Paralysis Patient Montoring & Health Caring System by Using IoT

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Abstract- *Many individuals with memory/cognitive issues and physical disabilities are required to take a complex daily schedule of medications. Diabetic Mellitus (DM) can greatly reduce the patient's quality of life if left untreated. Traditional insulin infusion techniques' involving a syringe and needle is impractical and unpleasant. Insulin pumps are a great alternative to achieve ease of use and personal comfort. An existing low cost insulin pump is further modified to have additional features to improve user experience. The pump is highly precise delivering accurate quantities of insulin irrespective of external conditions. The invention of insulin pump was a relief for diabetic patients, as they could dispense insulin dosages self-reliantly. The design aspects and architecture of the insulin pump is presented here and using temperature sensor human body temperature is sensed continuously. But it is very expensive for a low earned people to check their health conditions frequently in a hospital. Thus, our goal is to design a device based automatic insulin injection.*

I. INTRODUCTION

1.1 OBJECTIVE OF PROJECT

Diabetes is a chronic metabolic disorder resulting from defects of insulin secretion or action. Insulin secretion is of two types. Type 1 diabetes (T1D) is characterized by a lack of insulin secretion by the pancreas and can be treated by exogenous administration of insulin, while Type 2 diabetes (T2D), whose onset is often facilitated by unacceptable daily habits, e.g., physical dormancy and unhygienic diet, is characterized by an inefficiency in the action of insulin. The concentration of Blood Glucose (BG) approach to exceed the safe range, resulting in hyperglycaemic events that for long term, can lead to solemn damage such as retinopathy and cardiovascular disease or in hypoglycaemic events due to exogamic insulin administration that can be risky in the short term or they can cause coma or even death.

According to the last report provided by the World Health Organization, the number of people with diabetes has risen from 108 million in 1980 to 432 million in 2017, which designates that about 8.5% of adults aged 18 years and older had diabetes, with the prospective of exceeding 500 million cases in 2030. Of note is that 10% of diabetic cases are T1D, a pathology treated through exogenous insulin administrations which requires conscientious management because of the jeopardy of inducing inimical hypoglycaemic events. Diabetes requires 24/7 management, which mainly consists of diet, physical exercise and drug/insulin therapy.

Virtually all of these actions, especially the dosing of drug/insulin. Diabetic a condition in which human body loses its faculty to control the Blood Glucose level to its adequate amount. Glucose is the main source of energy to our body. Carbohydrates, proteins, fats that our body receives through pabulum intake is digested and converted into glucose. This glucose is utilized by body cells for energy and exorbitant glucose should be converted into fat which will be stored in cells. The hormone that avails for conversion of extortionate energy into fat is called insulin, engender by Beta cells of the Pancreas.

Hyper-glycaemia can be controlled by incrementing the amount of insulin injected.

However, this can lower blood glucose too far so Low blood glucose is called hypo-glycaemia, and this is the inhibiting factor in endeavours to control hyper-glycaemia. These problems are overcome in the proposed system. Drug release is the process in which drug convert into suitable product form which is subjected to absorption, distribution, metabolism and excretion (ADME).

1.2 BACKGROUND STUDY

Study 1: The first study is a randomized, double-blind, crossover trial comparing single-dose administration of Gla300 vs. Gla-100 (clinical trials no. NCT01195454) [11]. Briefly, 24 European T1D subjects (17 males, age = 43±10 years; BMI = 25.6±2.0 kg/m2) received single subcutaneous doses (at 9:00 am) of Gla-300, at 0.4, 0.6 and 0.9 U/kg, and Gla-100, at 0.4 U/kg, and underwent a 36-h glycemicclamp after each dosing. By protocol, in the 5-h prior to experiment and during the clamp, glucose infusion was adjusted to achieve the pre-clamp target level (100 mg/dL ± 20%). A variable intravenous infusion of insulin glulisine was given as necessary to maintain the clamp level and was stopped before bolus injection when a stable glucose glycemic clamp level was achieved without glucose infusion for at least 1 h. The blood samples were collected at 0, 1, 2, 4, 6, 8, 12, 16, 20, 24, 28, 32 and 36 h for measurements of serum insulin concentration. For more information about the protocol we refer to [11].

Study 2: It is a randomized, double-blind, crossover trial comparing repeated-dose administration of Gla300 vs. Gla-100 (clinical trials no. NCT01349855) [12]. Briefly, in this multiple-dose tosteady-state study, a total of 30 T1D subjects, grouped in two cohorts (cohort 1 (N=18): 17 males, age = 45±7 years; BMI = 25.9±2.1 kg/m2; cohort 2 (N=12): 11 males, age = 41±10 years; BMI = 24.8±3.2 kg/m2), received once-daily subcutaneous administrations (at around 8:00 pm) of either 0.4 (cohort 1) or 0.6 U/kg (cohort Gla300 for 8 days in one treatment period and 0.4 U/kg Gla-100 for 8 days in the other. A 36-h glycemic clamp procedure was performed after each 8-day period. By protocol, in the 5-h prior to experiment and during the clamp, glucose infusion was adjusted to achieve the clamp level of 100 mg/dL. A variable intravenous infusion of insulin glulisine (at a rate < 1U/h in all cases) was given as necessary to maintain the clamp level and was stopped shortly prior to study treatment administration.The blood samples were collected after dosing on day 8 at 0, 1, 2, 4, 6, 8, 10, 12, 14, 16, 20, 24, 28, 32 and 36 h for measurements of serum insulin concentration. For more information about the protocol we refer to [12].

Study 3: It is a randomized, double-blind, crossover trial comparing repeated-dose administration of Gla300 vs. insulin degludec 100 U/mL (Deg-100) (EudraCT no. 2015-004843-38) [13]. Briefly, in this multiple-dose to SteadyState study, a total of 48 T1D subjects, grouped in two cohorts (cohort 1 (N=24): 22 males, age = 44±10 years; BMI = 25.4±2.5 kg/m2; cohort 2 (N=24): 24 males, age = 41±12 years; BMI = 26.0±2.1 kg/m2), received once-daily subcutaneous administrations (at around 8:00 am) of either 0.4(cohort 1) or 0.6 U/kg (cohort 2) Gla-300 for 8 days in one treatment period and Deg-100 for 8 days in the other. A 30-h glycemic clamp procedure was performed after each 8-day period. By protocol, in the approximately 8-h prior to experiment and during the clamp, glucose infusion was adjusted to achieve a clamp level of 100 mg/dL. A variable intravenous infusion of insulin glulisine was given as necessary to maintain the clamp level and, after glucose being stable for at least 1 h prior to dosing, was stopped at least 20 min before administration of study treatment. The blood samples were collected at 0, 1, 2, 4, 6, 8, 10, 12, 14, 16, 20, 24, 28 and 30 h after dosing on day 8 for measurements of serum insulin concentration.

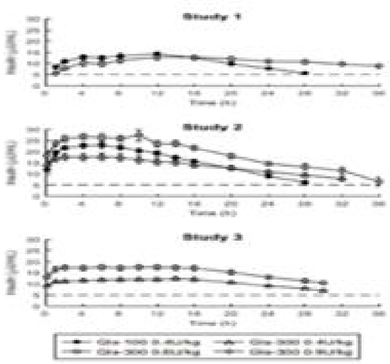


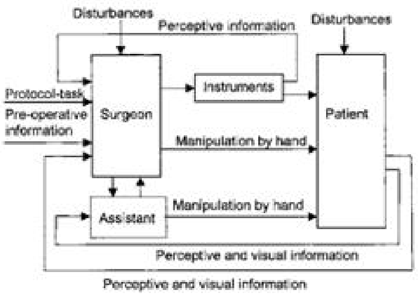
Fig 1.1 Model Graph

1.3 DESCRIPTION OF PROJECT

Automatic insulin delivery system is proposed to overcome the above issues in the traditional devices. This insulin pump is a device looks like pager and it can be fixed at the lower abdomen i.e. waist where the people wears belt. It is a portable device so everyone can easily carry this device. This system automatically delivers the limited dosage of insulin at appropriate time regularly for those taking multiple injections daily.

II. EXISTING SYSTEM

Insulin is typically injected subcutaneously using an insulin syringe which is measured in units of insulin. Injecting a volume of air first equal to the amount of medication to be withdrawn from the vial greatly eases pulling the medication into the syringe. If air bubbles appear in the syringe, tapping the syringe with the needle end held upright is an effective means to move air bubbles to the top where they can be pushed out via the plunger. We have to manipulate by hand. All these process are done in presence of surgeon. Separate instruments to gather the data. It takes more time. It must be in full observation while monitoring. The patient should check the remaining insulin in the syringe to ensure the correct amount of insulin remains in the syringe. Since the aim is to inject the medication in the subcutaneous space4 while at the same time minimizing discomfort, smaller gauge and shorter needles are preferable to decrease the chance of IM injection. Although reuse of either needles or syringes is not recommended, many patients adopt this practice.



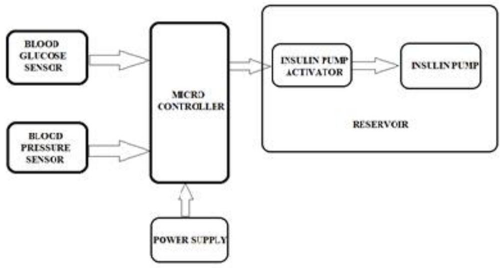
Blocks Diagram .

2.1DRAWBACKS OF EXISTING SYSTEM:

1 High cost of the device which makes it prohibitive for many people.
2 Complicated setup and maintenance procedures.
3 Risk of device malfunction due to technical issues or human error.
4 Risk of data breaches and hacking due to the use of wireless technology.
5 Dependence on continuous access to a reliable power source.
6 Risk of malfunctions due to changes in environmental conditions.
7 Risk of allergic reactions or other medical complications due to incorrect usage

III. PROPOSED SYSTEM

The Simulation of insulin directly into the portal artery while using a subcutaneous path requires to consider the delay in the insulin action to reach the extra cell tissue. This time delay varies from person to person, and even in the same subject, it is variable along the day and depends on other variables like type of exercise and type of meal ingested. There are also a group of patients which glucose level swings quickly from high to low and from low to high. This condition is called "labile" diabetes. These difficulties make hard the algorithm design because an insulin overdose could lead to a hypoglycemic episode. Hypoglycemia leads to loss of consciousness and even death. About continuous glucose monitoring, there are problems of exactness anddispersion in measurements. People have a poor diabetes monitoring and a high risk of developing complications sometimes deadly.

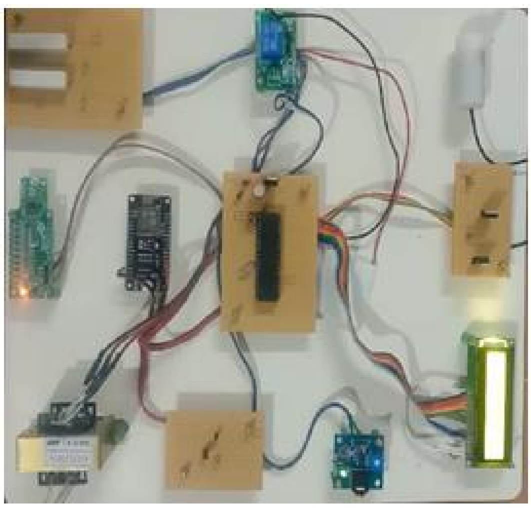


PROPOSED SYSTEM BLOCK DIAGRAM

IV. EXPERIMENTAL SETUP

The system automatically records an average glucose value every 5 minutes for up to72 hours. Results of several finger stick blood glucose readings taken with your glucose meter at different times each day are entered into the monitor for calibration. After 3 days, the sensor is removed and the information stored in the CGM is downloaded into a computer. You and your diabetes educator can then review your glucose levels in relation to the other data collected and make any necessary adjustments in your diabetes management plan. The information will be presented as graphs or charts that can help reveal patterns of glucose fluctuations.A monitors is used to look for trends in glucose levels, like what's happening overnight or high blood sugar levels between meals, or early morning spikes in blood sugar.

It's not meant to replace monitoring your blood sugars with a meter though. The main advantage of continuous glucose monitoring is that it can help identify fluctuations and trends that would otherwise go unnoticed with standard A1C tests and finger stick measurements, and allow you to take action to avoid severe highs or lows.



Together with temperature, pressure is one of the most important physical quantities in our environment. Pressure is a significant parameter in such varied disciplines as thermodynamics, aerodynamics, acoustics, fluid mechanics, soil mechanics and biophysics. As an example of important industrial applications of pressure measurement we may consider power engineering. Hydroelectric, thermal nuclear, wind and other plants generating mechanical, thermal or electrical energy require the constant monitoring and control of pressures: overpressure could cause the deterioration of enclosures or drains and cause very significant damage.As a significant parameter, pressure enters into the control and operation of manufacturing units that are automated or operated by human operators. Pressure measurement is also used in robotics, either directly in controls or indirectly as a substitute for touch (artificial skin for example), for pattern recognition or for determining strength of grip. All these activities require instrument chains in which the first element is the pressure sensor, delivering data relating to the pressure of compressed air, gas, vapor, oil or other fluids, determining the correct operation of machines or systems. The variety of mentioned applications demands a great diversity of sensors. This diversity also derives from the fact that pressure covers a very wide range from ultra-high vacuums to ultra-high pressures. It can be expressed as an absolute value(compared to vacuum) or as a relative value (compared to atmospheric pressure); it can also represent a difference between two pressures or relate to various media and fluids whose physical characteristics (e.g. temperature) or chemical characteristics(e.g. risk of corrosion) are very varied.

S.NO	Existing System	Proposed System
1	High Power Consumption	Low Power Consumption
2	IoT Not Interfaced	IoT Interfaced
3	High Cost	Low Cost
4	Not Compact	Compact Size
5	It Will Make Pain	No Pain
6	It is Operated Manually	It Operates Automatically

COMPARISON OF PROPOSED SYSTEM WITH EXISTING SYSTEM

Result& Discussion:

Result: The use of automatic insulin injection using IoT has the potential to significantly improve the quality of life of people with diabetes by providing them with an easier and more reliable way to manage their condition. It eliminates the need for manual injections, which can be time consuming, painful, and can lead to inaccurate measurements. Furthermore, since the IoT device can connect to a cloud platform, it can be used to monitor the patient’s glucose levels in real time, alerting them when their insulin levels are too high or too low.

Discussion: While automatic insulin injection using IoT is a promising technology, there are still some challenges that need to be addressed. Firstly, there is the issue of privacy, as it is necessary to ensure that the data collected by the device is secure. Additionally, the reliability of the device needs to be tested in order to ensure that it is capable of providing accurate readings, as this could have a significant impact on the health of the patient. Finally, there is the challenge of cost, as this technology is still relatively new and may be expensive for many people to access.

V. FUTURE SCOPE

- The future scope of Automatic Insulin Injection using PIC Controller is vast. The probabilities are endless. One potential area of improvement is the use of Artificial Intelligence (AI) to make the machine even more efficient.
- AI can be used to detect patterns in the patient's glucose levels in order to expect the need for insulin and adjust the dosage accordingly. By adding Meta system, it will fully automated and controlled by AI. The Meta Technology will shows the data’s of patient in mobile, tab , laptop or other web applications and meta glass.
- In Future, this project is established and operates by mobile and laptops, Patient movement and store the datas of patient in cloud by use of IoT or AI Technology.

VI. CONCLUSION

The prototype of a low cost insulin pump based on MEMS was developed. The Android application along with the database ensures easy access of data and pump usage for both doctor and the patient respectively. The pump was put through numerous experimental iterations and proved to be highly accurate with respect to the injected insulin dosage. The pump being compact and light weight can be easily worn.

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