DEVELOPMENT OF A MOBILE TELEMEDICINE SYSTEM WITH MULTI COMMUNICATION LINKS FOR URBAN AND RURAL AREAS IN BULGARIA

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Abstract

Telemedicine, the use of information technology to deliver health care from one location to another, has the potential to increase the quality and access to health care and to lower costs. Telemedicine besides facilitating the delivery of quality healthcare to the remotest regions, can also prove to be useful to increase the efficiency of urban physicians whose main target is the urban masses.

This software system offers a telemedicine platform with the ability to create a clinical analysis with textual information and data from biomedical peripherals, and send data for consultation. Health care professionals are able to view the data and respond to the case using a Personal Computer from remote.

Since the delay is the enemy for patients, so the integrated and high-speed telecommunication is an optimal option for Telemedicine systems.

Index Terms: Telemedicine, telehealth Internet, Java

1. INTRODUCTION

Application of electronics, computer and telecommunication technology for medical information exchange from one site to another, to facilitate the improvement of health care delivery.

Lessons learned from other developing countries indicated that usage for community purpose would face problems in operations and cultural sustainability, even with the relatively low-cost internet-based system. Computer networks have made it possible to share electronic medical records and to deliver medical expertise via remote consultation. Web-based telemedicine systems have been attempted by many researchers, and the most approaches are experimented with the use of videoconferencing for remote consultation [1].

Prevention and treatment interventions on this scale require efficient information management, which is critical as clinical care must increasingly be entrusted to less skilled providers. To help them, we need to find a way not only to improve management tools, but also to reduce unnecessary, duplicate efforts[2]. To overcome the problems, proposed development of internet-based community telemedicine in Bulgaria should be based on the concept of initially focusing on the essentials. In this paper, we developed telemedicine system to promote the idea of E-medicine.

Characteristics in the system

– Provides the efficient and convenient methods for patients and doctors to communicate with each other and allows patients to send their medical data/image through the Internet;

– Build computer-based patient records and other electronic information systems that provide relatively easy and fast access to large databases and that permit the application of powerful statistical methods for analysing and displaying those data;

– Potentially allows easier access to more information about a patient than the user either requests or needs.

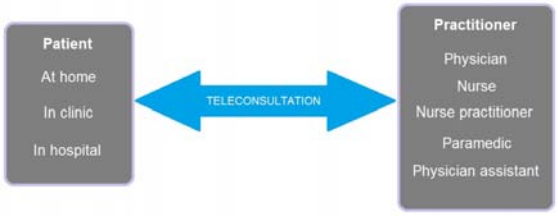

Fig. 1. Real-time video conferencing between a practitioner and a patient or between a practitioner and patient and another specialist practitioner.

Fig. 1 show ways in which telehealth can be used in determining the problem and making a diagnosis.

The inability to examine a patient directly is frequently raised as a criticism of telehealth's capacity

to discover patients' problems and make a correct clinical diagnosis. The fact that face-to-face consultations the correct clinical diagnosis is usually made in 60%-80% of cases from the clinical history alone suggests that telehealth should be able to make a correct diagnosis in the majority of cases as long as a detailed clinical history is taken[3].

Clinical research comparing telehealth with conventional methods of clinical examination and interpreting investigations suggests that telehealth is a reliable way of making clinical diagnosis remotely. The diagnostic accuracy of telehealth consultations does not have to be 100% equivalent to conventional methods of clinical practice to make telehealth a workable proposition. If a telehealth application is consistently reliable in a sufficient percentage of cases and is of high quality and lower cost, it can safely replace some, but not all, elements of conventional clinical practice.

Types of telemedicine information.

In a face-to-face consultation, a physician might use some combination of all five senses-sight, sound, touch, smell and taste-to assess a patient's condition. In telemedicine, however, the sensory data are first converted into electrical impulses for transmission to the remote physician.

Methods to convert smell and taste stimuli into electrical signals are still in the experimental stage and, while the sense of touch can be translated successfully into an electrical equivalent, the reverse process is more difficult and not well understood.

Hence, a consultation relies primarily on the two senses of sight and sound[6].

The information (useful data) derived from these senses can be divided into four types:

- text and data;
- audio;
- still (single) images;
- video (sequential images).

Table 1 gives telemedicine examples of these types along with their typical file size in kilo- or megabytes following digitization [4].

Table 1. Typical examples of telemedicine information

Source	Type	File size
Patient notes	Text	< 10KB
Stethoscope	Audio	100 KB
Chest X-ray	Still image	l MB
Ultrasound	Video	10 MB

2. MAIN TEXT

Telemedicine in Bulgaria is a new, seductive, and superficially easy-to-use technology, there tends to be a belief among health service managers that it can simply be made available to clinicians who will automatically accept and use the telemedicine systems.

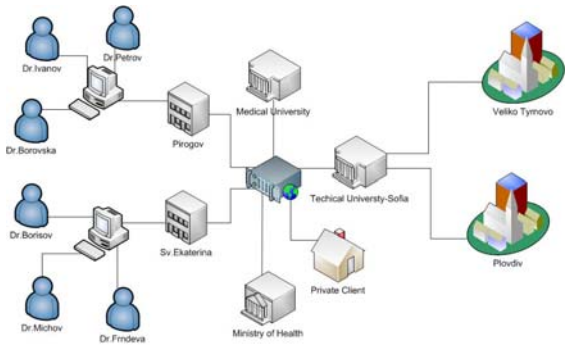

Fig. 2. TU-Sofia Telemedicine Network

Every developed nation throughout the world, whatever the political persuasion of its government, is facing serious difficulties with the delivery of healthcare to its citizens[5].

The USA and the countries of Europe exhibit the full diversity of these different systems but they face the same daunting problems, particularly:

- the increasing age of the population;
- the increasing cost of medical technology;
- patient expectations;
- economic and social change

These and other factors drive up the cost of healthcare and reduce equity of access. [7]

These advantages are difficult to factor into the cost-benefit equation but they are attractive to countries such as Australia, Canada, Sweden, Norway and Finland where distance and/or climate prevent rural communities from experiencing the same provision of services as their urban counterparts.

The priorities in underdeveloped countries are very different. Often finance, organization, culture and/or distance do not allow the authorities to provide even basic healthcare[8].

While underdeveloped countries are unable to finance these programmes themselves, a surprising amount of progress can be made with small clinics, voluntary organizations and satellite links to specialists in industrialised countries.

3. SYSTEM ARCHITECTURE

In this system, JBoss server maintains the whole system, which includes Seam Framework, Rich-Faces , Hibernate, and PostgreSQL object-relational database system. JBoss, by Red Hat, is the leader in enterprise-class open source middleware. JBoss Enterprise Middleware is comprised of certified, supported platform and framework distributions that are based on JBoss Community projects.

Seam is a powerful open source development platform for building rich Internet applications in Java. RichFaces is an open source framework that adds Ajax capability into existing JSF applications without resorting to JavaScript. Hibernate is concerned with data persistence as it applies to relational databases.

System Management can been specified as a combination of Service System, Information System, Entertainment System, Security System and Department Administration System. And every system performs particular functions.

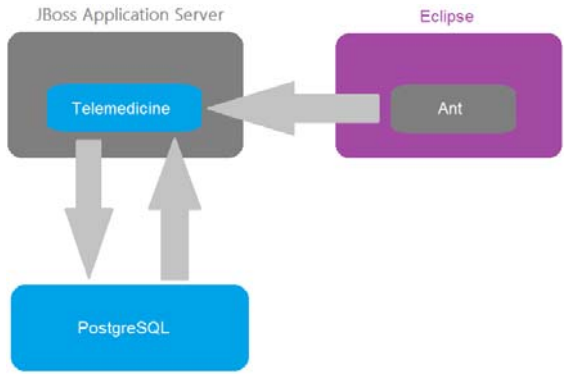

Fig. 3. System Architecture

The approaches to home monitoring range from low-cost and easy to use touch-tone telephone systems to more expensive systems that mimic the real-time videoconferencing approach in traditional telemedicine and web-based systems that allow access to patient data from anywhere an Internet connection is available[9].

These systems are different from web interfaces to medical records systems at hospitals. In the hospital systems, only care providers can view and add information to records. In the patient-targeted systems, patients can access their records. One of the advantages of current database systems is the capability to enforce global integrity constraints on a large amount of data. Input of contradicting data will be rejected by database systems in order to maintain correctness. On the other hand, in medical information systems it may be necessary to realize two or more databases in one system, where there are some controlled contradictions among these databases.

Data sharing and data security are important functions required for medical information systems. There are, however, cases when we need to show non-real data to some users. Security mechanisms usually prevent a user from retrieving critical data. If a request for retrieval of some data is rejected by the system, a user may find there is something secret being kept from him. Using PostgreSQL rule system in medical information systems, doctors can make a smooth explanation of a patient's condition in serious cases, when hiding real data is required [10].

I believe that PostgreSQL rule system can be applied to many fields in medical data processing.

CONCLUSION

The goal of this E-Medicine system was to demonstrate that an asynchronous web-based telemedicine system could be successfully implemented with low-cost components that are available off the shelf.

Even novice computer users were able to operate the system, although the web browser user interface may be too complex for some.

A larger trial with a patient population that has a greater need for telemedicine support is needed to comprehensively test the clinical impact of E-Medicine systems.

In conclusion, after painting a brief picture of some of the interests affecting telehealth, we see a rosy future. The unifying point of contact among government, professional groups in health care, and the telecommunications industry is a focus on consumers. The interest of the telecommunications companies is in providing the pipeline for services into the home. It is interesting to see the interest of consumer IT companies in health care on the Internet as a major area of growth potential.

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