HCS 200c: Virtualization, Mobile Computing, and Telehealth

This lesson gives an introduction to the general architecture of health IT includes a brief overview of computer hardware, software, and network technology; Web services; and data storage. In-house architecture is contrasted with outside applications and service providers offering remote hosting. Medical and point-of-care devices that interact with information systems are discussed along with issues of connectivity and interoperability.

- HIT Cloud and Web Services
- HIT Virtualization
- HIT Mobile Computing
- HIT eHealth: Telehealth
- Flashcards
- Sorting Activity: Cloud Computing
- Sorting Activity: Advantages of Virtualization
- Practice Quiz

HIT Cloud and Web Services

In today's era of ubiquitous computing, services provided through the Internet are extensively used for personal, home, business, and healthcare environments. Web services require special technical equipment and skills. It is often less expensive for business and health information technology (HIT) system administrators to lease services through the Internet than to maintain staff to implement them in-house.

HIT Cloud Computing

Cloud computing is a type of Web service that is becoming increasingly popular. The National Institute of Standards and Technology (NIST) defines cloud computing as

In cloud computing, users access resources (hardware, software, data storage) that are hosted on the Internet rather than physically maintained at the users' location. Cloud computing users may need nothing more than a device, such as a laptop, smartphone, or tablet PC, with Internet connection.

Cloud Models

If a business or healthcare organization incorporates cloud computing in its system or network architecture, it is important to establish ownership of the cloud computer resources:

- Private cloud is operated for a single organization.
- Community cloud is shared by several organizations with interests in common, such as several hospitals in a region.
- Public cloud is available for a fee. Examples are cloud services provided by vendors such as Amazon, IBM, Microsoft, and Google or provided by smaller vendors such as Rackspace, CSC, and BlueLock.
- Hybrid cloud combines multiple clouds. [2]

Cloud vendors offer their services to subscribers—individuals, businesses, healthcare providers, and others—who contract for the service. The subscriber's degree of control is reflected in the form of the subscription:

- ***Software as a Service (SaaS)***: Subscribers get access to a fully formed software application and all the related computer resources. In a SaaS agreement, subscribers have the least control over the cloud computer resources.
- ***Platform as a Service (PaaS)***: Subscribers get access to computer resource components. They can develop and operate their own applications, based on these components, using tools provided by the PaaS platform.
- ***Infrastructure as a Service (IaaS)***: Subscribers lease all computer hardware resources from the cloud vendor and build and maintain their own software on the IaaS platform. [2]

Advantages of Cloud Computing

Cloud computing is particularly appealing to businesses and healthcare providers who are new to computer infrastructure requirements. It offers significant advantages:

Minimal Startup Costs	All that is needed is basic wired or wireless Internet access.
Minimal Ongoing Costs	Ongoing costs are confined to subscription and usage fees. There is no physical computer infrastructure to maintain.
Controlled Data Storage Costs	Data storage costs reflect just what the subscriber uses, and data storage takes up no floor space.
Access Mobility	Subscribers can access their data anywhere, anytime, with a mobile device, laptop, smartphone, or tablet PC.

EXAMPLE

A Convenience of PaaS

Dr. Wong's practice uses a PaaS subscription to a cloud-based EMR. Dr. Wong leaves his practice early one afternoon. When he gets home, his ofice nurse calls about a patient who needs a prescription refilled. Dr. Wong can bring up the Internet on his smartphone and access the cloud-based EMR. He looks up the patient's record and submits an e-prescription to the patient's pharmacy, then logs off.

Disadvantages of Cloud Computing

The risks associated with cloud computing must be considered:

Dependency on Internet	If Internet access goes down, so does access to the cloud computing resources.
Effects of Internet Traffic	Cloud computing performance may be affected by Internet traffic.
Minimal Administrative Control	The network administrator works for the ISP or for the cloud service, not for the subscriber.
Potential Threats to Privacy and Security	Privacy and security may be the most significant concerns with cloud computing, particularly for healthcare users. All data and software are located offsite of the subscriber, "in the cloud." How can the subscriber be sure the data is available as needed, is kept private and secure, and maintains HIPAA standards?

EXAMPLE

A Disadvantage of PaaS

Dr. Wong's practice uses a PaaS subscription to a cloud-based EMR. Dr. Wong leaves his practice early one afternoon. When he gets home, his ofice nurse calls about a patient who needs a prescription refill. Dr. Wong tries to access the cloud-based EMR but finds the Internet access is not available.

Dr. Wong can write a paper prescription for the patient, but he must get that paper prescription to the pharmacy. Also, he must do so without benefit of the alerts and warnings the EMR provides. Not an ideal situation.

Knowledge Check

A physician has set up computers, network servers, and storage devices and installed a new EMR computer system in her practice ofice. What is the physician using?

cloud computing in which all the hardware, software, and data is set up and maintained by the cloud vector, and the physician simply needs access through an internet connection.

a traditional computer setup with hardware, software, and data all housed in the physician's office.

A small physician practice has subscribed to an EMR that is maintained by a cloud vendor. Each physician, nurse, and administrator in the practice has either a laptop or a smartphone that provides access to the EMR. What is this physician practice using?

a cloud-based computer setup in which all the hardware, software, and data is setup and maintained by the cloud vendor, and the physician simply needs access through an internet connection

a traditional computer setup with hardware, software, and data all housed in the physician's office

Internet Web Services

Whether or not system or network administrators use cloud computing services, it is likely they will use one or more cloud-based Web services within their system architecture.

Email

Email is an essential communication tool in today's businesses and healthcare organizations. Often, system administrators outsource email to an email cloud vendor.

It is common practice for users to send a business email to a coworker who is sitting just a few feet away to ensure a record of that message is stored. Healthcare email users must be very cautious, however, because email security is limited. Patient healthcare records should never be sent via email.

Instant Messaging

Currently, a wide variety of instant messaging Web services are available, providing quick and easy communication. Some EMRs use instant messaging to notify providers about significant events in an inpatient's treatment, such as that laboratory studies are completed and the results are ready to review.

Instant messaging can be disruptive if overused. For example, too many EMR alerts can lead to alert fatigue, and significant events can be missed in a flood of insignificant events. Balanced use is the key to effective instant messaging.

Video and Voice over Internet (VoI)

Internet Web services can be used to communicate using voice and video. Most computers and mobile devices are equipped with video cameras. VoI on Web services, such as Google Talk and Skype, enable voice and video conferencing between physicians and their patients.

Social Media

Businesses and healthcare organizations use services such as LinkedIn to search for potential employees. Many entities also build a profile on social media sites such as Facebook to advertise their services.

Knowledge Check

A hospital uses a cloud-based email service. Employees are encouraged to use the service for most kinds of internal communication, but they are warned about certain kinds of email content and of the dangers of using email for outside communication. This is because_____.

a record is kept of all email communication, and they can later be accessed and used as evidence in a lawsuit

email is a very insecure method of communication, and patient healthcare data therefore should not be sent through email

Cloud Computing for HIT

The use of cloud computing and other Web services in healthcare is expanding rapidly. Following are just a few examples.

EHR/EMR on the Cloud

A growing number of EHR/EMR systems are available as SaaS cloud computing solutions. Obviously, the healthcare provider whose patient data will be stored in a cloud-based EMR must perform intense due diligence to ensure patients' privacy is protected and to meet all HIPAA standards. [3] Examples of cloud-based EHR/EMR systems include

- Meditouch
- Centricity [3]
- CureMD

- Practice Fusion
- Athena Health [4]

Other Cloud Applications

The opportunities for HIT applications to be cloud-based are ever expanding. Following are just a few cloud-based applications that healthcare providers are already using:

- Personal health records such as Microsoft HealthVault and Health ATM
- Email-based faxing
- Online drug usage portals
- E-prescription services
- Health data management and performance analytics
- Patient wellness programs that encourage individual healthy habits and lifestyle
- Medical research
- Clinical decision support systems [5]

Knowledge Check

The following are examples of HIT applications that might be offered as cloud-based Web services. Choose the option that is NOT a candidate for cloud computing.

EHR/EMR systems

Medical research

e-prescribing and CDSS

POC testing

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HIT Virtualization

A vendor who offers cloud computing and Web services might seem to have infinite computer resources. How is it possible to provide services to so many subscribers with such variable levels of control?

One of the techniques used by cloud computing vendors is virtualization, which allows many systems to "apparently" run on a single hardware system.

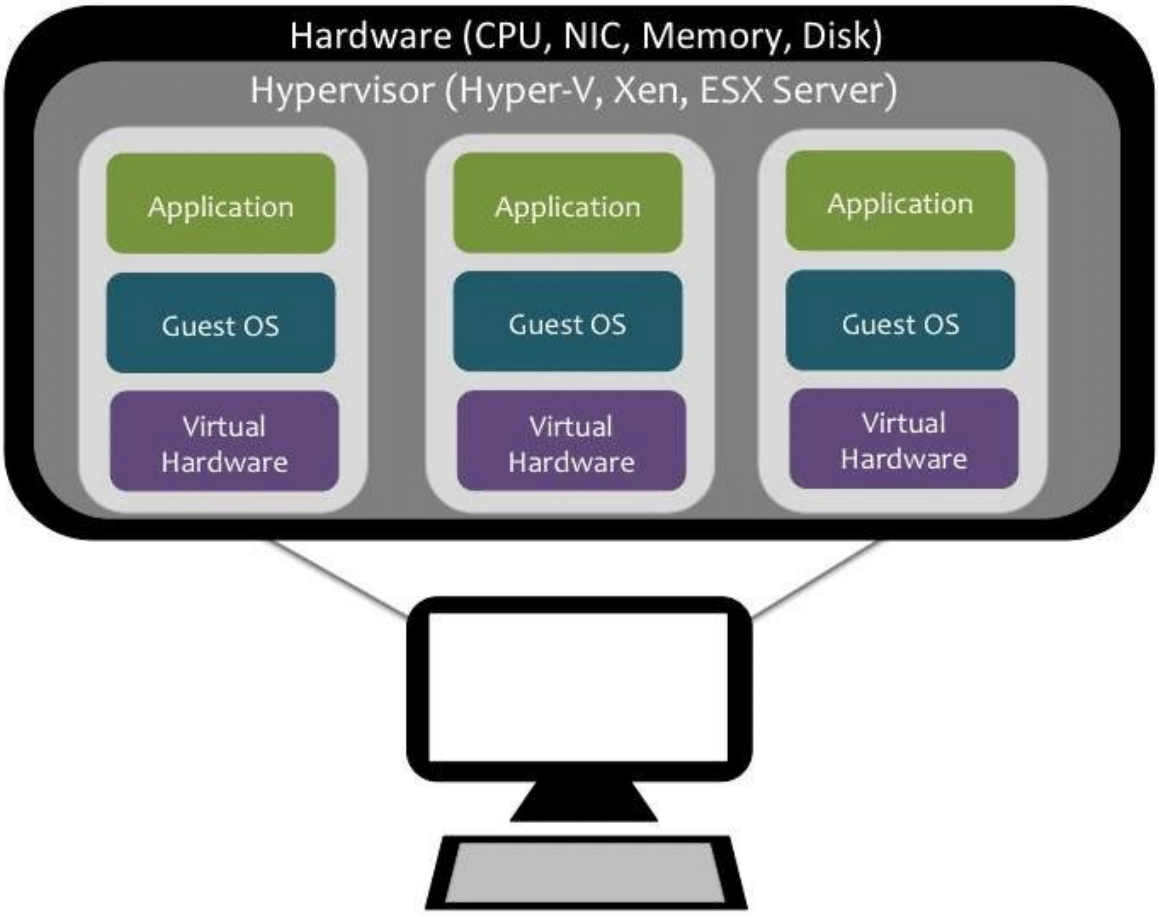
Virtualization has been around for several decades. In 1972, IBM's Virtual Machine Facility/370 provided a system that, from user's point of view, was dedicated solely to his or her use but in reality could provide service to many different users or could provide different services to the same user.

Virtualization

Virtualization provides a layer between the computer hardware and the application software. A virtual system provides a logical rather than a physical view of computing resources. Virtualization allows the system administrator to

- Make the operating system think that a group of servers is actually a single computing resource.
- Allow multiple operating systems to run simultaneously on a single machine.

Virtualization takes advantage of a concept called partitioning, which divides a single physical computer server into multiple logical servers. Once the physical server is divided, each logical server can run a separate operating system and application independently.



Virtualization has been used extensively to re-create end-user environments on a single computer for purposes of

- Software application version testing
- Software application testing on different operating systems, such as Windows NT and Linux

Recent advances and the development of the hypervisor have led to an increased interest in the use of virtualization for other purposes.

Web Application Development

Virtualization has become a mainstream tool for software developers. Rarely are applications created today for a single operating system. Virtualization allows developers working at a single workstation to write code that runs in many different environments and, perhaps more important, to test that code in each environment.

Consolidated Computer Resources

Consolidating computer resources through virtualization enables businesses and other organizations to reduce the number and types of servers and storage devices they need to support their applications. This systems approach reduces the power consumption of the computer resources, including the servers and the storage devices. Consolidation also results in fuller use of existing computer resources, and a smaller number of servers and storage devices are simpler to manage. [1]

According to John Waters in "Virtualization Definition and Solutions," network virtualization can be used to "combine computing resources in a network by splitting the available bandwidth into independent channels," [1] which allows real-time channel assignment to a particular server or device.

Consolidation therefore results in cost savings and simplification of the management associated with computer and network resources. [1]

Distributed Computer Resources

Ironically, virtualization also allows distributed servers and storage devices to appear as a single resource and to be more readily managed. Virtualization separates the physical nature

of computer resources, including the number and identity of individual servers, processors, operating systems, and storage devices from the softwarerunning on them.

Advantages:	**Consolidated Computer Resources**
Cost Savings	*Cost savings* is the primary advantage when virtualization is used to consolidate computer resource.

Advantages:	**Distributed Computer Resources**
More Efficient Management	*More efficient management* is the primary advantage when virtualization is applied to distributed computer resources.
Higher System Availability	Greater control over *system availability* is an advantage of virtualization. If one physical system goes down, support can readily be shifted to another physical system.
More Robust Disaster Recovery	Disaster recovery is similar to system availability. If a *disaster* brings down one or more servers, virtualization allows *recovery* to readily shift to another physical resource.
Workload Balancing	Virtualization allows more even *distribution of available computer resources* but also requires more effort to ensure peak time application requirement conflicts are addressed.

Advantages:	**Both Consolidated and Distributed Computer Resources**
Better Response to Change	Whether a consolidated or a distributed system is the goal, virtualization greatly enhances an organization's business agility. Virtualization allows great flexibility and enables organizations to *better respond to changes* in the business climate as addressed in the examples that follow.
Resource Utilization	It is estimated that only 5 to 25 percent of server capacity is utilized in traditional computing system architecture. Virtualization can improve *resource utilization*.
Management Shift	Systems administrators can shift their focus away from managing technology to *managing services provided by the computer technology*.

EXAMPLE

Advantages of Virtualization

Virtualization allows great flexibility and enables organizations to better respond to changes in the business climate as demonstrated by these examples.

A cloud vendor offering EMR services to physician practices can readily add hardware to support more customers and then simply add, under the hypervisor, additional partitions to service the new customers.

A large hospital might contract with a new physician practice. If that practice runs on a UNIX operating system, the hospital could readily add a virtualized UNIX OS under the hypervisor to accommodate the new practice interface.

Challenges of Virtualization

Virtualization changes the way systems are managed, administered, and operated. These changes can be challenging to IT staff, and retraining may be required to fully transition from traditional to virtual systems.

Virtualization creates the potential for performance conflicts between the different applications served. Systems administrators must be very aware of peak hours of usage that might slow system performance.

The complexity of the layers associated with virtualization present real challenges to the systems administrator. So when choosing a virtual management (VM) system, the systems administrator should expect the VM vendor to include tools that provide easier management, monitoring, and allocation of virtualized resources.

HIT and Virtualization

With the HITECH Act's influence, healthcare organizations are increasingly aware of the challenges that come with implementation of EHR and EMR systems.

If a small physician practice decides to subscribe to a cloud vendor EMR solution, it is important to have a basic understanding of the technology used in the vendor solution. It is particularly important for the practice to be knowledgeable about the system and data security the vendor provides.

Cloud vendors who implement virtualized system solutions may be better equipped to provide consistent system availability and performance as well as robust disaster recovery capabilities.

Large-scale healthcare providers who maintain their own computer resources, such as integrated delivery systems (IDSs), and large hospitals can benefit from virtualization just as any other business might:

- Eficiency and cost savings resulting from less hardware and/or better utilization of existing hardware
- Improved system availability and reliability
- Robust disaster recovery and backup

The challenge for these healthcare providers is to hire new staff and/or to retrain existing staff to ensure their IT and HIT staff have suficient knowledge and understanding to effectively and eficiently manage the virtualized systems.

Knowledge Check

A large hospital can use_____to consolidate its computer resources and manage the EMR, email, and all other applications under the umbrella of a simpler and less expensive single computer system.

virtualization

a distributed system

hyperdrive

hypervisor

A systems manager for a healthcare organization's integrated delivery system has several different systems installed in different locations. The administrator manages these systems separately and has designed interfaces that allow the data to be consolidated when needed. This approach to computing is called_____.

virtualization

a distributed system

hyperdrive

hypervisor

A large hospital intends to consolidate its computer resources and implement virtualization. Which of the following will NOT present a challenge for this hospital?

- Applications systems may conflict and cause system performance issues.
- The systems administrator will need new tools to manage virtualized resources.
- Resource consolidation will be expensive.
- The IT staff may require retraining or new staff may be required.

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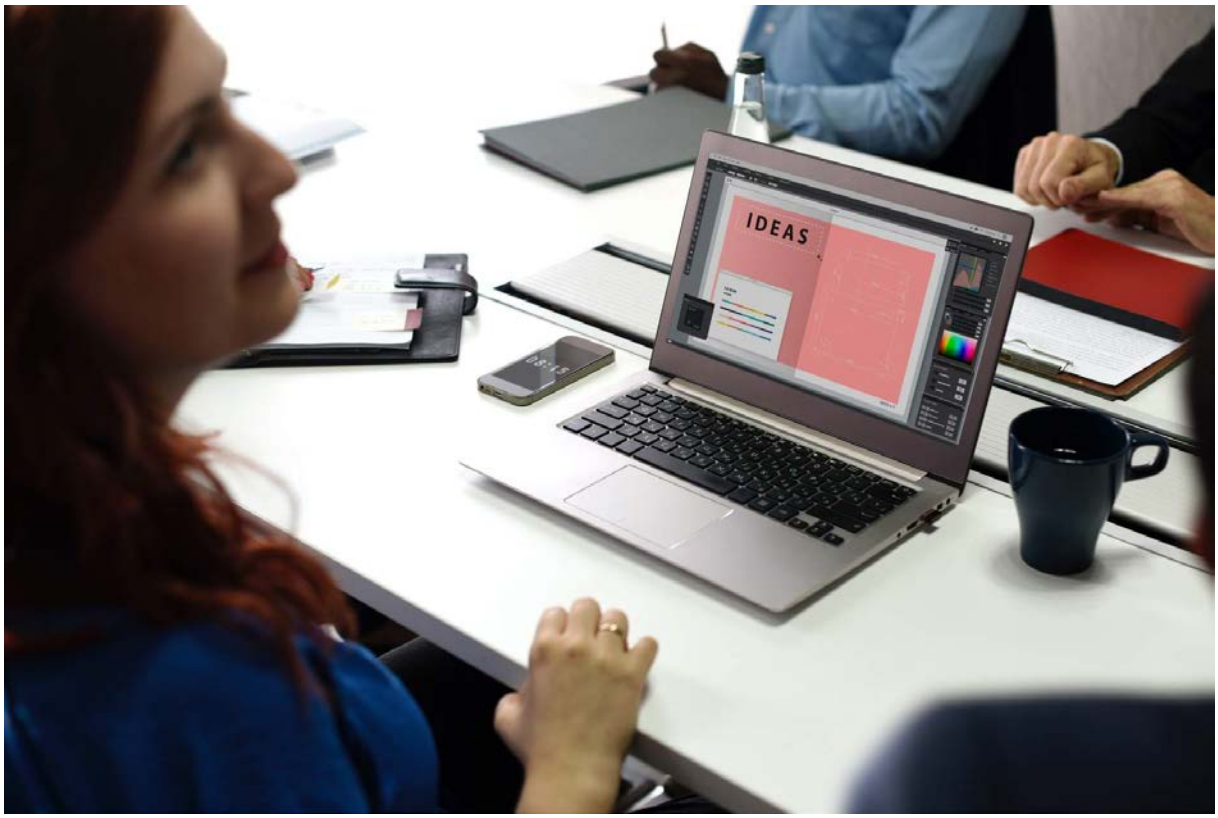
HIT Mobile Computing

Nineteen ninety-three marked the beginning of the mobile computing era with the introduction of the Apple Newton Message Pad, a device that was ahead of its time. By 2009, annual sales of mobile devices had reached 17 million worldwide. [1] Electronic devices today are smaller, lighter, and more mobile than their predecessors due to miniaturization of electronic circuits, processors, and batteries.

Healthcare providers are constantly on the go. Mobile devices free them from being tethered to a desktop computer and allow them better access to patient records at point of care, greatly improving patient safety and quality of care.

Earlier discussion of mobile devices at point of care focused on medical testing and analysis. Here the focus is on tablet PCs, personal digital assistants (PDAs), smartphones, iPads, and other devices that enable healthcare providers to remotely access information or software applications.



Protecting patient data is a more complex and significant effort with wireless mobile devices. However, mobile devices, coupled with intranet and/or Internet access, give providers access to a variety of medical and administrative applications in a variety of settings; some examples are listed in the following table.

Healthcare Application	Use for Mobile Device
Drug reference	The number of medications prescribed daily and the dramatic number of new drugs coming on the market require physicians to regularly check drug reference books. Traditionally, these references were dictionary-sized manuals that required constant hard-copy updates. With a mobile device and Internet access, providers have up-to-date information including correct dose, drug route, and medical contraindications such as drug–drug interactions.
Medical calculations	Many drug dosages, especially for children and the elderly, are based on the patient's weight. A handy calculator on a mobile device reduces the chance of errors when a physician calculates drug dosages.
Medical reference	Physicians and nurses often research a condition or symptom through medical reference materials. Traditionally, these materials took up many shelves in a library and required constant manual updates. With a mobile device and Internet access, providers can access the latest treatment recommendations at point of care.
EMR patient information	A patient's medical history, laboratory reports, and other critical information are stored in the EMR, often before the paper chart is available. Any member of a patient's interdisciplinary healthcare team can use a mobile device, supported by intranet or Internet, to access and update patient records at point of care. This capability greatly improves patient safety and quality of care.
EMR system clinical functions	A physician can perform clinical functions with a mobile device supported by intranet or Internet access. Mobile access to e-prescribing is particularly useful when pull-down menus and preselected lists of drugs make e-prescribing from the point of care effortless.
Patient encounter coding	Coding patient encounters is important to the provider reimbursement process. Procedure codes must reflect the level of difficulty and/or amount of time a physician spends with a patient. Mobile devices can provide computational assistance for accurate coding, thus ensuring correct reimbursement for services rendered.
Appointment calendar	Physicians have busy schedules and see many patients in a single day. Appointment tracking is an essential tool. A mobile device coupled with intranet or Internet access gives physicians access to their schedule anywhere, anytime.

Knowledge Check

What is the primary advantage mobile devices provide physicians over wired devices such as a desktop computer?

- Healthcare applications ca be accessed anywhere at any time using a mobile device.
- Security for mobile devices is easier to manage.
- Data is easier to enter on a mobile device.
- More data can be stored on a mobile device.

Which of the following clinical functions is particularly useful at point of care?

- E-prescribing
- Patient encountercoding

Laboratory orders

EMR patient information

While treating a patient, the physician performed some research associated with the patient comorbidity of diabetes and heart disease, this is called_____.

appointment

medical reference

medical condition

patient encounter coding

Adoption of HIT Mobile Computing

As early as 1995, 90 percent of US physicians were found to express high interest in mobile computing. [2] Despite the high interest, however, one analysis found that by 2005, only 37 percent of Florida physicians were using mobile computing. [3] [4]

Patterns of mobile device adoption in healthcare have been examined. Following are some highlights of the findings:

- "Younger doctors, medical students and physician residents are more likely to use mobile devices." [5]
- "Family physicians may not be more likely to use mobile devices, but when they do, they use more features, perhaps because PCPs see such a wide range of patients." [4]
- "Physicians in urban settings are more likely than doctors in rural settings to use mobile computing, even though the benefits of mobile devices are equally applicable in rural and urban settings." [6]

Early HIT Mobile Computing

The gap between the 90 percent of physicians who expressed an interest in mobile devices in the 1990s and the actual usage in the early 2000s relates to drawbacks of early mobile devices.

- Early mobile devices were not the sleek, pocket-sized devices in abundance today. They were awkward to carry.
- Early mobile device response and computing times were slower. The devices had very small memories and very little ability to multitask.

- Physicians and other clinicians need a device that can operate all day on a single battery charge. Early devices held only 1– to 2–hour charges with continuous use.
- Early mobile devices lacked functional keyboards and user-friendly input mechanisms.

Early mobile devices were cumbersome to use and a hard sell to healthcare professionals, who value eficiency and ease of use. Adoption of mobile devices was therefore slow in the healthcare sector.

Benefits of HIT Mobile Computing

Advances in technology and improvements in usability and design have reversed the slow adoption of mobile computing devices.

According to a report by Manhattan Research, "Physician tablet adoption for professional purposes almost doubled since 2011, reaching 62 percent in 2012, with the iPad being the dominant platform. Furthermore, one-half of tablet-owning physicians have used their device at the point-of-care." [7]

Modern mobile devices have overcome most of the issues of slow processors and insuficient battery life. Modern mobile devices can multitask, and they provide keyboards and other input devices that are easy and eficient to use.

Mobile devices offer a variety of benefits to healthcare providers. Some are listed in the following table.

Benefit	Example
Cost savings	The cost savings of untethering a physician and other providers in a healthcare environment is calculated to be significant.
Healthcare best practices	Mobile devices when coupled with clinical decision support tools assist a physician to learn and practice evidence-based medicine.
Communication with patients	Mobile devices can be used to display diagrams and other informational graphics to patients depicting what is wrong with them and/or what kinds of procedures will be used in their treatment. This can greatly improve patient comprehension and better empowers the healthcare consumer.
Mobile healthcare	Mobile devices untether the physician and other clinicians. This is a critical time-saving mechanism. It also greatly enhances clinical decision making and provides a more efficient and effective point-of-care treatment.
Safer drug dispensing	As previously discussed, medical calculators and other clinical decision support tools can prevent medical errors such as adverse drug interactions or contraindications.
Better clinical outcomes	There is growing documented evidence that patient clinical outcomes can be improved when physicians have access to more complete and more up-to-date information through a mobile device at point of care.

Table adapted from AMIA Annual Symposium Proceedings (2003). [8]

Challenges and Regulation of HIT Mobile Computing

Mobile computing in healthcare brings a few challenges for the healthcare system and network administrators.

Mobile devices are wireless, so healthcare network administrators must provide encryption and security measures that protect patient information and ensure adherence to HIPAA standards.

Traditional restrictions against the use of wireless devices in healthcare settings, particularly hospitals, are based on fear that wireless transmissions might interfere with electronic medical devices used to treat patients. The possibility of interference must be disproved, or protections must be put in place to eliminate this danger.

From the regulatory perspective, all mobile devices used with an EMR/EHR system must pass the HITECH Act certifications specifications and meet all established standards and protocols.

Last, but not least, the FDA has "a public health responsibility to oversee the safety and effectiveness of a small subset of mobile medical applications that present a potential risk to patients if they do not work as intended. In order to balance patient safety with innovation, it is important for the FDA to provide manufacturers and developers of mobile medical applications with a clear and predictable outlines of our expectations." [9]

These challenges are being addressed. Mobile computing devices are here to stay in healthcare today and in the future.

Knowledge Check

Which of the following is NOT a benefit of using mobile devices in healthcare?

- Better clinicaloutcomes
- Improved healthcare best practices
- Cost Savings
- Increased network security

Which of the following represents a drawback of early mobile devices that negatively affected adoption in healthcare?

- Sleek and slim design
- Primitive input mechanisms
- Lots of memory and fast processing speeds
- Long-life batteries

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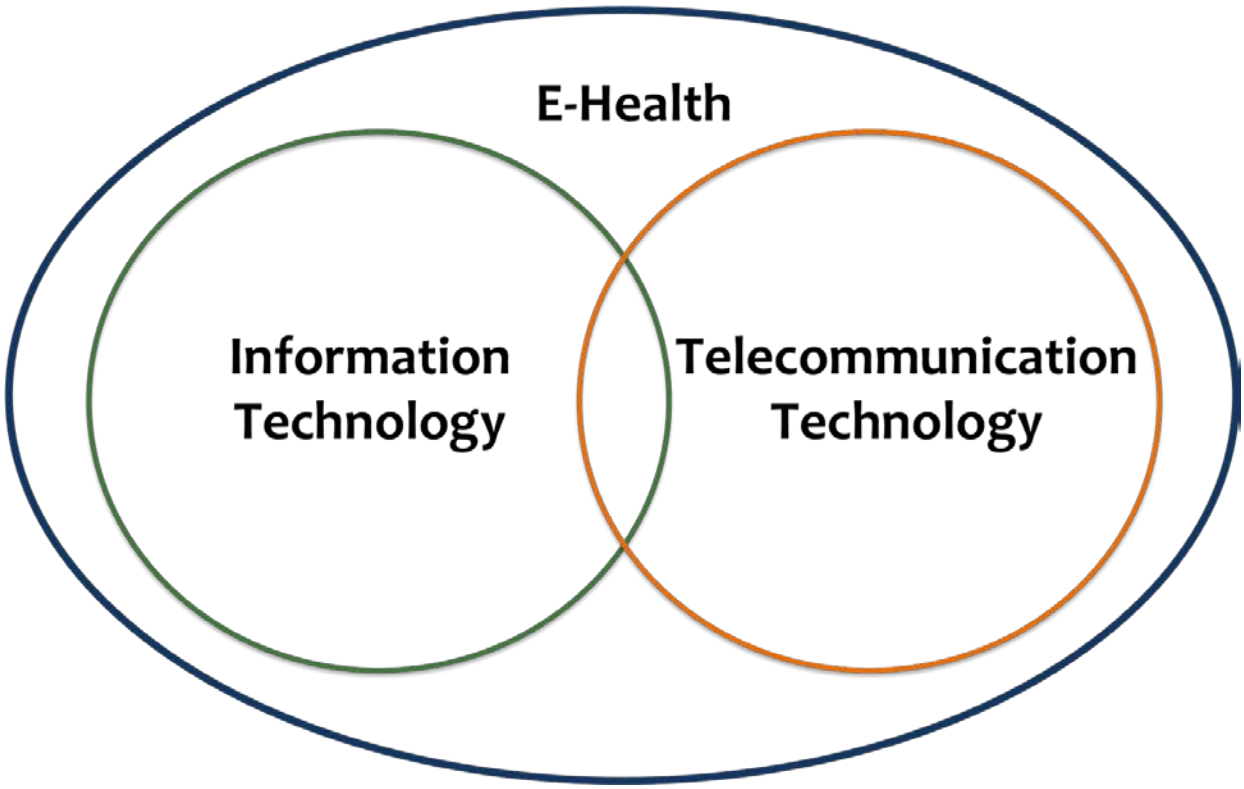
Continue with other activities/quizzes...

HIT eHealth: Telehealth

eHealth encompasses aspects of healthcare that utilize information and telecommunications technologies to support healthcare delivery and other healthcare-related activities.



Increasing the cost-effectiveness of telemedicine by embracing eHealth.
 by CAST, adapted from Mitchell, J. [1]

The scope of eHealth is evolving. At present, it encompasses services and systems at the leading edge of medicine/healthcare and information technology, including the following:

- Electronic health record (EHR) and electronic medical record (EMR) systems
- E-prescribing
- Consumer health informatics
- Mobile health (mHealth)

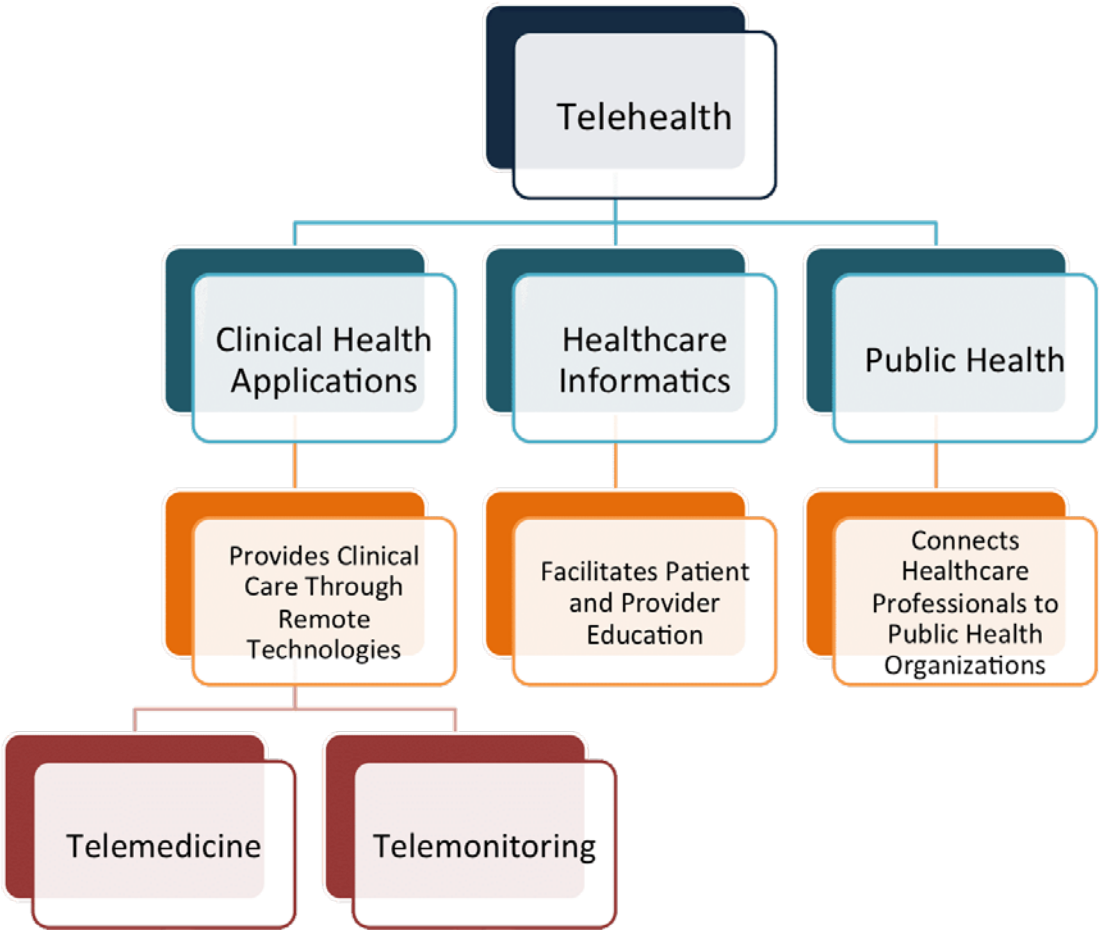
Currently, standards and regulations are defined and associated with each of these individual services and systems.

eHealth services are often driven by business principles. Telehealth brings many benefits to healthcare and represents one emerging aspect of ehealth. Telehealth is gradually becoming part of the healthcare mainstream. [1]

Telehealth

Telehealth provides direct but remote support of clinical healthcare. It offers patients and providers remote access to health informatics data. Telehealth supports public health administration and thus public safety.

Smart technology in the home, with remote links to HIT systems, enhances quality of patient care. Telehealth supports patient monitoring systems and takes advantage of Internet and mHealth mobile technology to collect community and clinical health data; to deliver health information to practitioners, researchers, and patients; to monitor patient vital signs in real time; and to provide direct provision of care. [2]



Telehealth utilizes a variety of hardware and software components, including computers, fax machines, telephones, video monitors, robotics, and remote patient monitoring devices used to collect and transmit patient data for monitoring and interpretation supported by an intranet or Internet network between two or more sites.

Telehealth Clinical Applications

Telemedicine

Telemedicine [3] is clinical care provided through remote technologies. It is focused on the doctor–patient or other provider–patient interaction and provides evaluations, diagnoses,

and/or prescriptive services for patients.

Telemedicine is supported by telehealth technology that allows long-distance healthcare in rural or remote areas, schools, prisons, and the home. Some of the more common applications for telehealth include diagnostic evaluation and data exchange, such as real-time video images.
If a business or healthcare organization incorporates cloud computing in its system or network architecture, it is important to establish ownership of the cloud computer resources:

EXAMPLE

Telehealth in Practice

Dr. Watanabi holds a medical consultation with a patient via a telecommunication system. He uses an online stethoscope to perform an electronic examination to aid in diagnosis and decision making regarding patient treatment. Telehealth technologies make this remote patient visit possible.

Telehealth and telemedicine improve healthcare quality for patients, reduce disparities among patient populations, and increase convenience for patients.

Telemonitoring

Telemonitoring [4] is another extension of telehealth. Telemonitoring uses mHealth devices to monitor and transmit patient vital signs and symptoms to distant healthcare facilities where healthcare providers evaluate and review the measures. This monitoring occurs separately from actual patient–physician visits.

According to testimony given by Farzad Mostashari, MD, MPH, Senior Advisor, Ofice of the National Coordinator for Health IT,

"Home monitoring can place daily metrics of patients' health—weight, blood

pressure and other vital measures—in patients' and providers' hands, improving chronic care management and patient engagement.

Early detection of problems made possible with real-time information, but not imaginable through ofice visits at six-month intervals, can help avoid unneeded hospitalizations for patients with heart failure and other chronic conditions.

Secure sharing and remote reading of patient information such as radiographic images on high speed channels can improve care coordination and reduce the risk of medical errors. [5]"

EXAMPLE

The US Department of Veterans Affairs Ofice of Care Coordination Home Telehealth Program installs medical devices in patient's homes to improve quality of care for veterans across the United States. According to the Florida Health Information Management Association (FHIMA),

Veterans use the home devices to capture various measurements including blood glucose, blood pressure, pulse from the blood pressure device, temperature, weight, pain, pulse oximetry, and pulse from the pulse oximetry device. All these measurements are obtained from measurement devices (except pain, which is subjective) which are connected to the home device.

The home device sends the measurements to a national vendor server located within the VA network and it sends those measurements to VHA systems where their VA providers can view them. [6]

EXAMPLE

AT&T offers the Diabetes Manager System (from WellDoc Communications, Inc.). This service runs on a smartphone platform. According to an article on the HealthData Management website,

The application enables type 2 diabetic patients to enter their blood sugar readings into their mobile phone and receive real-time feedback on what they should eat and other ways they can help stabilize their blood sugar. The software also can alert patients when they need to test their levels.

Further, the application sends the data to vendor servers, where it is analyzed and can be accessed by the patient's physicians and disease management caseworkers. [7]

Telemonitoring services provide timely intervention and initiation of treatment. Healthcare problems are addressed before they worsen and result in the need for hospitalization.

However, challenges arise with telemonitoring. Some home monitoring devices send readings constantly. With so much data coming into the healthcare facility that monitors the readings, important information could be missed, leaving the patient susceptible to health issues and leaving providers vulnerable to malpractice lawsuits.

Telehealth and telemonitoring technology must evolve to meet these challenges; monitoring facilities must establish protocols to mitigate the risks; and patients must be educated about the various aspects of telemonitoring that require their participation.

Telehealth and Health Informatics

Telehealth can facilitate patient and provider education and informatics across wide geographic areas. Distance education can be given simultaneously to onsite and offsite participants, including patients, caregivers, physicians, and other providers, such as physician residents.

Telehealth improves access to information and supports informatics for providers through teleconferencing and Internet-based access to knowledge sources.

EXAMPLE

Education through Telehealth

The UC Davis Health System offers a two-day Telehealth Education Internet-based course:

This two-day course begins with an executive overview, a high-level introduction to telemedicine and is designed for administrators, physicians, IT specialists, and operation managers who would like to establish a new or expand an existing telehealth program.

Participants are guided through various aspects including strategic planning, clinical, operational and technical considerations, as well as legal issues valuable to know when implementing a telemedicine program. [8]

Telehealth and Public Health

Telehealth offers healthcare to underserved communities where care otherwise would not be available. It supports clinical care, connecting healthcare professionals to individuals and groups in public health and health administration.

EXAMPLE

Teleconference for Coal Workers

The Alaska Collaborative on Health and the Environment (CHE–AK) held an Internet teleconference on April 25, 2012, on Public Health of Coal Transport and Exports.

Breathing coal dust has been linked to higher rates of cardiopulmonary disease, chronic obstructive pulmonary disease (COPD), high blood pressure, lung disease, and kidney disease. An Internet article invited interested parties to join this free 1–hour teleconference to learn why

160 Washington physicians are calling for a comprehensive health impact assessment (HIA) for the proposed Gateway Pacific coal export terminal.

Seward residents began their own air quality monitoring to answer questions about how much fugitive coal dust is getting into the air and what substances it contains.

Development of new coal mines at Wishbone Hill and Chuitna would likely increase the risk of coal dust exposures along transportation routes and in Seward. [9]

Telehealth improves communication between healthcare professionals, between physicians and patients, and between physicians and public health administrators.

Telehealth Cost Benefits

In addition to the clinical, educational, and communication benefits, telehealth brings much needed cost savings to healthcare.

Telehealth Economic Benefits	Description
Reduces the number and severity of healthcare interventions	Greater access to care, including home monitoring, eliminates unnecessary visits by a nurse to the home or by the patient to the emergency department.
Eliminates travel costs	Treatment is provided closer to home, often eliminating costly travel and greater urban medical costs. Video consultations between a rural clinic and a specialist can eliminate cost-prohibitive travel for patients.
Improves quality of care and thus healthcare outcomes	Specialist advice is more readily accessible.

Table adapted from Informatics for Healthcare Professionals. [10]

In Informatics for Healthcare Professionals, Miller and Young state that successful telehealth programs "tend to be well integrated into existing procedures; using existing infrastructures, where possible, to save money and avoid wasteful duplication; and provide an obvious improvement over alternative mechanisms." [10]

Knowledge Check

Which of the following healthcare service or system would NOT be considered part of telehealth?

- Remote access to informatics data
- Direct clinical care provided remotely
- Support for public health
- Access to an EHR/EMR system

Which term best describes the service accessed by a patient who has a home device that takes his blood pressure and transmits the results to the physician's ofice several times a day?

- Telehealth
- Telemedicine
- Telemonitor

- eHealth

Healthcare issues are detected earlier is a telehealth advantages that results in cost saving. True or False.

- True
- False

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Continue to other activities/quizzes...

Flashcards

Cloud Computing	Where users access resources (hardware, software, data storage) that are hosted on the Internet rather than physically maintained at the users' location.

Private cloud	A c,loud operated for a single organization

Community cloud

Cloud storage shared by several organizations with interests in common, such as several hospitals in a region.

EMR patient information

A physician has received an alert that laboratory results are back on a patient's screening for Lyme disease.

Medical reference

While treating that patient, the physician performed some research associated with the patient comorbidity of diabetes and heart disease.

5 of 22

Appointment calendar

A physician spent an unusual amount of time with one particular patient who had just been hospitalized. She needs to adjust her schedule for the rest of the day.

6 of 22

Drug reference

The number of medications prescribed daily and the dramatic number of new drugs coming on the market

require physicians to regularly check drug reference books. Traditionally these

7 of 22

Medical calculations

Many drug dosages, especially for children and the elderly, are based on the patient's weight. A handy calculator on a mobile device reduces the chance of errors when a physician calculates drug dosages.

8 of 22

EMR system clinical functions

A physician can perform clinical functions with a mobile device supported by intranet or Internet access. Mobile access to e-prescribing is particularly useful when pull-down menus and preselected lists

Patient encounter coding

Coding patient encounters is important to the provider reimbursement process. Procedure codes must refiect the level of dif i culty and/or amount of time a physician spends with a patient. Mobile devices can

Cost savings example

The cost savings ofuntethering a physician and other providers in a healthcare environment is calculated to be signi i cant.

Healthcare best practices example

Mobile devices when coupled with clinical decision support tools assist a physician tolearn and practice evidence-based medicine.

12 of 22

Communication with patients example

Mobile devices can be used to display diagrams and other informational graphics to patients depicting what is wrong with them and/or what kinds of procedures will be used in their treatment. This

13 of 22

Mobile healthcare example

Mobile devices untether the physician and other clinicians. This is a critical time-saving mechanism. It

also greatly enhances clinical decision making and provides a more ef i cient

Safer drug dispensing example

As previously discussed, medical calculators and other clinical decision support tools can prevent medical errors such as adverse drug interactions or contraindications.

Better clinical outcomes example

There is growing documented evidence that patient clinical outcomes can be improved when physicians have access to more complete and more up-to-date information

Partitioning	Divides a single physical computer server into multiple logical servers.

Virtualization	Allows many systems to “apparently” run on a single hardware system.

SaaS

Software as a Service (SaaS): Subscribers get access to a fully formed software application and all the related computer resources. In a SaaS agreement, subscribers have the least control over the cloud

PaaS

Platform as a Service (PaaS): Subscribers get access to computer resource components. They can develop and operate their own applications, based on these components, using tools provided by the PaaS

IaaS

Infrastructure as a Service (IaaS): Subscribers lease all computer hardware resources from the cloud vendor and build

and maintain their own software on the IaaS platform.

21 of 22

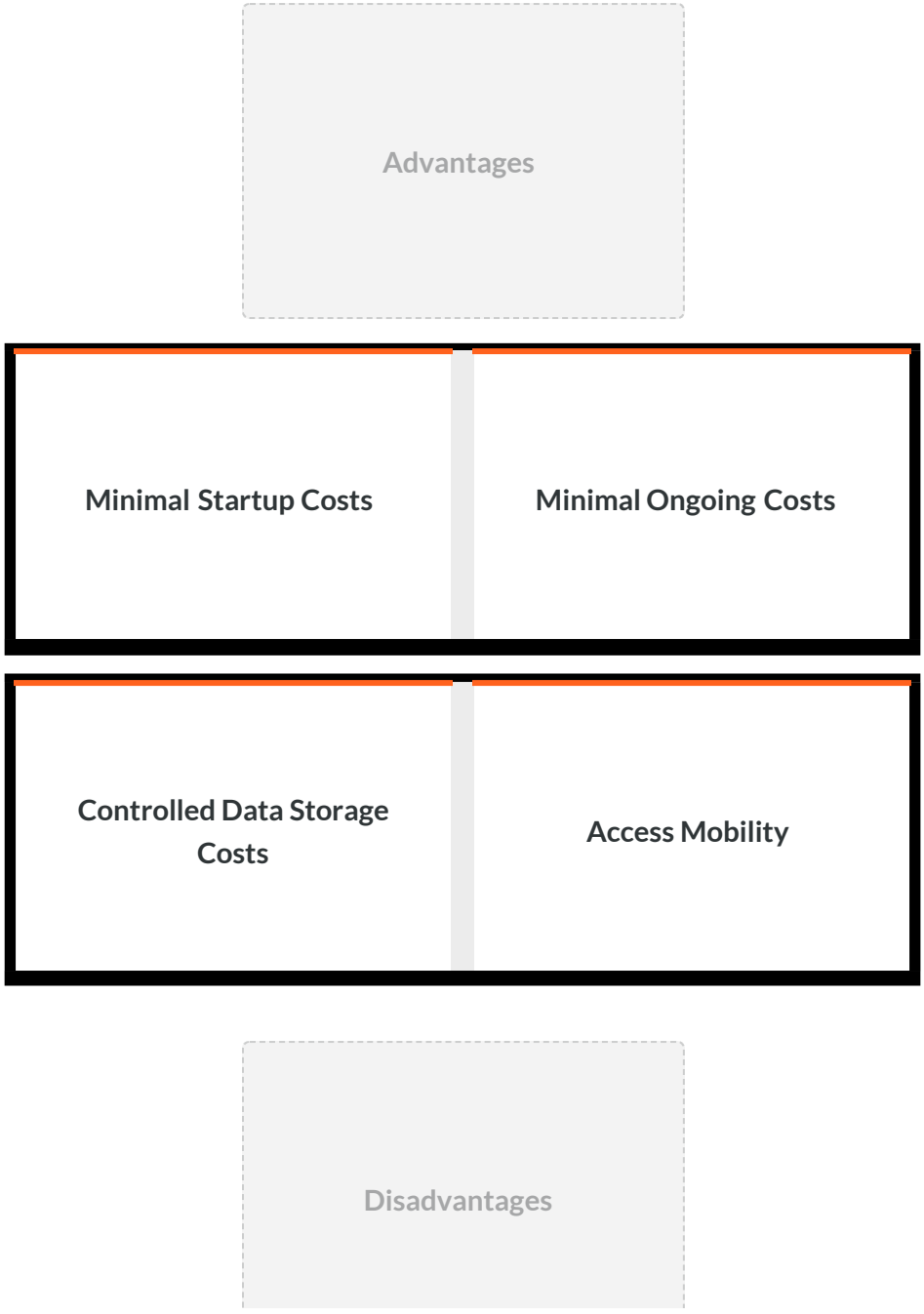
Examples of cloud-based EHR/EMR systems

MediTouch; Centricity; CureMD; Practice Fusion; and Athena Health.

22 of 22

Sorting Activity: Cloud Computing

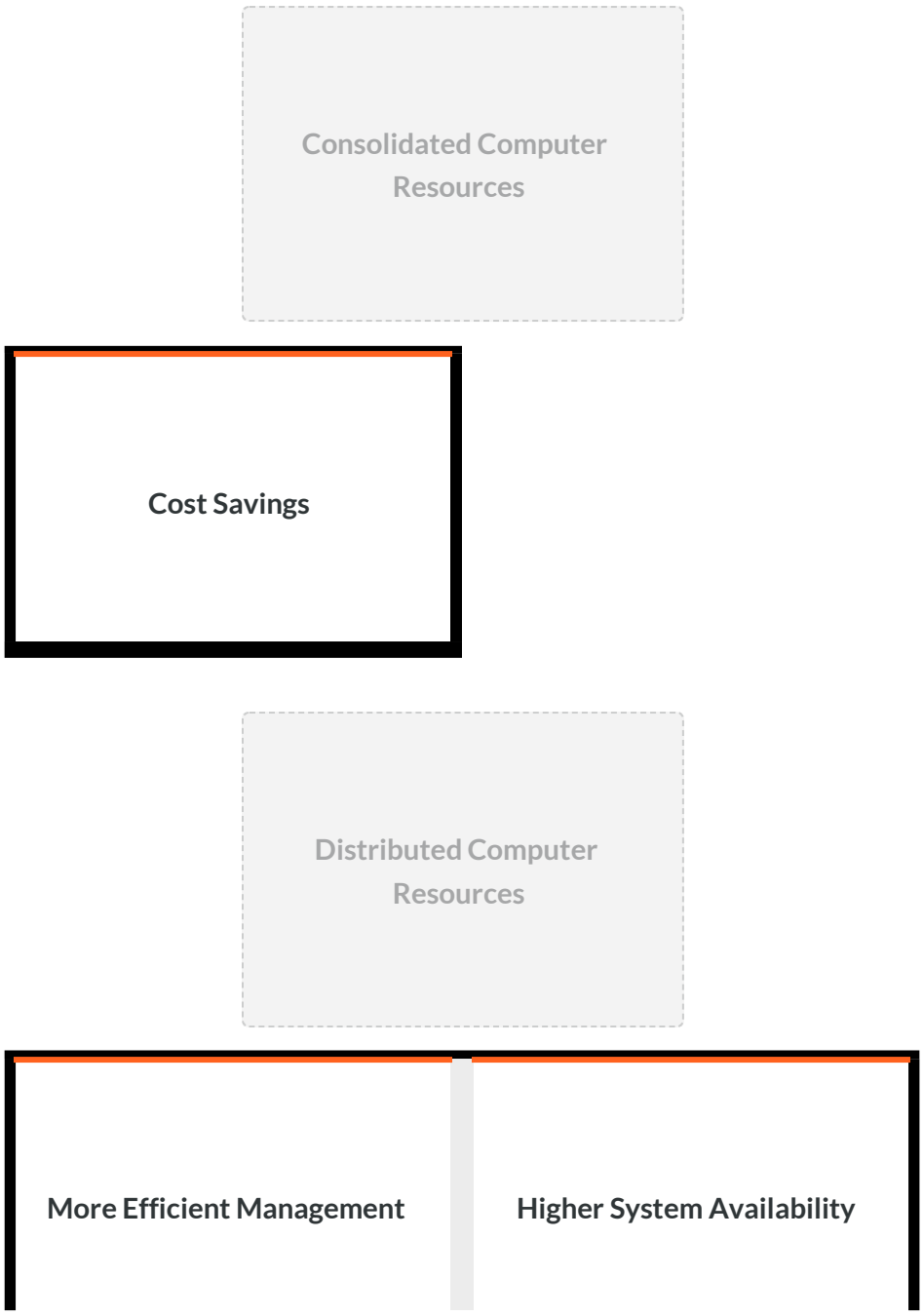
Advantages/disadvantages of Cloud Computing.

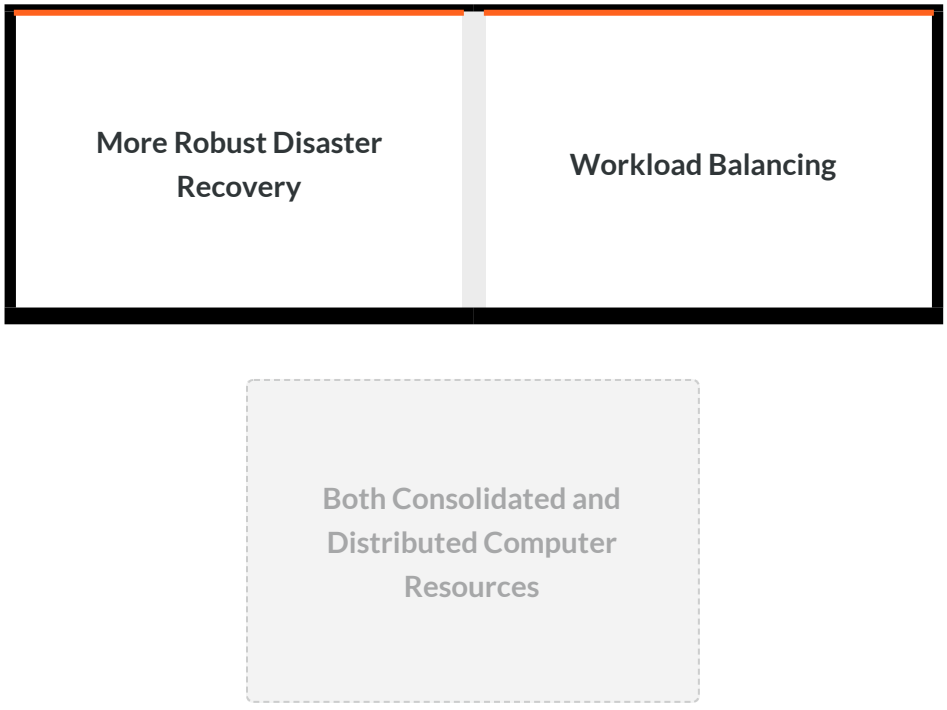



Dependency on Internet
Effects of Internet Traffic
Minimal Administrative Control
Potential Threats to Privacy and Security

Sorting Activity: Advantages of Virtualization

Sort the advantages of virtualization by type of resources




More Robust Disaster Recovery
Workload Balancing
Both Consolidated and Distributed Computer Resources
Better Response to Change
Resource Utilization
Management Shift

Practice Quiz

Question

01/70

When subscribers get access to a fully formed software application and all the related computer resources, this is called_____.

Saas

Iaas

Daas

Paas

Question

2/70

When subscribers get access to computer resource components is called _____.

Saas

Paas

Daas

Iaas

Question

3/70

When subscribers lease all computer hardware resources from the cloud vendor and build and maintain their own software on the platform is called _____.

Saas

Iaas

Daas

Paas

Question

4/70

Where users access resources (hardware, software, data storage) that are hosted on the Internet rather than physically maintained at the users' location.

Cloud computing

Off-site computing

External computing

Service computing

Question

5/70

All of the following are advantages except:

Minimal Startup Costs

Dependency on Internet

Minimal Ongoing Costs

Access Mobility

Question

6/70

All of the following are disadvantages except:

Effects of Internet Traffic

Controlled Data Storage Costs

Minimal Administrative Control

Potential Threats to Privacy and Security

Question

7/70

A physician has set up computers, network servers, and storage devices and installed a new EMR computer system in her practice ofice. What is the physician using?

Cloud computing in which all the hardware, software, and data is set up and maintained by the cloud vendor, and the physician simply needs access through an internet connection.

A traditional computer setup with hardware, software, and data all housed in the physician's office.

A record kept for all email communications that can be accessed later.

Dual computers connected via cables to shared data.

Question

8/70

A small physician practice has subscribed to an EMR that is maintained by a cloud vendor. Each physician, nurse, and administrator in the practice has either a laptop or a smartphone that provides access to the EMR. What is this physician practice using?

Cloud computing in which all the hardware, software, and data is set up and maintained by the cloud vendor, and the physician simply needs access through an internet connection.

A traditional computer setup with hardware, software, and data all housed in the physician's office.

A record kept for all email communications that can be accessed later.

Dual computers connected via cables to shared data.

Question

9/70

A small physician practice subscribes to an EMR maintained by a cloud vendor and pays a monthly fee for the subscription. That fee increases if the number of patients increases or if the practice expands and adds more physicians. This type of cloud is a_____cloud.

---

private

public

hybrid

community

Question

10/70

A small physician practice subscribes to an EMR maintained by a cloud-based Internet service, purchases Internet access through an ISP, and uses mobile devices for each physician, nurse, and administrator in the practice. The practice accepts the EMR application offering exactly as it is offered by the cloud vendor. This is a_____cloud subscription.

Saas

Iaas

Daas

Paas

Question

11/70

Most healthcare providers who choose cloud-based EMR solutions do so because they will not have to maintain the computer resources necessary to support the EMR. They also gain the_____of very low startup costs and a fairly steady expense for EMR maintenance in the form of a monthly subscription cost.

---

advantage

disadvantage

Question

12/70

Some healthcare providers are concerned that storing their patient data on the Internet can be a/an_____from the privacy and security perspective. Due diligence when investigating cloud vendors is important in light of HIPAA requirements.

---

advantage

disadvantage

Question

13/70

In one particular physician practice, some of the physicians do not like the way certain components of the EMR function, but the practice has a SaaS agreement, which is a/an_____from their perspective because the EMR is contracted on an as-is basis.

---

advantage

disadvantage

Question

14/70

The physicians feel that the ability to access the cloud-based EMR from their mobile devices, anywhere and anytime, is a significant_____, although there are times when Internet access is not available, which can make this cloud-based EMR solution a real_____.

---

advantage / advantage

advantage / disadvantage

disadvantage / advantage

disadvantage / disadvantage

Question

15/70

The physicians hope the practice will grow. As it does, the billing from the cloud vendor will be adjusted as the usage of data storage space changes. Most of the physician partners consider this an_____because it is automatic.

---

advantage

disadvantage

Question

16/70

A hospital uses a cloud-based email service. Employees are encouraged to use the service for most kinds of internal communication, but they are warned about certain kinds of email content and of the dangers of using email for outside communication. This is because_____.

---

a record is kept of all email communication, and they can later be accessed and used as evidence in a lawsuit

email is a very insecure method of communication, and patient healthcare data thereby should not be sent through email.

instant messaging is not very reliable, and the physicians might not have their phones available at all times.

too many messages can produce alert fatigue, which can result in physicians unwittingly ignoring important messages.

Question

17/70

The hospital also uses a Web-based instant messaging service to handle alerts sent to physicians' smartphones for significant events in an inpatient's treatment or progress. The use of instant messaging should be kept to a minimum because_____.

---

a record is kept of all email communication, and they can later be accessed and used as evidence in a lawsuit

email is a very insecure method of communication, and patient healthcare data thereby should not be sent through email.

instant messaging is not very reliable, and the physicians might not have their phones available at all times.

too many messages can produce alert fatigue, which can result in physicians unwittingly ignoring important messages.

Question

18/70

Among these three options, which service is the most appropriate means of Internet-based communication between providers and patients?

Voice over Internet

Instant messaging

Social media

Software as a service

Question

19/70

The following are examples of HIT applications that might be offered as cloud-based Web services. Choose the option that is NOT a candidate for cloud computing.

EHR/EMR systems

Medical research

E-prescribing andCDSS

POC testing

Question

20/70

_____divides a single physical computer server into multiple logical servers.

Partitioning

Sequencing

Filing

Backing

Question

21/70

A large hospital can use_____to consolidate its computer resources and manage the EMR, email, and all other applications under the umbrella of a simpler and less expensive single computer system.

---

virtualization

a distributed system

a sequential system

cloud utilization

Question

22/70

A systems manager for a healthcare organization's integrated delivery system has several different systems installed in different locations. The administrator manages these systems separately and has designed interfaces that allow the data to be consolidated when needed. This approach to computing is called _____.

---

virtualization

a distributed system

a sequential system

cloud utilization

Question

23/70

A cloud vendor wants to offer an EMR system to physician practices. The vendor realizes that some physicians will be running a Microsoft operating system (OS), some a UNIX OS, and some a Linux OS. The vendor can use virtualization and install one computer with a_____to develop and test the EMR for all three OS systems.

---

hyperdrive

hypermanager

hypersave

hypervisor

Question

24/70

If the systems administrator for a healthcare organization's integrated delivery system has several different systems installed in different locations but would like to manage those distributed systems as if they were under the control of a single computer, the administrator could utilize_____.

---

virtualization

a distributed system

a sequential system

cloud utilization

Question

25/70

A cloud vendor has an EMR system that runs on several separate computer systems. If the systems administrator installs virtualization but keeps the physically distributed computer systems, the primary advantage achieved will be_____.

---

cost savings

efficient management

deliberate selection

vendor identification

Question

26/70

A large hospital's systems administrator wants to consolidate the computer hardware and install a single virtualized computer system. The primary advantage of this approach will be_____.

---

cost savings

efficient manager

deliberate selection

vendor identification

Question

27/70

It is estimated that only 5 to 25 percent of server capacity is utilized in traditional computing system architecture. Virtualization can improve utilization of computer capacity and thereby improve_____.

---

business agility

resource management

systems availability

cost savings

Question

28/70

A cloud vendor has several physical computer systems supporting its EMR application subscribers, managed with a virtualization hypervisor. If one of its physical systems goes down, the virtualization provides the vendor with greater control over_____.

---

business agility

resource management

systems availability

cost savings

Question

29/70

Virtualization allows businesses or healthcare providers to respond quickly to changes in their users, computer, or applications requirements, which greatly enhances their_____.

business agility

resource management

systems availability

cost savings

Question

30/70

A large hospital intends to consolidate its computer resources and implements virtualization. Which of the following will NOT present a challenge for this hospital?

Applications systems may conflict and cause system performance issues.

The systems administrator will need new tools to manage virtualized resources.

Resource consolidation will be expensive.

The IT staff may require retraining or new staff may be required.

Question

31/70

The number of medications prescribed daily and the dramatic number of new drugs coming on the market require physicians to regularly check drug reference books. Traditionally, these references were dictionary-sized manuals that required constant hard-copy updates. With a mobile device and Internet access, providers have up-to-date information including correct dose, drug route, and medical contraindications such as drug–drug interactions. What type of healthcare application is this?

Medical calculations

Medical reference

Drug reference

Appointment Calendar

Question

32/70

Many drug dosages, especially for children and the elderly, are based on the patient's weight. A handy calculator on a mobile device reduces the chance of errors when a physician calculates drug dosages. What type of healthcare application is this?

Medical calculations

Medical reference

Drug reference

Appointment calendar

Question

33/70

Coding patient encounters is important to the provider reimbursement process. Procedure codes must reflect the level of dificulty and/or amount of time a physician spends with a patient. Mobile devices can provide computational assistance for accurate coding, thus ensuring correct reimbursement for services rendered. What type of healthcare application is this?

Medical reference

Patient encounter coding

Appointment calendar

EMR system clinical functions

Question

34/70

Physicians have busy schedules and see many patients in a single day. Appointment tracking is an essential tool. A mobile device coupled with intranet or Internet access gives physicians access to their schedule anywhere, anytime. What type of healthcare application is this?

Drug reference

Appointment calendar

Patient encounter coding

EMR patient information

Question

35/70

Physicians and nurses often research a condition or symptom through medical reference materials. Traditionally, these materials took up many shelves in a library and required constant manual updates. With a mobile device and Internet access, providers can access the latest treatment recommendations at point of care. What type of healthcare application is this?

Drug reference

EMR patient information

Medical reference

EMR system clinical functions

Question

36/70

A physician can perform clinical functions with a mobile device supported by intranet or Internet access. Mobile access to e-prescribing is particularly useful when pull-down menus and preselected lists of drugs make e-prescribing from the point of care effortless. What type of healthcare application is this?

Medical reference

Medical calculations

EMR system clinical functions

EMR patient information

Question

37/70

What is the primary advantage mobile devices provide physicians over wired devices such as a desktop computer?

Healthcare applications can be accessed anywhere at any time using a mobile device.

Security for mobile devices is easier to manage.

Data is easier to enter on a mobile device.

More data can be stored on a mobile device.

Question

38/70

A mobile device enables a physician to look up possible pharmaceutical contraindications, including at point of care, from which of the following sources?

Medical reference

Drug reference

EMR patient information

Medical calculator

Question

39/70

Which of the following clinical functions is particularly useful at point of care?

E-prescribing

Patient encounter coding

Laboratory orders

EMR patient information

Question

40/70

Which of the following represents administrative functions a physician might access with a mobile device supported by intranet or Internet access?

Appointment calendar, patient encounter coding

Appointment calendar, patient encounter coding, POC tests and analysis

POC tests and analysis, appointment calendar

Patient encounter encoding, POC tests and analysis

Question

41/70

A physician is at a child's bedside and needs to determine the correct dosage of an antibiotic. The physician wants to ensure the child's safety. This is called:

Medical calculations

EMR patient information

Appointment calendar

Medical reference

Question

42/70

A physician has received an alert that laboratory results are back on a patient's screening for Lyme disease.

Medical calculations

EMR patient information

Appointment calendar

Medical reference

Question

43/70

A physician spent an unusual amount of time with one particular patient who had just been hospitalized. The parent had several conditions, including diabetes and heart disease. The provider wants to ensure reimbursement appropriately represents services rendered.

EMR patient coding

Patient encounter coding

Medical reference

Medical calculations

Question

44/70

While treating that patient, the physician performed some research associated with the patient comorbidity of diabetes and heart disease.

Medical reference

Medical calculations

EMR patient information

Appointment calendar

Question

45/70

Healthcare providers showed tremendous interest in mobile devices as early as 1990s. This interest translated into the immediate and widespread adoption of mobile devices for healthcare-related point-of-care applications.

True

False

Question

46/70

Due to the drawback in early mobile devices, certain kinds of physicians were more likely to adopt mobile computing than others. Which of the following were least likely to adopt mobile computing?

Medical students

Rural physicians

Hospital residents

Young physicians

Question

47/70

Which of the following is NOT considered a drawback of early mobile devices that negatively affected adoption in healthcare?

Large size of the device

Lack of Internet access

Limited battery life

Slow processing speed

Question

48/70

Which of the following represents a drawback of early mobile devices that negatively affected adoption in healthcare?

Sleek and slim design

Long-life batteries

Primitive input mechanisms

Lots of memory and fast processing speeds

Question

49/70

Healthcare providers initially showed little interest in using mobile devices. That trend is reversing today.

True

False

Question

50/70

Which of the following is NOT benefit of using mobile devices in healthcare?

Better clinical outcomes

Improved healthcare best practices

Cost savings

Increased network security

Question

51/70

Which of the following best represents a benefit of using mobile devices in a healthcare setting?

Mobile healthcare

Transmission interference with medical devices

Adherences to HITECH standards and protocols

Systems support for wireless mobile devices

Question

52/70

Dr. Lee has been using his tablet PC to illustrate aspects of medical conditions for his patients. He is anexample of a mobile device being used to promote _____.

---

cost savings

healthcare best practices

communications with patients

safer drug dispensing

Question

53/70

Dr. Lee uses his mobile device to check for contraindications and dosage dispensing advice. This is an example of using a mobile device to promote _____.

---

safer drug dispensing

mobile healthcare

better clinicaloutcomes

cost savings

Question

54/70

AC Hospital asked its HIT systems administrator to review the possibility of providing all of its physicians with mobile devices. Doing so would allow the hospital to minimize the number of more expensive desktop computers currently installed in every patient treatment room. If the decision is made to move to mobile devices, the benefit would be_____.

---

improved healthcare best practices

cost savings

better communication with patients

better clinical outcomes

Question

55/70

AC Hospital wants its HIT systems administrator to include discussion of intangible benefits associated with patient safety and quality of care when mobile devices are considered for use at point of care. This shows a concern on the part of hospital administrators for_____.

---

cost savings

mobile healthcare

better clinicaloutcomes

safer drub dispensing

Question

56/70

Clinical care provided through remote technologies is called _____.

telemonitoring

telehealth

telesensory

telemedicine

Question

57/70

Which of the following healthcare service or system would NOT be considered part of telehealth?

Remote access toinformatics data

Direct clinical care provided remotely

Support for public health

Access to an EHR/EMR system

Question

58/70

Patients who are elderly and bedridden at home would be appropriate candidates for telemedicine services. True or False.

True

False

Question

59/70

Patients who are disabled and find traveling dificult would be appropriate candidates for telemedicine services. True or False.

True

False

Question

60/70

Patients who live in rural areas far from healthcare facilities would be appropriate candidates for telemedicine services. True or False.

True

False

Question

61/70

Which term best describes the service accessed by a patient who has a home device that takes his blood pressure and transmits the results to the physician's ofice several times a day?

Telehealth

Telemonitor

eHealth

Telemedicine

Question

62/70

Healthcare issues are detected earlier would result in cost savings. True or False.

True

False

Question

63/70

Patients and providers travel less would result in cost savings. True or False.

True

False

Question

64/70

There is less disparity in healthcare access would result in cost savings. True or False.

True

False

Question

65/70

Healthcare outcomes are improved would result in cost savings. True or False.

True

False

Question

66/70

One of Dr. Watanabi's patients is a 91–year–old veteran named John. The VA Telehealth Services set up a home computer for John, and once a month Dr. Watanabi has a remote visit from his ofice to John at his home. Together, they monitor John's vital signs and talk about issues during the visit. This is an example of_____.

---

telehealth

telemonitoring

telemedicine

telesensory

Question

67/70

Two years ago, Dr. Watanabi implanted a very sophisticated pacemaker in John's chest to control an irregular heartbeat. The VA set up an m-device next to John's bed that plugs into the phone line. Every night while he sleeps, John's pacemaker sends his heart beat patterns and pulse to Dr. Watanabi's ofice. Each morning, one of Dr. Watanabi's medical technicians checks the transmission looking for irregular patterns that might indicate an issue. This is an example of_____.

---

telehealth

telemonitoring

telemedicine

telesensory

Question

68/70

John is just one of many patients Dr. Watanabi treats in his busy practice. UC Davis Health System offers a course that he feels would be beneficial to him, but Dr. Watanabi is too busy to travel. Dr. Watanabi is delighted to discover that the course is Internet based, so he can avoid the travel and take the course at his own pace. This is an example of_____.

---

telehealth

telemonitoring

telemedicine

telesensory

Question

69/70

Telehealth offers healthcare to underserved communities where care otherwise would not be available. True or False

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True

False

Question

70/70

eHealth includes all but which response?

E-prescribing

Mobile health

EHR/EMR systems

Cost productive measures