



Getting Telehealth technology right

Connectivity and Bandwidth

Good quality sound and a clear picture are integral to a good Telehealth consultation.

Telehealth consultations are sent via your internet connection, so the type of internet connection will affect call quality.

Video calls contain about three times more information than audio calls, and the exact amount of information to be sent depends on the:

- Number of pixels in the picture
- Frame rate, which is the number of pictures sent per second; and, the
- Encoding standard used for the picture.

The quality of the connection must be maintained from one end of the consultation to the other.

A fault or slowdown at any point is enough to disrupt the entire connection and result in stalling, blurring, fragmenting, or loss of the connection altogether.

Types of connectivity:

DSL (Digital Services Line), also known as “broadband”, is the most common form of connectivity that private practices and non-government health services use today.

The usual types of DSL that is available is ADSL (Asymmetrical Digital Services Line): it is asymmetrical because the download speed is faster than the upload speed.

The space available on your DSL line is shared with all other customers of your telecommunications or internet service provider, and therefore during busy times the speeds will be slower than advertised. Therefore when using DSL, get the fastest speed available, with the advertised upload and download speeds being at least 512 kilobits per second in each direction.

A dedicated DSL line for video conferencing may be required.

Additionally it is recommended that you purchase a business grade service if one is available. This will not necessarily be any faster than a domestic service, but is usually sent through a part of the network with lower load making reliability higher. Also, if there are problems, the business customers are prioritised.

Mobile Broadband via Portable Modem, Phone, etc. – 3G and 4G

Mobile broadband can be used for video communication, but the quality is variable. We recommend getting technical advice specific to your region if you are considering using this method of connectivity.

Some general points are:

- 4G is much faster than 3G but is not generally available more than 10km from the centre of major capital cities
- The quality of the service depends on the distance from the nearest tower, and how many other people are using the service at the same time
- In some rural areas, the 3G can be significantly better than the DSL service, particularly if the site is more than 3 kilometres from the exchange or if the local cables are damaged, so it is worth looking into this if the DSL is poor quality or unavailable.

Satellite Connection

Use of satellite connection for Telehealth is only recommended for remote areas where nothing else is available and this can be very expensive; due to the great distance of the satellite and back, there is a noticeable delay around half a second in transmission. Furthermore, affordable satellite connections have very limited bandwidth and poor upload speeds, so video communication is often difficult.

The quality is better if one avoids the times of highest general usage, which are around 9am, lunchtime and 7-9pm.

ISDN (Integrated Services Digital Network)

An ISDN line is a digital telephone line with a data speed of 128 kilobits per second. Three of these are needed for a good quality video call. They are very reliable because these lines are not shared with any other users, but are expensive to operate, and have mostly been used by government departments.

Coaxial Cable

Coaxial cable was initially only for cable TV, but can now be used to obtain an internet connection. If it is available in your area, it will have a very fast download speed. If the upload speed is also good, then it can be used as a reliable means of video conferencing.

Fibre Optic Cable

This is the method of connectivity used by the National Broadband Network. It is very fast, with less delay in transmission and is very suitable for video communication.

Use it for Telehealth if and when it becomes available in your area.

Wi-Fi

This is the very limited range of wireless connection used to provide mobile connectivity at short range. Within this range it is very fast, and you should not notice any decrease in speed compared to having a physical cable connection

to your router or modem. However, the signal decreases in strength rapidly with distance, and does not go through solid walls very well; as a result there may be parts of the health service where WI-FI does not work. If this is the case small repeater stations can be installed to increase the range.

Do not do Telehealth consultations over the public WI-FI that is available in places such as airports and cafes because the security may be poor.

Equipment

Standard Definition or High Definition Video

The display resolution of your computer or Telehealth screen depends on the number of pixels that make up the image: The higher the number of pixels the higher the definition and the clearer the picture.

Standard definition is still quite adequate for most types of video consultations.

One situation where a high definition system is useful is surgical mentoring, where a distant surgeon is advising a local team who are operating or performing a procedure. In this particular case a high resolution over a larger field of view is important.

High definition equipment needs higher bandwidth which costs more and may be unworkable in some rural areas because there is insufficient bandwidth to support it.

To see details such as skin lesions, wounds and small print, a close up camera is a cheaper and more effective piece of equipment than high definition system- alternatively photos or film footage can be sent separately to the specialist for more detailed examination.

General equipment issues

Location of video screen

If you have a separate camera (that is you are not using a laptop computer with a camera embedded in it) consider whether you want to place it on the usual computer desktop screen or elsewhere such as on another computer.

Using medical records or practice management software at the same time as conducting a video consultation is easiest if the Telehealth camera and image is on a different screen.

One option is to purchase a separate laptop/computer for video consulting and installing the videoconferencing software on it to free up other computers.

If using Telehealth specific hardware, this will come with a separate screen.

Number of video points

If you have a busy service with many rooms, you might consider more than one Telehealth video point. However, it is probable that your bandwidth will not permit more than one or two Telehealth sessions to run simultaneously. A fast DSL connection that is dedicated solely to video calls can only handle two video calls simultaneously.

One option to allow the video point location to be flexible is to place the video equipment on a small trolley which can be moved from room to room as required. In this case you will need a free internet connection in each room.

Reliability

In general separate Telehealth hardware or a separate computer set up for telehealth is most reliable.

Videoconferencing software, particularly if it is external to the computer's usual applications, is less reliable, and requires more time from the user to keep it in good working order.

It will need regular updates and may experience problems if other aspects of the computer are updated, such as the operating system. It may also stop working if changes are made to the routers or firewall on the practice networks.

Software might also cause issues with the medical records software.

Video phone units

Smaller videoconferencing units are available that resemble telephones

Advantages:

- They will fit on a clinician's desk
- They are the easiest of all equipment options to use; some function just like a telephone
- They are very reliable
- They are moderately priced

Disadvantages:

- They cost more than most software
- They are designed for video communication as their main function, so are not as versatile as a laptop

Mobile devices: Tablets, Ipads and smart phones

Advantages:

- Great flexibility for being on-call or for home visits
- Disadvantages:
- Small image size
- Hard to do consultation on a device that has to be held in the hand, although using a stand may help
- Call quality is often variable and unreliable when out in the field. It will be better if using local WI-FI
- Potentially easier to breach security; this can be overcome by encrypting transmissions.

All you need to conduct a Telehealth consult is a computer that is connected to an adequate internet connection and a camera (see over the page about cameras)

Software

There are multiple types of video communication software such as Skype, GoToMeeting etc. Many of these are available as a free download from the internet.

Always check with the specialist as to which program they use for Telehealth consults well in advance of the appointment.

Cameras

Some hardware and laptops have inbuilt cameras; for other systems one needs to purchase a separate video camera or webcam. If you have an inbuilt camera it is worth considering having an external camera as well as you will find that you can often get a better field of view and have greater flexibility during the consultation.

In Telehealth, sometimes a wider angle will be needed to see a family or small group of people, and at other times close up views are needed. Therefore test potential cameras to see if they can fulfil both of these functions.

A good camera for Telehealth will have a higher quality lens with good autofocus and focal distance. Higher definition cameras will not necessarily improve video communication as currently all video cameras and webcams collect more information than can be sent through a typical video transmission. The software inside the computer or other device has to cut down the information coming from the camera before sending it on.

Therefore, in general, the suitability of a camera for video consulting does not relate directly to how many pixels it captures.

An adequate camera should be used for Telehealth consults. These cameras can be purchased from a computer/electrical store for a reasonable price (\$200 or less).

Security

The first principles of cyber-security are that you should be very cautious and vigilant.

There are two reasons for this:

1. No computer or communication system is completely secure. With time, skill and intention even the highest levels of secure systems have been breached, and this is happening all over the world all the time.
2. Inappropriate access to and use of health information has the potential to ruin a person's work or personal life. There have been recent instances in the United Kingdom where medical records and other clinical information have been obtained by the media (by phone in these cases) and used to threaten individuals. Fortunately this does not appear to have happened in Australia to date, but it serves as a warning the potential dangers.

Assume that your system can be broken into and think about how this risk can be mitigated. The degree of response by you has to be balanced against the degree of risk; this can be assessed by considering three main factors.

- 1. The information:** Consider what information is stored. It may be prudent not to have some information on your system at all. For example, if the practice has a patient that would be significantly damaged by a breach of privacy, because they have a high profile position, are celebrities, or are at risk for some other reason, keep their information under a pseudonym and be sure there are no other identifying factors.
- 2. The people who can access the system:** Consider internal organisational security. Do you know exactly how many people know the passwords, when the

passwords were last changed, and what information the different types of people in the organisation can access? A disgruntled staff member could do a great deal of damage and unscrupulous individuals could be tempted to access information for financial reward if offered. Ensure that only the right people have access and consider changing passwords regularly.

3. The technical components: These are becoming more widely known, but in essence they are:

- Always use a firewall (a system designed to prevent unauthorised access to or from a private network).
- Ensure up to date good quality anti-virus protection software.
- Make sure your Wi-Fi is secure.
- Always have some physical security around your IT system (locked doors as appropriate), so that an unauthorised person cannot access your router, servers or data.
- Encrypt health data, including Telehealth transmissions, when it is being sent outside the organisation. (Encryption translates the data to a secret code that requires a password or a secret key to decrypt it and make it understandable.)

Some other general principles of cyber-security are:

- Data is only as secure as the weakest link in the system. Do not share information with other organisations if you are concerned about their level of security.
- A system that can be monitored is more secure than one that is left to run itself with no-one watching.
- Information that is stored is much more vulnerable than information that is transmitted once and not stored, because hackers can chip away at your system at their leisure. This is one of the reasons we recommend not recording video consultations. If you do want to make video recordings, rather than keeping them on a server, consider burning them to a disc and keeping them in a locked cupboard.
- In general, being inside a well-run network is more secure than trying to do it all yourself.

Interoperability

Interoperability is the ability of hardware and software on different computers or other technology, to share data. Many product providers promise interoperability, but few deliver it adequately if at all.

The reasons for this are:

- Some brand systems have been designed so that they will not interconnect with other brands; these are often large ones trying to take over the whole market by freezing others out.
- Equipment and software suppliers are generally mainly interested in selling products. They are often not technically proficient and are either unable (or just unwilling) to assist with making their equipment work with other systems.

- There are many different technical standards (formats that have been approved by recognised standards organisations) and compliance with any one is voluntary.
- Interoperability is often temporary and fragile. Even if it has been achieved between particular groups of systems, a change in one aspect of a system can cause interoperability to suddenly fail. Additional time and effort (which many health services do not have) is then needed to re-establish the compatibility.

At the present time, it is unrealistic to expect interoperability between all video conferencing technology and software. This is a goal to be strived for in the future and needs to be approached by requiring standards compliance and/or by greater use of managed networks.

Trouble-shooting

Two common problems with Telehealth consultations are a failure to get the Telehealth call started and poor quality or call failure once a session has begun.

The call will not start or fails completely and won't restart

If the video call will not start or has totally frozen/stopped after starting, first check that everything is plugged in, turned on, and all cables are connected.

If you don't identify any problems with the equipment try turning it off and restarting (after about 10 seconds). This is the most popular advice given by IT helpdesks to frustrated users, and quite often it actually works!

The quality of the call is very poor

This is a common problem caused by insufficient bandwidth on your connection.

If the bandwidth is too low, the image quality will pixelate (break up into blocks of colour), freeze, or crash (stop running) altogether. This is because too much information related to the picture (in the form of pixels) is trying to go through a limited amount of space on the connection at the same time.

Devices called buffers collect stalled information and send it on as soon as space becomes available. For example, one can see the buffer in action when downloading a video from YouTube; the video will not play until the information has been received and put together coherently. This delay is also noticeable when downloading web pages that contain many images or embedded video clips.

When such a delay occurs in your Telehealth session it can ruin the continuity of the session to the extent that it is not workable.

Think about why the bandwidth might be low at that particular time. Remember that the blockage could be anywhere in the system not just within your service (as described in the section on Connectivity and Bandwidth) on the first page.

If you are in a service which is operating with only one DSL (broadband) line and one of the staff is searching the web, another is downloading a movie and several are sending emails, then the reason for the problem could be internal.

One solution is to request everyone not to do these things while video consultations are occurring, and another is to install a separate line exclusively for video communication.

A second reason for poor bandwidth could be that the internet service provider's system is congested, for example, in the late afternoon or early evening when many people start using their home internet connections. If this appears to be your problem, purchasing more bandwidth or not scheduling video consultations at this time will help.

If it is necessary to run a video consultation despite poor bandwidth, then there are a couple of options that may help:

- If you can adjust the frame rate of the connection, reducing the frame rate will lower the amount of information being sent per second. Frame rates down to about 12 per second are quite adequate for consultations, but below that the quality drop is noticeable; once the frame rate gets below 5 or 6 per second the image becomes very jerky.
- Try turning off the audio part of the connection, by asking both parties to press the mute button; this will enable all the available bandwidth to be used for the video part of the communication. Then make a telephone call to maintain the audio communication and use speaker phone on your end while continuing to run the video part of the connection.