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# ROLE OF INFORMATION TECHNOLOGY IN IMPLEMENTATION OF TELEMEDICINE SYSTEM

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## ABSTRACT

Introduction: Telemedicine is the wider description of providing medical and healthcare services by means of telecommunications. The aim of this study was to investigate the role of information technology in the implementation of a telemedicine system to assist people with diabetes in a master's thesis.

Methodology: A search of electronic databases including Medline, Excerpta Medica Database (EMBASE), Cochrane, and Cumulative Index to Nursing and Allied Health Literature (CINAHL) for relevant papers was performed. All studies addressing the use of telemedicine in emergency medical or pre-hospital care setting were included. Out of a total of 1,230 abstracts that were reviewed, result of 39 articles and 3 books were gathered.

Findings: during the study, we knew technologies, and were using the results to implement a telemedicine system for diabetic patients. Technologies do not only assist medical practitioners and patients receiving treatment, they also benefit perfectly healthy people by providing a wide range of general health assessments.

Conclusion: telemedicine is medical services through the use of telecommunications.

## Indexing terms/Keywords

Telemedicine, Telecare, Telehealth, eHealth, Information technology

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## INTRODUCTION

The progresses in novel telecommunication technologies have created new chances to provide telemedical care and led to improvements in clinical outcomes in emergency medical care. Well structured outpatient care could reduce the need for hospital acceptation, comfort early intervention, prevent emergency management and avoid disease progression in these patients [1].

The term telemedicine is supporting medical services through the use of telecommunications. Telemedicine is providing medical and healthcare services by telecommunications. Information Technology (IT) in areas covering control, multimedia, pattern recognition, knowledge management, image and signal processing; have enabled a wide range of applications to be supported [1-3].

Figure1 summarizes a number of services that telemedicine is capable of supporting. It is not a complete list of all services that telemedicine is capable of supporting, but shows all major services currently used worldwide [1-2].

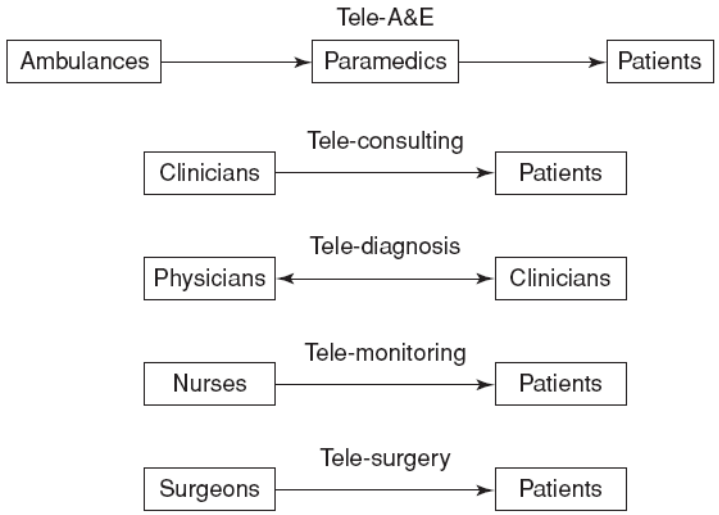


**Fig 1: Subsets of telemedicine connecting different people and entities together**

Telemedicine has been deployed in calamities and it is well suited to the management of major incidents where a dearth of healthcare professionals can be recovered by teleconsultation [2].Telemedicine is well appropriate to developing the reach of specialist services, particularly in the pre-hospital care of acute emergencies where remedy delays may affect clinical outcome [3].

With advances in telecommunication, the use of telemedicine was facilitated by the invention of the telephone in the nineteenth century. In a century ago telemedicine was given Medical advice by physicians over the telephone [1-2]. This culminated in one of the earliest recorded uses of information and communication technology (ICT) in telemedicine, when Einthoven, on 7th February 1906, transmitted electrocardiogram (ECG) tracings over telephone lines [4]. With the invention of the television in the 1950s, advances in closed-circuit television and video conferencing led to the adoption of telemedicine in patient monitoring and consultations [5]. In the 1960s, the National Aeronautics and Space Administration (NASA) were used telemedicine for remote physiological monitoring of astronauts during manned space flights [6-7]. After the December 1988 earthquake disaster in Armenia, NASA established the first international telemedicine project known as the Space Bridge to Armenia that allowed telemedicine consultation between medical centers in the United States and Armenia [8]. Now, we see many telemedicine projects implemented with telecommunication in different branches of Medicine in the whole of the world. The aim of this study was to investigate the role of information technology in the implementation of a telemedicine system to assist people with diabetes in a master's thesis.

## Methodology

We performed an automated electronic search using the terms identified in Medline. The terms included the following: Telemedicine, Telecare, Telehealth, health and Information technology . The search terms were used as keywords on Medline, Excerpta Medica Database (EMBASE), Cochrane Database of Systemic Reviews (CDSR), Cochrane, and Cumulative Index to Nursing and Allied Health Literature (CINAHL). The search was then finalized using Boolean operators to combine ('OR') and cross-reference ('AND') between domains. The first ten pages of a basic web search using the Google search engine were reviewed for relevant articles and books. Studies carried out between 1970 and 2014.

## Findings

Technologies do not only assist medical practitioners and patients receiving treatment, they also benefit perfectly healthy people by providing a wide range of general health assessments. This can help maintain optimum health and identify abnormalities as early as possible via prognostics and health management techniques [1,9-10].

Telemedicine uses various types of networks so that physicians can share ideas, surgeons anywhere in the world can perform a single operation together irrespective of where the operating theatre is, nurses and paramedics can retrieve a patient's record anytime anywhere [1,11-12].

Hospitals and clinics use the network for everything from patient care to administrative work and inventory management [9,13-17].

Different network types are optimized for different applications in telemedicine, many alternative types of wireless networks are currently available for telemedicine services. Wireless communications have been developed to such an extent that numerous options exist. wireless telemedicine is far more popular than wired systems[1,9,18-23].

Key properties are summarized in Table1.

**Table 1: Properties of some common wireless systems**

| Network Type | Frequency Range | Speed | Maximum Range |
|---|---|---|---|
| Bluetooth | 2.4–2.485 GHz | 3 Mbps | 300 m |
| IR | 100–200 THz | 16 Mbps | 5 m |
| Wi-Fi | 2.4–5 GHz | 108 Mbps | 100 m |
| ZigBee | 900 MHz | 256 Kbps | 10 m |
| Cellular Networks | 850–1900 MHz | 20 Mbps | 5 km |
| WiMAX (Fixed) | 10–66 GHz | 1 Gbps | 10 km |
| LMDS | 10–40 GHz | 512 Mbps | 5 km |

Figure 2 shows Block diagram of a medical information system [1,24-31].

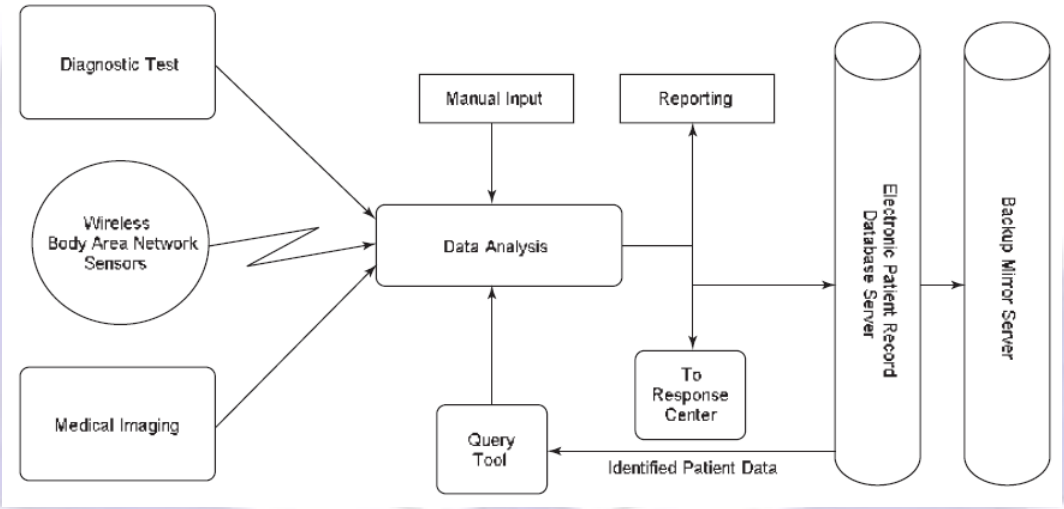


**Fig 2: Block diagram of a medical information system.**

In the case of telemedicine, the majority of the data comes from patients and involves a diverse range of data types from biosignals to surveys about daily activities that require manual entry. Once captured, the data needs to be transmitted to an appropriate location for processing in order to make sense of what the data conveys about the patient. Next, processing entails technologies in different areas such as signal processing, multimedia and data mining; how the data is rocessed depends on the nature of data and related application [1,16-22].

Having analyzed the data such that any necessary actions can be taken in response to the given situation, the data needs to be stored for archival as it can be very useful in a number of ways; for example, a patient who is allergic to certain substances needs to make oneself known prior to receiving treatment. Data can also be used anonymously for statistical analysis of virus mutation and spread pattern in the study of disease control, government agencies can use the anonymous data for regulatory planning, etc. So, an effective way of storing a massive amount of data and speedy retrieval of relevant data is also an important topic to study [10].

Biomedical engineers need to develop a system based on requirements specified by clinical staff.

The proliferation of smartphones, tablets, and other mobile electronic devices creates an opportunity to extend standard professional health care, particularly in medical emergencies where urgent intervention could reduce mortality and improve quality of life. Telemedicine could enhance emergency medical services by helping expedite urgent patient transfer, improve remote consultation, and enhance supervision of paramedics and nurses. [2,30-31]

A number of wearable devices may be carried by a paramedic depending on the nature of the rescue and types of information sought. Figure 3 shows a collection of wireless equipment that a paramedic wears when attending to an injured patient. [1]

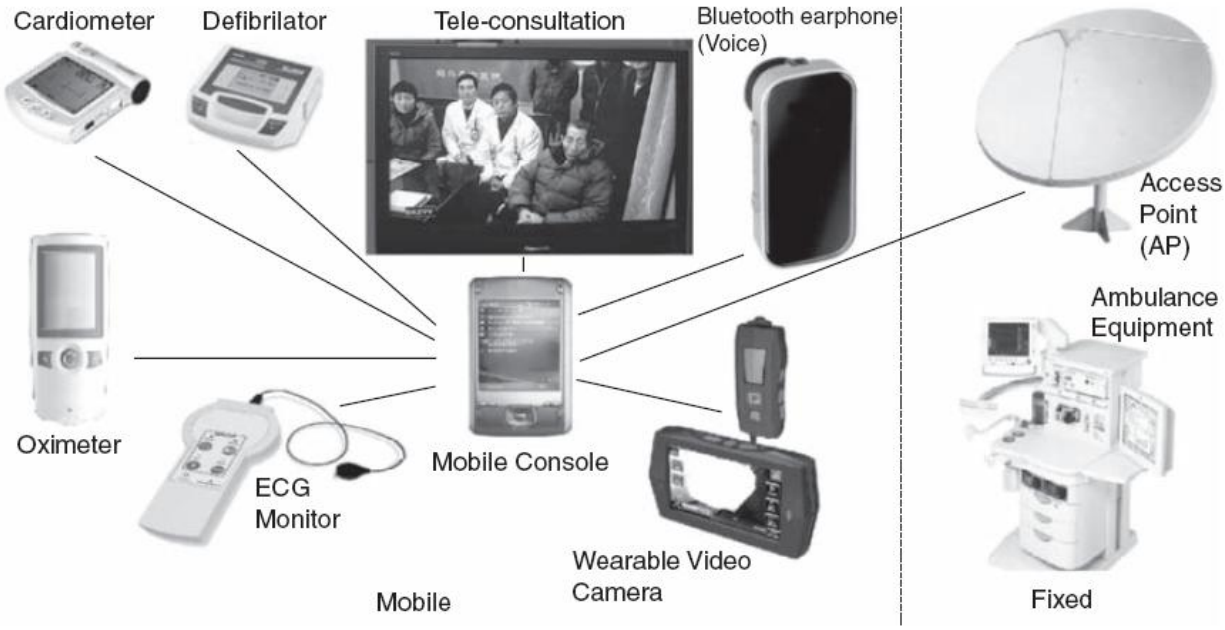


**Fig 3: Wireless devices serving a paramedic on the scene**

Telemedicine provides the patient with a structured disease management process and can be self empowering. Telemedicine is description of supporting medical services through the use of telecommunications. Teleneurology [33], Teledermatology [34], Teleoncology [35], Teledialisis [36] are some of Real time Telemedicine services.

Teleneurophysiology [37], Tele-ECG [38-40], Teleophthalmology [41], TeleObstetrics [42], Virtual Autopsy [43-44] are some of Store and forward Telemedicine services.

## CONCLUSIONS

This paper proposes the design and implementation of a wireless telemedicine system, in which an ECG monitoring system whose goal is to provide an anywhere and at any time assistance to Diabetic patients to detect heart diseases in real-time and reduce communication costs.

This system will improve the mobility of patient so patient could do his/her daily activities during monitoring. Also the proposed system provides an ability to continuously monitor Diabetic patient's ECG signals instead of the discrete measurements. In other hand this system reduces the unnecessary stay of the patient in the hospital and indirectly saving their quality time and precious money and would lead to the conclusion that this will reduce the mortality rate of Diabetic patients due to heart diseases.The current system has already been implemented, validated with the ECG database and offer accurate results.

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