

Guidelines of Telehomecare for the Underserved

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Abstract

Telehomecare is a remotely controlled healthcare service delivered to a patient at home. The service entails automated interactive audio and video equipment and monitored medical devices. Enabling technologies allow the patient to hold home videoconferences, receive educational materials over the Web, upload physiological measurements, view data records from archives, respond to automated alerts and reminders, receive instructions in electronic mail concerning medication, and share experiences with other patients, in group discussions. This paper deals with guidelines of telehomecare for the underserved. Defined as patients who are urban residents and do not have adequate medical insurance, or those who live in a rural community that lacks major medical facilities and specialists. The guidelines discuss patient and provider needs, customized technologies, information exchanges, and evaluation metrics.

Keywords:

Guidelines; telehomecare; underserved; telemedicine

Introduction

Telehomecare is a remotely controlled healthcare service delivered to a patient at home or to an assisted living resident. The service entails automated interactive audio and video equipment and monitored medical devices. In general, telehealth networks should utilize technologies that are interchangeable, compatible, scaleable, accessible, and reliable. Enabling technologies of telehomecare permit the patient to hold home videoconferences, to receive educational materials over the Web, upload physiological measurements, view data records from archives, respond to automated alerts and reminders, receive instructions concerning medication in electronic mail, and share experiences with other patients, in group discussions [1]. Telemedicine is one of many solutions to the paucity of professional caregivers in remote regions in which there are no major hospitals. Elderly who wish to remain in familiar surroundings during treatment may prefer to subscribe. The concept of delivering health services by remotely controlled technologies appears promising for the aged, retarded, physically handicapped, and patients requiring post surgical care, and rehabilitation after alcohol or drug abuse. Telehomecare has been successfully implemented in cases of diabetes, congestive heart failure, chronic obstructive pulmonary disease, and chronic wound healing [2,3]. The success of the telehomecare program will depend on fulfilling patient and provider satisfaction criteria [4].

This paper deals with guidelines of telehomecare for the underserved. Defined as patients who are urban residents and do not have adequate medical insurance, or those who live in a rural community that lacks major medical facilities and specialists [5,6]. Both criteria are judged relative to national averages for geographical areas with similar demography. The objective of this study is to state guidelines in terms of patient and provider needs and requirements, customized technologies, operations of information exchanges, and several requisite evaluation metrics, which represent the means by which to achieve the telehomecare operations.

Patient

Eligibility is based on patients who are underserved but have minimum health coverage, and those who reside in remote geographical areas. Insurance is provided by a third party such a health maintenance organization underwritten by a national medical insurance agency.

Patient must be informed of network changes throughout treatment, particularly with regard to provider assignments. There must be no loss of benefits as a consequence of service cancellation by the patient.

Severe illness may prevent a patient from enrolling in a telehomecare program. Impaired mobility, motor coordination, language ability, loss of visual acuity or hearing, mental deficiency, or ineffective cognition, and debilitating comorbid conditions are common reasons. Every effort should be made to add peripheral devices or introduce medical aids so as to improve the chances of patient eligibility. It is quite evident that the homeless, or patients who habitually occupy temporary quarters are unacceptable subjects.

The patient must have telephone and electrical power lines. Space provided in the home must be adequate to accommodate medical equipment and their connections.

Patients must be willing to accept the responsibilities of self-monitoring, uploading measured results, responding to messaging, and following instructions.

Provider

In every instance, a primary care physician is assigned for initial screening, subsequent care, and evaluation. The screening is done during the initial face-to-face session. At

intervention closure, the physician directs an evaluation questionnaire.

There must be a clear understanding of the basis upon which reimbursement will be made for professional service. Malpractice insurance for physicians who practice in another country or under different local licensure codes must be acquired.

Certification, however, may not be possible based on telehealth experiences alone. Public policy regarding reimbursement schedules particularly covering consultation across national boundaries and international borders is still an open issue awaiting standardization and international agreements.

A licensed nurse manages intermittent contact sessions through the use of customized videoconferencing equipment and dedicated personal computer. An effort should be made to increase the number of these virtual visits and reduce the number of face-to-face calls to lower cost. As expected, the licensed nurse is trained in medical protocols associated with a particular class of related diseases. What is new is the requirement that the nurse be familiar with computer software and hardware components of a telehomecare system. Extensive training may be necessary before these technologies are mastered.

The caregiver must provide data control to maintain image archives, respond to emergencies, design and distribute questionnaires, and exchange messages with patients using electronic mail. Automated alert mechanisms are complementary and offer corroborative controls. Special procedures are activated with the alerting system when monitoring signals during sleep.

An important responsibility is the preparation of the patient for self-maintenance procedures. The patient must feel comfortable with the many tasks of telehomecare, and develop self-reliance as well as a positive attitude especially when changes in regimens and primary care are necessary. This endeavor will require political skills — what to say and how to say it.

Health providers must speak slowly, clearly, and in a language understood by the patient. On-site classes may require a reference glossary, adaptive approaches of pedagogy, which depend on the background and educational level of the patient, formal lectures supplemented by contacts with discussion groups, and educational materials linked to the primary Web site.

Providers administer training programs especially designed for patients. Clear instructions must be transmitted to the patient regarding handling, storage, safe operation, power connection, and cleaning procedures to keep invasive devices free of pathogens. Instructions sent to the patient must be in simple syntax, succinct, and clearly stated. The patient must learn to recognize signs that distinguish need for emergency treatment from contact with the telehealth

provider. Discussion groups between patients and moderated by the case nurse are encouraged as part of the clinical regimen. Support groups have helped correct behavioral problems.

Customized Technologies

Videoconferencing replaces face-to-face contact between patient and a health professional. As a matter of policy, the number and complexity of components should be minimized. All modules must be reliable, designed with some redundancy so that in the event of power outages or failure essential functions will continue to work and repair can be made during scheduled maintenance.

The hardware system essentially consists of an inexpensive video camera and microphone, which supports treatment through messaging. The case management nurse transmits instructions concerning type of medication and dosage, moderates group discussions, and reviews personal problems. Consultants and medical specialists can contact the patient from their offices.

An audio and video recorder is used to acquire all information throughout an encounter, which is annexed in a temporary file. Case management nurse reviews these temporary files and retains only significant data for the medical record. Medication supply is assessed and recorded to determine whether the patient has taken the proper dosage.

A personal computer is connected to the Internet using a modem and the home telephone line. The computer supports several functions. For example, the patient can upload physiological measurements, view personal records stored in the archives, and receive written instructions and educational materials over the Web with regard to the affliction. The nurse can respond to alerts and install reminders.

These operations require dedicated Intranet and Internet access furnished by a service provider contacted by means of a toll-free telephone number. Authorization for opening an account is given by the healthcare provider. Operating through the provider, the home-based unit opens an encrypted secure socket layer connection to the data server located in the workstation. Access is made possible only through authentication of user name and password.

There are computer ports for medical device interfaces. The computer is modified so that it has no data storage capability or the possibility of installing software that can override instructions. A dedicated communication line is opened between patient and the primary provider to secure information and ensure restricted Web browsing. The Web browser software supports video streaming and, alternatively, frame-freeze technologies. A frame of the video can be extracted and transmitted to a laboratory for diagnosis and then archived.

The personal computer is used to download training instructions and messaging, written response to virtual visits, acquire technical information on the Web, upload monitored medical device measurements, and to hold chats with other patients. Camera, microphone, and computer are integrated to form one functionally unified system.

User-friendly aids are added for the benefit of the naïve and inexperienced patient. All buttons on the console must be color coded labels and contain identifiers in large print. The camera should have a capability of zoom in on local lesions. Calibration must be periodically checked. Use of the mouse for Web-browsing must be simplified either through wireless or touch screen technologies.

Patients who are intimidated by complex machines must feel comfortable with whatever is emplaced and requires operation. Hence, the provider or vendor technician must demonstrate all critical functions, where the equipment will be used.

Except that the microphone is perhaps replaced by a directional array to minimize background noise, an equivalent setup is located in the workstation of the case management nurse. It incorporates a videoconferencing capability that can be serially extended to many patients.

Monitoring devices must be reliable, cost-effective, and operated easily by the novice and computer illiterate. Readouts are part of the medical record. After automated signal processing, the measured quantities are uploaded into a computer database located in a central repository serving the community. Manual readings of values taken from medical equipment should also be possible. By means of a password, the patient can access personal files containing these data, clicking on graphical displays, within tables and on measurable variables.

Information Exchanges

Principal sources of patient information consist of clinical interviews, treatment, and questionnaires.

In clinical interviews, questions related to state symptoms are asked at controlled rates that do not provoke anxieties, and replies are given that furnish a personal medical history. Based on this information, the attending physician establishes a medical regimen, prescribes medication, requests imaging, makes referrals, and orders laboratory tests.

Sources stemming from treatment include messaging, laboratory procedure findings, such as X-ray and blood analysis, physiological readings, and medical device monitoring.

Questionnaires are used to produce on-going evaluations, which may form a basis for strategy change in treatment. Transmission of these data across national boundaries and

international borders requires policy decisions and prior agreements.

There must be compliance with the Guidelines of Health Insurance Portability and Accountability Act (HIPAA) [7]. Authentication and transport security mechanisms include User/ Password, Security ID, Public Key Infrastructure, and Secure Socket Layer Encryption for transport, Virtual Private Network, and Symmetric Key Encryption.

Decision support software is needed. It signals the nurse whenever the patient failed to follow instructions such as not uploading monitored data and not reading messages. Out of normal range values are also flagged.

Several Web sites may be utilized in the course of an intervention. One shows personal medical information, while another with links covers all aspects in varying depth of disease of which the patient is afflicted. Graphics of monitored values, their statistical trends, treatment protocol, medical history and evaluation are placed on the Web site

Educational information dealing with the pathology, treatment, and medications on the Web must be designed to different levels of literacy both with regard to language and technicalities and offered in multi-languages options. Patient can decide on language preference.

A web based clinical information system is available to researchers. The national compiled data are stored in a repository that is continually updated. A concomitant resource is the a program that converts patient clinical data sets into format used in the registry, graphic displays and tables.

Data tracking is essential to maintain accurate and complete medical history. Software installed in the remote workstation automates videoconferencing proceedings, logs virtual visits, archives images, and provides an audit trail so that there is guaranteed delivery and notification of when the communication was read and by whom.

Evaluation Metrics

Governmental agency concerns deal with the effectiveness of videoconferencing, Internet access, physiological monitoring, in terms of whether these technologies actually improved quality of life, and reduced unit cost of healthcare. A key issue is whether the rolls of underserved were diminished.

Statistical measures may involve mortality, morbidity tables, and elapsed time before the patient requires hospital or long-term facility care. The numerical ratio of face-to-face calls to virtual visits is an important determinant.

Patient satisfaction relies on quality healthcare, low co-payment cost, and problem free outcomes, particularly dire consequences stemming from a breach of privacy [8].

Satisfaction survey answers whether a patient was able to use medical devices or operate videoconferencing and computer peripherals without problems or calling for assistance [9].

A positive attitude about telehealth and a willingness to learn danger signs are essential for a successful intervention.

An equitable formula must be found for reimbursements particularly for consultants crossing international borders. Licensure, ethical codes, insurance against malpractice, and medical protocols are factors that must be considered.

Metrics are needed for health improvement, prognosis, cost incurred, patient satisfaction, and health organization recommendations comparative studies.

Total cost includes medications, expendables, equipment repair and service, emergency hospitalization, attending physician and medical specialists, additional provision made for other family members, nurse management, and homecare administrative expenses. Network, database, server, labor, materials costs are separated from those incurred by physician, nurse, and consultants, in terms of time and clinical record additions [10,11].

As a control, the case management nurse has the authority to initiate videoconferencing and select a local Internet provider. The patient can only contact the nurse by direct dialing on a home telephone or using secure electronic mail [12].

Conclusions

Eligible and motivated underserved together with highly skilled providers can employ customized technologies and participate in information exchanges to support the operations of telehomecare. A distinct synergism allows the patient to hold home videoconferences, receive educational materials over the Web, upload physiological measurements, view data records from archives, respond to automated alerts and reminders, receive instructions in electronic mail concerning medication, and share experiences with other patients in group discussions. The success of a telehomecare program will depend on fulfilling patient and provider satisfaction criteria, the degree of which can be measured by evaluation metrics.

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