

Definitions & concepts used in Telemedicine

(from the document "Guidelines and standards for practice of telemedicine in India")

1.1 Telemedicine

The World Health Organization defines Telemedicine as, "The delivery of healthcare services, where distance is a critical factor, by all healthcare professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of healthcare providers, all in the interests of advancing the health of individuals and their communities".

1.2 Telehealth

Telehealth is the use of electronic information and telecommunications technologies to support long-distance clinical health care, patient and professional health-related education and training, public health and health administration.

(Source - HRSA/OAT: <http://telehealth.hrsa.gov/welcome.htm>)

1.3 Teleconsultation

Teleconsultation is the use of information and communications technology to enable clinical consultation between geographically separated individuals such as health care professionals and their patients or health care professionals engaged in diagnostic, mentoring, or other clinical decision-making activities related to the delivery of health care services.

(Source: <http://www.hc-sc.gc.ca>)

1.4 Telemonitoring

A real time and live interactive monitoring (evaluation) of technique(s) or procedure(s) of an applicant seeking privileges, or a surgeon seeking to certify or document his competence in a specific technique or procedure(s). The Telemonitor is in one location and the surgeon to be evaluated is in another. The Telemonitor must have the ability to see the performance of the procedure or technique being executed by the student in real time. The Telemonitor and the applicant must have the ability to verbally communicate during the session.

Telemonitoring may be used as an adjunct to proctoring in the privileging process but should not alone be a substitute for proctoring to determine competency. Integration of Telemonitoring

into the proctoring process may reduce, but not eliminate, the number of on-site proctored cases required.

Telemonitoring assumes that the ability of the Telemonitor to physically intervene at the site of the primary procedure is not possible without the telecommunications interface

(Source: http://www.sages.org/sg_pub21.html#define)

1.5 Teletreatment

Treatment provided to the patient through Telemedicine. The specialist at the Specialty Centre could advise the consulting doctor at the Consulting Centre about the course of treatment to be taken.

1.6 Patient Information Record (PIR)

All information pertaining to the patient for providing care using Telemedicine. This included clinical as well as non-clinical information.

1.6.1 Clinical Information

This includes history of the illness, associated signs and symptoms, clinical observations, clinical interventions, diagnostics and treatments etc., relevant for providing care, using Telemedicine.

1.6.2 Non-clinical Information

Non-clinical information include information about the patient's environment, demographic information, life style, occupation or about related people, etc., where this is relevant for providing care using Telemedicine.

1.7 Telemedicine Consultation Centre (TCC)

Telemedicine Consulting Centre is the site where the patient is present. In a Telemedicine Consulting Centre, equipment for scanning /converting, transformation, communicating for medical information of the patient can be available but it is not essential. A Telemedicine Consulting Centre usually has a General Practitioner or in very remote locations a Registered Medical Practitioner who will be able to communicate to the TSC the symptoms/problems of the patient.

1.8 Telemedicine Specialty Centre (TSC)

Telemedicine Specialty Centre is a site, where the specialist is present. He can interact with the patient present in the remote site and view his reports and monitor his progress. A Specialty Centre is generally located in a Specialty or Super Specialty hospital catering to specific specialties or all specialties.

1.9 Healthcare network

Communications network designed to suit the health sector and the provision of health information via an assortment of electronic devices (computers, printers, scanners, etc.) connected for mutual exchange of digital information.

(Source:http://www.hc-sc.gc.ca/ohih-bis/res/thesaurus/thesaurus_alpha_e.html#TELECONSULTATION)

1.10 Telemedicine System

Telemedicine system consists of an interface between hardware, software and communication channel to eventually bridge two geographical locations to exchange information and enable teleconsultancy between two locations. The hardware consists of computer, printer, scanner, video conferencing equipment etc. The software enables the acquisition of patient information (images, reports, films etc.). The communication channel enables the connectivity whereby two locations can connect to each other.

1.11 Telediagnosics

Telediagnosics is the use of information and communications technologies to enable the diagnosis of a patient between geographically separated individuals. Telediagnosics is usually a real time and live dialogue between the specialist and the doctor at the remote site with regard to the diagnosis of the patient's illness. The specialist is in one location and the consulting doctor/patient is in another. But it is also possible that Telediagnosics could be of a Store and forward type where the patient's information is transmitted to the TSC and the specialist gives his expert opinion after a specific period of time. This could happen in circumstances where the specialist was not available at the time of receipt of patient information at the TSC or there was a communication breakdown and it was not possible to give the opinion in real time.

1.12 Store and Forward

The method by which the medical images and data of patients are captured and stored locally in the TCC (Telemedicine Consultation Centre) and/or at a central location and subsequently forwarded/ transmitted to the TSC (Telemedicine Specialty Center). In this method the Teleconsultation is carried out after the medical data is received at the TSC

1.13 Real time transmission

It is the method of transmission of medical images and wave-forms (images from CT scan, Cath Lab, Color Doppler, Ultrasound, X-ray, PFT, ECG etc.) from TCC to the TSC as it is being acquired. In this method the Teleconsultation is carried out along with the medical data while being acquired at the TCC and rendered at the TSC.

1.14 Still Medical Image

These include still images of diseases, pathological slides, X-rays, CT, MRI, etc. Each image represents a single projection. Series of images represent volumetric data. Diagnostic Imaging and Communication in Medicine (DICOM 3) is the accepted standard for these image data storage and transmission.

ACR (American College of Radiology) and NEMA (National Electronic Manufacturer Assoc.) are forming relationships with pathology and cardiology groups to extent the standard for additional types of images and photographs, including pathology slides, medical photographs, microscopy, Angiography, Endoscopy, Laproscopy, full motion heart and blood vessel images and ultrasound images. As standards become available they should be incorporated.

The following are the standards formats for storing of several still images, which are applicable in Telemedicine.

1.14.1 JPEG (Joint Photographic Experts Group)

JPEG, which is developed by the joint organization of ISO and ITU-TS, is a compression and decompression standard for still image. JPEG is designed for digitization of full-color image and gray-scale image but not for moving image. Currently, JPEG is also used for still image transmission on the WWW (World Wide Web). For the purpose if this exercise JPEG can be accepted but it must be at least version JPEG2.

1.14.2 GIF (Graphics Interchange Format)

GIF is the format for color raster image. GIF87 was released in 1987, GIF89 in 1989. It is a standard format for WWW (World Wide Web). Most PC and UNIX workstations support GIF format. However, the color is limited to 24 bits.

1.14.3 TIFF (Tag Image File Format)

TIFF is another format for color raster image. Most PC and UNIX workstations support TIFF format. It was developed by Aldus, and currently owned by Microsoft.

1.15 Moving Medical Image

These include ultrasound, some nuclear medical images, etc. basically, ultrasound image is a series of images represented a temporal sequence. Medical images by various modalities must be able to create and transmit using the DICOM 3.0 protocol standards. DICOM 3.0 details are described in section 4.2. For moving image, MPEG and MPEG2 can be used in non-medical applications are applicable in Telemedicine.

1.15.1 MPEG2 (*Moving Picture Experts Group 2*)

MPEG2 is ISO/IEC13818 standard. MPEG is the recognized standard for motion picture compression. It uses many techniques also used by JPEG, but adds inter-frame compression to exploit the similarities that usually exist between successive frames. Because of this, MPEG is able to compress a video sequence by about a factor of three more than “M-JPEG” methods for similar quality.

1.16 HTML (**Hyper Text Markup Language**)

Hyper Text Markup Language (HTML) is a simple markup system used to create hypertext documents, which are portable from one platform to another. Essentially, HTML documents are SGML documents with generic semantics that are appropriate for representing information from a wide range of applications. HTML markup can represent:-

- Hypertext news, mail, documentation, and hypermedia:
- Menus of options
- Database query results
- Simple structured documents with in-line graphics
- Hypertext views of existing bodies of information

The World Wide Web initiative (W3) links information throughout the world. To accomplish this, W3 uses the Internet Hypertext Transfer Protocol (HTTP), which allows transfer representations to be negotiated between client and server. Results are returned in a Multipurpose Internet Mail Extension (MIME) body part. HTML is one of the representations used by W3, and is proposed as a MIME content type. HTML is an application conforming to SGML.

1.17 **Interoperability:**

Develop Telemedicine networks that interface together and create an open environment sharing the application on different participating systems in real-time or seamless interface between several applications

1.18 **Compatibility:**

Equipment/systems of different vendors and different versions of the same system, to be able to be interconnected.

1.19 **Scalability:**

Equipment/systems inducted for Telemedicine to be able to be augmented with additional features and functions as modular add-on options.

1.20 Portability:

The data generated by an application that runs on one system to be able to be ported to different platforms with a minimum effort.

1.21 Reliability:

Telemedicine systems to follow relevant reliability standards of equipment/systems of similar category to ensure availability of service with minimum system downtime.

1.22 Inclusion of all the stakeholders:

Making the recommendation with due consideration of the rights and responsibilities of patient/community, health care service provider, the technology provider, the government etc.

1.23 Making recommendations vendor neutral:

Ensuring that the recommendations are not biased against any specific vendor/manufacturer of Telemedicine systems

1.24 Making standards technology neutral:

Ensuring that the recommendations will not favor any specific technology leaving scope for present/future alternatives.

1.25 Unique Provider Identifiers

Unique Provider Identifiers in addition to overcoming communication and coordination difficulties, identifier would enhance the ability to eliminate fraud and abuse in health care programs – these include Unique Patient Identifier, Telemedicine centre identifier.

1.25.1 Unique Patient Identifier:

Each and every patient is identified by a unique and universal Patient Identifier. This Universal Patient Identifier will enable the benefits- Same patient can move across multiple providers without loss of data, one centralized PIR can be assimilated, Medical records database can be built and queried across time, Captures one-time patient demographics for later analysis.

1.25.2 Telemedicine Centre Identifier:

Each Telemedicine service center acting as either Telemedicine Consulting Centre (TCC) or Telemedicine Specialist Centre (TSC) or both is identified by a unique and universal identifier code. This Telemedicine Centre identifier - Allows for easy identification of provider for Telemedicine purpose, Only genuine hospitals can get onto Telemedicine network having proper infrastructure, Allows for common billing format across providers, Registration number of providers can be used as identifier.