

Teaching At A Distance With Merging Technologies  
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### **White Paper: Telemedicine**

On October 25 in 1965, downtown St. Louis stopped in its tracks and thousands watched as the last piece of the mammoth gateway arch was being put into place. The weight of the two sides required braces to prevent them from falling against each other. Fire hoses poured water down the sides to keep the stainless steel cool, which kept the metal from expanding as the sun rose higher. Some horizontal adjustments were required, but when the last piece was put into place and the braces released, it fit perfectly, according to plan, and no one was surprised (Liggett, 1998).

Just like the arch, telemedicine requires a careful process that includes systematic design and implementation. There will be success if all the pieces of the plan receive the same attention as the most obvious. The base sections of the Gateway Arch required more engineering savvy and study than any other component. The last and most visible span that connected the two halves received the most attention from the thousands of onlookers, but success was directly related to how the original supports were positioned.

#### Telemedicine Introduced

The process should begin with a clear understanding of **telemedicine**. **Tele** means “at a distance,” so in its simplest form, **telemedicine** is defined as *medicine at a distance*. The Institute of Medicine defines telemedicine as *the use of electronic information and communications technologies to provide and support health care when distance separates the participants* (Institute of Medicine, 1996). Grigsby and Sanders (1998) define telemedicine as the use of telecommunications and information technology to provide health care services to persons at a distance from the provider. Actually, there exist in the literature dozens of definitions of telemedicine, but all contain these components:

- Separation or distance between individuals and/or resources
- Use of telecommunications technologies
- Interaction between individuals and/or resources
- Medical or health care.

Also, it is implied in most definitions that telemedicine refers to health care offered by recognized, formally accredited medical organizations. Organizational affiliation differentiates telemedicine from self-diagnosis, unsanctioned medical treatment, or quackery.

#### Background

The term telemedicine has become common in the medical literature during the last decade. However, most give credit for originating the term to Kenneth Byrd who with several other physicians formed a video microwave network in 1968 from Massachusetts General Hospital to Boston’s Logan Airport. There were a number of other projects at about the same time, but this effort is considered as the modern launching of the concept of telemedicine.

It is important to recognize that telemedicine is a growing field within the profession of medicine. It has journals, such as the *Journal of Telemedicine* and *Telemedicine Today*, has a professional association (the American Telemedicine Association; <http://www.atmeda.org/>), and holds an annual professional meeting (to be held in 2001 in Fort Lauderdale).

Articles dealing with various aspects of telemedicine can be found in the journals of the various sub-disciplines of medicine, and scientific research is being conducted and reported with increasing frequency in prestigious journals of the profession. Finally, federal and state governments and private organizations are funding telemedicine projects totaling tens to hundreds of millions of dollars. The communications revolution is having an impact on medicine just as it is on education, training, government, business, and law.

One technique for categorizing health care services is to modify a tool used to identify how education is practiced. Coldewey's Quadrants consists of a x, y-axis with time as the vertical dimension and place/location as the horizontal. Thus, four quadrants are formed. The first quadrant represents *Same Time/Same Place* health care, where the professional and the patient are physically together in the health care facility.

*Different Time/Same Place* medicine involves patients coming to one site but emphasizes that *when* patients come for health care is not important. The emergency room is the traditional approach to different time, same place medicine.

*Same Time/Different Place* medicine traditionally has meant that there is an itinerant physician or medical professional that travels to where the patients are located. Increasingly, real-time telecommunications technologies such as two-way television are being used by medical professionals to reach patients no matter where they are located.

*Different Time/Different Place* is health care where there is asynchronous interaction between professional and patient. In many fields, such as education and training, this means correspondence communication, increasingly using the Internet/World Wide Web.

The concept of Coldewey's Quadrants is an attempt to categorize various ways health care can be provided. More important, it calls attention to the important idea that medical professionals should be able to practice the field using any appropriate approach – classical and innovative – time and location notwithstanding. This is the lure and promise of telemedicine.

Finally, the idea of examining the concept of telemedicine in relation to time and location helps in the development of a theoretical rationale for the implementation of this approach. Equivalency theory is used to guide the practice of distance education (Simonson, 1999). Equivalency theory states that if the experiences of patients are equivalent, then the outcomes of those experiences will also be equivalent. Key to this approach is the definition of equivalent, which means similar but not equal. A triangle and a square can be considered equivalent if they have the same area, even though they are fundamentally different. Similarly, the experiences of the recipient of telemedicine should be made equivalent without the expectation that everything be equal, or exactly the same as that offered to the classical, face-to-face patient. Recognizing the idea of equivalency is fundamental to the acceptance of telemedicine as a mainstream, viable approach to health care.

#### Applications

Kvedar, Menn, and Loughlin (1998) list four major applications for telemedicine: remote consultation, remote monitoring, remote education, and telementoring.

*Remote Consultation* is the most common telemedicine application and what most refer to when they use the term telemedicine. This application implies one health care provider seeking the advice of a professional colleague or subspecialist to resolve a patient's problem.

*Remote Monitoring* is a longstanding application where the most common use is to access a patient's vital signs at a distance using telecommunications technologies.

*Remote Education* is increasingly important as the geographically concentrated expertise of a medical unit is redistributed to isolated practicing professionals, and professionals in training.

*Telementoring* involves the development of techniques to share the output of surgical tools such as endoscopes and laparoscopes to distant locations.

The Institute of Medicine (1996) organizes applications of telemedicine differently and identifies five areas of emphasis: Patient Care, Professional Education, Patient Education, Research, and Health Care Administration. These applications are self-explanatory and can be translated into the previously identified four categories of telemedicine applications.

#### Impediments to Telemedicine

The Institute of Medicine identifies five concerns that prevent and slow the growth of telemedicine. The five issue areas are: Professional Licensure, Malpractice Liability, Privacy, Confidentiality, and Security, Payment Policies, and Regulation of Medical Devices.

*Professional Licensure* issues stem from the traditional view of professional practice as involving a face-to-face encounter between clinician and patient. Telemedicine breaks the physical link and may complicate where a telemedicine practitioner should be licensed if the professional and the patient are in different states. Currently, multiple state licenses are required.

*Malpractice Liability* is usually described as a deviation from the accepted medical standard of care. For telemedicine practitioners, the subject of malpractice presents potentially complicated legal issues, since state law generally governs liability.

*Privacy, Confidentiality, and Security* issues relate to serious questions that have been raised about current legal protections for medical privacy and confidentiality. The Hippocratic oath requires that physicians keep silent about what they learn from people, “counting such things to be as sacred secrets.” Information and telecommunications links present new opportunities for infringements of privacy.

*Payment Policies* for telemedicine are a major barrier to the growth of telemedicine. Until 1999, telemedicine did not meet the requirements of the Health Care Financing Administration (HCFA) for in-person, face-to-face contact between providers and patients. While most medical consultations using telemedicine have been ineligible for payment in the past, guidelines for reimbursement are still evolving. Currently, Medicare covers interactive video systems (Gringsby and Sanders, 1998), and for this reason most health care organizations are using two-way videoconferencing for their initial telemedicine initiatives.

*Regulation of Medical Devices* is of concern because the federal Food and Drug Administration, through its Center, regulates some of the devices used in telemedicine.

In summary, the issues that have slowed the growth of telemedicine are important and should be addressed. However, they are not necessarily unique within the medical profession. Rather, they are issues that are resolved continuously as the health care field adopts new technologies, medical and informational.

#### Telemedicine Research

Limited research is reported on the medical effectiveness and cost effectiveness of telemedicine (Gringsby, J. et.al., 1995). Current research seems to support the conclusion that telemedicine is effective when practiced correctly, but that additional evaluation and assessment activities need to be conducted (Institute of Medicine, 1996).

#### Conclusions

Telemedicine will continue to be a dynamic influence within the profession of medicine. The benefits of this innovation will be in two primary areas – medical benefits and cost benefits. First, telemedicine is a logical extension of the growth of the technical and technological aspects of health care. The medical benefits of an active telemedicine program are related to how professionals use the technology. A modification of a famous analogy used in educational research when applied to telemedicine summarizes the medical impact of telemedicine.

Telemedicine and information technologies are *mere vehicles* that permit the delivery of health services but which have no greater impact on health care than the truck that delivers our groceries has on nutrition. It is the content of the vehicle that permits effective health care, not the vehicle itself (Clark, 1983).

Second, cost effectiveness is likely to be the most significant outcome of telemedicine. The significant costs of medical care and the increased requirements for services that are projected for the next several decades forecast a cost advantage for the organizations that understand and utilize technologies effectively. Certainly, telemedicine is only one category of technology, but it may soon be the “ears and eyes” of the health care organization.

In summary, telemedicine is a recognized subcategory of the health services profession. As a technique and tool in the modern medical center it has the potential to expand and accelerate the services offered and the impact made. For telemedicine to be successful, its implementation must be a logical extension of the vision and mission of the organization within which it is used. Aeschylus once again provides insight about why an organization should consider telemedicine, “...*resolve is not to seem, but to be, the best.*”

#### References

- Clark, R. (1983). Reconsidering research on learning from media. Review of Educational Research, 53(4), 445-459.
- Grigsby, J. & Sanders, J. (1998). Telemedicine: Where it is and where it is going. Annals of Internal Medicine, 129 (2), 123-127.
- Kvedar, J., Menn, E., & Loughlin, K. (1998). Telemedicine: Present applications and future prospects. Urologic Clinics of North America, 25(1), 137-149.
- Liggett, R. (1998). A prescription for telemedicine. Telemedicine Today, October, 2.
- Simonson, M., Schlosser, C. & Hanson, D. (1999). Theory and distance Education: A new discussion. The American Journal of Distance Education, 13 (1), 60-75.

#### Additional Resources

1. *Journal of Telemedicine and Telecare*, Royal Society of Medicine Press, Ltd., 1 Wimpole St. London W1M 8AE England.
2. Midwest Rural Telemedicine Consortium. 1111 6<sup>th</sup> Ave. Des Moines, IA 50314. 515-643-8750
3. American Telemedicine Association, 1010 Vermont Avenue, NW Suite 301, Washington, DC 20005, 202-628-4700. <http://www.atmeda.org/about/>
4. Office for the Advancement of Telehealth. 5600 Fishers Lane, Rm 11A-55, Rockville, MD 20857, 301-443-0447. <http://telehealth.hrsa.gov/welcome.htm>
5. National Laboratory for the Study of Rural Telemedicine, University of Iowa, College of Medicine, Iowa City, IA. <http://telemmed.medicine.uiowa.edu/>

## Appendix: Telemedicine Systems



At the heart of most telemedicine facilities is the *compressed video teleconferencing system*. Teleconferencing systems are used for group sessions. The hardware is portable, but most often is permanently located in a seminar room, classroom, or office. The typical teleconferencing system used in telemedicine facilities is equipped with:

- 2 32" Color Monitors with built-in speakers
- 1 video camera
- 2 voice activated, or push-to-talk microphones
- Videocassette Recorder
- Document Camera

Also, *set-top systems* are available which are much more portable and are considerably less expensive:



Finally, *desktop systems* are often used by individual professionals. These systems use an existing microcomputer equipped with firmware and software.

