REVIEW OF RESEARCH
IMPACT FACTOR : 5.7631(UIF) UGC APPROVED JOURNAL NO. 48514 ISSN: 2249-894X
VOLUME - 7 | ISSUE - 11 | AUGUST - 2018

MEDICAL EDUCATION AND TELEMEDICINE

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ABSTRACT

Physicians in rural communities have limited access to continuing medical education (CME) opportunities. We hypothesized that CME could be delivered via a telemedicine network as effectively as in-person. Telemedicine is the use of electronic information to communicate technologies to provide and support healthcare when distance separates the participants. Telemedicine has a variety of applications in patient care, education, research, administration and public health. Worldwide, people living in rural and remote areas struggle to access timely, good-quality specialty medical care. Residents of these areas often have substandard access to specialty healthcare, primarily because specialist physicians are more likely to be located in areas of concentrated urban population. Telemedicine has the potential to bridge this distance and facilitate healthcare in these remote areas.

KEY WORDS: *CME, Telemedicine, Telehealth.*

INTRODUCTION

Telemedicine is the use of electronic information to communicate technologies to provide and support healthcare when distance separates the participants.

"*Tele*" is a Greek word meaning "distance "and "*mederi*" is a Latin word meaning "to heal". Time magazine called telemedicine "healing by wire". Although initially considered "futuristic" and "experimental," telemedicine is today a reality and has come to stay. Telemedicine has a variety of applications in patient care, education, research, administration and public health. Worldwide, people living in rural and remote areas struggle to access timely, good-quality specialty medical care. Residents of these areas often have substandard access to specialty healthcare, primarily because specialist physicians are more likely to be located in areas of concentrated urban population. Telemedicine has the potential to bridge this distance and facilitate healthcare in these remote areas.

HISTORY OF TELEMEDICINE

The development of modern telemedicine began with the invention of the telecommunications infrastructure, including the telephone and telegraph. Early on, telemedicine technology was adopted for use in military situations during the Civil War, such as ordering medical supplies or medical consultations. Casualty and injury lists were also delivered via telegraph.

The first example of an electronic medical record transfer occurred in 1948 in Pennsylvania, when radiology images were sent 24 miles between two townships via telephone line. A few years later, Canadian radiologists built on that early application of telemedicine technology and created a teleradiology system for use in and around Montreal. In 1959, clinicians at the University of Nebraska transmitted neurological examinations across campus to medical students using two-way interactive television.

In the early days of telemedicine, health professionals used the burgeoning technology as a way to reach patients living in rural areas. However, the technology quickly expanded into urban areas, especially those that suffered from healthcare shortages. In 1967, physicians at the University of Miami School of Medicine and Miami's Fire Department transmitted electrocardiographic rhythms over existing voice radio channels from fire-rescue units to the city's Jackson Memorial Hospital.

TYPES OF TELEMEDICINE

Telemedicine can be classified into three main categories: remote patient monitoring, store-and-forward and interactive telemedicine.

Remote patient monitoring - Also known as telemonitoring, remote patient monitoring allows patients with chronic diseases to be monitored in their homes through the use of mobile medical devices that collect data about blood sugar levels, blood pressure or other vital signs. Remote caregivers can review the data instantly.

Store-and-forward - Also known as asynchronous telemedicine, store-and-forward telemedicine allows providers to share patient information, such as lab results, with a physician at another location.

Interactive telemedicine - Interactive telemedicine allows physicians and patients to communicate in real time. Such sessions can be conducted in the patient's home or in a nearby medical facility and include telephone conversations or the use of video conferencing software that complies with Health Insurance Portability and Accounting Act regulations.

Telemedicine vs. telehealth

Telemedicine is a subset of telehealth, which includes both remote clinical service delivery and nonclinical elements of the healthcare system. In practice, however, the two terms are often used interchangeably. While eCare is often used as a synonym for telemedicine, the Federal Communications Commission adopted the term eCare as an umbrella concept for the electronic exchange of information to aid in the practice of advanced analytics and medicine.

Telehealth refers to a broader spectrum of remote healthcare services than telemedicine and does not necessarily involve clinical services. It includes nonclinical services such as continuing medical education, provider training and administrative meetings.

In contrast, telemedicine refers specifically to the use of medical information exchanged for the purpose of improving a patient's health. It pertains to the use of electronic communications to provide clinical services without requiring a patient to come in to a doctor's office.

Technology such as video conferencing and transmission of still images are considered part of both telemedicine and telehealth.

ADVANTAGES OF TELEMEDICINE

Some of the advantages of telemedicine for patients include:

- Convenience - Patients do not have to take time away from work for an appointment. There is also no travel time or associated expenses, such as paying for gas or child care.
- Increased access - Patients in rural areas can obtain specialty services more easily. Similarly, patients who live in federally designated underserved areas have increased access to primary, dental and mental healthcare.

The Advantages of Telemedicine for providers include:

- Reduced cancellations or no-shows - Because of its convenience for patients, telemedicine can reduce the number of cancellations or no-shows. Providers can reach out prior to or at the appointment time if the patient forgot about the appointment.

- Encourage healthy lifestyle choices - Telemedicine allows providers to encourage their patients' healthy lifestyle choices, such as smoking cessation.

DISADVANTAGES OF TELEMEDICINE

Some of the disadvantages of telemedicine include:

- Inability to prescribe medications - Many states generally do not allow online prescribing (not to be confused with e-prescribing) without an established relationship between the physician and patient. A physical examination or evaluation may be required before a physician can write a prescription for a patient, but there are inconsistencies in state laws as to what constitutes a physical examination.
- Technical training and equipment - Providers need to be trained on how to use telemedicine equipment. There are also the associated costs of the equipment, such as integrated telemedicine carts and encounter management software, to consider. The startup cost of implementing telemedicine may be especially prohibitive to rural facilities.
- Licensing issues - Certain states may require providers who practice telemedicine across state lines have a valid license in the state where the patient is located.

Medical Education and Telemedicine

Online continuing medical education (CME) for physicians can be carried out via telemedicine systems. Telemedicine systems thus offer new ways to practice medicine and enable the remote delivery of personal health services, continuing medical education, and patient health education.

An extensive international literature has reported on the efficacy of telemedicine and clinical outcomes of telemedicine. Little attention has been paid to the benefit reported for practitioners despite this being a rationale for the use of telemedicine in rural and remote areas.

Physicians are reported to benefit from telemedicine by increased contact with specialists via the telecommunications system. The appropriate use of online CME via telemedicine has the potential to contribute to the improvement in the population's health through increased access upskilled health professionals and enhancing confidence of the rural health workforce.

However, the provision of more online CME might crowd out the time that a physician can devote to medicine practice and thus worsen the health status of his or her patients. The relation between online CME and health may thus be nonmonotonic, and there could be an optimum amount of online CME that can achieve sustainable improvements in health. Public health researchers use life expectancy at birth as a good proxy that reflects population's health, and this is also used in the current study to evaluate variations in health.

CME via telemedicine permits us to estimate the optimal provision of telecommunications health professionals. Second, this study is among the first to integrate technology development and healthcare provision to highlight the effectiveness of online CME via telemedicine in sustainable health improvement. Third, the telemedicine system in Taiwan is a good model system that other countries can learn from when seeking to provide the accessibility and affordability of healthcare for rural residents as well as health professionals for remote physicians. This study thus aims to investigate what factors affect online CME provision in healthcare systems and what the optimal online CME lectures are for improving health.

Factors Affecting Online CME Provided

The telemedicine program provides real time teleconferencing, transfers medical data for consultation, and increases confidentiality of health workers and patients in remote areas. The CME lectures that are provided through the educational technology system may be affected by the healthcare system as a whole, including factors such as telecommunications and face-to-face programs used, as well as medical resource concerns, including per capita gross domestic product (GDP) and per capita national health expenditure (NHE). The online CME that is provided could thus be a function of the following factors: in

which Tel. care presents the quantity of telemedicine health services and Con. services represent conventional health services.

Online CME and Health

Physicians spend time on CME activities to cover the full range of topics important to their professional development. Research has shown that CME is an effective tool for changing physician practices and improving patient care. Online CME thus aims to improve physician performance and the health status of their patients. There is a potential trade-off between online CME and other economic and healthcare factors that possibly affect health status. A rise in the lectures provided by online CME can affect health status through two channels. The first is the health crowding-out effect, whereby an increase in online CME lectures reduces activity with regard to other healthcare factors and the economy's resources which might also improve health status. This channel tends to deteriorate the population's health. The second is the effects of health improvement, whereby an increase in online CME lectures tends to improve the quality of healthcare. This channel leads to better health status. The net effect of a rise in online CME lectures on health status thus depends upon the relative strength of these two channels. The relationship between online CME lectures and health status is possibly nonlinear, and this needs to be examined. Healthcare provision through in-person and telecommunications systems has also unclear health effects, due to similar concerns. This research thus incorporates these ambiguous health effects and tries to find the optimal level of online CME lectures, as follows: where Life exp. represents the population's life expectancy, online represents the number of online CME lectures, online represents the square of the number of online CME lectures, represents an idiosyncratic error term, and represents hospitals and time period, respectively. The vectors of are composed of healthcare and economic explanatory variables.

Subjects

The subjects of this study are to examine the following: What factors foster learning processes in the CME context in telemedicine? What is the possible role of online CME in the context of health improvement? And how optimal learning processes can be integrated with various health services? The results of this investigation can serve as paradigms for providing optimal online CME via telemedicine, thus improving the population's health.

Method

In econometrics, panel data can contain multidimensional data and observations on multiple phenomena observed over multiple time periods for the same hospitals or patients. By applying telemedicine experiences in Taiwan over the period 1995-2004, this study uses panel data and the method of ordinary least squares for the multiple regression model with Stata 10.0 (Stata Corp., College Station, TX) and aims to embed an adequate set of phenomena affecting the provision of online CME lectures versus health status.

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 and communicating the patient's medical information can be available.

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.

Telemedicine System

The Telemedicine system consists of an interface between hardware, software and a communication channel to eventually bridge two geographical locations to exchange information and enable teleconsultancy between two locations.

The hardware consists of a computer, printer, scanner, videoconferencing 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.

Telemedicine in India

In Utopia, every citizen may have immediate access to the appropriate specialist for medical consultation. In the real world however, this cannot even be a dream. It is a fact of life that "All Men are equal, but some are more equal than others." We in India are at present, unable to provide even total primary medical care in the rural areas. Secondary and tertiary medical care is not uniformly available even in suburban and urban areas. Incentives to entice specialists to practice even in suburban areas have failed.

In contrast to the bleak scenario in healthcare, computer literacy is developing quickly in India. Healthcare providers are now looking at Telemedicine as their newly found Avatar. Theoretically, it is far easier to set up an excellent telecommunication infrastructure in suburban and rural India than to place hundreds of medical specialists in these places. We have realized that the future of telecommunications lies in satellite-based technology and fiber optic cables.

The Beginning

The Apollo group of hospitals was a pioneer in starting a pilot project at a secondary level hospital in a village called Aragonda 16 km from Chitoor (population 5000, Aragonda project) in Andhra Pradesh. Starting from simple web cameras and ISDN telephone lines today, the village hospital has a state-of-the-art videoconferencing system and a VSAT (Very Small Aperture Terminal) satellite installed by ISRO (Indian Space Research Organisation). Coupled with this was the Sriharikota Space Center project (130 km from Chennai) which formed an important launch pad of the Indian Space Research Organisation in this field.

CURRENT EFFORTS

In India, telemedicine programs are actively supported by:

- Department of Information Technology (DIT)
- Indian Space Research Organization
- NEC Telemedicine program for North-Eastern states
- Apollo Hospitals
- Asia Heart Foundation
- State governments
- Telemedicine technology also supported by some other private organizations

DIT as a facilitator with the long-term objective of effective utilization/incorporation of Information Technology (IT) in all major sectors, has taken the following leads in Telemedicine:

- Development of Technology
- Initiation of pilot schemes-Selected Specialty, e.g., Oncology, Tropical Diseases and General telemedicine system covering all specialties
- Standardization
- Framework for building IT Infrastructure in health

The telemedicine software system has also been developed by the Centre for Development of Advanced Computing, C-DAC which supports Tele-Cardiology, Tele-Radiology and Tele-Pathology etc. It uses ISDN, VSAT, POTS and is used to connect the three premier Medical Institutes of the country (viz. All India Institute of Medical Sciences (AIIMS), New Delhi, Sanjay Gandhi Post Graduate Institute of Medical Sciences

(SGPGIMS), Lucknow and Post Graduate Institute of Medical Education and Research (PGIMER), Chandigarh). Now it is being connected to include Medical centres in Rohtak, Shimla and Cuttack.

CONCLUSION

It does not require too much of a stretch of imagination to realize that telemedicine will soon be just another way to see a health professional. Remote monitoring has the potential to make every minute count by gathering clinical data from many patients simultaneously. However, information may be lost due to a software glitch or hardware meltdown. Therefore, relying too heavily on a computer system to prevent errors in healthcare data may be problematic. There has to be a smart balance between total dependence on computer solutions and the use of human intelligence. Striking that balance may make all the difference in saving someone's life. In 2008, the potential of telemedicine, tele-health and e-health is still left to our imaginations. Time alone will tell that Telemedicine is a “forward step in a backward direction” or to paraphrase Neil Armstrong “one small step for IT but one giant leap for Healthcare”.

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