

# Independent Medical Care Unit for Rural Health Care Development

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**Abstract:** We are well aware of telemedicine which is used in the rural areas where doctor and patient interact with help of video chat. This machine is upgrade of telemedicine. This is a machine similar to the ATM which is widely used. This machine has interactive software where patients can enter their *symptoms and problems* or their doubts while facing medical emergencies. This software takes in all the information from the patients, processes it and then provides the result. If it is a consultancy, the unit just shows the do's and don'ts to the patient and gives them the proper advice, else if the patient is suffering from any diseases eg: fever, the machine takes a blood test and the temperature of the patient is noted from his breath and from the collected data the results are obtained. The required drug to be injected is loaded to a syringe automatically. According to the type of drug the angle of insertion of the syringe is adjusted and once the patient leans his/her shoulder tightly to machine, the machine injects the drug with ease. If the data collected cannot be processed or if the result obtained does not match any of the predefined results, a doctor is connected to the line and he can advice the patient and prescribe medicine through video conference. The medicine prescribed by him can be drawn from the machine, similar to drawing cash from an ATM. These IMCU units could be situated along with a drug/pharmacy store so all the medicines and injections are loaded to it every day. This will improve BIOINFORMATICS to a greater extent. Even serious medical emergencies like snake bite, epilepsy, heart attack, cardiac arrest can be treated through this method which helps in providing initial first aid.

**Keywords**—telemedicine,robotics,rural health development.

## I. Introduction

In the saga of exponentially increasing descendants of our tri-coloured nation, with limited services available to the bulging human population, immediate medical attention becomes imperative. The masses of people living in villages distanced from modernization are especially affected by the delay in first-aid. Even in cities, with the increasing traffic, delay in medical attention is inevitable. In order to provide basic help in these difficult circumstances, we can use automated medical assistance machines, as explained below. The Immediate Medical Care Unit (IMCU) is an interactive machine that will acquire data in the form of tests and queries from the patient. The tests (such as, blood test) produce immediate results (like sugar levels, pressure levels, etc.). These machines are placed in various medical centers and hospitals, also collecting the existing patient records and required details which are added to a database. The current test results of patients are compared with the database and if a record matches, the diagnosis prescribed in the record are prescribed for the patient. If a perfect diagnosis is not achieved then the patient is immediately referred to an available doctor online, thus sorting out one's problem immediately. In case of emergencies such as snake bites, first aid medicines are provided by the medicine immediately until further assistance arrives. Patients may use a generalized method of pre-payment.

The basic working model consists of two modules; an embedded system coupled with software coding for intravenous functioning. These modules are attached to a GUI to interact with the patient. The sensing elements used to perform the basic tests are connected to a processor that performs further processing to finalize the results. The results are compared with existing database records through simple and effective coding. The preferred diagnosis is then displayed to the user by interfacing the software module with the display.

## II. System Design

*Fig. 1. shows the layout of the Independent medical care unit, the whole system design is explained with the help of this figure*

### A. Sensors

This unit uses wide variety of sensors which are used in the patient diagnosis. In the above block diagram only a few sensors are shown. This can be further increased to any number of sensors required. The signals which are obtained in the sensors are very feeble signals. These signals are amplified by the operational amplifiers present here in this block. We have used several sensors like *temperature, breathe rate and blood oxygen level*.

### B. Analog to digital converter:

This block receives all the analog signals from the sensors which provide vital data of the patient and sends it to the database. We can use a [ADS42JB69](#) from Texas Instruments.

### C. Questions asked to patients by the software:

The GUI software which is a touch input interface asks a series of questions to the patients regarding the symptoms and the diet or treatment he/she has previously taken. All this data is collected and sent to the database along with the data of diagnosis of the patient from the sensors.

### D. Retrieval of results of database:

Once all the required data is collected and sent to the database, the database searches for any similar cases recorded previously by the doctors. If the symptoms and diagnoses match, the control goes to pharmacy sector and then to the robotic injection unit. If the symptoms do not match the database, the control moves to the video chat option where the doctor comes in, checks all the data retrieved by the sensors and then prescribes the drugs. Now the control again passes over to the pharmacy sector.

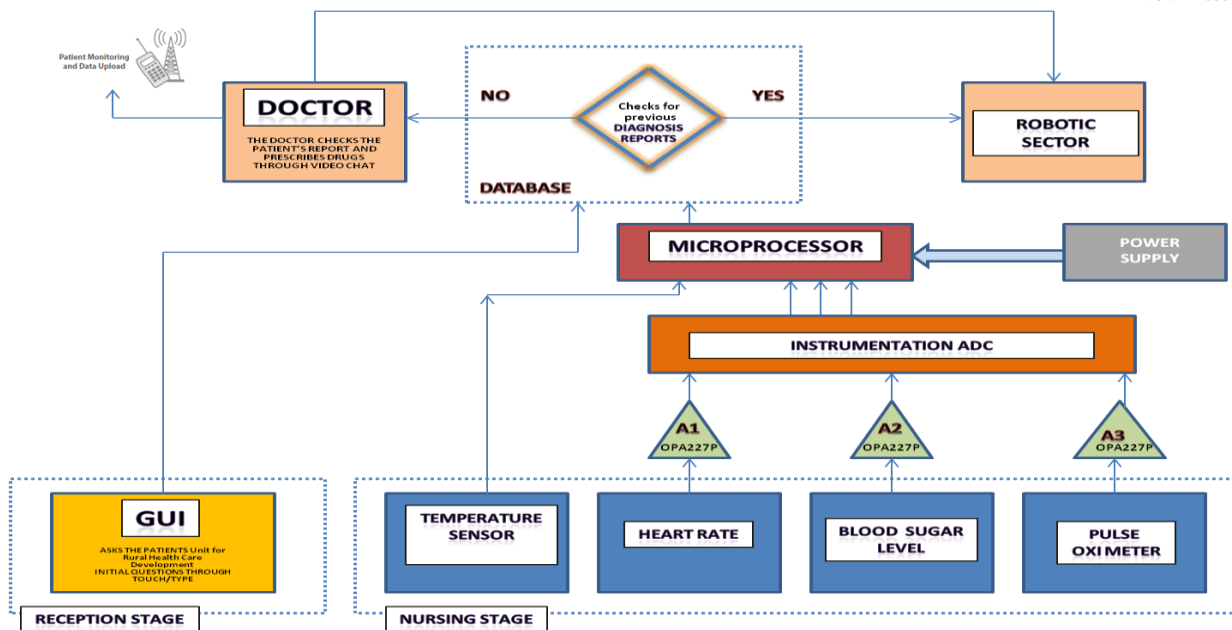


Fig. 1.: Layout of Independent Medical Care Unit (IMCU)

#### E. Robotic sector:

##### i.) The pharmacy sector :

It contains the pick and place robot arrangement where the robot arrangement picks and retrieves the medicine prescribed by the doctor or the database results

##### ii.) Injection and surgery unit :

This is where the remote surgery and the injection of the drugs preferred using the robotic arrangement.

### III. Working

The above block diagram can be used to explain the system working, initially the GUI asks the questions to patient regarding the diagnosis through touch/type this is the **reception stage**. The **nursing stage** comprises of sensors namely the temperature sensor, Heart rate, blood sugar level, pulse oxi meter etc. all these values which are feeble signals are amplified by A1,A2,A3 precision op-amps. They are send to analog to digital converter .Further they are sent to the microprocessor and the values acquired from the sensors along with the data collected from the patients through the GUI is sent to the computer through internet facilities .These data are entered to the database and compared with the previous diagnosis reports, if the reports match, the medicines are preferred and they are delivered to the patient through the automatic drug delivery system which comprises a pick and place robot arrangement. If the data acquired does not match then these details are sent to the doctor and doctor speaks live with patient through video calling. After the consultation the doctor prescribes medicine and the medicines are delivered.

For all these processes, proper training must be given to the patient but these problems can be overcome by assigning an assistant to each IMCU, who will guide the patient. Initially the main IMCU sector receives the diagnosis data of the patient from the diagnosis

sector and then sends the data to the unit and the unit sends it to the database with the collected information. If the data matches to any of the symptoms or diseases, the medicine to be prescribed is decided and the medicine is delivered to the patient. If there must be a drug injection done, the drug is sent to the injection unit and it is injected to patient. If the data does not match any of the symptoms in the database then, a doctor comes on video chat and the doctor interacts with patient and the drug prescribed is sent to the medicine storage and the whole process is repeated.

### IV. Advantage and Disadvantage

#### Advantages:

- Our proposed **Independent Medical Care Unit** is a lot time saving factor. It skips the reception stage, nursing where the patients need to wait for hours together to meet the doctors. Even for the doctors it saves time where as he need not do the basic levels of analysis as he already has all the patient details and the patient's history where he can directly go for the treatment process.
- The patient need not travel all the way to the hospitals/clinics to meet the doctors. Instead they can approach their nearby IMCU which provides an easy access to the patients and provides accurate results.
- Provides first-aid in the case of emergency situations which is a life saving factor.
- This will be more economical when practiced throughout the country and will be affordable by the poor people too and the rate for the treatment will be generalized.
- In rural areas mainly where there are not much efficient doctors available this IMCU is very helpful.

- When this is installed all over the country it is easier for the government for making study about health conditions of people in a particular region and immediately the necessary actions are taken by the government for the welfare of the people in that particular region in case of epidemics.

#### **Disadvantages:**

Cost of unit is high. Maintenance must be done by trained staff. Acceptability of this project among rural people cannot be achieved unless they are educated.

### **V. Discussions**

This unit is mainly designed for the rural people and for their welfare. As healthcare is the most primary need in a society, these kinds of units will help the rural people in getting at least the basic health care. In the beginning of this project we could interface only the temperature sensor and get the reading. The aim is achieving accuracy in other sensors and we are working towards its perfection. The I.M.C.U's in the future can be interconnected by cloud computing or other means thereby increasing the database. If a particular disease is diagnosed by a doctor in one corner of the world, it can be made retrievable and be matched by any other I.M.C.U. at another corner. I.M.C.U. can also be made to send alerts in case of a communicable disease diagnosed in a person. The government will be able to take immediate action to prevent the spread and take necessary measures. Each I.M.C.U can also have its separate database, where the collected patient information in that area will help in researching and identifying the type of problem the people in that area are facing. Further minor surgeries may also be performed by the robots through instructions from the doctor over long distances. A master arm can be attached to the existing I.M.C.U. and the surgery can be performed.

### **VI. Conclusion**

In this paper we have described the telemedicine need in rural areas and also the implementation of technology in the medical field. In countries like India the doctor to patient ratio is very poor. By implementing these kinds of units we can reduce the crowd in hospitals and we can impart good medical care in cheaper cost to all classes of people.

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