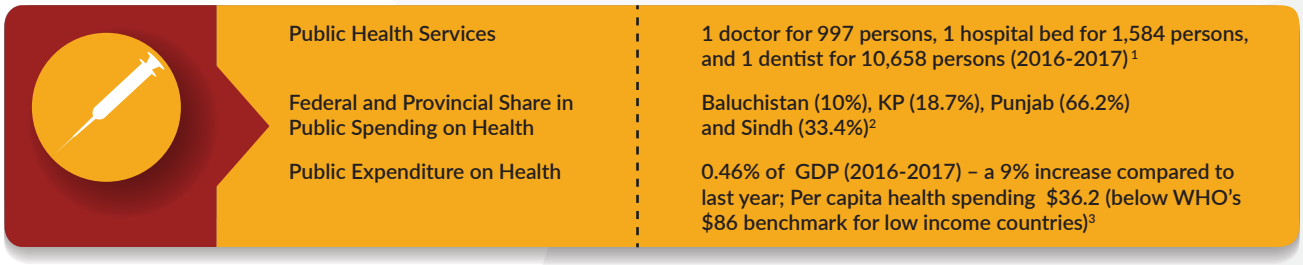
Digital health encompasses many sub-sectors including mHealth, teleHealth, health information technology and tele-medicine. Out of these, mHealth, the delivery of health services via smart phones, is being used extensively for the provision of digital health services across the globe. The main reason behind the growth of mHealth is the ease of usage and higher accessibility of mobile technology. d-Health gives emphasis on receiving information instantaneously in order to diagnose diseases, track illnesses and also generate awareness in the general public. In remote areas there might be a deficiency of adequate numbers of doctors and nurses for providing treatment and in those situations mobile health is an absolute necessity. The medical practitioners in these areas usually depend on mHealth for receiving prompt information regarding various diseases and also obtaining actionable medical information to convey to others close to them. This also helps to accelerate training as well as education when it comes to the medical students who are working in remote areas.

Digital health is empowering people to better track, manage, and improve overall health, live better and more productive lives. It is also helping to reduce inefficiencies in healthcare delivery, improve access, reduce costs, increase quality, and make health services more accessible and effective.

2. Health Sector of Pakistan

2.1 Overview

Pakistan is a large country with an area of 796,100 kilometers and an estimated population of 200 million making it the fifth most populous country in the world. In Pakistan, 72% of the population lives in rural areas and 28% of the population lives in urban areas. A consistently high population growth rate exceeding 2% annually has led to Pakistan being quite a young nation with over 35% of its population being under the age of 14 years.[4]



Pakistan's health services are largely limited, especially in the far-flung and rural areas. The health care system is a three-tiered delivery system: primary, secondary and tertiary care. Starting at grass root level, health houses provide community health care services through lady health workers and are connected to basic health units with an upward referral pathway to rural health center, tehsil hospitals and district hospitals. There are just a few well-equipped tertiary level teaching hospitals. According to recent statistics, Pakistan has 95,000[5] nurses and 180,000 doctors[6]. Pakistan has approximately 14,000 health institutions in the country including 1000 hospitals, 105,000 hospital beds, 4,800 dispensaries, 5,500 basic health units, 900 mother and child care centers and 600 rural health centers[7]. It is noteworthy that Pakistan is the fourth highest source of international medical graduate doctors in the United States[8].

After the devolution of power, the health sector mandate was redefined on three levels: federal, inter-provincial, and provincial[9]. The responsibilities for public health and healthcare services were devolved to the provincial level, with each province establishing its own health department. Many health programs, such as Family Planning, Primary Health Care, and Program on Immunization were also devolved. As a result, the Provincial Governments have formulated their long-term health sector strategies (2012-2020) to ensure improved healthcare and coverage of essential services[10].

1. "Pakistan Economic Survey (2016-17) – Health", Ministry of Finance, Government of Pakistan, Retrieved on June 13, 2017 from: http://www.finance.gov.pk/survey/chapters_17/11-Health.pdf
2. Ibid.
3. Ibid.
4. https://en.wikipedia.org/wiki/Demographics_of_Pakistan
5. http://www.who.int/workforcealliance/countries/Pakistan_En.pdf
6. http://www.pmdc.org.pk/Statistics/tabid/103/Default.aspx
7. http://www.pbs.gov.pk/sites/default/files//tables/10.1.pdf
8. https://www.thenews.com.pk/print/174762-Pakistan-the-fourth-biggest-contributor-of-doctors-to-the-US
9. "Devolution – Provincial Autonomy and the 18th Amendment", Jinnah Institute, 2014, Retrieved on July 1, 2017 from: http://jinnah-institute.org/wp-content/uploads/2015/02/Devolution-Report.pdf
10. "Economic Survey of Pakistan (2016-17) – Health", Ministry of Finance, Government of Pakistan, Retrieved on May 11, 2017 from: http://www.finance.gov.pk/survey/chapters_17/11-Health.pdf

At the National level, The **Ministry of National Health Services Regulation**[11] and Coordination (MNHSRC), was formed in 2013 to frame health policies and enforce regulations on a national level. The Ministry of National Health Services, Regulations, and Coordination aims to provide efficient, equitable, accessible, and affordable health services, improve national and international coordination in public health, ensure oversight for regulatory bodies in health sector, improve population welfare coordination, and ensure enforcement of drug laws and regulations.

Given the widening gap created between supply and demand of medical facilities for the population at large; private sector has stepped in to provide medical facilities across the country. Private sector accounts for approximately 80% of all outpatient visits[12]. However, this is also an urban phenomenon and access to private sector medical facilities in rural areas is still dismal.

2.2 National Digital Health Initiatives

The expansion of Information and Communication Technology (ICT) around the globe has set up an unprecedented opportunity for delivery of healthcare facilities and infrastructure to resolve problems of accessibility and timely health care service provision. In Pakistan, some of d-Health's initiatives have been introduced at both National and Provincial levels. A few of those are listed below:

2.2.1 Public Sector Initiatives

The Government of Pakistan has launched an e-health service[13] in the form of personal identification cards, which store health histories and patient data securely so that doctors and insurers can have access to consistent patient histories to make informed decisions. Such government initiatives are also coupled with existing health policies, such as the **Prime Minister National Health Program**[14] which provides health facilities to underprivileged citizens of the country. E-health service program has it's own challenges, however, it has directly impacted 3.1 million families in 40 districts living below the poverty line of Rs. 200 per day providing them a benefit of 0.3 million rupees per family per year[15].

Another digital initiative called **eVaccs**[16] is a vaccination project that is rolled out by the Government of Punjab and KPK, in collaboration with the Federal Ministry of Health and WHO (World Health Organization). The project automates the whole process of immunization, from ensuring on-the-field vaccinator attendance to increasing geographical coverage of vaccination. The program is applauded for its impact, reaching out to 2.6 million children so far and increasing overall coverage for low-income rural areas by approx. 160% in almost two years[17].

[11] "Vision and Mission", Ministry of National Health Services, Regulations, and Coordination, Retrieved on May 15, 2017 from: www.nhsrc.gov.pk
[12] https://aphcp.com/health-care-in-pakistan/
[13] e-Cards (Health), NADRA, Retrieved on July 21, 2017 from: https://www.nadra.gov.pk/solutions/secure-document-solutions/e-health-cards/
[14] "Prime Minister National Health Program", Retrieved on June 9, 2017 from: http://www.pmhealthprogram.gov.pk/about-us/
[15] https://www.pakistantoday.com.pk/2017/12/08/pm-health-card-failing-to-address-greater-problem-of-healthcare/
[16] "eVaccs", Government of Punjab, Retrieved on July 21, 2017 from: http://open.punjab.gov.pk/evaccs/
[17] Ibid.

2.2.2 Private Sector Initiatives

2.2.2.1 Agha Khan Hospital

The Agha Khan Development Network e-Health Resource Centre (AKDN eHRC) was established in 2011 to provide strategic d-Health support to the Agha Khan Development Network health agencies and their partner health institutions with managing their d-Health operations. In d-Health, multiple electronic features have been added to existing health infrastructure for easy access to doctors and specialists, access to medicine, and access to medical information for both doctors and patients. The Agha Khan University, an extremely well reputed university-cum-hospital setup, has a **Center for Innovation in Medical Education** [18] , which provides access to a d-Health clinic, a digital library, and a digital research unit where d-Health technologies are built and tested. The Center also envisions the "next generation hospital ward", by simulating a futuristic 8-bed virtual ward, with the latest patient monitoring, networking, and teleconferencing facilities.

2.2.2.2 COMSATS

Commission on Science and Technology for Sustainable Development (COMSATS) started a first of its kind healthcare delivery mechanism in 2001. Tele-medicine was used for consultation in the earthquake of 2005. This mechanism includes linking of a TeleHealth clinic at any rural area located remotely with the COMSATS Resource Centre in Islamabad (urban area) through internet. From 2001 onwards, COMSATS continues to provide healthcare through its TeleHealth clinics located in various rural areas in Pakistan like Gujjar Khan, Skardu and Zhob in collaboration with its partner organizations[19].

2.2.2.3 Sehat Kahani

Sehat Kahani is a TeleHealth platform that connects at-home, out-of-work-force female doctors to underserved patients in low and middle-income markets providing access to quality health care. Sehat Kahani currently constitutes a network of 14 d-Health Hubs across Pakistan (Sindh, Punjab, KPK and Karachi) which has served to more than 550,000 patients directly and indirectly through its digital health care services[20].

2.2.2.4 doctHERs

According to the Pakistan Medical and Dental Council, more than 70 per cent medical students are women, and yet only 23 per cent are registered female doctors. doctHERs, similar to Sehat Kahani is a small but significant way to rectify the gap between trained and practicing female doctors, nurses and community health workers. Nurses are available at various time slots to conduct the patients' history and examination. The details are then communicated to the assigned female doctor who, in collaboration with the nurse, provides the needed advice and treatment. The nurse under the virtual supervision of the doctHERs carries out all treatment procedures.

2.2.2.5 Oladoc

It is an online platform for patients, to help them make informed choices and connect with the right doctors. The portal allows patients to book appointments online and get reminders for their appointments. They can also give feedback on the doctors or hospitals that they have visited, and discover hospitals and clinics near by filtered across facilities, services and location.

For Pakistan, the numbers of promising healthcare startups are rising. Few of the recent startups are RingaDoctor, AugmentCare, Ring MD, Sehat, Health Wire, Vitealth and Marham. However, many pilots are not followed by full-scale implementation and experience scalability challenges due to absence of sustainable financing, high risks for individual stakeholders and long time-to-market for commercial solutions.

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[18] "Centre of Innovation in Medical Education", The Agha Khan University, Retrieved on June 11, 2017 from: https://www.aku.edu/cime/Pages/home.aspx

[19] http://www.dHealthcomsats.com/

[20] http://sehatkahani.com/

2.3 Provincial Digital Health Initiatives

Post 18th Amendment, the provinces are financially more autonomous and more powerful to decide their own health system and health policies. Provinces are now responsible for providing the right growth mechanism and strategy to their respective health sectors, in addition to the earlier service delivery role. A brief account of health sector focus by each province alongside the work done in d-Health is shared below

2.3.1 Punjab

53% of the population of Pakistan lives in the Punjab province where the health indicators are better than other provinces. Moreover, Punjab has developed a Health Sector Strategy 2012-2020 so that the challenges of the health sector can be addressed. PKR 111 billion has been reserved for the health sector by the Punjab government in the provincial budget 2017-18, increased from PKR 70 billion in 2016-17[21]. Still, the health indicators are far from WHO and other global standards. After the 18th constitutional amendment, Punjab government has developed new programs, including disease control programs, up-grading health facilities, integration of a number of vertical programs and human resource training institutes. An autonomous Health Care Commission responsible for regulating the service delivery in all public and private healthcare entities has also been established in the province. The provincial government has taken a number of initiatives to improve health outcomes, which include Health Sector Reform Programs, Chief Minister's Initiative of Primary Health Care, Punjab Devolved Social Services Programs, and Punjab Resource Management Programs.

Punjab province is at the forefront of technology use in the health sector. Through the **eVaccs** project, the PITB provided vaccinators smartphones with applications to digitize their fieldwork and monitor attendance and performance. The smartphones are used to enter real-time immunization records that are then sent to a centralized database. Attendance of field workers in the Punjab rose from 36% in 2014 to 94% in 2016 and geographical coverage improved from 25% to 88% in the same period as a result of this intervention.

Another project **Disease Surveillance System (DSS)** ensures availability of historical data in an organized form which helps the government to improve emergency response and preparedness to tackle epidemics like dengue fever etc. Dedicated data entry operators at tehsil and district headquarter hospitals are equipped with laptops and internet connectivity, to report certain disease cases as per predefined templates and further stored in a centralized server for analysis. A web-based data entry interface has been developed, which is accessible to government hospitals via secured user names and passwords. In another initiative, Punjab government has digitalized the **medicine procurement** systems that increases the transparency in awarding contracts. PITB has also developed an **EMR/ HIMS** (Electronic Medical Record and Hospital Information Management Systems) for Pakistan Kidney and Liver Institute's (PKLI) Hepatitis Prevention and Treatment Centre (HPTC).

One more program, **Health Watch,** was launched in 2014 across Punjab with collaboration of the PITB. The purpose of the program was to monitor the quality of health services extended to citizens of the province at all kinds of health facilities. Under this e-monitoring project, android phones and SIMs with internet connectivity were provided to the District Health Managers. The DHMs visits health facilities and submits the inspected data (attendance of the staff, availability of medicines/stock-outs,oOverall health facility conditions/highlight non-functional equipment) through this Health Watch application. Over 3,000 health facilities across Punjab are monitored by 210 health officers including the Chief Executive Officer (CEO) Health, District Officer Health (DOH), and Deputy District Officer Health (DDOH). [22]

[21] https://dnd.com.pk/punjab-budget-2017-18-at-glance-health-budget-increased-by-58-4/130499
[22] https://www.pitb.gov.pk/dp-health

2.3.2 Sindh

In Sindh province, the Department of Health (DOH) is responsible for public health. Similar to Punjab, Sindh Health Commission has been established to regulate the health care services in the province.

Sindh's budget for health has been increased from 80 Billion in 2016 to 100 Billion PKR for 2018-19. Post 18th constitutional amendment and devolution, government of Sindh reviewed the health sector challenges and developed a Health Sector Strategy 2012-20[23]. The strategy focuses on strengthening the district health system and human resources, regulating private sector, utilizing innovative financing schemes and responding to stewardship and governance role of the government. However, technology intervention to address the health care challenges is something that has been ignored and has not even been discussed in the Health Policy or Health Strategy.

Child health, maternity health, and Dengue are few major health problems in the province. Only 27% of deliveries from rural areas take place in health facilities. Health indicators are particularly poor in Sindh falling even below the average for rural Pakistan. Few of the on-going projects/programs that the department of health is working on include the Dengue Control and Prevention Program, Child Survival Program, Safe Blood Transfusion Authority, HIV/AIDS Control Program and the Hepatitis Free Sindh Program.

Sindh government has launched an m-Health initiative called "Tibbi". It is a smartphone based health application and it will replace existing paper-based systems. Through this application, health workers will be able to collect real-time data about the use of health services and the performance of all health delivery points. This will also enhance the monitoring and performance of government health staff across the province.

This application had particular benefit for vaccination of children across the province. The application "Teeko" developed by the Agha Khan Development Network's e-Health Resource Centre in partnership with the Sindh government was later adapted into "Tibbi" and transferred at no cost to the Sindh government[24].

2.3.3 KPK

After devolution of power, Khyber Pakhtunkhwa was the first province to develop a Health Sector Strategy. Department of Health in the province is responsible for implementing this strategy. The strategy includes objectives and initiatives that contribute to more than one health outcome and include all levels of health service provision (primary, secondary and tertiary care). Like Punjab and Sindh, an autonomous health care commission was established to improve the quality of health care services in both private and public sectors. The total health budget reserved is PKR 65 billion for 2017-18, 20% higher than 2016-17[25].

The Bureau of Statistics (BoS) Khyber Pakhtunkhwa conducted a survey in 2017 and the key findings of this survey reflect the government's targeted efforts towards improving the health status of people.

The Government of Khyber Pakhtunkhwa has embarked upon a number of reforms such as autonomy of tertiary care hospitals, increased salary package for health workforce, free emergency services in all tertiary and secondary care hospitals, incentives for maternal health care services and social health insurance through the Sehat Insaf Programme[26].

[23] https://ecommons.aku.edu/cgi/viewcontent.cgi?article=1215&context=pakistan_fhs_mc_chs_chs
[24] https://www.aku.edu/news/Pages/News_Details.aspx?nid=NEWS-001542
[25] http://www.app.com.pk/rs65-7b-allocated-for-health-sector-in-kp-budget-2017-18/
[26] http://www.healthkp.gov.pk/wp-content/uploads/2017/12/KPHS2017_30_Oct_2017.pdf

Sehat Insaf is provincial government's health insurance and free treatment scheme available at the government and some designated private hospitals. Effective since February 2016, the health insurance scheme has now entered in its third phase benefitting over 2.5 million deserving families around the province. 69,000[27] people were given free treatment in the province through Sehat Insaaf Card until 2017[28].

Khyber Pakhtunkhwa Information Technology Board - KPITB in collaboration with the KP Health Department signed an agreement with COMSATS Internet Services for establishing and operating a Telemedicine Center in Behali, District Manshera. The facility will be extended across Khyber Pakhtunkhwa. There is a dire need of tele-health facilities in the rural areas of KPK and this tele-medicine project, e-Ilaj will provide specialized healthcare services in far-flung areas of KPK. At the same time it will lessen the burden on tertiary care hospitals.[29]

In 2016, e-Vaccs was launched in all 25 districts of KPK with 2000 registered vaccinators with the support of PITB. As a result of e-Vaccs launch in KPK, the vaccinator attendance rose up to as high as 70% in November 2017 (an increase of 31%, since launch)[30].

2.3.4 Balochistan

Department of Health works under the Government of Balochistan and is responsible for improving the health standard in the province. Balochistan also has a Health Sector Strategy developed in 2013. The health budget reserved for Balochistan for 2017-18 is PKR 18.3 billion[31]. However, the health sector shows a very gloomy state in Balochistan. Standards for health care in Pakistan are poor and these get even worse in the province of Balochistan. The state of hospitals, Rural Health Centers and Basic Health Units are not encouraging in the rural areas of Balochistan. Doctors are also not willing to work in the rural areas of Balochistan due to financial constraints.

23 hospitals are operative in different districts of Balochistan but they lack efficiency and service delivery.[32] The patients of these hospitals are regular visitors of private hospitals in Karachi, Quetta and Punjab. Even the BMC (Bolan Medical Complex Hospital) and Civil Hospital at Quetta are below par in terms of service delivery.

Government of Balochistan with the support of PITB launched e-Vaccs in seven (7) of their districts. The outcome of this project is positive in the province where over 40,000 children have been vaccinated. d-Health is at a very nascent stage in the country and there is much less to no focus of d-Health in Balochistan. However, the intervention of technology in health care can be very useful especially in the province of Balochistan where health care facilities are dismal.

2.4 Challenges

The health sector in Pakistan is propelled by challenges—mainly an ageing population, rural inaccessibility to healthcare, manpower shortage, low insurance penetration, inadequate public sector investment and inconsistent quality standards. Like many developing countries, the health care system of Pakistan is a mix of public, private; formal, non-formal; and modern with traditional medicine; NGOs and faith based healers, all co-existing. Government spending on health has always been less than optimal (0.6% of GDP) [33]. Most part of the allocations to health is consumed by secondary and tertiary care, leaving merely 15% for preventive and primary health care. Inadequate infrastructure and standards along with poor quality of services have shaken the trust of the public, resulting in hardly 20% of the population utilizing the first level care in the public sector. Inequitable access, urban-rural disparities, lack of regulation of private sector & non-conformity of essential services packages have made the healthcare delivery non-responsive.

[27] https://tribune.com.pk/story/1576900/1-69000-patients-get-free-treatment-k-p-sehat-insaaf-cards/
[28] https://tribune.com.pk/story/1576900/1-69000-patients-get-free-treatment-k-p-sehat-insaaf-cards/
[29] http://kpitb.gov.pk/projects/e-ilaj
[30] https://www.pitb.gov.pk/e-vaccs_kpk_bln
[31] https://www.dawn.com/news/1339841
[32] http://thebalochistanpoint.com/exclusive-report-health-sector-in-balochistan-problems-and-solutions/
[33] https://nation.com.pk/26-May-2017/govt-spends-less-gdp-on-health-survey

Some key international indicators support the weak state of health facilities in Pakistan. Life expectancy at birth is 59 years while the average for other comparable countries is 61 years. Pakistan has amongst the highest rates of first day deaths and still-births at 40.7 per 1,000 births, followed by Nigeria (32.7), Sierra Leone (30.8), Somalia (29.7), Guinea-Bissau (29.4) and Afghanistan (29.0). Every year 200,000 babies die in Pakistan in the first one month of their birth. Fewer than half of women have access to a skilled health worker present at birth.[34]

A detailed account of some of the key challenges contributing to such stats is stated in this section.

Poor Health Access

Infrastructure: There is a wide gap between supply and demand of medical facilities for the population at large; the doctor-to-patient ratio being 1 doctor for 997 patients in Pakistan. Medical facilities such as clinics and hospitals are scarce. When advanced medical care is necessary, villagers must traverse long distances through the desert. Transportation in itself can be a prohibitive barrier of expense for many poor villagers.

Medical Professionals: There is a brain drain of doctors and medical professional due to and inadequate career and compensation structure. As a result of which, there is a dearth of trained and quality healthcare professionals in the country.

Access to Information: There is a clear gap on sources of information to access health services. There is no directory, source or access point to gather information on the whereabouts of health facilities, features of which specialty is available where and which doctors to reach out to. Access to such basic information is a clear problem in the country.

Urban-Rural Disparities

There are other challenges in the shape of young doctors unwilling to serve in rural areas. Working conditions in rural areas are far from satisfactory and doctors prefer to work in urban areas. Rural healthcare lags in quality, affordability, and accessibility for several reasons. Distances are typically greater in rural areas than in urban areas, involving increased costs, communication difficulties, and transportation times for patients, medicines, and doctors alike.

Lack of Awareness

Pakistan is one of the only three countries, others being Afghanistan and Nigeria, that are still struggling to eradicate polio, and one of the major reasons for this is a lack of awareness of the disease. Diseases like schizophrenia, and autism are considered unmanageable. Sexual and reproductive health issues are not even acknowledged. Generally, due to lack of awareness, we have a reactive approach towards regular checkups and rectification.

Quacks

The misfortune of our health system is that the government's failure to cater to the needs of the people has led to quacks and untrained people filling the vacuum. In the absence of well-trained health professionals and a network of medical facilities, quacks pose as healers and target sick people into agreeing to risky 'medical' treatment.

Lack of Prioritization by the Governments

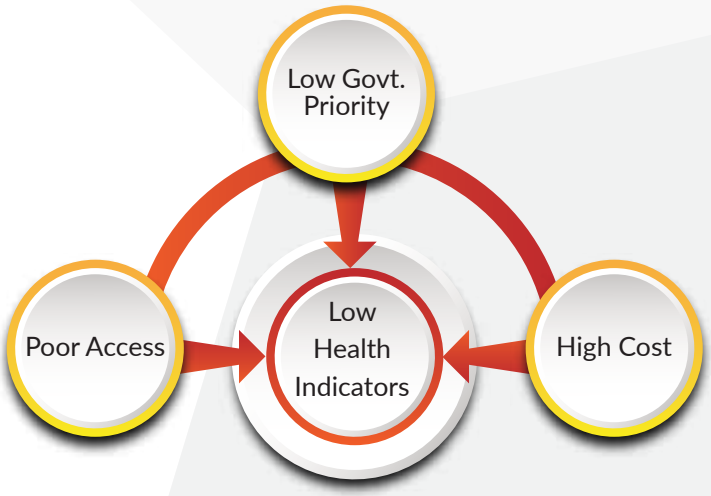
In Pakistan, the health sector has been a relatively low policy priority for the governments. This is evident from the fact that public sector spending on health has always been less than optimal (0.6% of GDP).[35]

[34] https://www.dawn.com/news/1089403

[35] http://www.nationalplanningcycles.org/sites/default/files/planning_cycle_repository/pakistan/national_health_vision_2016-25_30-08-2016.pdf

High Health Cost

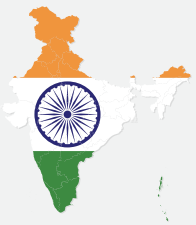
In countries like Pakistan, the challenge is to build health infrastructure that is able to deliver an acceptable quality of healthcare to the mass population whilst meeting the growing aspirations of the emerging middle class. Although quality healthcare is sparingly available in Pakistan, it comes with a very high price tag. While the rich generally have access to world-class healthcare through self-pay or private insurance, the poor have little or no access to services that would be considered a basic human right in most developed countries.



3. Global Learnings in Digital Health

d-Health, especially in the developing countries, has been identified as an opportunity to improve healthcare services; health surveillance, health literature, and health education, knowledge, and research. Health challenges of the developing countries are more or less the same and these countries are trying to reap the benefits of d-Health.

There is no single model that can ensure success. Kenya, Uganda, India, and other developing countries have developed d-Healthstrategies, identified prioritized areas, and implemented projects. Although, there is no study available that evaluates the d-Health policy expected outcomes in these countries yet, it can be observed that these strategies have not been able to achieve the desired initial results. Despite developing d-Health strategies, we mostly see isolated initiatives by the donor-funded non-governmental organizations. Lack of government buy-in, funding and meaningful collaboration amongst the key stakeholders are some of the biggest challenges faced by d-Health in these countries.



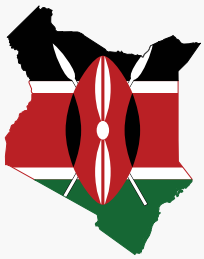
3.1 India[36]

Prime Minister Narendra Modi launched the Digital India program in 2015, 9 pillars of the Digital India, d-Health is an important initiative under eKranti

- d-Health areas identified are online medical consultation, online medical records, online medicine supply, and pan-India exchange for patient information; to be realized within a span of next three years
- Establishment of d-Health division in Ministry of Health and Family Welfare (MoHFW)
- A separate body NeHA (National e-Health authority) established for the promotion of e-Health standards
- The introduction of Electronic Health Record (EHR), national knowledge network for tele-education, teleconsultations and digital library are some vital digital intervention for nation's health
- An eHospital app has been launched with an Online Registration System (ORS). This service has been linked to Aadhaar numbers, provides online registration, payment of fees and appointment, online diagnostic reports, inquiring availability of blood online services etc.

[36] https://news.medgenera.com/6-major-narendra-modi-healthcare-initiatives-for-healthier-india-2017/
https://www.pwc.in/assets/pdfs/publications/2016/indian-healthcare-on-the-cusp-of-a-digital-transformation.pdf

3.2 Kenya[37]



Still unable to increase healthcare access in Kenya- small start and struggling

- Isolated efforts by donor-funded non-governmental organizations, without MoH approval
- Few initiatives were aligned with national needs or priorities
- Lack of government buy-in and funding resulted in abandonment of these projects
- d-Health users and care providers had not been consulted during the projects' design-programs did not reflect their needs
- Many interventions focused on similar issues, leading to duplication and fragmentation
- Lack of integration with the national health information system, which prevented the ability to share valuable information between them or with the MoH
- Issues of data security and confidentiality

National d-Health strategy in 2011

National d-Health strategy in 2011

90% mobile penetration boomed d-Health projects Targeted five key areas: telemedicine; electronic health records, information for citizens; mHealth and eLearning

70% of the initiatives rely on mobile phones

3.3 Uganda[38]

- In 2011, the MoH rolled out the District Health Management Information System to the 112 districts of Uganda, replacing the existing paper-based system
- National d-Health Strategic Plan 2012/13
- Reported positive results in disease control and prevention through disease surveillance
- Most were donor funded, operated in silos, remained mere proof-of-concepts and lacked scalability
- d-Health implementations in Uganda have lacked prior planning stages
- Lack of local ownership and accountability, support and funding
- Poor coordination and communication, and a lack of proper d-Health implementation frameworks
- Personal data at risk is a barrier to adoption of d-Health-no regulations
- Lack of internet infrastructure
- Lack of ICT professionals and skills

[37] https://reliefweb.int/report/kenya/developing-dHealth-policies-greater-equity-kenya
[38] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5458569/

3.4 Europe[39]

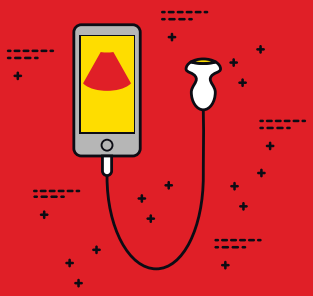
Results and lessons from Europe

- Strong political commitment at the national policy level, comprehensive d-Health policy
- Implementing d-Health strategy has proven to be much more complex
- Established specific competence centers or/and have dedicated departments in ministries
- Electronic Health Record (EHR) systems are a consistent element in all national strategies and roadmaps
- Few European countries have implemented a fully operational ePrescription service
- Tele-Health: at least small local Tele-Health or telemedicine pilots
- Unique patient identifier (ID) was an element of d-Health strategies in most countries
- Almost all countries have some kind of national body directly responsible for d-Health standards development
- New legislation (privacy, confidentiality, liability, and data protection) is often still in the process of being drafted
- A body for d-Health impact evaluation

[39] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3243126/

WEARABLES AND SENSORS
DIGITAL CONTACT LENS

MOBILE HEALTH & APPLICATIONS



SMARTPHONE-BASED ULTRASOUND DEVICE

WORLD OF DIGITAL HEALTH

TELEMEDICINE, E-LEARNING

PARTNERSHIP BETWEEN HEALTHCARE
AND TECHNOLOGY

CLOUD/BIG DATA/ NATIONAL ELECTRONIC
HEALTH RECORD

5. Recommendations for Digitalizing Health in Pakistan

5.1 Recommendations' Summary

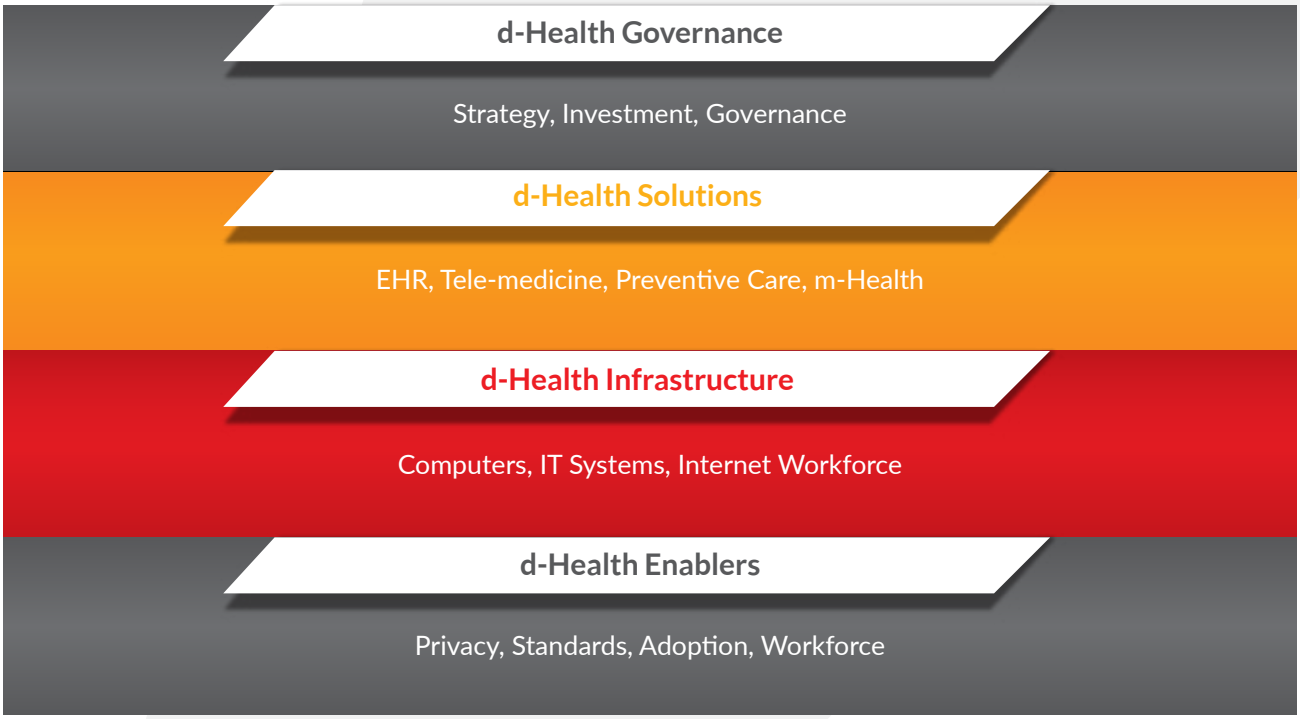
- Leadership and Governance-Government to Lead
- Establishment of d-Health division/department/unit in Health Ministries/ Provincial Departments
- Development of Comprehensive dHealth Strategy, Plan and Monitoring
- Establish d-Health Regulation Function
- Creation of Clear Roadmap and Health Areas for Tangible Value Creation
- Alignment of National d-Health Plans with National Digital Agenda
- Creation of Online Registration System
- Establish Electronic Health Record (EHR)
- Public-Private Partnerships

5.2 Recommendations' Profile

Looking at examples around the world, some takeaways can help Pakistan change its outlook of the health sector. There is no one set implementation model, to be proposed to address all of Pakistan's healthcare issues. However, some lead can be taken by giving due focus to the following recommendations:

1 Leadership and Governance- Government to Lead

Good leadership vision and governance is needed with a clear ownership by the government for the Digital Health Agenda. As seen in other countries, a wider impact can be achieved only if the Governments (Federal and Provincial) have the will and the right focus. Some areas of emphasis include:



Proposed Layered Approach

2 Establishment of d-Health division in Health Ministries/ Provincial Departments

Ministry of National Health Services, Regulations and Coordination and Provincial Health Departments can consider to establish dedicated departments for d-Health.

3 Development of Collaborative d-Health Strategy, Plan and Monitoring

Comprehensive d-Health strategy is required to be formulated by the Federal Health Ministry in consultation with health sector stakeholders- health professional associations, hospital and health-services associations, academic, research institutes and think tanks, national, state and local public health and health-care authorities and health ICT vendors.

4 Establish d-Health Regulation Function

Establish a national d-Health regulatory authority to implement and enforce national d-Health regulatory frameworks. It should undertake responsibility for enforcing the laws & regulations relating to the privacy and security of the patient's health information & records alongside ensuring best practice implementation for d-Health services.

5 Creation of Clear Roadmap and Health Areas for Tangible Value Creation

d-Health context is different for developed and developing countries. The key issue is how to develop d-Health for developing countries in a way that is able to address its distinctive health issues. d-Health for a country like Pakistan, should focus on three objectives over the next five years; **expand coverage, provide quality healthcare services and optimize cost.**

6 Alignment of National d-Health Plans with National Digital Agenda

Ministries of health also need to encourage and support the implementation of national d-Health plans aligned with national ICT and broadband agendas. For example, certain percentage of budget and development projects can be allocated to digital health.

7 Creation of Online Registration System

While it is important to outline d-Health strategy for the country, some low hanging fruits can be undertaken quickly and easily as part of a wider range of changes or solutions to a problem. Similar to India, Online Registration System should be established in Pakistan for providing services like selection of hospitals, OPD Appointments, LAB Reports, details of blood availability etc.

8 Establish Electronic Health Record (EHR)

Fully realized EHRs will have a single record that includes all of a patient's health information: a record that is up to date, complete, and accurate. This puts providers in a better position to work with their patients to make good decisions. Electronic Health Record (EHR) systems are a consistent element in all national strategies and roadmaps of developing and developed countries like India, Kenya, Uganda and Europe.

9 Public-Private Partnerships

Public-Private Partnership (PPP) is the most viable business model for development and implementation of digital health programs, where each party can offer and share resources, capabilities and opportunities. A workable PPP can involve governments, health tech companies (providers of healthcare solutions, content, software) and mobile operators (ICT partners).

In order to counter the scalability and sustainability issues faced by small-scale d-Health initiatives in Pakistan, government must take a more pro-active stance. Investment in digital health must be prioritized by the government, which in turn can have large-scale impacts in the digital health sector in the country. Tele-medicine can play a vital role in providing solutions to poor health access, availability of trained medical professionals and

reducing the urban-rural healthcare disparity. Awareness of healthy lifestyle, diagnosis and treatment at the right time can save us from many diseases and m-Health can play a key role to facilitate such initiatives. In the end a comprehensive d-Health strategy has the potential to address the inefficiencies in the healthcare system and in turn reduce the cost of health services in Pakistan.

5.3 Stakeholders and Roles

Collaboration among digital health stakeholders is key as individual companies do not own the whole set of capabilities (e.g. health, ICT, go-to-market expertise) or resources (e.g. funding, ICT infrastructure, distribution) required. The development of a holistic ecosystem is possible only through the involvement of diverse and multiple stakeholders, with the converging agenda of improving the sector's health. It will also help in forming the case for d-Health in terms of what benefits may be delivered to each stakeholder group, and how that group should be involved in the planning and delivery of the vision itself.

Mentioned below are few key stakeholders and the roles they can play in establishing country wide digital health programs

Federal and Provincial Governments

- Leadership and Governance
- Ownership of Policy Development and Implementation
- Monitoring and Evaluation
- Appropriate Funding
- Appropriate Governance Structure at National & Provincial Levels
- Formulation of Supportive Legislation and Regulations

Provincial IT Boards

- Participation in d-Health Strategy Formulation
- Capacity Building of Government Health Agencies to use ICT's
- Facilitate Government in Strategy Implementation
- Partner with Private Sector and Start-Ups for d-Health Solutions

Multi-lateral Organizations

- Ability to Create the Bridge between Grassroots and the Governments
- Expertise and Best Practices brought in from of other Markets and Countries
- Availability of Technical Assistance and Funding
- Access to the Grassroots and On-Ground Problems
- Local examples: WHO (World Health Organization) USAID, World Bank (WB), Asian Development Bank (ADB)

Government Hospitals

- Participation in d-Health Strategy Formulation
- Internal Transformation for d-Health Readiness
- Gather Information about the Current Health State and Stats

Private Health Care Providers and Start-Ups

- Facilitate Research and Development of New Products and Services: Electronic Health Records and Information Systems
- Bring in Innovative Solutions
- Bridge the Gap of Quality Health Care Service Delivery

Technology Providers

- Role as ICT and Digital Service Partners for Governments, Health Providers and Health Tech Companies
- Bring Commercial Perspective Necessary for Sustainability and Scalability
- The Range of ICT Services Operators Provide – Directly or through Partnerships – includes solutions for telehealth, imaging, supply chain, health work management, data management and hosting, cloud and IoT etc.

d-Health Regulatory Function

- Formulation of Supportive Regulations for New Technologies like cloud and IoT etc.

Health Professional Associations

- Participation in d-Health strategy formulation

Advisory Group- Academic, Research Institutes and Think Tanks

- Academics, thought leaders and health sector representatives. Not involved directly in decision-making but able to exert a high degree of influence due to their acknowledged expertise in the field and/or their role as formal or informal advisers to key decision-makers
- Provide input into the development of d-Health governance model

6. Conclusion

Health needs in Pakistan have grown at a daunting pace. Clearly, the existing health system in Pakistan is struggling to counter the acute challenges in the health sector. Digital Health is well positioned to address most of these challenges in the long term. However, digital health itself is at an early stage of development around the world and there is no one-size-fits-all solution available to be adopted. Yet practices and approaches followed in some of the countries can serve as a guidance for other struggling nations like Pakistan.

While some initiatives are being taken by different public and private sector entities in Pakistan, what is needed is a holistic d-Health strategy followed by proper implementation to help propagate digital health practices and benefits in the country. This requires a collaborative approach by all stakeholders, so that everyone contributes in the development of digital health and reap the immense benefit of digitalizing the health sector.