6 Essential Components for Building a Successful Telehealth Infrastructure

Summary

With a projected market value of $3.5 billion by 2020, telehealth is poised for exponential growth [1]. Fueled by demographic and reimbursement shifts, healthcare organizations need to have a clear vision of the goals of their telehealth infrastructure as they grow. A successful telehealth system must be available where care happens and must have flexible components that easily integrate with existing technology, all while maintaining proper patient data security. Security and HIPAA compliance can be difficult with the rise of healthcare apps and providers utilizing their own devices. In order to prepare themselves for this projected growth, telehealth systems need to be scalable to accommodate an increasing amount of data and technologic components. The purpose of this paper is to help define what characteristics make a telehealth infrastructure program successful in reaping the rewards of this revolution in healthcare.

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Introduction

In the U.S., the telehealth market is expanding, with a reported annual growth rate of 40% for the next five years [1]. Healthcare organizations are playing catch-up in how they will provide and integrate telehealth services into their programs. To integrate telehealth services, healthcare organizations will have to examine and construct a program with the six essential components of a successful telehealth infrastructure including hardware, software, IT infrastructures, IoT, scalable design, and patient and data security.

In order to build this telehealth infrastructure, it is important first to understand five factors fueling the expansion of the market. Those factors include the increase in the U.S. population of the elderly, those with chronic diseases, upcoming changes in regulatory policies, patient and provider receptivity, and budgetary constraints. Understanding how these factors influence new and existing telehealth systems will help prepare organizations for this growth in telehealth services.

U.S. Demographic Shifts

Demographic shifts in the U.S. population is the first driving factor of growth in telehealth. According to the CDC, the number of people aged 65 or older is estimated to reach 71 million by 2030, comprising nearly 20% of the population, as compared to only 12% of the population in 2000. This increase is especially prominent in those aged 80 years or older, with a growth from 9.3 million in 2000 to 19.5 million in 2030 [3]. This shift has led to healthcare organizations rethinking the way they provide care. They are adopting and adapting the use of technology to augment care and improve workflow to accommodate this growing need.

Chronic Illness

The increasing proportion of Americans with a chronic disease is the second crucial factor of the current growth of telehealth. Forty-five percent of Americans, or 133 million people, have at least one chronic illness. These chronic diseases are responsible for 7 out of every 10 deaths in the U.S., killing more than 1.7 million Americans every year and accounting for nearly 75% of all healthcare spending in the U.S. These numbers are only expected to rise, with estimates of chronic diseases affecting 164 million people, or 49%, of Americans, by 2025 [4]. These chronic diseases require increased frequency of doctor visits, disease monitoring, and screenings, which can all be facilitated and managed through telehealth services.

Policy Change

The third contributing factor to the growth in telehealth is the change in regulatory policies. In the last few years, over 150 pieces of telehealth legislation were introduced [2]. These changes in policy are leading to an improvement in reimbursement for telehealth and digital healthcare. According to the Center of Connected Health Policy, as of late 2018, 50 states currently provide reimbursement for live video in Medicaid fee-for-service, a payment model that is dependent on the quantity of care rather than the quality of care. While only 11 states reimburse for store-and-forward, the collection of clinical information and electronic transmission to another site for evaluation [18].

Lack of reimbursement was cited as the most significant barrier to adopting telehealth services; any changes in the reimbursement policy will further fuel and increase adoption rate growth [5]. A new proposal by the Centers for Medicare & Medicaid Services to reimburse virtual check-ins may indicate a shift in policy towards telehealth.

Patient and Provider Receptivity

Patient and provider receptivity of telehealth is the fourth factor motivating the increase in telehealth services. Over three-quarters of consumers (77%) have expressed interest in using telehealth programs, and over 65% are willing to utilize telehealth to manage their chronic diseases [6]. This positive feeling toward telehealth services continues once they utilize these systems. Sixty-seven percent of patients who used telehealth services report that it increases their satisfaction with medical care [7].

> **67%**
> of Patients who utilized telehealth services report that it increases their satisfaction with medical care[7]

For providers, implementing telehealth systems is seen as a priority for healthcare leaders. Fifty-eight percent of healthcare leaders placed a high priority on offering telehealth services [8]. 86% of healthcare executives that have not already adopted telehealth into their operations say that it is a medium to high priority [9]. Three-quarters of U.S. hospitals either have consumer telehealth services in place or plan to implement the capability by the end of 2019, according to Teladoc's second annual state of consumer telehealth benchmark survey [10].

Budget Constraint

Lastly, budgets play a pivotal role in the expansion of telehealth, as there is a gap between the need for telehealth services and services currently being offered and the available budget in place. Investments in telehealth programs are modest, with most healthcare organizations surveyed reporting budgets less than $250,000 per year. Budgets are generally expected to grow next year, with more than half of executives expecting growth of up to 25%. Of healthcare leaders who identify the need for telehealth services, only 14 percent said they have those capabilities. This gap indicates the continuing growth of telehealth services [2].

Six Essential Components for Building a Successful Telehealth Infrastructure

Understanding the five contributing factors and how they impact telehealth expansion can help healthcare organizations make informed decisions when building their telehealth infrastructure. To construct a fluid infrastructure, organizations must assess the six essential components of any successful telehealth infrastructure. These components consist of seamless integrations of all the necessary hardware, software, IT infrastructure, IoT, patient data, security and scalability to achieve telehealth operability.

1. Hardware

When building out or enhancing a telehealth program, it is best to look at the hardware components currently in inventory first that can be integrated into a telehealth program in order to determine the gap of what is needed. Hardware pieces to evaluate and incorporate are items such as medical carts, medical tablets, bedside terminals, and personal devices. These are ideal pieces to incorporate into a program as they can be mobile. Mobility allows healthcare providers to conduct consultations in areas where care needs to happen. The reason is that healthcare professionals spend nearly 90% of their time moving from place to place, providing patient care. The hardware outlined below assists healthcare providers in achieving that constant mobility without detrimental impacts or breakdown in operations.

Medical Carts

Medical carts allow healthcare providers to bring clinical records and insights from room to room. These carts could be to provide care, access electronic health records (EHR), record medical data, or to consult with a specialist at a different

location. These carts allow for the use of cameras, monitors, keyboards, computers, and mobile medical devices at the patient's bedside, with a wireless connection to access patient records.

> **Tip:** Carts classified as medical grade or EN/IEC 60601-1 certified, provide medical electrical equipment compliance to meet safety regulations. And IPX1 rated carts offer the added benefit of water resistance with protection against drippings.

Medical Tablets

Similar to medical carts, medical tablets provide the mobility to consult with patients and access health data from any location with the ease of a lightweight device. Medical tablets also have the function of working as an entertainment device for patients. Twenty percent of hospitals in the U.S. offer tablets for patients to access their medical information with the added enhancements of entertainment apps [17].

> **Tip:** Medical grade tablets classified as medical grade and contain anti-microbial enclosures to help prevent bacterial growth. Rugged medical tablet designs are ideal for demanding work environments and accidental mishandlings to withstand drops.
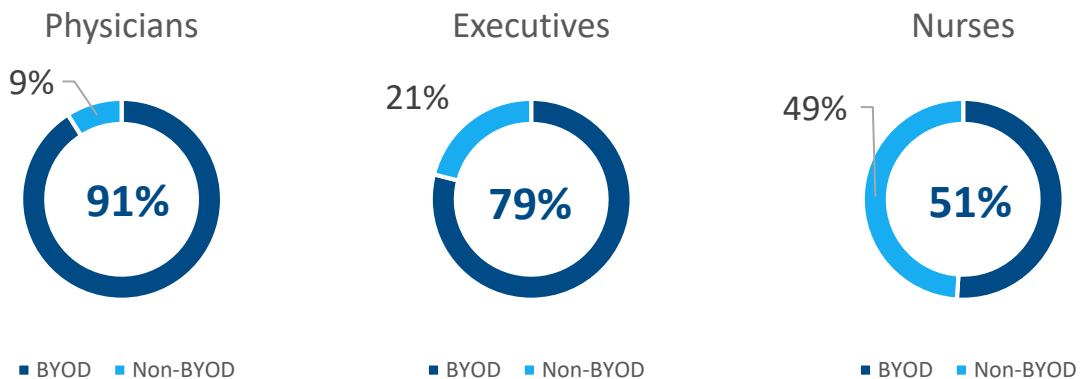
Bedside Terminals

Bedside terminals also allow for telehealth to be available where the patient is. The use of bedside terminals can vary depending on the type of application in telehealth on the patient and provider side. They can function as a nurse call station to alert staff, as a remote monitoring or document exam and laboratory findings device. For patients, they can work as an entertainment and communication device with individuals outside the facilities. By being available where care is provided, these can be essential pieces in a hospitals infrastructure.

> Tip: Bedside terminals classified as medical grade or EN/IEC 60601-1 certified for near-patient use and an antibacterial coating can be easily sanitized to prevent bacterial growth.

Personal Devices

A successful telehealth infrastructure needs to be flexible enough to handle the 'bring your own device', or BYOD, trend. The BYOD revolution, in which healthcare providers and their patients use their personal devices to access telehealth systems, will increase demand on telehealth infrastructure. With the growth of smartphone use and the number of worldwide smartphone users passing 5 billion by 2019, more healthcare providers and patients are going to be using these devices to engage with telehealth [14]. A recent study shows widespread BYOD among those in healthcare, including 91% of doctors, 79% of healthcare executives, and 51% of nurses. The advantages of BYOD for healthcare providers include improved workflow and time savings, as well as cost savings [9].

Bring Your Own Device Use in Healthcare

Physicians	Executives	Nurses
9%	21%	49%
91%	**79%**	**51%**
■ BYOD ■ Non-BYOD	■ BYOD ■ Non-BYOD	■ BYOD ■ Non-BYOD

> Tip: For programs favoring BYOD, it is important to consider a BYOD regulated program to decrease potential security breaches.

2. Software

Once telehealth programs, new or existing, have the necessary hardware selected, it is crucial to have the accompanying telehealth software that can easily integrate with all hardware components and current healthcare platforms. Telehealth technology was cited as the most crucial asset relative to program success among healthcare personnel [11]. To ensure no interruptions of operational workflows, healthcare facilities need the appropriate software and technology that easily integrates with existing and future platforms. Below are attributes of telehealth software ideal for creating program success and fluidity.

EHR Integration
Healthcare providers must be able to provide care remotely with software that can integrate with current EHR systems. Without this vital integration, telehealth programs cannot be executed efficiently and successfully.

HIPAA Compliant
Like all technology in the healthcare space, all aspects of a telehealth infrastructure need to be compliant with the Health Insurance Portability and Accountability Act (HIPAA) to protect patient privacy. These regulations pertain to the transmission or storage of electronic health data by a HIPAA covered entity to maintain patient data security.

Encryption Security
Similar to HIPAA compliance, it is crucial for telehealth software to utilize the latest encryptions to ensure patient data security meets HIPAA security standards and guidelines.

Analytics
Along with creating a telehealth program, it is necessary to track and manage operations by goals previously defined to determine the programs progress.

Electronic Prescriptions of Controlled Substances
Telehealth software should include electronic prescription features to allow providers to submit a prescription easily.

Reimbursement Documentation

As previously mentioned, many U.S. states new policy changes allow reimbursement for telemedicine services. However, to receive reimbursement, each visit must be well-documented. A platform that properly documents care will help with reimbursement procedures.

3. IT Infrastructure

An effective telehealth infrastructure includes all the pieces necessary for implementation, consisting of hardware and software with the ability to configure these pieces in ways that adapt to multiple healthcare environments. In order to adapt to these multiple healthcare environments, two attributes of a successful I.T. infrastructure must be met. For example, in an ICU setting, clinical information systems integrate patient care applications and data management tools to facilitate real-time decision making at the point-of-care. These systems can be employed in ICUs and at patient bedsides. They can be accessed via the hospital network or online, and improve access to a patient's EHR or other data. This type of integration allows for patient health data to be collected and shared with maximum efficiency in any healthcare environment.

The first attribute is that the technology must be available where care happens, and the second is that it must be reliable. The first is achieved with the proper hardware and software pieces that provide mobility so that telehealth services can be available where care happens. Reliable technology is also a must-have for telehealth infrastructure. According to a recent survey of healthcare executives, nearly half of estimate that their current telehealth solution fails 15% of the time, yet almost 70% consider reliability a "must have". A lack of confidence in the reliability of the technology is one of the top three reasons stated by providers as to why they are slow to adopt telehealth programs [5]. The second is achieved through a reliable I.T. network consisting of a reliable broadband internet connection and open system integrations.

> # 15%
> " Of telehealth solutions fail due to lack of reliability according to healthcare executives [5]

Broadband Internet

One key to successful telehealth services is access to robust digital infrastructure. Reliable technology is a must-have for telehealth infrastructure. According to a recent survey of healthcare executives, nearly half of estimate that their current telehealth solution fails 15% of the time, yet almost 70% consider reliability a "must have". A lack of confidence in the reliability of the technology is one of the top three reasons stated by providers as to why they are slow to adopt telehealth programs [5].

> " A minimum bandwidth of **384 KBPS** or higher is suggested when conducting telehealth services [13]

To ensure that networks can handle the demands of telehealth applications, healthcare organizations need to provide adequate infrastructure during the planning stages. The American Telehealth Association Practice Guidelines recommend sufficient transmission speed to ensure "the smooth and natural communication pace necessary for clinical encounters." A minimum bandwidth of 384 Kbps or higher is suggested when conducting telehealth services [13]. With reliable broadband connectivity, it ensures care can be available and dependable where care is provided.

Open System Integrations

In addition to connectivity, the second attribute of a telehealth IT infrastructure is the ability to integrate into the current IT infrastructure and is comprised of components that easily integrate. Healthcare executives prioritize that telehealth solutions are easy to use, easy to navigate, and compatible with their current systems [5]. Integration with EHR is also a priority when developing telehealth infrastructure. In a 2017 survey of healthcare personnel, the ability to integrate with EHR was rated as valuable by nearly 80% of respondents. Integration with other systems is also critical, with a majority (73%) of healthcare executives placing a priority on the ability to access PACS images (such as CT Scans) directly from the telehealth system [11]. Integration with lab systems, remote monitors, and

all communications systems are also crucial for facilities planning their telehealth infrastructure. The provision of open APIs and SDKs ensures smooth integration with existing infrastructure and management systems. Hardware and software integration can optimize performance and decrease latency for users. Having these components work together is beneficial to any system integration.

Healthcare Executives Telehealth Integration Priorities
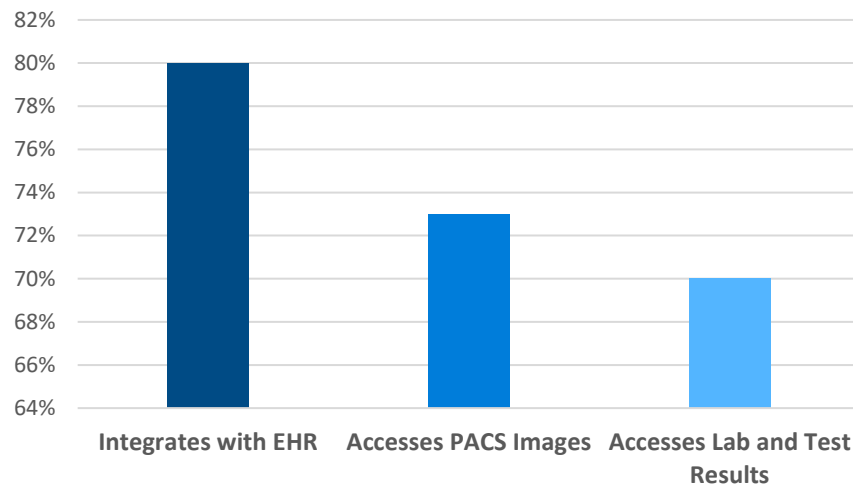
4. IoT

With a flexible IT infrastructure in place, the foundation is set to incorporate IoT into telehealth programs. Healthcare networks are increasingly investing in the Internet of Things, or everyday devices that are connected to the internet as the reliance on smartphones and BYOD's increases. These include wearable technology such as wrist watches or smart sensors that track the patient movements. Hospitals and doctors are using this technology to connect with patients and improve the overall visibility of their operations. Data show that over half (60%) of healthcare organizations surveyed have already introduced IoT devices into their facilities, citing cost savings and an increase in innovation as benefits of this adoption.

In addition to the increase in IOT adoption, IoT devices can help administrators track bed occupancy and can help practitioners monitor their patients remotely [9]. For example, using IoT real-time location services (RTLS) is a way to utilize the IoT to help keep components of telehealth infrastructure secure by tracking equipment throughout the healthcare facility. RTLS helps to improve workflow and decrease profit loss through theft or misplacement. In elder care facilities, this technology can also help track patients to prevent injury or patients wandering off. By equipping elder care facilities and hospitals with connected devices and monitors, providers can provide bedside care more conveniently, for both the patient and the provider.

5. Scalable Design

When designing a healthcare IT infrastructure along with IoT integrations, the design needs to have the capacity for growth. As demographic, regulatory, and reimbursement shifts occur, healthcare organizations need to have a telehealth system that can grow with them. This scalability includes having servers and broadband service that can be easily upgraded to support more devices.

Capacity for growth follows the trend in telehealth with systems moving from fragmented, siloed initiatives into an enterprise approach, which takes a system-wide view and pulls disparate elements into one cohesive system. The 2018 REACH Health survey indicates that almost half of the respondents are taking an enterprise approach to telehealth, a 23% increase compared to 2017. More than 50% of hospitals that started with a departmental approach is evolving toward or have already transitioned to a holistic operation. This approach is an effective tactic, with those healthcare institutions who utilize an enterprise model achieving 30 more of their goals than ones that are managed out of separate departments [8].

One way to achieve this approach is to select portable devices that can integrate with hardware and software outside of its manufacturer. This prevents depending on one provider and ensures future scalable growth. Whether with current or new connective and telehealth software vendors, it is essential to check if services can support increased use or additional components. Healthcare organizations should

inquire about any potential limits of components or users for future growth to achieve an enterprise approach to scaling a telehealth program.

6. Patient Data and Security

Although previously covered separately in hardware and software, patient data and security cannot be iterated enough. Any system that provides for the patient, the provider, and the healthcare system is a crucial component of a telehealth infrastructure. If the infrastructure is open to a breach in security, a vulnerability may result in medical device malfunction, a breakdown in healthcare services, or inappropriate access to patient information.

> "Security breaches cost the healthcare industry **$6.2 BILLION**[15]

These breaches can have a profound impact on patient care and safety. Along with violations to regulations can be costly for healthcare institutions. A recent data security firm report estimated that security breaches cost the healthcare industry $6.2 billion in 2016, while HIPAA Security and Privacy rule violation penalties for providers range from $50,000 per breach incident up to $1.5 million [15]. Security concerns are also significant to patients. Thirty-five percent of respondents are concerned about the privacy and security of their health information [16]. The cost to both bottom line and reputation are two of the reasons why protection is critical to any successful telehealth infrastructure.

Along with the detrimental impacts of data breaches, it is important to acknowledge the BYOD trend and its potential impacts on data breaches. While the BYOD movement has gained popularity due to its ease and cost savings, it also increases the risk for both data breaches and non-compliance. These devices allow healthcare providers to be productive from any location, but telehealth providers must create a secure infrastructure and focus on how they can secure the devices being used. The mobile devices must have HIPAA-compliant software with both

their operating system and any third-party applications that are used. Mobile devices should be two-factor authentication secured to limit access to sensitive information by people outside the healthcare environment. Infrastructure should also include the ability to remotely disable and remove data from any mobile device containing protected health information, should the device be lost or stolen to prevent potential breaches. Securing your telehealth from all possible threats is crucial to the success of any program.

Conclusion

As healthcare organizations play catch up to the rapidly growing telehealth services, it is necessary for them to build out a telehealth program with seamless integration of all six essentials components of a successful telehealth infrastructure aforementioned. By preparing a program with the appropriate hardware, software, IT infrastructure, IoT devices, and patient and data security, fluid telehealth operability can be achieved. The structure of these six components is not without the influence of outside factors shaping how programs are being built. U.S. demographic shifts of the elderly continue to grow, and the increase of individuals with a chronic disease, telehealth technology, and service will adapt to augment care and service these growing needs. Slow investments into telehealth programs currently constrain healthcare organizations as they explore this route. Change in state policies will further increase adoption as reimbursements are recognized through these services. Lastly, both patients and providers highly approve of and are willing to adapt to telehealth services. It is crucial to bear in mind the outside influences and the six essential components of a successful telehealth infrastructure to understand how it will impact operations and telehealth services both now and in the future.

About Advantech

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