Digital technologies are driving a new generation of telehealth

How the digital revolution is re-inventing telehealth as a frontline strategy for expanding access and lowering costs.

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Renewed interest and new investments
The concept of telemedicine originated more than 40 years ago, using basic telephone technology. In the late 1990s and early 2000s the evolution of the Internet and a growing technology infrastructure generated increased interest, especially in the developing world, where resources were scarce and traditional medical infrastructure was lacking. Telemedicine promised a way to quickly address these problems with the promise of care delivered anytime, anywhere at a relatively cheap cost. However, due to economic, financial, cultural and, most importantly, technological challenges, telemedicine did not meet its expected potential.

But several events have conspired to create a much more favorable climate for telemedicine adoption. While the basic technology has not changed, more sophisticated versions of that technology now provide a better quality of interaction between care giver and remote patient. Also, the concept has expanded to include patient and professional health education, public health services and health administration. This expanded menu of services is often called telehealth, to reflect the move beyond traditional medical care. This, combined with increased interest and investment by governments and non-governmental agencies like the World Health Organization (WHO), has created a robust demand for remote provision of care and services.
Are these sufficient proofs to say that telehealth might be at a tipping point? Most likely yes, but only when combined with the fact that ‘telehealth’ is reinventing itself, thanks to the digital revolution.

Take a look at the following facts –

- Global telemedicine services market is expected to grow from $11.6B in 2011 to $27.3B in 2016, a compound annual growth rate (CAGR) of 18.6% over five years, according to a study by Companies & Markets\(^1\)
- The US market for advanced patient monitoring systems is expected to grow from $8.9B in 2011 to $20.9B in 2016, according to a study by Kalorama Information\(^2\)
- American Telemedicine Association estimates that more than 10 million Americans have directly benefited from some sort of telemedicine service in 2012, double the figures from 2009. The number is expected to double from 10 million to reach 20 million in 2014-15\(^3\)

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**Expansion of telehealth is imminent**

The digital revolution that has put sophisticated tools in the hands of the average person has created a new type of healthcare consumer. This new consumer is technology enabled (although not necessarily tech savvy), more health conscious and empowered to participate fully in his/her own health management – from disease prevention to medical care. This new consumer will drive demand for an ever-expanding menu of telehealth offerings. This includes information and education on disease prevention, self-monitoring and health coaching tools, communication with healthcare providers and a host of chronic disease management and acute-care tools. The consumerization of technology has coincided with a consumerization of healthcare to produce an explosion of possibilities in the telehealth market. Powering this change will be mobility, analytics, cloud and social media capabilities.

**Newer digital technologies in the hands of consumers are redefining telehealth**

Each of these technology tools – mobility, analytics, cloud and social media – is disrupting both traditional IT and traditional medical care. Each of them is influencing the extent of modernization and expansion of telehealth in varying degrees with mobility, cloud and analytics leading the charge in that order. Social media has a great potential in the role of a valuable enabler of more specific intervention strategies in remote health monitoring space.

The Health Information Technology for Economic and Clinical Health (HITECH) Act of 2009 and the Affordable Care Act (ACA) of 2010 have given substantial push to the adoption of telehealth. While the HITECH act provided for telemedicine projects across the states, ACA has broadened access to health insurance, straining traditional medical resources and fuelling interest in cost-effective alternatives.
Mobility

According to a study by research2guidance, 500 million smartphone users worldwide will be using a health care application by 2015, and by 2018, 50 percent of the more than 3.4 billion smartphone and tablet users will have downloaded mobile health applications.4 mHealth has now become an integral part of telehealth strategy anywhere in the world, despite regulations that remain largely ambiguous.

Mobile handsets started out as a telehealth capturing the wireless/bluetooth signals from measuring devices and transmitting the data to a centralized server in a monitoring center. But today, mHealth applications on smart mobile devices can record, transmit, retrieve and analyze a variety of health parameters. They can do this by enabling manual entry of data; by connecting with compatible devices that measure the parameters; by measuring parameters themselves; or by a combination of any of these methods.

Another trend in mobility being used in some telehealth programs is “gamification” in which individuals with similar conditions compete individually or as part of team to achieve a goal. The players in the game (i.e. patients) receive points for progress toward the goal. Over a period of time, the scores are compared and the winner is announced. These kinds of programs can be effective in conditions like obesity, blood glucose monitoring, etc. Similarly, incentives in the form of bonus points or gift vouchers on achieving certain goals are also increasingly making their way into telehealth programs.

Mobile BI, the ability built on a telehealth mobile application to generate meaningful reports and analysis on data that is captured and retained, can help in timely interventions both by consumers and/or the monitoring centers. The concept of internet of things (IOT), especially through its ability to generate Big Data and analytics on top of that, is already accelerating imaginations around the possibilities of mobility in telehealth.

Endless possibilities with Internet of things in healthcare

The Internet of things in healthcare (IOTH) will contribute significantly to changing the face of telehealth in the years to come. Telehealth monitoring devices, data capturing and transmitting devices, the devices that will enable and complement these, therapeutic devices like nano pumps that can release a drug in the body based on a signal from another device - all of these form part of IOTH. These billions of devices and applications – sensors, gateway devices, micro controllers, micro radars, either embedded in the body or worn on the body, clothes or a mobile device – which communicate with each other via the Internet are expected to make monitoring, diagnosis, treatment and health promotions extremely personalized, accessible and convenient. And it will do all that while reducing costs.

IOTH is expected to use mobiles as devices, as connectors, as gateways, as monitoring agents, as intervention specialists and as an efficient and effective communication interface with between consumers and healthcare professionals largely.

IOTH’s power is in generating a huge volume and variety of data with a very high velocity (the classic Big Data). This exponentially expands the possibilities for using meaningful advanced analytics on top of that data gathering. This combination of data and analytics is expected to help achieve better clinical outcomes by providing better and faster risk stratification; care planning; and appropriate and timely intervention. These better outcomes are expected to reinforce the utility of telehealth and, in doing so, establish a virtuous cycle to enhance the adoption of telehealth in the ecosystem.

Because IOTH is expected to generate and encourage sharing of huge data, nontraditional healthcare IT players like telecom vendors have spotted an opportunity and are now interested in promoting and participating in telehealth programs.

IOTH, with its ability to connect a person, ambience (home/office/car etc.), and clinic/hospital in a seamless and real time fashion, will be critical to establishing and expanding telehealth across the globe. IOTH is already becoming a key component of smart homes and smart city concepts worldwide. Smart hospitals will be another trend that will look to IOTH and the associated telehealth concepts in the near term.
Cloud
Telehealth applications are rapidly moving to cloud platforms due to the following factors:

- Their ability to generate big data, which requires huge storage capacity
- Their need to be accessible from anywhere
- Their demand for fast computing power
- Their need to be affordable

With most cloud providers (both private and public) now ready to provide regulatory compliance and a high level of security, cloud adoption for telehealth applications and data are expected to increase. This will further accelerate adoption of telehealth solutions.

BI and Analytics
BI and analytics in their various complexities and forms are already occupying the heart of telehealth initiatives and solutions. Consider the following use cases which demonstrate their intrinsic value application in telehealth:

- A simple report on daily steps achieved vs. the goal, generated in a step tracking application on a mobile, with a color coding to indicate the level of activity
- A slightly more complex trending graph that alerts a monitoring nurse about a possible arrhythmia
- A much more complex analytical tool that helps a monitoring doctor to identify a patient at risk of prescription non-adherence based on multiple inputs (including social media) well before the non-adherence and consequent health events occur

With the adoption of IOTH, which will generate Big Data, we are seeing a huge potential to incorporate more, and more advanced, analytics into telehealth applications to get the maximum returns on investment. Such analytics, especially predictive and prescriptive analytics using big data, can be expected to increase the perceived value of telehealth projects by both customers (healthcare professionals mainly) and consumers (patients and health aware individuals). BI and analytics features on consumer-centric telehealth applications will especially help in stickiness on adoption and adherence.

Social Media
While social media traditionally is not leveraged in telehealth or telemedicine projects, there are now proven use cases where this untapped data available on social networks can improve the utility of telehealth applications. For example, healthcare entities can effectively bring together psychographic data (generated through social interactions) like personal expression, needs, wants etc. with physiological data (like that generated by fitness trackers) and medical data from EMRs in a health monitoring center to risk stratify members in an assigned risk group to identify those who are most likely to default on their goal plan. Adding the data taken from social media about the participants increases the specificity and sensitivity of the analysis.
Utility of telehealth for the entire care continuum

Traditional telemedicine largely involved diagnosis and treatment, using video conferencing in most cases, for ambulatory care, acute care and during follow up after a medical event. The primary purpose in such cases was curative and the objectives were to access quality care at cheaper cost in a timely manner.

Telehealth expanded the scope to include preventive aspects, especially post-event, in cases of chronic diseases like diabetes mellitus or hypertension. Also, monitoring centers are brought in to monitor conditions like sleep apnea and arrhythmia, and health coaches are deployed to provide ongoing counsel to susceptible individuals for mood disorders and substance abuse. Applications were built to remotely record and monitor certain predefined parameters like temperature, weight, blood pressure, etc., to send targeted health education materials and to train medical professionals remotely, etc. Telehealth, thus, started focusing on prevention (post event especially) and education and training of both patients and healthcare professionals. The same technologies, such as video conferencing, also are being used for health administration. Patient Centric Medical Home (PCMH) largely follows the telehealth model as well, covering chronically ill and geriatric patients who need medical care at home. These categories of patients need continuous monitoring to identify and attend to any event at the earliest time possible, and telehealth is most appropriate in such cases.

The future of telehealth is expected to increasingly cover efforts at wellness and true prevention to avoid costly health events that degrade patient wellness. Thus, the new era of telehealth is expected to cover not just patients, but healthy individuals as well. Beyond care to cure and prevent illness, health promotion will be a huge area of primary focus.

Wearables are leading the latest transformation of telehealth

Wearable devices like ‘fit bits’ are now common and contribute significantly to the shift in telehealth towards wellness monitoring that is bringing healthy individuals into the market. Health-conscious healthy individuals started tracking their health status (mainly for wellness purposes) using these tiny devices worn on body, usually around wrists, on arms, in the trouser pockets and so on. The parameters tracked by these devices are mostly life style activities (such as walking and running) and basic vitals, including pulse, respiration and blood pressure. However, wearables also are now being used for tracking parameters for preventive, diagnostic and curative purposes. For example, a wearable monitor can be used to track blood pressure in a hypertensive and to track activities in an obese person, for use in both diagnosis and intervention.

Many wearables are designed to sync up data with smart phones, taking advantage of the device’s flexibility and near-ubiquitous use among consumers.
Non-contact, non-embedded tracking devices are next
After wearables, expect remote monitoring to happen using non-contact, non-embedded tracking devices that are near the person but don’t touch him/her directly or indirectly while taking readings. Such devices are already in the market, but the technology itself is in a nascent stage. Right now, most of them use radar based technology to capture data such as heart rate, respiration rate, patient movement, bed occupancy and fall detection.

Digital consumers will drive expansion of telehealth
Consumers, using wearables and the newer non-wearable & non-implant trackers, are expected to drive the expansion of telehealth scope and the business models around it. This new avatar of telehealth can be called digital telehealth, in recognition of the fact that the scope has gone beyond the traditionally accepted components to include the digital technologies. Figure 3 captures the key tenets of the changing landscape from telemedicine to telehealth and from telehealth to digital telehealth.

Digital telehealth will expand beyond healthcare
A by-product of telehealth going digital is the interest in telehealth by non-healthcare industry players. While the motives and objectives for taking up telehealth initiatives vary from industry to industry, the fact remains that with more industries showing interest, possibilities for telehealth will continue to expand. Look at the following examples:

- **Retail**: Walmart has opened telehealth kiosks in select stores and plans to roll that out country wide. Primary objective is to add cost-effective retail clinics.
- **Life and general insurance**: Aviva has introduced Wellness for Life®, a wellness program that offers life insurance customers self-health monitoring tools, 24-hour access to a nurse either online or by telephone, and personalized healthcare resources. Primary objective is to increase customer life expectancy to reduce life insurance payouts.
- **Telecommunications**: AT&T Virtual Care® delivers a variety of end-to-end telehealth solutions that include hardware, software, and network infrastructure. Primary objective is to promote data generation, transmission, transfer and storage using telehealth through mobiles on their network.
- **Pharmaceutical industry**: Many pharmaceutical companies have started using telehealth technologies like intelligent pill dispensers for prescription adherence and wearables to track vital signs in clinical trials.

![Fig. 3 Key factors in the evolution of digital telehealth](image)
Digital telehealth brings with it new challenges and advantages

As the scope expands, the new digital telehealth is bound to face a new set of challenges. Some of the key challenges that are expected –

- Regulations like the FDA’s guidance on Medical Mobile Apps and lack of regulations in many of the developing countries. Regulatory concern around use of physiological data generated and captured by mobile phones and the apps continues to be an issue in most of the developing world. While this may not really hamper the adoption, it certainly can throw up surprises, such as new and sudden restrictions on certain types of monitoring using mobile phones.
- Concern around use of technologies that are perceived to pose a risk to privacy and security, such as cloud and social media.
- A lag between adoption of technology and reimbursement by payers. Wellness monitoring will be expected to be an out-of-pocket expense, though we have seen increasing coverage of traditional telehealth services.
- Challenges around certification and credentialing of telehealth providers also expands with digital telehealth.
- Recognition of telehealth programs and providers is still an issue across state borders in some countries (like the U.S.) and across international borders. The addition of social media and mobility only adds to this issue, especially for the mobile population.

Potential advantages of digital telehealth over telehealth

- More data, more analytics, better outcomes
- Inclusion of wellness may lead to better disease prevention
- More formal approach to incentives and disincentives
- Gamification, peer review, buddy systems and more personalized reminders and alerts will drive better compliance with medications and other treatment and prevention recommendations.
- Network capital can be leveraged using social media for better reach and awareness

What healthcare providers and payers should do now

Providers are already evaluating and adopting telehealth in one form or another. This has been fuelled by legislation like the HITECH Act and the ACA. Now is the time for providers to bring the “digital” together with telehealth, to reap larger benefits from telehealth initiatives.

The timing of digital telehealth could not have been better for healthcare payers. Payers will use digital telehealth in the context of HIX (Health Insurance Exchanges) to be more competitive, to be differentiated, and to be innovative. The consumer centricity brought in by the ACA makes digital adoption likely even for the uninitiated. Payers can also be more innovative about covering expenses of telehealth services.

Next steps for providers and payers include:

- Review and update the priorities in your existing telehealth strategy in the light of digital telehealth; if you don’t have a telehealth strategy, draft a comprehensive approach to digital telehealth.
- Establish digital telehealth business as a strategic profit center and not as a mere IT initiative.
- Look for partners who have the end-to-end capabilities to execute comprehensive digital telehealth programs.
- Identify pilot projects in wellness monitoring to ride on the wearables wave. The opportunity to build differentiation is enormous if acted upon quickly.
- Tightly link telehealth programs to digital technologies in the organization; this is important as these are often run by different business units within an organization.
Conclusion

Consumer centrity in healthcare, driven by digital disruption, is set to bring telehealth to a tipping point and expand its capabilities in ways previously unimagined.

Digital technologies have been key game changers for traditional telehealth. While mHealth has been associated with telehealth for a while now, its role is expanding significantly with expansion of the Internet of things (IOT) into healthcare. The volume of data generated, especially with expansion of telehealth into the wellness space and the social media listening, is projected to be huge. This opens up tremendous possibilities for advanced analytics to make medical research more meaningful, create more robust evidence based medicine and more individualized behavioral interventions. Most importantly, care delivery and clinical outcomes are expected to be more effective, efficient, cheaper and accessible when digital technologies are used in telehealth services.

Digital technologies are expanding telehealth's scope and adoption significantly. Digital telehealth has expanded to include health consumers interested in wellness, health promotion and disease prevention. It makes healthcare delivery possible in real time and truly anywhere. Digital telehealth has now gone beyond the healthcare provider industry and has attracted interest from the retail, life insurance, pharmaceuticals and telecommunications industries.

Both providers and payers can be expected to bring digital telehealth into main stream adoption through various business models. Some examples of this are already in works, while some are at ideation and planning stages. Wearables and associated tracking of lifestyle activities and health status data can become one of the major actuarial inputs in determining one's life insurance premium (or health insurance premiums, in countries where consideration of pre-existing conditions is allowed) and then form the basis for adjusting future premiums. Chronic disease management programs are already taking the digital telehealth route. A highly customized care delivery experience is possible with digital telehealth, especially when combined with genomics and social data elements.

With the expanding possibilities with digital telehealth, affordable, accessible and high quality care for the masses looks closer to reality than ever. Governments should take note of this paradigm shift in how telehealth projects will be conceptualized and implemented as they draft legislation to define regulatory requirements. While these regulations are much needed, it is also important to encourage innovation in this market.

Telemedicine took nearly 40 years to pave way for telehealth. Telehealth has been making a transition to its digital avatar in less than 10 years. Will the transition of digital telehealth to something more mature and bigger take less than, say, 5 years?

Written by:
Dr. Sandesh R. Prabhu, MBBS, MBA
Professional, Academy for Healthcare Management
Healthcare Solution Strategist, Business Innovation Services, Dell

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