Smart Asthma Meter with IoT

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ABSTRACT
This system helps the Asthma patients as well as the doctor to know about the lung capacity of the patient. In this project, we are interested to take a sensor which is a transducer that converts our air pressure into an equivalent voltage level. The transducer used is a DYNAMO which converts the Mechanical energy of the patients blow to electrical energy. Basing on the voltage generated by the patients blow the Peak Time is calibrated and programmed in the MSP – Controller. The controller has Bluetooth drive connected to it which transmits the recorded peak time to the patient’s mobile phone. The application in patients mobile receives the data from the controller, displays it to the patient and updates the values to the IOT framework in built in the application. The IOT framework has been interfaced with the doctor so that he can access the values at any time. It also has the feature to store the recorded values of previous three months.

Keywords— Blow Intensity, dynamo, Internet of things, LCD Display

I. INTRODUCTION

Asthma is a chronic air way inflammatory disease that restricts airflow in lungs through acute reduction of airway by a combination of smooth muscle constriction, swelling, and increased mucus secretion. While there is no cure for asthma, the disease can be controlled by avoiding or removing triggers, closely monitoring lung function, and medication management. The home environment is essential to the prevention, control, and treatment of asthma. Home care includes self-monitoring using peak expiratory flow (PEF) device and a written asthma action plan.

The ASTHMA METER is used to measure the volume of forced exhalation, and is a reliable and objective measure to signify potential onset of exacerbation before symptoms are felt, determine the severity of exacerbations, and evaluate treatment. Existing peak flow meters require the user to remember and follow the procedure to take peak flow measurements and thus have reduced compliance. This system is a low cost, portable, smart phone compatible peak flow meter design that connects to a smart phone through the Bluetooth.

The target audience for ASTHMA METER is low-socioeconomic status patients with asthma, and at risk for depression or anxiety. Lifetime incidences of depression (30.6%) and anxiety (23.5%) among persons with asthma are significantly greater than the incidences among persons without asthma (14.4% and 10.2%, respectively) (Strine et al., 2008). With the help of a custom smart phone application (app) and INTERNET OF THINGS (IoT) technologies, this system will allow patients and their clinicians to monitor patients’ asthma health by tracking asthma-related peak values and how they relate to one another.

The Asthma meter can help patient when his asthma is getting worse. Asthma sometimes changes gradually. His readings may show changes before he feel them. It can allow his health care provider to adjust his treatment to prevent urgent calls to the health care provider, emergency room visits or hospitalizations.

A peak flow meter is not a medicine; hence for most of the people, it has no major side effects. So it is a kind of precaution with no side effects. It encourages patients to self-monitor their asthma health constantly without negligence increase adherence of medication usage depending upon the recorded blow intensities

II. METHODOLOGY

The methodologies used in the system are of three stage. In the first stage the dynamo is interfaced with the controller. And the controller with Bluetooth drive. When the patients blow rotates the fans of the dynamo a voltage is generated and recorded in the controller. The controller transmits the data through the Bluetooth drive connected.
In the second stage the Bluetooth drive will be paired with the Bluetooth of patients mobile and data transmission will be proceeded. The application provides an interface to read the data for the patient and it has code which updates the values to online IoT framework.

In the Third stage the values updated on the link with the android application will be plotted for better reading. This helps the physician to read the values time to time and adjust the prescriptions for better results.

III. PRIOR APPROACH

The existing system available for checking asthma level is PEAK FLOW METER. These Peak flow meters are costly when compared to the cost of ASTHMA METER.

Apart from being costly these peak flow meters are calibrated for only calculating Peak Time and only understandable by a doctor whereas the asthma meter readings can be understandable by everyone when the calibrated readings and their intensities are provided.

The main use of asthma meter is its property of internet of things. This means the doctor can login to the interface provided and monitor any patients asthma levels. This also comes handy in emergency situations whereas the peak flow meter fails at such case.

The interface also has a property to store previously recorded values which the peak flow meter lacks. Using this, the doctor and patient can analyze his progress across the month and change the prescription accordingly.

IV. OUR APPROACH

The new approach for overcoming the defects of peak flow meter is divided into three blocks.

- Patient user interface
- Data user interface
- Doctor user interface

In patient user interface as its name it is placed at patients end. It consists of dynamo, controller, Bluetooth drive, power supply. The dynamo converts the mechanical energy to electrical energy. Basing this mechanical energy form blow of asthma patient is converted to electrical signal and monitored, because blow intensity energy can’t be read. The recorded energy will be transmitted to Bluetooth drive for further transmission.

Data User Interface is present between doctor and patient. It has an android application and IoT framework. The android application records the saved values and updates it to the IoT framework for reading. The IoT framework has database for recording and storing the values. Thus a Patient’s asthma level in last month can also be checked using this.

Hence the peak flow meter allows the doctor to monitor the patient even if he is out of station just through a click which helps the patients under observation to a large extent and peak flow meter doesn’t have this property.

Hence using the asthma meter will be helpful to people with low socio economic status and better prescription yields to lower the costs for the medicines.
Doctor user interface is at doctors level which helps a doctor to see the patients blow levels at anytime. This is done using a web page which has authentications so that only doctor can access it and the IoT framework is linked to it to see the graph plotted from values.

V. TESTING AND RESULTS

1. First the patient need to power on the circuit by connecting the battery to it.
2. Once the Bluetooth is turned ON the application shows us the paired devices in the mobile phone.
3. Select the Bluetooth HC 05 named Bluetooth which is the Bluetooth drive of the circuit.
4. Now that the kit and android mobile are connected the patient need to check the LCD DISPLAY. If it displays a text saying PLEASE BLOW then he can proceed further.
5. Now the patient needs to blow in the pipe mechanism provided with his maximum capacity.
6. The peak voltage and peak time are recorded and displayed at the LCD DISPLAY and the android application provided.
7. The android application updates the values to the IoT FRAME WORK using the link provided.

VI. CONCLUSION

We have designed a circuit which helps asthma patients to monitor their asthma levels regularly without the help of a doctor. It also helps the doctor to read the previous asthma levels of the patient and suggest a better prescription for him. This system is checked for consistency by giving diverse inputs. It has 24 calibrations programmed to MSP controller all of which are below the normal blow levels of people hence it has high sensitivity.

Along with peak value the system also displays the peak time which helps the doctor to reach a better conclusion. The use of Android mobile phones has been increasing rapidly; hence interfacing the circuit with the android device increases its scope to a large extent.

VII. Future Scope

The topic to be researched in future is to increase the sensitivity of the meter to a large extent so that it can replace the huge machines placed in hospitals to check for asthma.

Internet of things is a technology which is going to have its large impact in future hence the project makes
interfaces with new technologies which can be replaced by more newer technologies

REFERENCES