



TELECONFERENCING, AN IMPORTANT TOOL OF INFORMATION TECHNOLOGY, ITS USE IN MEDICAL EDUCATION : A REVIEW

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Abstract:

Teleconferencing means meeting through a telecommunications medium. It is a generic term for linking people between two or more locations by electronics. There are at least six types of teleconferencing: audio, audiographic, computer, video, business television (BTV), and distance education. The methods used differ in the technology, but common factors contribute to the shared definition of teleconferencing. Education and healthcare are basic needs for human development. Technical innovation has broadened the access to higher quality health care and instruction without regard to time, distance or geopolitical boundaries. Distance learning has earned popularity as a way of learning in recent years due to widely distributed learners, busy schedules and rising travel prices. Teleconferencing is also a very useful tool as a distance learning method. Teleconference is a real-time and live interactive course of study in which one set of participants are at one or more localizations and the other set of participants are at some other. The teleconference allows for interaction, including sound recording and/or video, and possibly other modalities, between at least two websites. Several methods are usable for adjusting up a teleconferencing unit. A detailed critique of the trend in the use of teleconferencing in medical training was carried on using Medline and a literature search. Teleconferencing was found to be a really useful tool in continuing medical education (CME), postgraduate medical teaching, undergraduate medical education, telementoring and many other places. The use of teleconferencing in medical education has many advantages, including savings in terms of travel costs and time. It affords access to the best educational resources and experience without any limitations of boundaries of distance and time. It encourages two-way interactions and facilitates learning in adults. Despite having some pitfalls in its implementation it is now being considered as an important instrument in facilitating learning in medicine and many medical schools and psychiatric hospitals are adapting this novel instrument.

Keywords: Telemedicine, Distance medicine, Teleconferencing, Videoconferencing, Continuing medical education, Undergraduate medical education & Postgraduate medical education.

Introduction:

Education and health care are basic needs for human evolution. Technical innovation has extended access to higher quality health care and instruction without regard to time, distance or geopolitical boundaries. Distance learning has earned popularity as a way of learning in recent years due to widely distributed students, busy schedules and rising travel prices. Tele-consultation, tele-proctoring robotic surgery, and even tele-presence surgery are simply part of the promise of raw technology. Use a telecommunications channel

- Link people at multiple positions
- Interactive to offer two-way communications

➤ **Dynamic to require users' active participation**

This belief is founded on a Pub Media and literature search for relevant publications on the topic. The search terms were the words “Teleconferencing in medical education”, “Videoconferencing”, “Video teleconferencing”, “Telemedicine” and “Distance education”. A citation list of “Journal of Telemedicine and Telecare” was also explored. A total of 41 articles were identified. The search included original research articles, review articles, case reports, and chapters in books, letters to the editor and conference proceedings.

Interactive Technologies: The new systems have varying degrees of interactivity - the capability to talk back to the user. They are enabling and satellites, computers, teletext, view data, cassettes, cable, and videodiscs all fit the same emerging pattern. They provide ways for individuals to step out of the mass audiences and take an active role in the process by which information is transmitted. The novel technologies are demagnified so that a special message can be exchanged with each individual in a large interview. They are the opposite of mass media and shift command to the user. Many are asynchronous and can send or receive a message at a time convenient for individuals without being in communication at the same time. This overcomes time as a variable affecting communication. A video, data and voice delivery system, reduce travel costs. When the material is retrieved and saved to a video tape or disc, the material can be used at anytime or anyplace. As more interactive technologies emerge, the value of being an independent learner will increase. Research shows that learning new technologies is as effective as traditional methods. Large groups are cost-effective and everyone gets the same information. Teleconferencing, made more personal and acceptable by interactive videoconferencing, has been used for years by many businesses to decrease travel associated costs and is now being employed increasingly in medical training. It is a very useful tool in distance learning. The Society of American Gastrointestinal and Endoscopic Surgeons has defined teleconferencing as a real-time and live interactive course of work in which one set of participants are at one or more localizations and the other set of participants are at some other. The teleconference allows for interaction, including sound recording and/or video, and possibly other modalities, between at least two sites. It can be utilized for teaching (e.g. Didactic lectures, demonstration of surgical or other medical procedures, and demonstration of uses of equipment), consultation, diagnosis, or calculation. ¹

Distance learning in medicine has gained popularity nowadays. The preference for distance education for those choosing this format has several contributing factors. The cost of travel, financial and in human imaginations, has diminished the potential for attending meetings far from family. Downsizing of practices - with fewer health professionals available to perform the work - has limited the ability of these people to draw aside from practices long enough to contract advantage of CME offered in distant cities. ²

With the enhancement of technology, e-learning is becoming an educational tool to deliver many aspects of curriculum. E-learning uses the Internet to deliver curriculum content and permits pupils to control content delivery, including the sequence, tempo, and time. E-learning modalities include distance learning and computer-based delivery models. Internet protocols are now currently robust enough for two-way point-to-point and multipoint videoconferencing, especially over advanced research and education networks such as Internet-2. ³

Types of Teleconferences: Audio Teleconference: Voice-only; sometimes called a Conference call guide. Interactively links people in distant locations via telephone lines.

Audio bridges tie all lines together. Meetings can be transmitted via audio conference. Preplanning is necessary which includes building a hot seat, setting an agenda, and providing printed materials to participants in advance of the fourth dimension then that they can be reviewed. Distance learning can be conducted by audio conference. In fact, it is one of the most underutilized, yet cost efficient methods available to education. Teachers should obtain training on how to best utilize audio conferences to augment other forms of distance learning.

Audiographics Teleconference: Uses narrow band telecommunications channels to transmit visual information such as graphics, alpha-numeric, documents, and video pictures as an adjunct to voice communication. Other terms are desktop computer conferencing and enhanced audio. Devices include electronic tablets/boards, freeze-frame video terminals, integrated graphics systems (as part of personal computers), Fax, remote-access, microfiche and slide projectors, optical graphic scanners, and voice/data terminals. Autographs can be utilised for meetings and distance learning.

Computer Teleconference: Uses telephone lines to connect two or more computers and modems. Anything that can be done on a computer can be sent over the lines. It can be either synchronous or asynchronous. An example of an asynchronous mode is electronic mail. Using electronic mail (E-Mail), memoranda, reports, updates, newsletters can be sent to anyone on the local area network (LAN) or wide area network (WAN). Items generated on computers which are normally printed and then sent by fax can be transmitted by E-Mail. Computer conferencing is an emerging area of distance training. Some institutions offer credit programs completely by computer. Students receive textbooks and workbooks via mail. Through common files assigned to a class which each student can assess, teachers upload syllabi, lectures, grades and remarks. Students download these files, compose their assignment and remarks off-line, then upload them to the common files. Students and instructors are usually required to log on for a prescribed number of days during the week. Interaction is a great part of the students' scores. Through computers, faculty, students and administrators have easy access to one another as well as access to database resources provided through libraries. The academic resources of libraries and special resources can be accessed such as OCLC, ERIC, and Internet. Administrators can access student files, retrieve institutional information from central repositories such as district or system offices, government agencies, or communicate with one another. Other resources can be created such as updates on state or federal legislation.

Video Teleconference: Combines audio and video to provide voice communications and video films. Can be one-way video/two-way audio, or two-way video/two-way audio. It can uncover anything that can be tripped up by a TV camera. The advantage is the capability to display moving images. In two-way audio/TV systems, a common application is to show people which creates a social presence that resembles face-to-face meetings and classes and enables participants to define the facial expressions and physical conduct of participants at remote sites. Graphics are used to enhance understanding. There are three basic systems: freeze frame, compressed, and full-motion video. Video conferencing is an effectual way to practice one teacher who teaches a number of sites. It is very cost effective for grades which may have a small number of students enrolled at each site. In many fonts, video conferencing enables the institution or a group of institutions to provide classes which would be called away due to low registration or which could not be supported otherwise because of the cost of providing an instructor in an unusual subject area. Rural areas benefit particularly from classes provided through video conferencing when they work with a larger

metropolitan institution that has full-time faculty. Through teleconferencing, institutions are able to serve all students equitably.

Why Use a Teleconference: Video conferencing increases efficiency and results in a more profitable employment of limited resources. It is a very personal medium for human issues where face-to-face communications are necessary. When you can see and pick up the person you are talking to on a television monitor, they respond as though you were in the same room together. It is an efficacious alternative to go which can well add up two weeks of non-productive time each year. With video conferencing, you never have to entrust the office. Documents are available, and experts can be on hand. A crisis that might take on major proportions if you are out of town, can be covered because you're on the telephone circuit of work. Videoconferencing maximizes efficiency because it proposes a way to work with several groups in different locations, at the same time. As the limited resource of funding has decreased, limited resources now include instructors, parking spaces and buildings. Students now include time as a limited resource. Teleconferencing enables institutions to share facilities and instructors which will increase our power to serve pupils. Nature of the trend of use of teleconferencing in medical training.

Continuing Medical Education (CME): The most widespread use of teleconferencing in medical instruction is in the subject area of CME. Referable to the speedy development in the medical skills, lifelong learning is needed for everybody involved in the medical arena. CME has become more and more important for physicians during the past decade and with the rising demand for continuous betterment of quality in medical practice, it is now almost mandatory in well-organized systems of medicine. Due to busy time schedules and high costs of travelling, videoconferencing provides a secure option for medical pros to present on time and costs to update their knowledge. Busy health professionals desire access to learning anytime and anywhere, including at home in the heart of the dark. There have been constant efforts to judge which is the best format for CME and it has been realised that small group teaching fulfils the format most effectively. This fits in easily with the concept of gaining use of telemedicine or videoconferencing in this area since relatively simple equipment can be utilized to receive teaching materials from a centre even in the doctor's office. Such classes are usually quite small and it is possible by means of a bridge to speak to several sites at the same time and remain interactive.⁴ A task was commenced in Belgium called "Pentalfa" in which the writers considered the option of teleconferencing to provide a section of the CME in the strain of long-distance education and CME for the graduate students. This was highly successful and the participants appreciated this CME project using teleconferencing.⁵ In Nova Scotia, a tele-health network has been developed which has used videoconferencing for CME since 2000⁶ and has been reported as a success. At the Mayo Clinic USA, a satellite system network is used for educational programming and activity and has been an integral part since 1986.⁷ The University of Alberta uses videoconferencing to link physicians in interactive continuing health education. In a study conducted about the programme, results indicated that the audience was really gratified with the programme and felt that the sessions were relevant to their drill. The interactive discussion component was placed really highly. Most respondents stated that they would change their practice based on the information discussed.⁸ Morganti et al suggested that videoconferencing networks are appropriate for CME and for distance education, in particular in the discipline of radiotherapy.² Other CME initiatives include videoconference journal clubs and small group learning. In a study involving videoconferenced journal clubs in dermatology the participants' satisfaction with the

videoconferencing journal club was high. The adoption of videoconferencing produced promising results, increasing the efficiency of house officer training.^{10,11.}

Use of teleconferencing in medical conferences: Interactive live video conferencing is being utilized for the transmission of live surgical procedures from the operation theatre complex to the conference venue many miles away or even put as a podcast on the Internet. This facilitates the audience to read, interact with operating surgeons sitting many miles away from the operating field of operations. In an international video teleconference for orthopaedic trauma education, interactive video teleconferencing successfully met the expectations as an educational tool and the remote participation did not adversely affect the ability to engage in discussion.¹²

Use of teleconferencing in undergraduate medical education: Teleconferencing has also been employed in undergraduate medical training. Several medical schools have used teleconferencing technology to “cover the walls of the campus”. The state of Georgia has implemented the Georgia State-wide Academic and Medical System, a distance learning teleconferencing network that allows the transmission of educational courses to remote campuses.¹³ There is the possibility of medical students studying their basic skills to find out – at least in percentage – from home, in a manner which best suits their learning style than conventional didactic lectures. Medical students can also be offered lecture content covering clinical objectives via interactive videoconferencing and a study shows that the students learn content focused on clinical learning objectives as well as using videoconferencing as they do in the traditional classroom setting.¹⁴ Videoconferencing of a live pelvic surgery was practiced to teach first year medical students about pelvic anatomy. In this study, students having recently completed their cadaver dissection and a practical on pelvic anatomy attended a live pelvic surgery through a videoconference that provided two-way pictures and voice conversation.¹⁵ A survey was performed to evaluate the concept of a telemedicine-orientated educational application by exposing junior medical students to surgical teaching via videoconferencing from the operating theatre and comparing this to the traditional method currently employed, which involves the presence of pupils in the operating room. Their experience with telemedicine assisted surgical teaching indicated high acceptance and satisfaction rates by clinical students.¹⁶ Video conferencing connects the sites for grand rounds and other sessions traditionally hosted by a medical centre/teaching institution, and allow peripheral sites, maybe in different countries, to present clinical material during these cycles. The Long Island Jewish Medical Centre and five other hospitals hold paediatric grand rounds via videoconferencing.¹⁷ Video conferencing is being extensively utilized by the National Board of Examinations in India for the training of graduate student and doctoral students in medical specialties including super specialties. The broadcast is live with two way audio and video interaction of scholars and the teachers. The scholars can have one-way video and two way audio interactions as the broadcast is sent via a satellite. A toll free number is given to the students to interact with the experts during the videoconference.¹⁸ Audio conferencing sessions have been used by the National Board of Examinations, a premier post-graduate examination body in India for interactive radio counselling for training of post-graduate students.¹⁸ An Australian centre provided synchronous tutorials in paediatric surgery using videoconferencing at two rural sites with the tutor located at a metropolitan paediatric clinical school. Videoconferenced surgical tutorials were highly valued by post-graduate medical students as an educational method.¹⁹

Telementoring: defined by the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES) as real-time interactive teaching of techniques by an expert surgeon

to a student not at the same site was first performed in 1962 by De Bakey.²⁰ Various subject areas of surgical telementoring over large distances have been carried on in several regions of the globe. K.M Augestad quotes Cubano in his article that long distance telementoring was an invaluable tool for providing instantly available expertise during laparoscopic procedures.²¹ A multi-continental, multilingual educational service can be offered through videoconferencing, multimedia information superhighways and tele-broadcasting networks. Attractive programmes can be made combining conventional lectures, workshops, talkshows, teleconferencing and tele-proctoring methods.²² Consequently, many institutions have adopted blended learning approaches combining face to face and distance learning. Videoconferencing is becoming part of the mix of technologies to provide distance education and blended learning in varied areas of health science.²³

Move Information - Not People: People Electronic delivery is more efficient than physically moving people to a website, whether it is a staff member or administrator.

Save Time: Content presented by one or many sources is obtained in many stations simultaneously and instantaneously. Travel is reduced, resulting in more productive time. Communication is improved and meetings are more efficient. It adds a competitive edge that face-to-face meetings do not.

Lower Costs: Costs (travel, meals, lodging) are cut by keeping employees in the office, speeding up product development cycles, improving performance through frequent meetings with timely data.

Accessible: Through any origination site in the universe. Larger Audiences: More people can serve. The bigger the audience, the more depressed the price per person.

Larger Audiences: More people can serve. The bigger the audience, the lower price per person.

Adaptable: Useful for business, associations, hospitals, and institutions to discuss, inform, train, educate or present.

Flexible: With a remote receive or transmit truck, a broadcast or receive site can be located anywhere.

Security: Signals can be encrypted (scrambled) when it is necessary. Encryption prevents outside viewers.

Unity: Provides a shared sense of identity. People feel more a part of the group...more often. People or groups at multiple locations can be linked frequently.

Timely: For time-critical information, sites can be linked quickly. An audio or point-to-point teleconference can be convened in three transactions.

Interactive: Dynamic; requires the user's active participation. It enhances personal communication. When used well for learning, the interactivity will enhance the learning and the teaching experience.

Satellite Communications: Long distance telephone calls, national and international televised sporting events, and cable movie channels operate via satellites. Orbiters have been practiced for long time.

Geostationary Orbit: British physicist and science fiction author, Sir Arthur C. Clarke, invented satellite communication in his 1945 paper *Wireless World*, which explained this east-west orbit, 22,300 miles above the equator; three satellites based on this area could provide global communications. Today, many satellites are arrayed in the Clarke belt. To earth stations, they seem fixed in place.

Satellite Footprint: In geostationary area, communications satellites have direct lineage-of-sight to almost half the globe - a large "footprint" which is a major advantage. A signal sent via satellite can be broadcast simultaneously to every U.S. city. Many

downlinks can be directed at one satellite and each can receive the same program; this is called point to multipoint.

Transponders: Via an uplink, video, sound or data signals can be sent to a satellite transponder. There may be upwards to 40 transponders per satellite; each can amplify and relay signals to earth, which are plucked up by ground stations.

C/Ku-Band: Domestic communications satellites work on two frequency ranges designated C- and Ku-band. Each calls for specific electronic equipment. C-band is less expensive; operates at 4 kHz. Ku-band operates at 12 kilohertz. Some teleconferences are broadcast on both sets.

Receivers: Convert satellite signals into channels viewed (one at a time) on a TV monitor; designed to tune-in the format, bandwidth, and audio sub-carrier. Programs broadcast in code (encryption) is decoded at receive sites.

Basic Receivers: Lowest cost; limited (or manual) channel tuning capability; may use fixed antennas.

Multi-Format Receivers: Most versatile; adjusts for all broadcast formats; receive any satellite video program in six or more bandwidth selections, and two agile audio sub carrier switches; usually a motorized system.

Fixed Position System: Low systems limited to reception from one satellite and one band.

Motorized System: Receives programs on different satellites by adjusting the dish position.

Automated Systems: Microprocessor controlled for instant movement to satellites (positions stored in memory).

International Satellite:

Alpha Lyracom Space Communications/Pan American Satellite is the world's first private international satellite system. PAS-1 carries many specialized communications services including full and part-time video, low and high speed data, transmit information and radio and business television to over 70 countries on three continents. It can be seen (received) by a 2.4 metre antenna. It has 18 C-band and six Ku-band transponders with a shared capacity that increases traffic. PanAmSat handles all phases of an international broadcast as compared to INTELSAT (International Telecommunications Satellite Organization) where the customer must book the domestic and foreign half circuits and pay for each downlink. INTELSAT was established primarily to handle the PTT telephone transmissions, while PanAmSat was established to be easily accessible by distance education institutions and private enterprise. The FCC licenses PanAmSat transportables for years, as compared to the FCC special temporary authority (STA) license for INTELSAT. PanAmSat transportables can uplink from any location without a special license. PanAmSat writes yearly contracts with clients. It does not shoot for multiple downlinks. Time on PAS-1 books from between \$960 to \$2,400 per hour depending on the volume discount based on yearly usage. To reserve time on PAS-1, call the day-of-air or future event number, with the originating site, uplink, downlink sites, and conference time. PanAmSat handles the remainder. By booking time through satellite brokers (EDS, PSN, Satellite Management International) ad how users can cut down time costs. PanAmSat is negotiating for three more satellites to be in office in 1994-95.

Compressed Video : Digital compression means that the codec compresses the video signal or data to a fraction of its original size so that the data rate is appropriate to transmit over low-cost terrestrial telephone lines or on a fraction of a satellite transponder. Codecs (Coder / DeCoder) compress the video and audio signal allowing

it to be transmitted in a smaller bandwidth which reduces the cost of the transmission. Standard transmission rates for video teleconferencing are multiples of 64 kBs up to the T1 rate of 1.54 MBs. Some codecs allow speed selection to fit the circuit employed. The speed selected is based along the capacity. When close to full motion video is needed, higher rates are called for. T1 circuits connect PBXs to the phone company's central office and can extend up to 24 voice channels at a lower cost than 24 voice circuits. A 56 KB or 64 KBS codec operates in the scope of one voice channel. A standard video signal digitized at 90 MBs is comprised of about 1400 voice channels.

Freeze Frame Video: The Freeze frame video uses telephone channels to send video data. Because of the narrow bandwidth, the image takes a few moments to reach the receive site where it appears on the TV as a still photograph. The advantages are lower costs and flexibility in linking multiple sites. Slow scan systems are similar to freeze frame and the terms are often used synonymously. Freeze frame technologies include a range of features; analog, digital, monochrome or colour pictures, resolutions, transmission speeds, and extra memory. Newer models provide multiple send times to select the resolution and transmission time through digital circuits and compression coding. Some units transmit video information in digital format over a data circuit which reduces the transmission time to about nine seconds to a 56 kilobit link. Because of the faster transmission rates, many new freeze frame applications use data circuits. Compressed video (near motion) and full-motion video differs; compressed video uses compression techniques to reduce channel bandwidth; images may not look as natural and may blur or lose background resolution. The advantage is that the significant decrease in bandwidth reduces costs. Compressed video uses a telephone data circuit - currently a T1 carrier or 1.5 or 3 megabits - to send television, voice and data. It reduces video information (NTSC Standard-colour television) with a compression technique to get rid of superfluous information and reduce the 100 million bits signal to 1.5 or 3 million numbers. Digital TV signals are developed down into thousands of elements called pixels. Between frames, many are the same. A codec takes advantage of this duplication by sending complete information on the first pixel and a brief code to echo the values. This dilutes the information transmitted and the bandwidth required. Interframe coding for conditional replenishment compares the changes between two frames and transmits changes. Motion compensation predicts changes between frames and transmits only the difference. The Software holds the compression algorithm which can be raised. The CCITT Px64 international standard requires rates to operate in multiples of 64.

Full-Motion Video: Standard TV signals are broadcast using a significant amount of the bandwidth of wideband channels - 4 to 6 megahertz for colour analog - to send video, voice and data. Because of the large channel capacity, it conveys a video with the full motion and resolution of broadcast TV. The bandwidth used is the digital equivalent of 80 Mbps or more which corresponds to a full satellite transponder or 1820 voice phone lines. This transforms into high costs for signal transmission.

Compression for One-Way Video: Consumer application of compressed video systems uses higher rates than two-way compressed video to reach near-broadcast quality picture picture. A digitally compressed video signal can be broadcast over 1/20 of a regular transponder channel, cutting prices to under \$200 per hour. One purpose of the technology is SKY PIX, a pay per view movie service based on a Compression Lab, Inc. codec marketed by NW Star Scan which offers viewers a selection of up to 40 pics. The video quality is better than VHS transmission quality. Scientific Atlanta offers PrimeStar, a competing entertainment service, which transmits at a data rate of 4 to 4.5

MBs. Practicing the same technology, they will offer B-Mac user compatibility with compressed video users at a lower cost because the transmission uses a fraction of a regular transponder channel. Compression Labs, Inc. have recently introduced the SpectrumSaver System, which can send a digital signal to a fraction of a satellite transponder. Because up to 15 or 18 signals can be conducted on a transponder (depending upon the system configuration), the price of satellite time is importantly shortened. The National Technological University (NTU) is using the scheme, as well as ITESM in Mexico. Each institution reports a savings of \$1 million in satellite time during the maiden year of operation. The organization is completely digital.

Scientific Atlanta is about to institute its new digital satellite system to the marketplace. This scheme is an ascent to an existing Scientific Atlanta analog satellite system. As such, users will be able to send in either analogue or digital format.

Fibre Optic Systems:

The transmission of voice, video and data by light wave signals inside a thin, transparent glass fibre cable, is providing more choices for telecommunications users and is rapidly bringing digital communication to the home and office. Single pair of fibres can carry up to 10,000 telephone calls simultaneously.

Advantages: transmission clarity, speed, accuracy, security, and loudness.

Disadvantages: Construction, installation and upkeep costs, merely they are going down.

Advantages of Using Teleconferencing in Medical Education:

At that place is enormous excitement around the future of medical tele-training. Maybe one of the principal causes is that it affords opportunities which were previously unavailable to the health professional student, practitioner, or individual patient because of conditions of geographic position, travel limitations, political economy or personal choice, to avail them of medical knowledge personalised for them.

1. Video conferencing has many advantages that enable distance and, to some extent, time problems to be defeat. The time taken for travel is an important barrier to attendance, and video conferencing overcomes this problem and does away with the associated travel costs. In summation, it improves the efficiency of training programmes generally by enabling sessions to be taken more often.
2. It overcomes time or programming problems for pupils who can meet at an education centre for a limited period only because of their full time or part time work, and family and community commitments.
3. It takes into account the best of educational programmes and taking opportunities to be delivered from anywhere in a country or overseas and delivers them instantly to the receiver whilst allowing simultaneous interactive teaching at many websites. Distance is now not a barrier for good quality learning and education.⁴
4. Offering a curriculum to students scattered over a wide geographical area is a challenging problem. Video conferencing is a powerful method of offering educational programmes to virtually all residency programmes with considerable cost and more efficient utilization of the resources. Videoconferencing has the potential for providing timely, high quality educational programs to viewers who may be scattered over a wide geographical area.¹⁴
5. It is a pragmatic and cost-effective method of partaking in educational resources between two or more establishments. Results show that videoconferencing has

the potential to become a practical, cost-effective method of sharing educational resources by means of interactive multi-site educational programs.¹⁵

6. Video conferencing via satellite makes real-time interaction possible between audience and staff as well as the central production of resource intensive course material which builds it an appealing educational tool.
7. The videoconferencing sessions can also facilitate collaborated learning even when scholars are situated far apart.

Disadvantages:

Although teleconferencing is a really useful instrument, it suffers some disadvantages in some contexts.

1. The initial price of the equipment and leasing the telephone circuits to transmit conferences may be prohibitory.
2. Companies which produce codec's have each developed unique methods of compression, which may be discrepant with the equipment at different sites, the desired method of communication or software, although protocols have been shown to permit communication among brand names.
3. If the bandwidth that carries the transmission between sites is not great enough, the students may observe ghost images when rapid movement occurs in real-time. If the organisation is not properly configured, class members may watch an audio echo effect. The result is audio noise that takes away from the learning environment.
4. Technical problems can contribute to the failure or gap of the teleconferencing sessions. Sometimes these problems call for a long time to be settled which may lead to cancellation of the school term. Technical problems include power failure at the distant end and disconnection of the satellite connection.
5. There is no direct self-directed learning through teleconferencing. However the student may choose teleconferencing through a self-led approach as the preferred mode of learning.
6. It is hard to teach psychomotor skills using teleconferencing.
7. Video conferencing technology can constrain dialogue, and students at distant sites often feel more disconnected than those on the website. Unless a substantial effort is gained by the instructor, students not located with the instructor may remain uninvolved in the class. Students may appreciate hearing answers to questions others ask even though they do not ask questions themselves.

Conclusion:

Teleconferencing is an exciting and useful instrument available for discovering and educational activity in medical training. With improvements in Internet technology, it is now possible to receive the best of scholarship and teaching opportunities available to wide and scattered students without the time and space constraints. Teleconferencing will play an important part in medical instruction in the future.

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