Video Conferencing Essentials

Telehealth Technology – An Executive Summary

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Introduction

The purpose of this document is to provide a basic understanding of the essentials of video conferencing in the health care environment. Its goal is to help readers become familiar with the following:

- History of the video conferencing industry and the advent of telemedicine
- Key telemedicine program selection and deployment considerations
- Basic approaches to telemedicine connectivity and management
- Prominent video conferencing manufacturers and their backgrounds

This document does not specifically recommend any manufacturer. It does not detail the pros and cons of specific products or lines. Capabilities and functionalities offered by each manufacturer change at a very rapid pace, and indeed, have changed during the brief time this document was written. Moreover, the “best” videoconferencing solution differs based on the specific needs of each situation.

The overall goal of this document is to provide readers with the information necessary to evaluate the multiple facets of implementing an organization-specific videoconferencing solution in this ever-changing environment.

In addition, the appendices contain valuable insights from Indiana health care professionals in their respective organizations’ telemedicine programs.

Finally, to help readers navigate beyond the detail level of this document, a list of questions for use in vendor interviews and a glossary of telemedicine terms are included.

Video Conferencing Overview

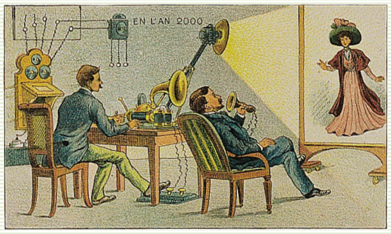
Video conferencing technology is changing rapidly. Over the past few years, the introduction of high definition video endpoints and integrated room systems has offered such life-like video quality that the term “telepresence” was adopted. However, before considering the more advanced systems of today, we will briefly examine where things started and how far we’ve come over the years.

History

AT&T developed the technology in 1954 and conducted the first video conference at the 1964 World’s Fair held in New York. Although it was a very futuristic concept, it would only take six short years until AT&T introduced their first production “Picturephone” in 1970. Despite many years of testing and improvements, the concept was not greeted with much enthusiasm by the public and the product ultimately failed. The same fate also met AT&T competitors’ systems, such as Ericsson’s early attempt at the video phone.

The technology was not forgotten through the late 1970s and found a more receptive audience in the commercial market in the early 1980s. Although businesses could see a use for the technology, it remained extremely expensive. By the mid 1980s, PictureTel (acquired by Polycom in 2001) produced a video conferencing system that cost $80,000 and required data lines that cost roughly $1,000 per hour – still far from being practical for most companies to adopt.

Through the 1980s and early 1990s, the technology was improved through advancements in data communications and video protocols. Some colleges and universities began to use video conferencing for classroom sessions and other training opportunities. During this time, the U.S. military also took advantage of the benefits of the technology and was one of the first commercial buyers of early systems. In 1991, IBM introduced the first PC-based video conference. Although it was in black and white, the data line only cost $30 per hour and the system cost approximately $20,000. It was a major breakthrough in price and ushered in the beginning of the desktop video conferencing revolution.



Video telephony in the year 2000, as imagined in 1910. From a French postcard. (Creative Commons)

Although the above image was created by a French artist in 1910, the first known prediction of video communication, called a Telephonoscope, was recorded in the magazine, “Punch” in 1878. It expanded upon Edison’s invention of the telephone and proclaimed that it would “transmit light as well as sound.”

Ericsson Video Phone in 1971

Although an important evolutionary step in video conferencing, the concept of the video phone failed to catch on with the general public.

By the mid 1990s, companies like Apple and Microsoft were well on their way to offering desktop solutions that offered basic video conferencing capabilities. During this time, many software applications were written for both platforms that enabled users to not only make person to person calls, but also multiparty calls through a reflector service – or video conference bridge. Also introduced around this time was the capability to view desktop presentations, such as Microsoft PowerPoint or Excel, as part of the call. Understandably, this application became very popular within both academia and the military.

By 2001, advancements in video, computer, and robotics technology led to the first transatlantic telesurgery, a gall bladder removal, from 4,300 miles away. The surgical procedure was conducted by a surgeon in New York City on a patient who was located in Strasbourg, France. The surgery was a technological breakthrough in many respects and marked the beginning of true clinical capabilities for these types of technologies.

Many of the major video conference manufacturers were on the path to high definition (HD) video by 2006. Along with the introduction of HD to set-top video conference units, companies like Cisco Systems, LifeSize, Polycom, and Tandberg were introducing Telepresence suites – specially outfitted conference rooms that gave the illusion that remote participants were sitting at the same table. Although extremely expensive to own and operate, these highly sophisticated systems were quite popular within the corporate arena. Despite the high cost of these systems, companies were able to justify the expense as a result of increasing travel budgets.

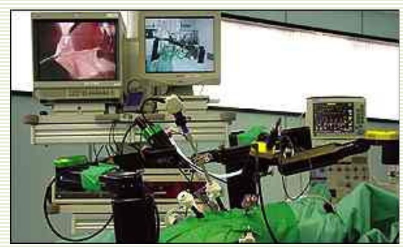
The introduction of HD video systems has also had other benefits to the health care field. Specifically, the high resolution cameras are used in clinical applications where viewing injuries or subtle facial expressions are critical. When combined with other peripheral equipment, such as digital stethoscopes and other higher-resolution cameras, video conferencing systems have taken on a new role of importance in providing an avenue of care to hospitals and clinics in both rural and metropolitan areas.

Market Trends

As evidenced through its history, video conferencing, like most other technologies, has continued to evolve over the years. This

Surgeon in New York City performing first transatlantic telesurgery in 2001

ZEUS, the robotic system used in this procedure, was provided by Computing Motion, a US surgical robotics company. By 2003, Computing Motion had merged with long-time rival Intuitive Surgical, forming one of the industry's most advanced providers of robotics specific to the health care field.



Patient in Strasbourg, France undergoing first transatlantic telesurgery in 2001

In the photo above, the video images seen on the monitor in the upper left-hand corner were transmitted back to the surgeon performing the operation in New York City.

evolution has brought the technology into new markets, each with their own special challenges and opportunities. At its core, however, video conferencing is a communications tool. Regardless of the industry application, video conferencing enables individuals or groups of people to enhance the communication process.

Video conferencing has seen a surge in adoption in today's volatile business environment. Past deployment barriers such as high cost, lack of network bandwidth, and technical expertise have been overcome by competition and technical innovation. The driving forces behind the video conferencing adoption movement include:

- Reduction in travel costs
- Time savings
- Improved communications (ability to see "body language", facial expression, etc.)
- Team collaboration
- Reduction in carbon emissions (green technology)

Because the new video systems are able to produce life-like visual images, it is much easier to conduct meetings as if remote participants were physically present. While many of the higher-end "room" systems offer the benefit of this immersive environment, many of the smaller, personal video conferencing systems are also beginning to support the telepresence experience. This only increases the likelihood that strong interest in this technology will continue for the foreseeable future.

Uses in Telemedicine

As in the corporate environment, the reduced travel costs, time savings, and environmental benefits of video conferencing are sought by executives in the medical community. However, video conferencing offers many telemedicine-specific benefits as well.

Telemedicine allows health care practitioners to offer their services across many different hospitals or clinics without having to travel to each location physically. This increases billing opportunities by allowing the efficiency of being in more places in less time. This can also increase overall job satisfaction and staff retention.

Telemedicine benefits local health care facilities by allowing them to retain patients, as opposed to losing those patients and all associated lab and procedure fees to a larger specialty hospital or clinic. In addition, patient confidence in the rural health facility grows with the number of services offered locally.

Patient health is enhanced by immediate delivery of certain health care services. In rural or underserved areas without the specialty practices of larger cities or metropolitan areas, telemedicine is often the only option for such immediate treatment. Telemedicine also can relieve patients from long travel or stays far away from home. Ill patients often benefit physically and emotionally from staying close to home, especially since the technology allows family to be involved in the virtual care experience. The technology also aids in reducing any financial burden resulting from lost wages or long distance travel.

While telemedicine cannot replace traditional office visits or face-to-face medical examinations, it can provide an excellent means of augmenting care when traditional services are not efficient or cost effective (Caputo, 2001). Specialty areas have seen expanded use with this technology, including:

- Cardiology
- Radiology
- Dermatology
- Ophthalmology
- Pathology
- Disease State Management
- HIV/AIDS
- Mental Health
- Rehabilitation
- School-based Services

According to the American Telemedicine Association (ATA), telemedicine encompasses different types of programs and services provided for the patient. Each component involves different providers and consumers.

- **Specialist referral service** typically involves a specialist assisting a general practitioner in rendering a diagnosis. This may involve a patient "seeing" a specialist over a live, remote consult or the transmission of diagnostic images and/or video along with patient data to a specialist for viewing later. Recent surveys have shown a rapid increase in the number of specialty and subspecialty areas that have successfully used telemedicine. Radiology continues to make the greatest use of telemedicine with thousands of images read by remote providers each year. According to a variety of reports and studies, almost 50 different medical subspecialties have successfully used telemedicine.

- **Patient consultation** uses telecommunications to provide medical data, which may include audio, still or live images, from a patient to a health professional for use in rendering a diagnosis and treatment plan. This might originate from a remote clinic to a physician's office using a direct transmission link or may involve communicating over the Internet.

- **Remote patient monitoring** uses devices to remotely collect and send data to a monitoring station for interpretation. Such "home telehealth" applications might include a specific vital sign, such as blood glucose or heart ECG, or a variety of indicators for homebound patients. Such services can be used to supplement the use of visiting nurses.

- **Medical education** provides continuing medical education (CME) credits for health professionals and special medical education seminars for targeted groups in remote locations.

- **Consumer medical and health information** includes the use of the Internet for consumers to obtain specialized health information and on-line discussion groups to provide peer-to-peer support.

Telemedicine Deployment Considerations

Prior to making a decision on the deployment of a telemedicine program, several important factors should be considered. Selecting the best video conference system based on evaluation of key functionalities is, of course, crucial. Additional areas of focus should include telemedicine peripherals, data networking, room design, and portability.

Although the additional areas of focus may seem secondary to the selection of a video conference system, they each play a significant role in the overall success of a telemedicine program. Some telemedicine programs have suffered major setbacks in overall acceptance because of incompatibilities between peripheral equipment, poor video or sound quality, and/or the inability to assess patients due to inadequate exam room configuration. Forethought during the developmental stages of the program will ensure a much higher rate of acceptance and success.

Video Conference System Key Functionalities

When video conference systems were first introduced, set standards for audio and video compression, security, data transmission, etc. did not exist. As a result, manufacturers developed their own standards, locking their customers into staying with the same manufacturer if they wanted to add additional locations to their video network.

As the industry matured over time, many of the technologies were evaluated and reviewed by standards organizations, such as the ITU-T (International Telecommunications Union), and adopted as communication standards or protocols. This not only paved the way to uniformity for systems manufacturers, but also enabled new technology vendors to enter the market quickly by integrating the common protocols they wished to support. The standards also propelled interoperability between various existing manufacturers that desired their systems to work with the systems of other vendors.

When comparing video conference systems to select the best fit for a particular program, the following key functionalities should be considered:

- **High Definition (HD)** – The visual clarity achieved with HD is far superior to that supported by standard definition (SD). HD carries nine times the pixel count (or resolution) as compared to SD video conferencing images (Wainhouse Research, 2007). As a result, despite the slightly higher price to obtain HD, it is generally recommended for medical applications. Purchasers should also be aware of industry predictions that SD units (much like analog television sets) will eventually become obsolete and may be removed from the market in the near future. The HD feature is typically available in 720p/30fps (frames per second), 720p/60fps, or 1080p/30fps. 1080p offers a clearer picture (higher resolution) as compared to 720p. In the case of frames per second (fps), 60 fps offer better motion handling, as compared to 30 fps. Video endpoints will always scale down and adjust to the system with the least capabilities. Therefore, if endpoint A supports 1080p/30fps and endpoint B supports 720p/30fps, a video call between the two endpoints will be conducted at the latter resolution and frame rate. Please note that computer network bandwidth and performance may be impacted by the introduction of video conferencing equipment within an organization without proper planning.

- **Dual Video** (H.239 communications standard) – This feature supports two channels of video in a single conference. This allows one video channel to carry a live view of conference participants while the other channel shows computer-based meeting content, including slides, spreadsheets, or other presentation material. This dual functionality proves very beneficial in executive briefings or training and education programs. In health care applications, this feature may be required to transmit information from telemedicine devices such as stethoscopes or other diagnostic systems. Be aware when comparing equipment that some video conferencing equipment manufacturers charge an additional license fee to enable this feature.

- **Dual Monitors** – This feature supports the ability to connect two video monitors (or televisions) to the video conference endpoint. This is particularly helpful if the dual video feature above is utilized. One monitor shows meeting participants, while the other monitor displays meeting content. However, if a video endpoint does not support dual monitors, it may still be used in a conference conducted with dual video and will typically create a picture-in-picture (PIP) view of the conference.

- **Peripheral Expansion Ports** – Video systems utilized in physical health examinations generally require the ability to connect to other peripheral equipment. Peripheral expansion ports enable a health care practitioner to connect examination cameras, stethoscopes, and computers to the video endpoint equipment. As noted above in the case of digital stethoscopes, the video endpoint used on the receiving end of the call must also support this type of interaction with peripheral equipment. Be aware that just because a device appears to have the appropriate expansion port, it may not be functional. Ask vendors specifically about port usability and compatibility with peripheral devices.

- **Pan-tilt-zoom (PTZ) Camera** – Besides their obvious functionality, these cameras can be remote controlled by an off-site physician during a video conference. In applications such as mental health, a PTZ camera may help a physician subtly zoom in on facial expressions or better view body movement that may be missed with the use of a standard fixed-focus or stationary camera.

- **Multipoint Conference Unit (MCU)** – As noted above, this feature allows a video endpoint to acts as a hub or meeting room for multiple video systems. A built-in MCU typically supports between four and eight total endpoints. Once again, an additional software license may be required to operate this feature.

- **Bandwidth** – All video endpoints come with a maximum bandwidth or throughput setting. This essentially throttles the performance of the system, impacting overall video quality and/or the ability to push large amounts of data across the network to the receiving end. Endpoints with higher bandwidth support offer more latitude when dealing with HD video content. Video conferencing manufacturers offer varying levels of bandwidth support in their product lines and <u>some charge a license fee to enable higher bandwidth throughput</u>.

- **Security and Encryption** (H.235) – This encryption standard is not mandated for use across video conference systems but is recommended for interoperability. Video systems not supporting this security standard will not be able to participate in secure video calls with systems utilizing this feature.

- **Firewall Traversal** (H.460) – This feature enhances a video conference endpoint's ability to transmit data across a network without interception by a network firewall, allowing faster and easier deployment of the equipment. However, in many cases, modifications will need to be made to the network switches, routers, and firewalls to fully support video conferencing. [Note that endpoints offering firewall traversal typically also include network address translation (NAT) support. NAT allows conversion of public internet protocol (IP) addresses to internal IP addresses, protecting network devices.]

- **Maintenance Contracts and Support Agreements** – Most video conferencing manufacturers charge an annual support fee for each video endpoint or network component being utilized. These fees allow end users to keep video conferencing equipment updated to the most current version of system software. While most manufacturers require purchase of a one year support plan with each new unit, annual renewal is not mandatory. <u>If regularly renewed, recurring maintenance fees can become substantial in total.</u> It is advisable to inquire about these fees and incorporate them into the operational budget for ongoing sustainability.

Please note that Appendix D on page 37 summarizes the above bullets into sample questions for use with vendors during the selection process.

Telemedicine Peripherals

Aside from the importance of video conferencing equipment to a telemedicine program, the selection and use of telemedicine peripherals (e.g. special cameras, stethoscopes, etc.) is crucial. Several manufacturers offer telemedicine peripherals, leading to potential problems when implementing a telehealth program.

Unlike the slightly more mature video conferencing industry, where manufacturers have been working to adopt set standards to increase system interoperability, the telemedicine peripheral market offers no such compatibility. Therefore, it is important to make sure all departments involved in the telemedicine program are in agreement as to which manufacturer and model of peripheral will be purchased. Most peripheral devices require either a matching device or a specific software program running on a laptop or PC on the receiving end. For example, a digital stethoscope from one manufacturer will likely not communicate with a digital stethoscope from another manufacturer and two are required for functionality.

In some cases, such as with an examination camera, no other matching peripheral device is required. This type of peripheral device merely transmits the visual image through the video conference equipment or stores it on a local computer for later transmission. However, it remains advisable to standardize on one manufacturer's product line to help reduce user confusion and subsequent errors.

Networking

When the time comes to make a purchase decision on video conferencing equipment, it is advisable to include someone from the Information Technology department who will be responsible for administering and/or maintaining the equipment. This is recommended because the video equipment will need to be specifically configured to work on the organization's data network and, in some cases, communicate with systems outside the local network – thus requiring it to get through the equipment that protects the network (firewall). In many cases this requires additional configuration work and takes time to set up properly.

In addition to being configured to communicate through the network firewall, the video conference endpoint will, in some cases, need to be assigned a public IP address – or a special set of numbers (like a telephone number) that others can dial from their video system. Once the address or number is given to clinicians or other personnel, the video endpoint may be called from another remote system. It is important to note that when connected to another clinical office, HIPAA requires that the calls be encrypted for security purposes. This encryption, called AES (advanced encryption standard), is another one of the communication protocols that are built into most current video conference systems.

Finally, a commonly overlooked aspect of video communications is network capacity or throughput. Unlike typical computer data that can be broken into bits and pieces and sent over a network in sporadic bursts, voice and video systems require much more bandwidth and can be severely affected by network congestion or slower speed connections. Therefore, it is very important to plan out how the voice and video traffic will flow across the network, which can be accomplished by assigning higher priority or quality of service (QoS) to this data through networking hardware. This will increase the effectiveness of the video system deployment as well as reduce frustration from other users who may potentially experience decreased network performance once a video system is introduced.

Room Design

Another important, but easily overlooked element that can affect the performance of equipment used in a telemedicine program is the concept of room design. Without going into too much detail, it is helpful to note that some thought should be given to the furnishings, colors, lighting, and materials that are utilized in rooms that will host patient consultations. The following is a condensed list of things to be aware of when setting up an examination room:

- Wall Colors – Muted pale tones work best; avoid overly bright or very dark colors.
- Wall Finishes – Paint should be flat or semi-flat finish; avoid gloss or enamel finishes and wallpapers that reflect light or contain busy, geometric patterns.
- Furnishings – Decor items, such as mirrors, glass dividers, etc. may reflect light, thus confusing the camera. These items also may increase sound reverberations in the room, which could negatively affect audio transmission.
- Windows – An abundance of sunlight can cast shadows and/or confuse the camera. Blackout shades or curtains (also colored in pale tones) are helpful in controlling light; interior rooms are ideal.
- Lighting – Proper lighting is very important when assessing patient health. Avoid harsh, direct light sources that produce heavy shadows; try to use a combination of diffused fluorescent and incandescent lighting if possible. External light sources such as professional photographic light fixtures may produce desired results.
- Acoustics – Room noise and reverberation can cause echoing and degrade the overall sound quality; the addition of fabric room dividers, draperies, and acoustic wall panels (also colored in pale tones) can greatly enhance the sound quality of a room.

Portability or Permanence

During planning, it is necessary to consider program needs for the portability or permanence of video conferencing equipment. For example, if the equipment will be used in a busy health care environment or emergency department with patients in various rooms, it can be helpful to integrate the equipment with a cart system. For systems that will not require mobility, it is possible to have the equipment professionally mounted to a wall.

Telemedicine carts can usually support easy movement of all necessary video conferencing and peripheral equipment from room to room. Most carts come configured with the video conferencing equipment, high definition monitor, speakers, microphone, and lockable drawer for telemedicine peripheral equipment. Telemedicine cart solutions are typically offered as after-market, purpose-built units by technology systems integrators. Some video conference equipment manufacturers also offer cart solutions as options, however the cart components and style differ from what is available through a custom-built system.

Wall-mounted installations generally include mounting the camera and video conference system (codec) close to the television monitor, using specialized mounts. This provides a professional appearance that is especially beneficial for boardrooms or clinical offices. In some cases, wall mounting is also desirable to protect the equipment. In a mental health installation, for example, equipment could be mounted behind a Plexiglas protective barrier.

Telemedicine Implementation

There are many scenarios under which video endpoints may be deployed to support a telemedicine program. While it is not possible or practical to detail all such scenarios in this document, it is important to discuss basic connection configurations to provide a general understanding of the various formats. It is also essential to consider resources necessary for long-term program success.

Single Point-to-Point Connection

Most video endpoints will likely be used for clinical applications where a system will be located in the emergency department, an examination room, or a clinical office. On the other end, typically at the point where the specialist resides, will be another video conference unit. In this simple scenario, if endpoint A calls endpoint B, that would be referred to as a point-to-point call (see Figure 1). Although this call can traverse private communications lines between the two endpoints, it is also possible that one of the endpoints will be connected to the Internet (not a private data circuit). In either case, special network configuration will need to be completed in order to assure that calls can connect in the intended fashion.

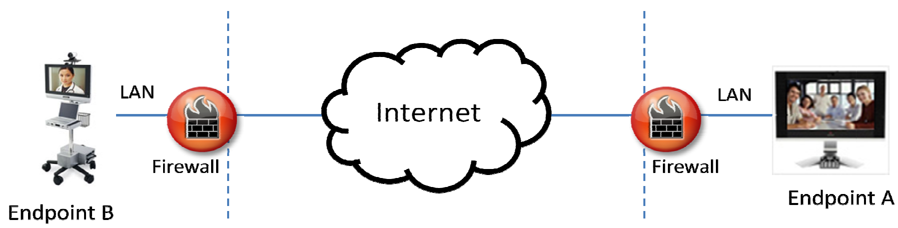


Figure 1 – Point-to-Point Video Conference

Multi-Point Connection with Internal MCU (Bridge)

Much like some voice telephone calls, it sometimes becomes necessary to add another party to the call to obtain additional insight, etc. In order to achieve this in a telephone call example, one of the call participants must perform the necessary steps to bring in an additional caller. Most business telephone systems support this conferencing feature, as do most cellular telephones. In the case of a phone call, the telephone system contains the necessary "intelligence" to perform this task.

However, in the example above of our simple point to point call, there is no underlying network that possesses the necessary ability to bring in an additional caller. Fortunately, some video conferencing endpoints are sold with built-in multipoint control units or MCUs. These MCUs or "bridges" perform the necessary call processing that enables the ability to add other video endpoints to the call. Depending on the make and model of the endpoint, some of these built-in MCUs can support 4 – 8 total sites on any given call.

Although purchasing an endpoint with an internal MCU does cost more than a “standard” unit, it might be worth the extra money to have this capability in case the need arises. It is also important to note that the endpoint that “hosts” the call or brings in the additional endpoint is acting as a “hub” for the call – and therefore will require additional network bandwidth to support the added endpoints.

In this example, endpoint A is able to conference in both endpoint B and C together on the call (see Figure 2). All participants are able to see one another at the same time in what is called “continuous presence”. This means that endpoint A is able to combine all three endpoint’s video into a split screen layout which is presented to all participants.

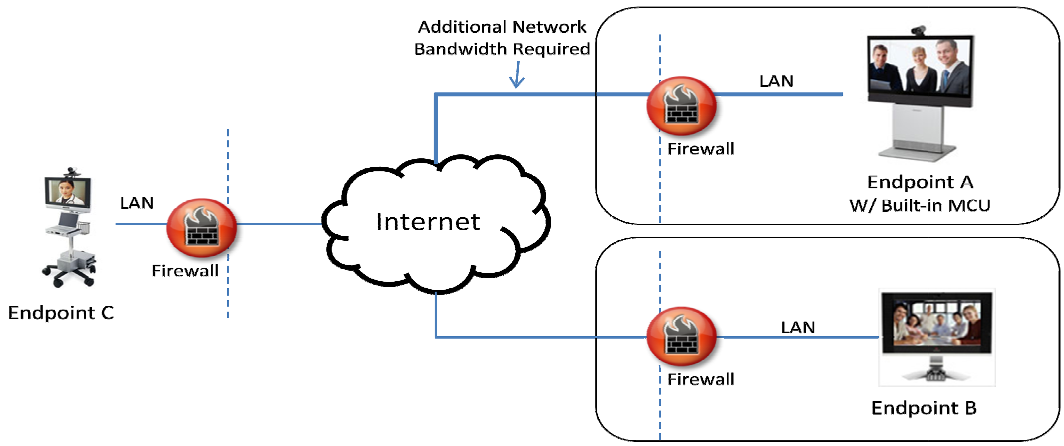


Figure 2 – Multipoint Video Conference with Built-in MCU

Multi-Point Connection with External MCU

In some cases it is necessary to add many participants to a call – perhaps well beyond what can be supported with a built-in MCU. If that situation were to arise, it would become necessary to leverage a larger, external MCU that is specifically designed to meet this requirement. These MCUs are designed to support various numbers of connections (or ports).

The higher number of ports an MCU can support, the higher its relative cost. For many organizations, however, large video bridges are a necessity as they are able to hold larger group meetings at a much lower cost than having people physically attend them in person. In addition, it is also possible to “daisy chain” multiple MCUs together to create an even larger pool of endpoints if needed.

These more complex systems might not see much use in a clinical environment. However, they may have practical application for administrative meetings or group training purposes, allowing many people to attend from various locations.

In the illustration below, the MCU is configured to create a virtual conference room where many participants are able to join or exit the meeting as desired. Most MCUs have the ability to be integrated into the organization's electronic calendaring system (for example, Microsoft Exchange) where meetings may be established at set times. In this situation, the MCU can be set to automatically call the required endpoints at the start of the meeting, therefore making the conference process completely automated (see Figure 3).

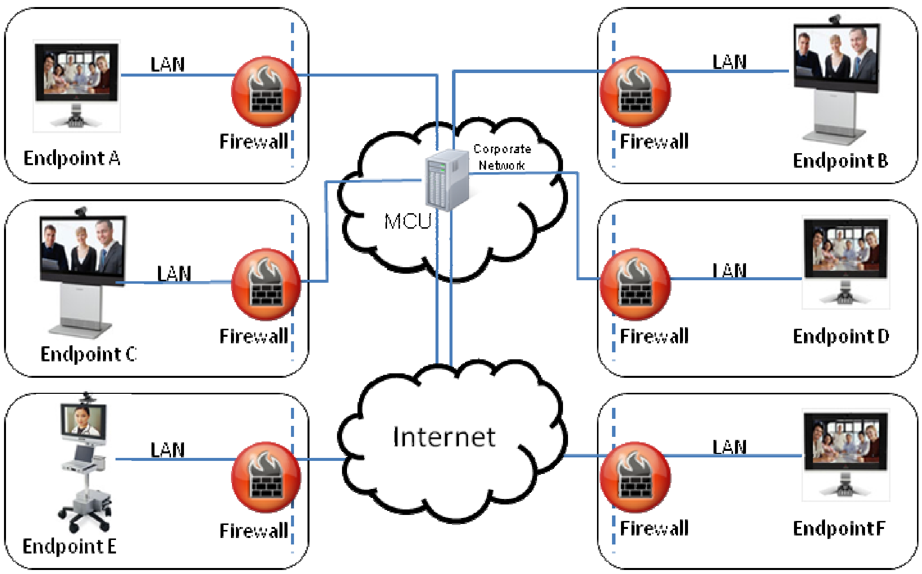


Figure 3 - Corporate Network with External MCU

Similar to recent video conferencing units, most current MCUs will operate with video endpoints from various manufacturers. This wasn't always the case, which obviously caused problems when participants who used video endpoints from differing manufacturers weren't able to connect through the MCU. However, much like the evolution of video endpoints toward standards-based communications, most MCUs are also now designed to embrace the same protocols, thus making them much more versatile and cost effective.

Another important feature of some MCUs is the ability to add recording and streaming capabilities to the system. These options, typically in the form of a software feature that can be enabled with a license or through the addition of an external piece of hardware, can greatly enhance the usefulness of the equipment. For example, if some staff members were not able to attend an important video conference, they would have the ability to replay the conference call at a time that is convenient for them. In addition, if a message needed to be delivered to the entire organization, the video streaming (network broadcasting) option would be one way to achieve that goal.

Endpoint Management Solutions

Much like managing other computer or information technology assets, video conferencing equipment requires occasional maintenance. This may include software updates, configuration changes, or administration assistance before or during a call. In these situations, a specially trained administrator will need to perform the desired work.

In larger organizations, there may be one or two video system administrators that are designated to only work on the video system infrastructure. However, in smaller organizations where IT staff may be limited or non-existent, an outsourced entity may be required. In either case, it is important to know that the video endpoints can be maintained remotely while connected to the organization's local area network (LAN).

In smaller deployments, the video endpoints may be managed individually via a management console that resides on each unit. This password protected interface will allow a technician to administer the system and perform the work necessary. The administrator may also perform this work from a remote location if the data network is configured to allow access to the video equipment.

Going one step further, for larger deployments where multiple video units have been installed, each of the video conferencing manufacturers have developed special software management platforms that can assist the video administrator in maintaining the equipment. This software, which is sold separately and resides on dedicated computer hardware, is configured to communicate with each video endpoint. This, in turn, allows the administrator to troubleshoot or update multiple video endpoints at once, therefore saving a significant amount of time – sometimes critically important in a clinical setting. Each of the manufacturers discussed offers their own proprietary endpoint management software, as follows:

- LifeSize Control
- Polycom Converged Management Application (CMA) and CMA Desktop
- Tandberg Management Suite (TMS)

Regardless of deployment size, it is vitally important to allocate resources for system maintenance during planning of a telemedicine program. Staffing (or budget for external assistance) must be allocated for a successful long-term telemedicine outcome.

Video Conferencing Manufacturers

As with most other businesses, the landscape of video conferencing manufacturers has changed over time through business acquisitions, mergers, and failures. This has left us where we are at today – with a handful of manufacturers that we will focus on for the purpose of this document. As you can see below (Figure 4), the top three manufacturers comprise 83% of the United States market share. Anecdotal evidence indicates that a similar breakdown exists within the health care space.

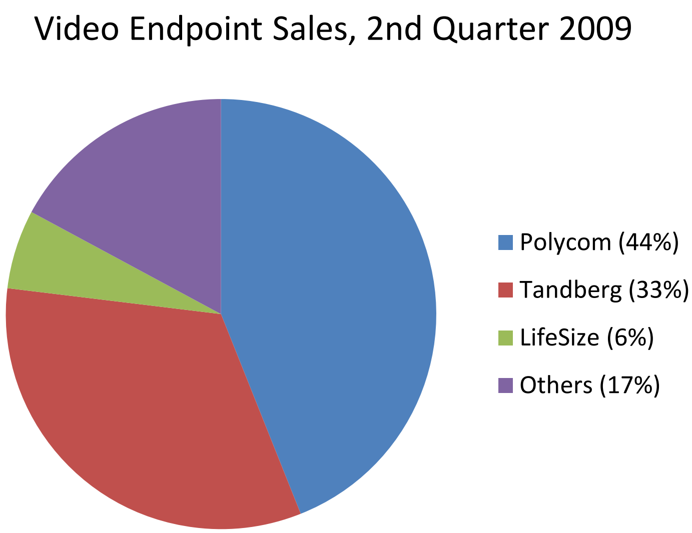


Figure 4

Polycom

Polycom is one of the industry's most entrenched players. Founded in 1990 and based in Pleasanton, California, Polycom has a long heritage in voice communications. Polycom holds various audio technology patents – many of which are used across their extensive line of telephones, speakerphones, and HD video systems. Some of Polycom's technical advancements have also been integrated into systems offered by other manufacturers.

According to company reports, global revenue for fiscal 2008 topped $1.1 billion for all product lines (Ben Worthen, 2009). Polycom sold approximately 44.4% of all video conferencing endpoints in the second quarter of 2009 (Ben Worthen, Justin Scheck, 2009). Along with a strong video endpoint business, Polycom also maintains approximately 25% of the video network infrastructure market (Frost and Sullivan, 2008).

Polycom offers an extensive line of voice, video conferencing, and network infrastructure systems. Their popular HDX line fits well within the operational requirements for telemedicine use. The HDX offering ranges from the HDX 4000 all-in-one system capable of 720p resolution (list price $7,999) up to the component style (separate video codec and camera) HDX 8006 system supporting 1080p video resolution (list price $17,499).

Tandberg

The oldest in the market, Tandberg was established in 1989 and has grown into one of the industry's most notable video conference equipment providers in endpoints and infrastructure systems. Headquartered in Norway and New York, Tandberg has developed an extensive HD video product lineup that spans from the computer desktop to fully integrated systems in the boardroom. As an early market presence, Tandberg has become a fixture in corporations that embraced the technology early on.

Tandberg reported revenue for fiscal 2008 of $809 million (Ben Worthen, 2009) and sold roughly 33.3% of all video conferencing endpoints in the second quarter of 2009 (Ben Worthen, Justin Scheck, 2009). Tandberg also made a strong play for the video infrastructure market with the purchase of equipment manufacturer, Codian, in 2007. With that purchase, Tandberg essentially leveled the playing field with Polycom by offering end-to-end video communications systems.

The Tandberg product line features a wide variety of video endpoint systems and infrastructure solutions (Codian) that work well for telemedicine applications. Standard Tandberg choices include the all-in-one 1700 MXP (list price $7,990) and the component style Edge series (starting list price $8,400), both capable of 720p resolution. The newer Quick Set C20 component, supporting 1080p video resolution (list price $7,900), has also become a popular choice for health care programs.

LifeSize

LifeSize is relatively new to the video conferencing market, yet has a respectable market share for its short existence. Founded in 2003 and based in Austin, Texas, LifeSize has quickly gained attention as a technology innovator. Noted as being the first company to introduce commercially available HD video conferencing endpoints in 2005, LifeSize essentially pushed the industry into the next phase of maturity with HD systems.

Since LifeSize is a private company, actual sales numbers are hard to determine, however it is estimated that LifeSize holds approximately 6% of the U.S. video conferencing market (Ben Worthen, Justin Scheck, 2009). LifeSize maintains that sales have grown by over 140% from October 2008 through October 2009 and include 800 new corporate customers every quarter (Peter Burrows, 2009).

Although the LifeSize product lineup includes a more limited variety of video endpoints compared to the other manufacturers, both their endpoint systems and infrastructure equipment (through Radvision) are gaining increasing notoriety within the health care market. From the recently released component style Passport offering 720p video resolution (list price $2,499) to the Express 220 system supporting 1080p resolution (list price $6,999), LifeSize has garnered attention for their price/performance value.

Other Video Endpoint Manufacturers

Although less prominent in terms of market share, other video endpoint vendors are present in the marketplace.

Most notably, that list includes:

- Aethra – Italian manufacturer offers a full lineup of video systems
- Cisco Systems – Offers network-focused, telehealth and telepresence room systems
- HP – Focused on larger, more expensive telepresence systems
- Radvision – Offers few endpoints; focused mainly on infrastructure solutions
- Sony – Offers a range of video cameras and endpoints from desktop to larger HD systems

Each of the companies above occupies sizable portions of the remaining video endpoint market. In terms of broad deployment in the health care market, however, these systems have either met limited acceptance or their systems are not well matched for the application (i.e. larger, integrated boardroom installations). Regardless, it must be noted that if an organization were to deploy video endpoints in their hospital or clinic from one of these vendors (i.e. Aethra or Sony), they would likely communicate adequately with systems from Polycom, Tandberg, or LifeSize.

Manufacturer Changes

Cisco Systems, a communications industry powerhouse, has very recently acquired Tandberg for $3.4 billion. Only time will tell how the combined companies manage their product lineup and chart the course for the future of their video communications business.

In addition, LifeSize was very recently acquired by Logitech. It is not yet known if this new financial backing will allow LifeSize to expand upon their innovative focus to become an even more formidable competitor in the enterprise environment, or if Logitech will encourage LifeSize to grow the endpoint business in a more mainstream, consumer-grade manner.

Meanwhile, rumors continue to fly that Polycom is a potential acquisition target of either Hewlett Packard or Avaya, indicating that more industry changes could be on the horizon. Regardless, all of the recent activity shows confidence in the belief that visual communications will see a much stronger surge of growth in the future as more organizations move to incorporate the technology.

Alternative Video Conferencing Solutions

There are, of course, many approaches to video conferencing other than those presented thus far. For example, dozens of companies offer software only, web-centered video conferencing solutions. Solutions popular with small businesses and individuals seeking free or low-cost face-to-face communication include:

- Skype
- ooVoo
- SightSpeed
- Microsoft (LiveMeeting)
- MegaMeeting
- Nefsis

While many of these systems do a fine job delivering essential video communications (some also offer meeting content or computer desktop sharing), most are not standards-based. This essentially means that these systems will only work within their own communications environment and will not communicate with other video systems. This can be especially problematic if it becomes necessary to communicate with standards-based video endpoints or the web-based systems of another provider. For example, Skype users cannot communicate with SightSpeed users, and vice versa.

These systems also may not guarantee the level of security desired for transmission of patient data. It is important to be aware of legal and regulatory requirements before making a decision. See Appendix A (pages 28- 29) for further information regarding HIPAA and other compliance issues.

In addition to web-based solutions, the major video conferencing manufacturers (along with a few others) have begun offering their own versions of PC-based “soft client” video conferencing systems. While the premise is similar to that of web-based offerings, these solutions are instead based upon dedicated network hardware systems deployed within an organization. Below is a list of notable companies offering these solutions:

- Cisco (Cisco Unified Videoconferencing)
- LifeSize (LifeSize Desktop)
- Polycom (CMA Desktop)
- Radvision (Scopia Desktop)
- Tandberg (Movi)
- Vidyo (VidyoDesktop)

These options typically resolve the issue of communicating with standards-based video endpoints. However, they each present their own distinct set of deployment considerations.

As these systems usually require comparatively significant up-front costs, they tend to be less attractive for new programs than video endpoints. They are also susceptible to viruses and other PC-related issues.

One other unique video conference system specific to telemedicine is provided through InTouch Health. This PC based, video-centric system is part of a robotic cart platform that can be remotely driven and operated by an off-site physician. While technically very similar to a video conference system mounted to a non-robotic cart, the InTouch unit is completely wireless and operates without manual assistance from hospital staff. While offering the freedom to work independently, just as if the physician were making rounds in person, the technology requires a unique infrastructure of wireless network equipment as well as robotic controls on the physician side. This proprietary environment mandates a significant investment in hardware and services and should be considered only if long-term financial resources are able to sustain the system.

Conclusion

The field of telemedicine is projected to be an increasingly prominent component of the health care delivery system, especially as the American geriatric population continues to increase. The technology trends currently present in the healthcare market will likely mature into the standard of care for delivering services to populations facing unique barriers to access.

It is essential that forward-thinking health care leaders understand the road we have taken to reach this point and use all available information to evaluate opportunities for their patients and organizations in the future.

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Appendix A

Business Planning for Telemedicine

Based on the experiences of Jennifer Baron, BS (Telemedicine Director, Indiana Clinic) and Stephanie Laws, RN, BSN (Project Associate, Union Hospital's Richard G. Lugar Center for Rural Health)

Operational Structure

A strategic operational structure helps ensure the success of telemedicine services. Planning for this structure should consider the unique issues and culture of the organization. Key issues to be considered, include:

1. Where will your telemedicine services be based?
    a. A centralized telemedicine department/service area that schedules, implements, and monitors programming.
    b. Individual departments with independent management of systems and resources.
    c. Combination (i.e. equipment dispersed throughout the organization with centralized scheduling and monitoring).
2. Who will head telemedicine services?
    a. Specialized and/or dedicated staff
    b. Dispersed responsibility as part of various position accountabilities
3. What resources will be necessary for the telemedicine program?
    a. Technical infrastructure and support
    b. Equipment
    c. Scheduling and monitoring systems
    d. Programming
    e. Human resources
4. What structures need to be developed and/or revised?
    a. Policies and procedures
    b. Protocols for various applications
    c. Credentialing and privileging
    d. Cultural modeling (i.e. leadership enforcement of telemedicine utilization)
    e. Training and competency documentation
    f. Compliance with accrediting and licensing agencies
5. What business and financial planning needs to take place?
    a. Strategic planning
    b. Revenue streams
    c. Return on investment
6. What other part of your organization may telemedicine affect?
7. What issues will the telemedicine create? (i.e. fear of competition by local providers)

Evaluating Effectiveness of Telemedicine Programs

Evaluating effectiveness will be different for each organization, department, and program. An evaluation needs to focus on a specific set of outcome measures chosen by leadership. These outcome measures may include: health outcomes (disease management), cost outcomes (return on investment), patient and provider satisfaction (utilization, perceptions), health systems delivery (workflow, referral patterns), and/or policy issues (regulatory requirements, reimbursement).

Role of Spoke Site

Telemedicine makes seeing patients easier for both patients and clinicians. Coordination between the spoke site (where the patient is located) and the hub site (where the clinician is located) is essential to making the telemedicine experience beneficial to the patient. Conversations should be initiated between the spoke site and the hub site prior to purchasing telemedicine equipment to ensure optimal interface capability and operation.

Telemedicine Equipment

In order to have a telemedicine consult or educational (CME) event you must have the necessary equipment. Peripheral diagnostic tools such as an exam camera or digital stethoscope may be necessary for certain services. These tools are important to the diagnostic process and, therefore, are typically selected by the hub site clinician. It is important to work with the hub site clinician who will provide the telemedicine service before purchasing diagnostic equipment.

Location

Specific locations should be identified for both clinical and educational events. Make sure the designated rooms are able to support the technology and equipment and are appropriate for the type of event that will take place in each room. Most sites find it effective to identify a conference room or two for CME services and a patient exam room for clinical services. The room(s) should be outfitted with a live data jack and power supply.

The room utilized at the spoke site requires several unique design considerations. First, the room must accommodate the telecommunication requirements for the telemedicine program. Because of the special electrical, telecommunications and computing requirements of telemedicine, proper allowance must be given to the installation of required cabling in a way that assures access for maintenance and upgrades, while at the same time maximizing patient and user safety. Consideration should also be given to work flow and patient activity within the room to avoid hazards which can arise from exposed cabling.

Staff Support

The spoke site should consider appointing dedicated staff to coordinate and facilitate programmatic operation. It is helpful to have dedicated information services or information technology staff, as well as clinical and educational staff, who are trained on the equipment and scheduling processes to coordinate with local staff and telemedicine representatives at the hub site. This recommendation will ensure that the telemedicine program and clinical services are available and running smoothly prior to a scheduled event or patient encounter.

Clinical Staff Support

A nurse should be provided by the spoke site to assist the hub site clinician throughout the patient encounter. This nurse will be responsible for the operation and manipulation of the peripheral diagnostic tools at the clinician's direction, as well as carrying out orders and providing follow-up instructions to the patient based on the clinician's recommendations.

Reimbursement

Organizations currently reimbursing for telemedicine procedures include:

- Anthem
- Medicare
- UnitedHealth
- Indiana Medicaid

Clinicians who deliver services via telemedicine are able to bill their professional fee utilizing a special coding modifier ("G/T"). The reimbursement rates are the same as if the patient was seen in person. Depending on the type of clinical services delivered and the location of the spoke site, an "originating" site fee may also be charged.

Regulations

It is important to become familiar with current legal and regulatory issues effecting telemedicine services such as:

- Stark Laws
- Anti-kickback Laws
- JCAHO/HFAB Guidelines (credentialing)
- Liability Issues
- Licensure Portability Laws

It is helpful to consult with your hospital's legal consultants on these matters. C-Tel (Center for Telehealth and E-Law) is also a helpful resource.

Licensure

While telemedicine technology increases a provider's capacity to serve patients and improve access to health care, providers must be licensed in the state where the care is being rendered, as well as seek credentialing and privileges at the site where the services are being provided. Medical malpractice should also be taken into consideration, which may be dependent on each site's respective rules and regulations governing this matter.

HIPAA and Telemedicine

A typical telemedicine consult involves the sharing of different kinds of protected health information (PHI). Therefore, a greater awareness of patient privacy concerns should be noted. Consents should be formally tailored to allow patients to carefully understand how the presence of outsiders or non-clinical persons involved in teleconsultations impacts privacy and confidentiality issues. The rules and regulations from the organization's accrediting and regulatory agencies (JCAHO/HFAP, state departments of health) should also be consulted to ensure compliance.

Other Telemedicine Resources

American Telemedicine Association: http://www.atmeda.org/

Office for the Advancement of Telehealth: http://www.hrsa.gov/telehealth/

Centers for Medicare and Medicaid Services: http://www.cms.hhs.gov/default.asp

Telemedicine Information Exchange: http://tie.telemed.org/

Center for Telehealth and E-Law: http://www.telehealthlawcenter.org

Appendix B

Case Study: Indiana Rural Health Association (IRHA)

Based on the experiences of Matt Serricchio, MPA (Special Projects Coordinator, Indiana Rural Health Association)

The majority of the business case for determining whether or not to utilize telemental health in a facility is based upon the unique needs of that facility.

Specific driving factors for our telemental health program (year one of IRHA's Outreach grant) have been as follows:

- Lack of mental health triage expertise in Critical Access Hospital (CAH) emergency rooms
- Practitioner driving time between clinics to see geographically dispersed patients
- Facilities want to provide billable services in house but lack necessary practitioner

When comparing equipment the basic criteria were as follows:

- Price point
- Expandability
- High definition zoom/pan camera
- Interoperability
- Ease of use (plug and play)

Based on these criteria, the LifeSize Express 200 has been IRHA's product of choice. LifeSize has since released scaled down versions that will be satisfactory for mental health needs as well, but may not be expandable into other specialties. Comparisons between Tandberg, Polycom, and LifeSize yielded results that allowed us to determine that LifeSize offered the best price for the best equipment for our grant project. Since the installations we have had no technical issues related to the equipment.

The process we are using as of this writing is a point to point connection. Each telemedicine unit will connect to the other via the Internet. A call can be initiated by either the practitioner or the patient side, depending on the situation. In a CAH emergency room the call is usually initiated on the patient side. In a community mental health center the calls may be initiated on either end, but typically the patient side initiates the call.

Calls involve the practitioner on one endpoint and the patient, with relevant staffing, on the other endpoint. From there, the evaluation or treatment follows the exact protocol as a face to face meeting. The additional layer of faxing, email or EMR transmittal of documents does require the facilities to look at their respective processes and abilities and adjust accordingly.

As with any face to face process, the calls are scheduled or handled in the same manner as all other appointments or ER protocols. Telemedicine only increases the availability of practitioners and the medium through which they communicate; it doesn't change the inherent process of patient treatment.

Telemedicine encounters are covered by some private providers, as well as Medicare and Medicaid. The model used in IRHA's outreach grant is to hire the practitioners on as staff and pay them using the same methods the facility uses to pay its onsite staff. If the need is there for an onsite staff practitioner, the need is the same for a telemedicine practitioner – only the pool to draw from is expanded.

In summary, telemental health only expands the reach of facilities in order to better serve their communities. The process in place for onsite visits is used to provide telemedicine consultations as well. There is no need for extensive reworking of business plans or models to incorporate telemental health into the facility. If the need is there and a practitioner is available, the telemedicine equipment can facilitate the expansion of services and providers through a different medium without changing patient care.

Appendix C

Case Study: Union Hospital's Richard G. Lugar Center for Rural Health

Based on the experiences of Erik Southard, RN, MS, CFNP (Executive Director, Union Hospital's Richard G. Lugar Center for Rural Health), Stephanie Laws, RN, BSN (Project Associate, Union Hospital's Richard G. Lugar Center for Rural Health) and Josh Zuerner (Chief Technology Officer, Joink, LLC)

Training

Technical training is essential for the telemedicine program to be successful. Staff involved in the operation of the equipment should complete core competencies related to basic device operation. This training should include basic troubleshooting skills, as well as remote control operation, camera control, and peripheral diagnostic device use.

All employees should receive the technical and operational skills component prior to being allowed to operate the videoconferencing equipment. It is highly recommended that core competencies be completed prior to the program's "live" date, at the time of orientation, and annually thereafter. A standardized form that mimics the organization's basic competency format is best. After completion, the competency form should be placed in the employee's human resource to satisfy accreditation and regulatory compliance. (See Sample Telemedicine Training Checklist on page 34.)

Staff should also be trained related to the key processes of the program – simple, easy-to-follow algorithms may be useful to assist staff. This may include when and how to contact the clinician (hub site), as well as what documentation may need to be collected and sent to the clinician (hub site) prior to beginning a patient encounter utilizing telemedcine.

Keeping records such as programmatic policies and procedures, algorithms, and any necessary documentation in easy-to-locate, color-coded envelopes may improve staff buy-in and promote high-end usability by facilitating easy access to needed forms. Standardization is vital for effective operation. (See Sample Algorithm for Obtaining a Telemental Health Consult on page 35.)

Peripheral Diagnostic Tools and Devices

Sometimes peripheral diagnostic tools and devices (cameras, stethoscopes, ophthalmoscopes, etc.) are needed at the spoke site (patient location) to provide a clear clinical impression for the provider to make an accurate diagnosis. It is recommended that the provider be involved in deciding what type of equipment is necessary. This is essential to ensure that the providers have the quality they need, as well as to promote end-user support for the project.

It has been noted that specialists do not rely solely upon this equipment to determine a patient's diagnosis, so it may be wise to complete a needs assessment prior to considering a purchase. If a peripheral diagnostic tool or device is needed for the project, it is necessary to determine if the videoconferencing device will support the tool/device. Some tools or devices require a software upgrade to be supported, while some only connect utilizing a serial port adapter. Not all videoconferencing devices are equipped with these features, so use caution prior to making your selection.

Use of a border controller

H.323 video conferencing: In this design, a border controller substantially benefited deployment. The primary benefit was reduced work load on our IT staff, as no special inbound conduits or firewall rules were needed for each unique device. Additional benefits of the border controller are dial by extension number, authentication, and access to call logs. (See Sample Network Diagram on page 36.)

Documentation

It is helpful to record serial numbers and license keys to aid in obtaining software upgrades and software license keys from various vendors. The ability to obtain remote access to a device via the web is also helpful if administrators need to double check settings or assist an end-user.

Sample Telemedicine Training Checklist
Documentation of Core Competencies

□ Assures privacy and confidentiality.

□ Able to turn on Tandberg teleconferencing device.

□ Able to access frequent contacts log and place call.

□ Demonstrates competency in the area of placing calls by manual entry of the address.

□ Able to locate camera control options.

□ Able to zoom, tilt, pan far end camera.

□ Able to zoom, tilt, pan near end camera.

□ Demonstrates proficiency at body placement relative to camera field of view.

□ Is proficient at voice projection and adjustment of microphone and volume control.

□ Shows aptitude for decreasing background noise and peripheral distractions.

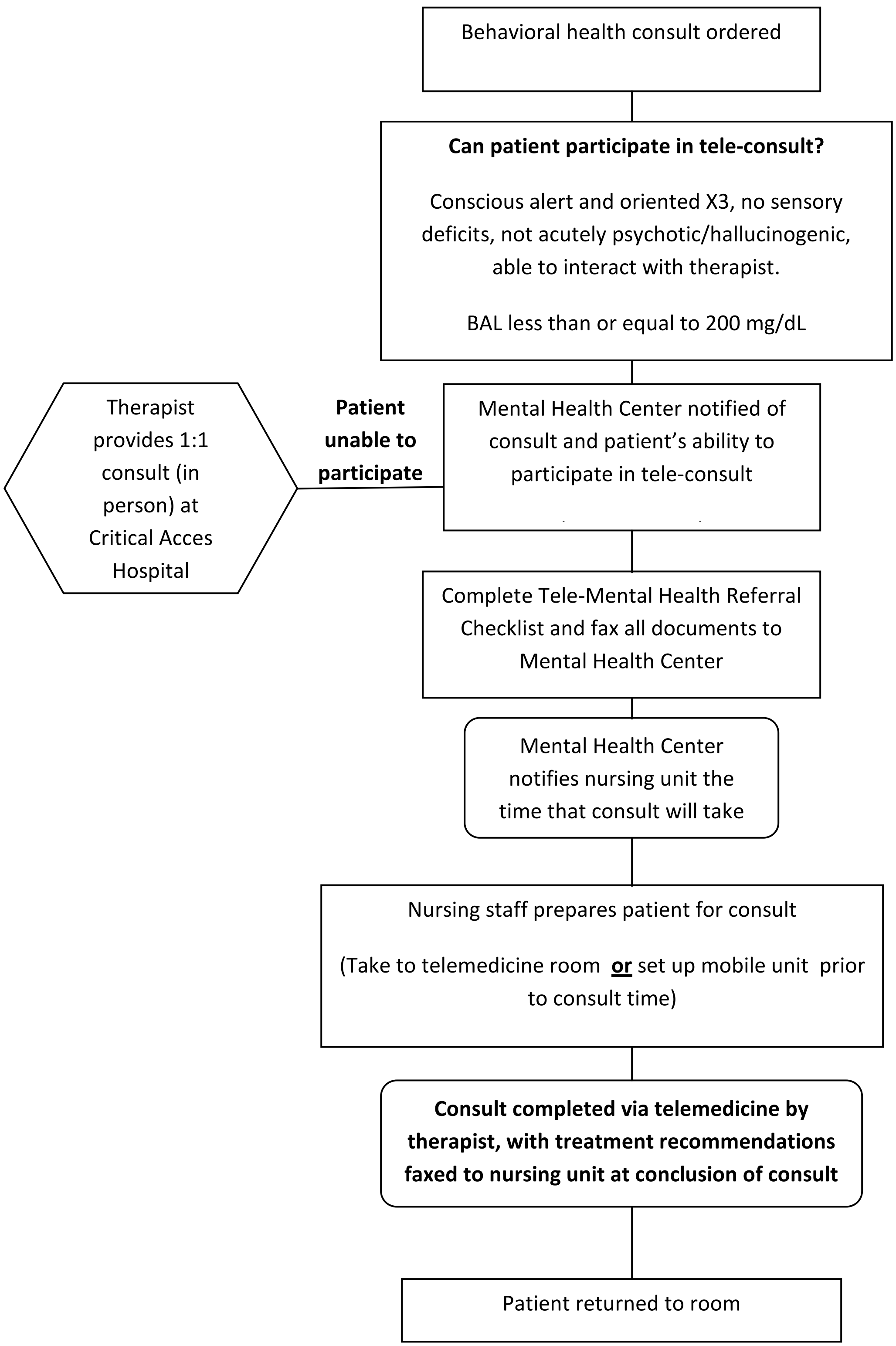
□ Knows how to mute microphone on near end.

□ Able to troubleshoot minor technical problems.

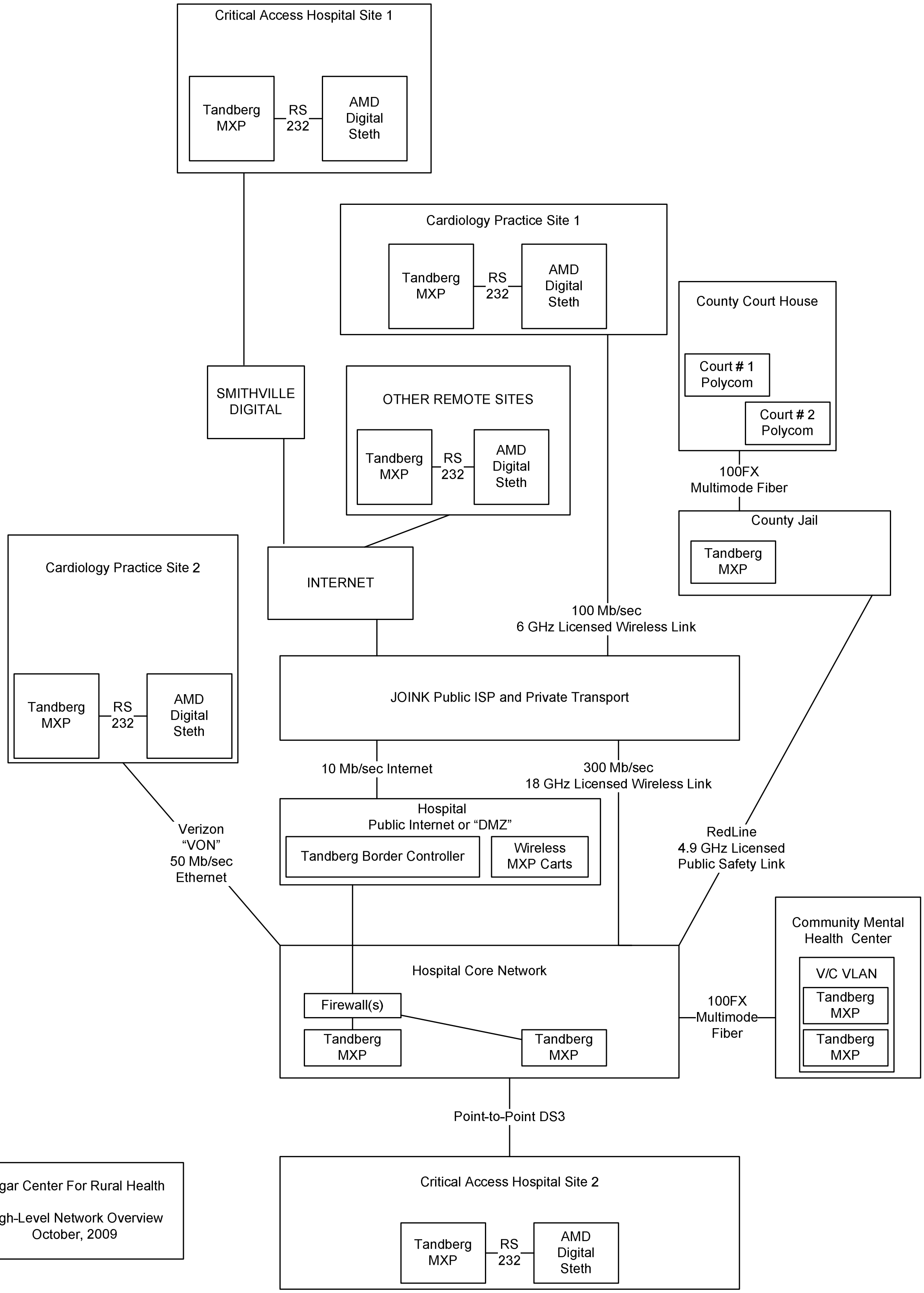
□ Able to terminate video conferencing call.

____________________________	________	_________________________	________
Trainer	Date	Trainee	Date

Sample Algorithm for Obtaining a Telemental Health Consult



Sample Network Diagram



Appendix D

Sample Vendor Meeting Questions

Below is an initial list of questions to ask video conference technology vendors about each video conference equipment line being considered:

- Does the video conference system support high definition video? If so, is it 720p or 1080p?
- Does the system support dual video (H.239)? If so, is there additional software needed and/or a cost to enable this feature?
- Does the system support dual monitors? Do they connect via DVI or HDMI connections? Does this require extra cables that will need to be purchased?
- Does the system support other external equipment, such as additional video and audio inputs or digital diagnostic equipment? Does this external equipment have to have a specific type of port to connect to the system? If so, what type of port is needed?
- Is the primary camera on the system pan-tilt-zoom (PTZ)? Can the camera be controlled by both the near end and the remote end?
- Does the system include an internal multipoint conference unit (MCU)? If so, is there a cost to enable this feature?
- What is the minimum and maximum bandwidth your system supports? Is there a fee or charge to enable a higher throughput?
- Does the system support encryption that is HIPAA compliant – specifically H.235?
- Does the system offer firewall traversal (H.460) and network address translation (NAT) support?
- In regard to maintenance contracts and support agreements, are there annual fees associated with the equipment being discussed? If so, what is the fee breakdown and what does each fee cover?
- Are the systems being offered standards compliant (H.323/SIP)? (Simply, will the equipment talk to other systems? Are there any other systems to which it will not talk?)
- Are other back end infrastructure components required to support the equipment?

Appendix E

Telemedicine/Telehealth Terminology Glossary

Significant portions of this glossary were obtained from a list of terminology definitions compiled by the American Telemedicine Association (ATA).

The following is a list of terms and definitions that are commonly used in telemedicine and telehealth. This list is not all-inclusive and should be considered as a general resource for the purposes of this document.

Application Service Provider (ASP): An ASP hosts a variety of applications on a central server. For a fee, customers can access the applications that interest them over secure Internet connections or a private network. This means that they do not need to purchase, install and maintain the software themselves; instead they rent the applications they need from their ASP. Even new releases, such as software upgrades, are generally included in the price.

Asynchronous: This term is sometimes used to describe store and forward transmission of medical images or information because the transmission typically occurs in one direction in time. This is the opposite of synchronous (see below).

Authentication: A method of verifying the identity of a person sending or receiving information using passwords, keys and other automated identifiers.

Bandwidth: A measure of the information carrying capacity of a communications channel; a practical limit to the size, cost, and capability of a telemedicine service.

Bluetooth Wireless: Bluetooth is an industrial specification for wireless personal area networks (PANs). Bluetooth provides a way to connect and exchange information between devices such as mobile phones, laptops, PCs, printers, digital cameras, and video game consoles over a secure, globally unlicensed short-range radio frequency. The Bluetooth specifications are developed and licensed by the Bluetooth Special Interest Group.

Broadband: Communications (i.e. broadcast television, microwave, and satellite) capable of carrying a wide range of frequencies; refers to transmission of signals in a frequency-modulated fashion, over a segment of the total bandwidth available, thereby permitting simultaneous transmission of several messages.

Clinical Information System: Relating exclusively to the information regarding the care of a patient, rather than administrative data, this hospital-based information system is designed to collect and organize data.

CODEC: Acronym for coder-decoder. This is a video conferencing device (i.e. LifeSize, Polycom, Tandberg, Radvision, etc.) that converts analog video and audio signals to digital video and audio code and vice versa. CODECs typically compress the digital code to conserve bandwidth on a telecommunications path.

Compressed video: Video images that have been processed to reduce the amount of bandwidth needed to capture the necessary information so that the information can be sent over a telephone network.

Computer-based Patient Record (CPR): An electronic form of individual patient information that is designed to provide access to complete and accurate patient data.

Data Compression: A method to reduce the volume of data using encoding to reduce image processing, transmission times, bandwidth requirements, and storage space requirements. Some compression techniques result in the loss of some information, which may or may not be clinically important.

Diagnostic Equipment (Scopes, Cameras & Other Peripheral Devices): Hardware devices not part of the central computer (i.e. digitizers, stethoscope, or camera) that can provide medical data input to or accepts output from the computer.

Digital Camera (still images): A digital camera is typically used to take still images of a patient. General uses for this type of camera include dermatology and wound care. This camera produces images that can be downloaded to a PC and sent to a provider/consultant over a network.

Digital Imaging and Communication in Medicine (DICOM): A standard for communications among medical imaging devices; a set of protocols describing how images are identified and formatted that is vendor-independent and developed by the American College of Radiology and the National Electronic Manufacturers Association.

Disease Management: A continuous coordinated health care process that seeks to manage and improve the health status of a carefully defined patient population over the entire course of a disease (i.e. CHF, DM). The patient populations targeted are high-risk, high-cost patients with chronic conditions that depend on appropriate care for proper maintenance.

Distance Learning: The incorporation of voice, data, and video technologies, allowing students to "attend" classes and training sessions that are being presented at a remote location. Distance learning systems are sometimes interactive and are a tool in the delivery of training and education to widely dispersed students, or in instances in which the instructor cannot travel to the student's site.

Distant Site: The distant site is defined as the telehealth site where the provider/specialist is seeing the patient at a distance or consulting with a patient’s provider. Other common names for this term include – hub site, specialty site, provider/physician site, and referral site. The site may also be referred to as the consulting site.

Document Camera: A camera that can display written or typed information (i.e. lab results), photographs, graphics (i.e. ECG strips) and in some cases x-rays.

Electronic Data Interchange (EDI): The sending and receiving of data directly between trading partners without paper or human intervention.

Electronic Patient Record: An electronic form of individual patient information that is designed to provide access to complete and accurate patient data, alerts, reminders, clinical decision support systems, links to medical knowledge, and other aids.

Encryption: A system of encoding data on a communications channel, Web page or e-mail system where the information can only be retrieved and decoded by the person or computer system authorized to access it.

Firewall: Hardware and/or software that block unauthorized communications between an institution's computer network and external networks.

Full-motion Video: This describes a standard video signal of 30 frames per second (fps) that allows video to be shown at the distant end in smooth, uninterrupted images.

Guideline: A statement of policy or procedures by which to determine a course of action, or give guidance for setting standards.

H.320: A widely-used video compression standard that allows a wide variety of videoconferencing systems to communicate. Usually associated with ISDN.

H.323: This is the technical standard for videoconferencing compression standards that allow different equipment to interoperate via the Internet Protocol (see below).

H.324: This is the technical standard for videoconferencing compression standards that allow different equipment to interoperate via Plain Old Telephone Service (POTS).

Health Level-7 Data Communications Protocol (HL-7): This communication standard guides the transmission of health-related information. HL7 allows the integration of various applications, such as bedside terminals, radiological imaging stations, hospital census, order entries, and patient accounting, into one system.

HIPAA: Acronym for Health Insurance Portability and Accountability Act of 1996. The Standards for Privacy of Individually Identifiable Health Information (Privacy Rule) establishes a set of national standards for the protection of certain health information through the U.S. Department of Health and Human Services (HHS). The Privacy Rule standards address the use and disclosure of individuals' health information (called "protected health information") by organizations subject to the Privacy Rule (called "covered entities"), as well as standards for individuals' privacy rights to understand and control how their health information is used. (Per www.hhs.gov/ocr/hipaa.)

Home Health Care & Remote Monitoring Systems: Home health care is care provided to individuals and families in their place of residence for promoting, maintaining, or restoring health; or for minimizing the effects of disability and illness, including terminal illness. In the Medicare Current Beneficiary Survey and Medicare claims and enrollment data, home health care refers to home visits by professionals including nurses, physicians, social workers, therapists, and home health aides. Using remote monitoring and interactive devices allows the patient to send in vital signs on a regular basis to a provider without the need for travel.

Informatics: The use of computer science and information technologies for the management and processing of data, information and knowledge.

Integrated Services Digital Network (ISDN): This is a common dial-up transmission path for video conferencing. Since ISDN services are used on demand by dialing another ISDN based device, per minute charges accumulate at some contracted rate and then are billed to the site placing the call. This service is analogous to using the dialing features associated with a long distance telephone call. The initiator of the call will pay the bill. ISDN permits connections up to 128Kbps.

Interactive Video/Television: This is analogous with video conferencing technologies that allow for two-way, synchronous, interactive video and audio signals for the purpose of delivering telehealth, telemedicine or distance education services. It is often referred to by the acronyms ITV, IATV or VTC (video teleconference).

Internet Protocol: The Internet Protocol (IP) is the protocol by which data is sent from one computer to another on the Internet. Each computer on the Internet has at least one address that uniquely identifies it from all other computers on the Internet. IP is a connectionless protocol, which means that there is no established connection between the end points that are communicating. The IP address of a video conferencing system is its phone number.

Interoperability: Interoperability refers to the ability of two of more systems to interact with one another and exchange information in order to achieve predictable results. There are three types of interoperability – human/operational, clinical, and technical. Interoperability refers to the ability of two or more systems (computers, communication devices, networks, software, and other information technology components) to interact with one another and exchange data according to a prescribed method in order to achieve predictable results.

ISDN Basic Rate Interface (BRI): This is an ISDN interface that provides 128k of bandwidth for video conferencing or simultaneous voice and data services. Multiple BRI lines can be linked together using a multiplexer (see below) to achieve higher bandwidth levels. For instance, it is possible to combine 3 BRI lines so as to provide 384k of bandwidth for video conferencing. It should be noted that BRI services are not available in some rural locations.

ISDN Primary Rate Interface (PRI): This is an ISDN interface standard that operates using 23, 64k channels and one 64k data channel. With the proper multiplexing equipment the ISDN PRI channels can be selected by the user for a video call. For instance if the user wants to have a videoconference at 384k of bandwidth then they can instruct the multiplexer to use channels 1 through 6 (6 x 64k = 384k). This is important because the user typically pays charges based on the number of 64k channels used during a video conference. The fewer channels used to obtain a quality video signal the less expensive the call.

JCAHO: Acronym for Joint Commission on Accreditation of Healthcare Organizations.

Lossless: A format of data compression, typically of an order of less than 2:1, in which none of the original data information is lost when the image is reproduced.

Lossy: A process of data compression at a relatively high ratio, which leads to some permanent loss of information upon reconstruction.

Medical/ Nursing Call Center: A call center is a centralized office that answers incoming telephone calls from patients. Such an office may also respond to letters, faxes, e-mails and similar written correspondence. Usually staffed by nurses, call centers provide basic health information and instructions to callers but do not provide an official diagnosis of conditions or prescribe medicine. Call centers act as an initial triage point for patients.

Mobile Telehealth: The provision of health care services with the assistance of a van, trailer, or other mobile unit in which the health care provider might provide patient services at a distance from a normal medical facility. Services may also be provided through mobile technologies that allow a mobile vehicle equipped with medical technologies to attach to an existing health care facility, such as mobile CT, MRI, or TeleDentistry.

Multiplexer (MUX): A device that combines multiple inputs (i.e. ISDN PRI channels or ISDN BRI lines) into an aggregate signal to be transported via a single transmission path.

Multipoint Control Unit (MCU): A device that can link multiple videoconferencing sites into a single video conference. An MCU is also often referred to as a “bridge.”

Multipoint Video Conferencing: Interactive electronic communication between multiple users at two or more sites which facilitates voice, video, and/or data transmission systems – audio, graphics, computer and video systems. Multipoint video conferencing requires an MCU or bridging device to link multiple sites into a single videoconference.

Network Integrators: Organizations specializing in the development of software and related services that enable devices and systems to share data and communicate with one another.

Originating Site: The originating site is where the patient and/or the patient's physician is located during the telehealth encounter or consult. Other common names for this term include spoke site, patient site, remote site, and rural site.

Patient Exam Camera (video): This is the camera typically used to examine the general condition of the patient. Types of cameras include those that may be embedded with set-top video conferencing units, handheld video cameras, gooseneck cameras, camcorders, etc. The camera may be analog or digital depending upon the connection to the videoconferencing unit.

Peripheral Devices: Any device that is attached to a computer externally (i.e. scanners, mouse pointers, printers, keyboards, and clinical monitors such as pulse oximeters or weight scales).

Pharmacy Solutions: The use of electronic information and communication technology to provide and support comprehensive pharmacy services when distance separates the participants.

POTS: Acronym for Plain Old Telephone Service.

Presenter (Patient Presenter): Telehealth encounters require the distant provider to perform an exam of a patient from many miles away. In order to accomplish that task, an individual with a clinical background (i.e. LPN, RN) trained in the use of the equipment must be available at the originating site to "present" the patient, manage the cameras and perform any "hands-on" activities to successfully complete the exam. For example, a neurological diagnostic exam usually requires a nurse capable of testing a patient's reflexes and other manipulative activities. It should be noted that in certain cases, such as interview based clinical consultations such as Telemental Health or Nutrition Services, a licensed practitioner such as an RN or LPN might not be necessary and a non-licensed provider such as support staff could provide telepresenting functions.

QoS: Acronym for Quality of Service. QoS is a data networking term that specifies a guaranteed throughput level. QoS mechanisms are used to give higher priority to real-time data, such as voice over IP (VoIP) and video, than to non-real-time data, such as file downloads.

RHIO: Regional Health Information Organization (RHIO) and Health Information Exchange (HIE) are often used interchangeably. RHIO is a group of organizations with a business stake in improving the quality, safety, and efficiency of healthcare delivery. RHIOs are the building blocks of the proposed National Health Information Network (NHIN) initiative at the Office of the National Coordinator for Health Information Technology (ONCHIT).

Router: This device provides an interface between two networks or connects sub-networks within a single organization. It routes network traffic between multiple locations and it can find the best route between any two sites. For example, PCs or H.323 video conferencing devices tell the routers where the destination device is located and the routers find the best way to get the information to that distant point.

SIP: Acronym for Session Initiation Protocol. SIP is an IP telephony signaling protocol. Primarily used for voice over IP (VoIP) calls, SIP can also be used for video or any media type. SIP is a text-based protocol, which makes it suitable and very flexible for integrated voice-data applications. SIP is designed for real-time transmission, uses fewer resources, and is considerably less complex than H.323.

Standard: A statement established by consensus or authority that provides a benchmark for measuring quality and is aimed at achieving optimal results.

Store and Forward (S&F): S&F is a type of telehealth encounter or consult that uses still digital images of a patient for the purpose of rendering a medical opinion or diagnosis. Common types of S&F services include radiology, pathology, dermatology, and wound care. Store and forward also includes the asynchronous transmission of clinical data, such as blood glucose levels and electrocardiogram (ECG) measurements, from one site (i.e. patient's home) to another site (i.e. home health agency, hospital, clinic).

Switch: A switch in the video conferencing world is an electrical device that selects the path of the video transmission. It may be thought of as an intelligent hub (see hub above) because it can be programmed to direct traffic on specific ports to specific destinations. Hub ports feed the same information to each device.

Synchronous: This term is sometimes used to describe interactive video connections because the transmission of information in both directions is occurring at exactly the same period.

System/Network Integration: The use of software that allows devices and systems to share data and communicate to one another.

T1/DS1: A digital communications circuit or type of telephone line service offering high-speed data, voice, or compressed video access in two directions, with a transmission rate of 1.544 Mbps.

T3/DS3: A digital communications circuit of 45 Mbps.

TCP/IP (Transmission Control Protocol/Internet Protocol): The underlying communications rules and protocols that allow computers to interact with each other and exchange data on the Internet.

Telecommunications Providers: An entity licensed by the government (the Federal Communications Commission in the U.S.) to provide telecommunications services to individuals or institutions.

Teleconferencing: Interactive electronic communication between multiple users at two or more sites which facilitates voice, video, and/or data transmission systems.

Telehealth and Telemedicine: Telemedicine and telehealth both describe the use of medical information exchanged from one site to another via electronic communications to improve patients' health status. Although evolving, telemedicine is sometimes associated with direct patient clinical services and telehealth is sometimes associated with a broader definition of remote healthcare services.

Telematics: The use of information processing based on a computer in telecommunications, and the use of telecommunications to permit computers to transfer programs and data to one another.

Telementoring: The use of audio, video, and other telecommunications and electronic information processing technologies to provide individual guidance or direction. An example of this help may involve a consultant aiding a distant clinician in a new medical procedure.

Telemonitoring: The process of using audio, video, and other telecommunications and electronic information processing technologies to monitor the health status of a patience from a distance.

Telepresence: A set of technologies, such as high definition audio, video, and other interactive elements that enable people to appear as if they were present in a place in which they are not physically located. Telepresence differs from videoconferencing as it offers face-to-face interactions between the people in the meeting through the transmission of life-size, high-definition images and audio.

Teleradiology and Picture Archiving and Communications Systems (PACs): The electronic transmission of radiological images, such as x-rays, CTs, and MRIs, for the purposes of interpretation and/or consultation. Digital images are transmitted over a distance using standard telephone lines, satellite connections, or local area networks (LANs). Teleradiology also is beginning to include the process of interfacing with the hospital information systems/radiology information systems (HIS/RIS) in the transport of digital images. PACs provide centralized storage and access to medical images over information systems.

Ultrasound: A device that uses high-frequency sound waves to examine structures inside the body. It can rapidly detect tumors and other abnormalities, often right in the physician's office.

Universal Service Administrative Company (USAC): The Universal Service Administrative Company administers the Universal Service Fund (USF), which provides communities across the country with affordable telecommunication services. The Rural Health Care Division (RHCD) of USAC manages the telecommunications discount program for health care.

Video Conferencing Systems: Equipment and software that provide real-time, generally two-way transmission of digitized video images between multiple locations; uses telecommunications to bring people at physically remote locations together for meetings. Each individual location in a video conferencing system requires a room equipped to send and receive video.

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Wi-Fi: Originally licensed by the Wi-Fi Alliance to describe the underlying technology of wireless local area networks (WLAN) based on the IEEE 802.11 specifications. It was developed to be used for mobile computing devices, such as laptops, in LANs, but is now increasingly used for more services, including Internet and VoIP phone access, gaming, and basic connectivity of consumer electronics such as televisions and DVD players, or digital cameras.