# A Novel wireless and mobile E-Health expert system

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## Abstract

In This paper is aim to build an expert system for remote patient monitoring, and show how this study reduce costs to hospitals throw (reduce number of rooms , reduce the number of daily meals).The benefit of reduce the patient cost and make patient life easy where the patient is treated electronically without dealing with traditional methods.

## 1. Introduction

Telemedicine can be defined as the distant delivery of health care and remote sharing of medical knowledge using telecommunication means. In recent years, several telemedicine applications have been successfully implemented over wired and wireless communication technologies. [1].

Using Wireless and Medical Expert System (MES) in follow up process for patients outside hospital help the patient to live their life freely .The patients will be under control while being far away from hospital.

This new technology will save money for Patients and Hospitals.

The use of advanced Telecommunication and Information Technologies to exchange health information and provide health care services across geographic, time, social and cultural barriers.

The main objective of this research is to design and implement a new way of following up patients with no need of the traditional ways. This will be achieved by using proposed Medical Expert System (MES).

Term of healthcare practice supported by electronic processes and communication, dating back to at least 1999. Usage of the term varies: some would argue it is interchangeable with health informatics with a broad definition covering electronic/digital processes in health while others use it in the narrower sense of healthcare practice using the Internet [2].

E-Health is the single-most important revolution in healthcare since the advent of modern medicine, vaccines, or even public health measures like sanitation and clean water. [3].

This paper is organized as follows; section 2 presents the related works. The proposed Medical Expert System Design and Implementation is described in section 3. Section 4 describes the experimental results. Finally, section 5 presents the conclusion.

## 2. Previous Studies

Aerotel Medical Systems, [4] one of the leading manufacturers of advanced trans telephonic telemedicine systems, it has closed the purchase of Adrian Life Care division activities which is a highly specialized global supplier of advanced wireless communications solutions for critical missions as innovative wireless and mobile monitoring solutions for improving people's health, safety and quality of life for Home-Care and Tele-Health.

Krishnaveni, Jayaraman, Gunasekaran and Ramadoss in 2007 [5] used JADE Algorithm and Neural Network. Problem: The Electro Encephalo Gram (EEG) is useful for clinical diagnosis and biomedical research. EEG signals often contain strong Electro Oculo Gram (EOG) artifacts produced by eye movements and eye blinks especially in EEG recorded from frontal channels. These artifacts obscure the underlying brain activity, making its visual or automated inspection difficult. The goal of ocular artifact removal is to remove ocular artifacts from the recorded EEG, Leaving the underlying background signals due to brain activity.

Kamruzzaman, Hassan, Siddiquee and Mazumder in 2004 [6] wrote a paper in Medical Diagnosis Using Neural Network. Problem: Describing a Modified feed Forward Neural Network Constructive Algorithm (MFNNCA), a new algorithm for medical diagnosis. Back propagation algorithm is the most widely used learning algorithm to train multiplayer feed forward network and applied for applications like character recognition. The most well known constructive algorithm is dynamic node creation, feed forward neural network construction algorithm and cascade correlation algorithm.

Polakovic In 2005, [7] did a Backpropagation Algorithm in ECG classification. Problem: Artificial Neural Networks can be viewed as simplified mathematical models of brain like systems and their functions as parallel distributed computing networks. They use the Back propagation algorithm to adapt the neural network to classify the patients ECG to class of normal ECG and abnormal ECG.

Telemedicine has been shown to reduce the cost of healthcare and increase efficiency through better management of chronic diseases, shared health professional staffing, reduced travel times, and fewer or shorter hospital stays. Several studies have documented increased patient satisfaction of telemedicine over the

past fifteen years. Telemedicine can be in the following areas: [8]

- Telehome Home Health Care.
- Tele-Psychiatry.
- Tele-Radiology.
- General Telemedicine.
- Tele-Cardiology.
- Telemedicine Consulting.
- Tele-Dermatology.

## 3. Medical Expert System Design and Implementation

### 3.1 Stakeholders

In our program, the stakeholders as shown in Table 1 below, we can see that the Physicians, Nurse, Secretary are the stakeholders.

Table [1] shows the stakeholders

| Stakeholders Number | Description |
|---|---|
| 1 | physicians |
| 2 | Nurse |
| 3 | Secretary |

### 3.2 System Model

As shown in the Figure 1, our system model determinants are Physicians, Nurse, Secretary, Registration Patients, System of Case and Control Room. The relationship between them is shown in Figure 1.

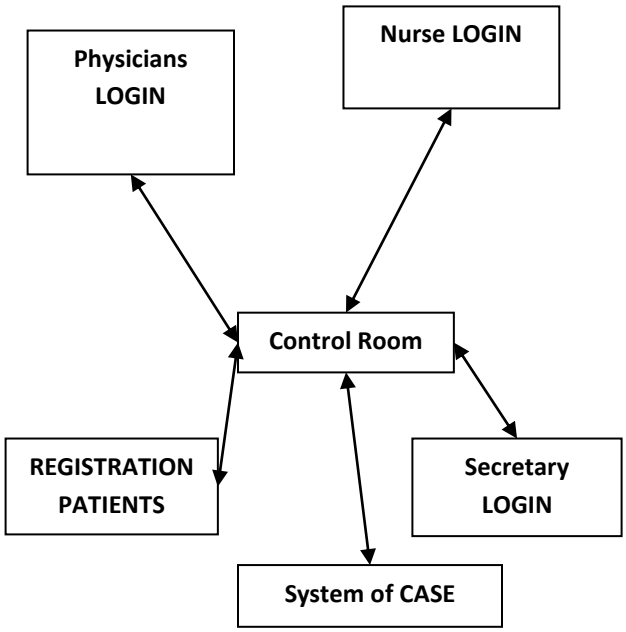


Figure 1: our system model

### 3.3 Requirements

In this section will state all the services provided by the system, what the system should do and how the system will behave in a particular situation.

All Physicians, Nurse and Secretary can login to the system by entering their names and their passwords before making any operation.

Control Room, the system database will have information about all Physicians , Nurses and Secretaries, from the database we can verify that if the Physicians , Nurses and Secretaries names and passwords are correct or not, and the system will allow them to enter the system.

Registration Patient, Nurses and Secretaries who will record information about patients when they come to the hospital or clinic.

### 3.4 Functional Requirement

In our system there are functional requirements, these requirements as shown in Table 2 shows that every Stakeholder has permissions to perform some operations in the system such as: add, delete, modify, query…

Table 2 Functional Requirement

| Description |
|---|
| 1. Medical Secretary can add new patients |
| 2. Medical Secretary can delete the patients |
| 3. Medical Secretary can modify the data of patient |
| 4. Medical Secretary can query the data of patient |
| 5. Medical Secretary can add the data of case for patient |
| 6. Medical secretary can delete the data of case for patient |
| 7. Medical secretary can modify the data of case for patient |
| 8. Medical secretary can query the data of case for patient |
| 9. Nurse can add new patients |
| 10. Nurse can delete the patients |
| 11. Nurse can modify the data of patient |
| 12. Nurse can query the data of patient |
| 13. Nurse can add the data of case for patient |
| 14. Nurse can delete the data of case for patient |
| 15. Nurse can modify the data of case for patient |
| 16. Nurse can query the data of case for patient |
| 17. Nurse can use the system of case |
| 18. Physician can query the data of patient |
| 19. Physician can query the data of case for patient |
| 20.Physician can work in the system of case |

### 3.5 Non-Functional Requirement

After we explored the functional requirement, the second part of requirement which is the non-functional requirement as shown in Table 3 below:

Table 3 Nonfunctional Requirements

| Notes |
|---|
| 1. Easily to learn<br>2. Software should be easily adopted by the hospital<br>3. Software should be easily maintenance |
| 4. Can get data when we need it |
| 5. Free error, Installed , implemented and test |
| 6. Secure of the system (ability to resist attack) , user name and password |
| 7. Can find a problem and fix it |

### 3.6 Data Flow Diagram

This section concentrates on data flow diagram to diagramming data movement, it moves from general to specific in our research through context level and level 0.

A System Context Diagram (SCD) in software engineering and systems engineering is a diagram that represents the Actors outside a system that could interact with that system. This diagram is the highest level view of a system. It is similar to a Block diagram. SCDs show a system, often software-based, as a whole and its inputs and outputs from/to external factors.

In our system we can see how Context Level Data Flow Diagram Represent the relation between stakeholders and the system as shown in Figure 2.

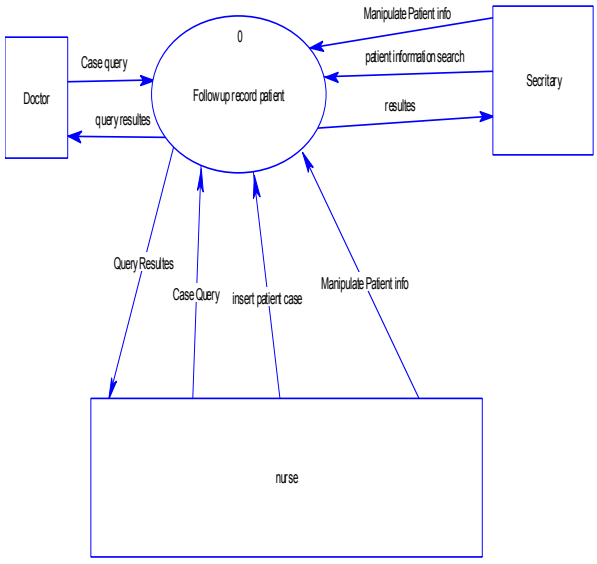


Figure 2 Context Level Diagrams

## 4. EXPERIMANTAL RESULT

### How will I build this Expert System?

I asked Oracle language programmer to create an expert system to give us results and advice to the patient about his health. Wireless device will be installed on the patient's body to transfer data to the control room in the hospital which has an expert system about the patient and to be analyzed (diabetes, pressure, temperature, pulse), and to give out the result of current case.

### Expert system users: Medical Secretary, Nurse and Physician.

Medical Secretary: registration for new patient, enter the initial data for the patient, delete and modify for the record of patient as the privilege gives to her/he, Nurses: can enter the data of patient, modify and delete the record for patient and use the expert system as the privilege give to her/he, Physician can enter the data, show all the data for the patient and use the expert system as the privilege give to her/ he.

## 5. Conclusions

This study aimed to build an expert system for remote patient monitoring, and it has been designated to answer these questions:

1. What is the benefit to the hospital from this research? Reduce costs to hospitals in general, and can determine through, Reduce the number of rooms , reduce the number of daily meals required from the hospital, in Services:
   Washing Room, Cafeteria, Electricity, Maintenances
2. What is the benefit to the patient from this research? Be less cost to the patient that he is in the hospital, exercise social life naturally.
3. What is the impact of the use of this expert system on the community?

Society becomes more advanced in technology and makes life easier, where the patient is treated electronically without dealing with traditional methods.

- Improves communication between providers.
- Educational to remote and consulting practitioners.
- High patient and provider satisfaction.
- Keeps local healthcare money in local community.
- Possibly improves process of care and quality of care.
- Reduced overall cost of healthcare.

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