Smart IV Drip Management And Auto-Refill System

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Abstract- *Innovation and invention of various clinical care units in hospitals and nursing units are greatly challenged by the development of biomedical engineering devices. Hospitals still require automated systems because of their enormous patient volume and nursing facilities. As the population grows, so does the demand for healthcare equipment and maintenance, making it necessary for everyone to take care of their health in a safe manner. Numerous automated health monitoring tools are being created these days to protect patients and ease physician burden. As technology has grown, numerous sophisticated methods have been developed to ensure that hospital patients recover quickly.Injecting intravenous fluids, medications, blood, or blood products straight into a vein is known as intravenous therapy. It is generally necessary to measure and regulate the flow of saline or intravenous fluids. This study proposes a single window solution for fully automated continuous monitoring, fluid flow control, and automatic saline container change based on Android and IoT. The fully automated way of monitoring the IV fluid feeding system will be made easier for nurses and caregivers in the future.*

Keywords- Intravenous fluid flow, Arduino, Android, IoT, and saline fluid flow.

I. INTRODUCTION

Automated teller machines, self-checkout at airports, mobile phone-operated temperature controllers, automated vehicle parking assistants, and many other technologically controlled routines are examples of how automation plays a significant role in human existence in modern times. However, the impact of automation is still being felt in a number of industries, including banking and healthcare. It's critical to understand the necessity of healthcare devices in the nursing care and senior care nursing systems. The field of health care monitoring has seen a significant transformation thanks to the development and design of smart health care gadgets. The growing competition in the development of medical devices lowers costs, which speeds up production, and the field's adoption of automation also reduces waste in healthcare delivery.The elderly population with health issues needed a lot of nursing care and medical personnel, but it was unable to keep up. The present decline in nursing shortages in many nations is expected to result in a sharp rise in nursing units in recent years. Inflation is caused by the way hospitals manage their finances, which includes budgeting for salaries and perks. the difficulties facing the healthcare sector and the need for researchers to use the most recent and available technologies in a creative way at a lower cost. By creating new technological innovations, the majority of industries today are demonstrating a greater interest in the health of the populace.Due to a lack of healthcare professionals, the large patient population cannot be continuously monitored and checked. Healthcare management is now sustainable, scalable, and viable for growing populations thanks to automation.

II. LITERATURE REVIEW

1. **Iot-Based Saline Level Monitoring System.**

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Abstract: Saline treatments for dehydration and other medical conditions are frequently used during the course of medicine to help patients feel better. Nursing staff must constantly monitor the saline level when patients are fed with saline. Patients are frequently injured as a result of staff negligence because they fail to recognize when the saline level in the container has reached its maximum. There are many cases where patients are being harmed due to the staff's inattentiveness, as their absence does not notice the completion of the saline level in the container. As soon as the saline in the container is finished, an issue with blood backflow occurs. So, an IoT-based saline level monitoring system was created to prevent injury to the patient. The suggested variant has a sensor built in that continuously detects the saline droplets. In order to keep track of patient safety, the sensor buzzes the medical staff whenever it fails to detect drops for a predetermined amount of time.

2. **Saline Level Monitoring Using Iot.**

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Abstract: This paper deals with cost effective, reliable and automatic saline flow monitoring system which can be easily implemented in any hospital and can be easy for doctors as well as nurses to monitor the saline flow from a distance. The proposed system eliminates continuous on sight monitoring of patient by nurses or doctors. The system can be made available at very low cost. The same circuit can be reused for another saline bottle giving only one time investment.

III. METHODOLOGY

The concept of saline flow monitoring and control in single window IoT system has an advantage for monitoring multiple intravenous liquid flow access and control in a simultaneous process. The system is reliable, cost effective which has a saline monitoring transmitter parts with Arduino UNO as a major controller.

3.1 Existing approach:

In the present health care systems nurses are responsible for taking care of patients. They are the one who monitors the saline level and uses roller clamp for controlling the flow of saline manually. When the clamp is rolled in upward direction it compresses the tube and stops or slows the saline rate. If it is rolled in downward direction it releases the tube and increases the fluid rate. In the present world there exists no system which will reduce the dependency of nurses in monitoring the saline levels. Thus there is a need for development of automatic saline level monitoring system.

3.2 Proposed System:

Based on the comment programmed by the programmed, the system will control the flow rate automatically. A flow sensor is developed and employed in the drip chamber of the electrolyte bottle in-order to determine the circulation rate of the electrolyte. Here three electrolyte bottle is used to provide an uninterrupted flow for patients. A level sensor will sense the saline level of the bottle and then transmits the data signal to Arduino. If the level in one bottle gets over it will be turned off and another bottle gets turned on using solenoid valve. The solenoid valve will be controlled by the Arduino. Here four solenoid valve is used. If the flow of the fluid is unable to stop then there is a high probability of the liquid to be returned back to the body. The main intension of this project to close the forth valve automatically without any human operator. The flow time and the rate of flow will be set using keypad. The commencing time of the electrolyte, rate of flow, patient abnormalities will be monitored by the doctor using IOT. The flow sensor is used to know the exact electrolyte flow from the electrolyte bottle. Here MEMS sensor used to monitor the patient status, if any abnormalities occurred in the patient, MEMS sensor will detect and microcontroller then the controller will stop the flow of electrolyte.

IV. HARDWARE COMPONENTS

The Automated Saline Flow Control and Container Switching Device consists of the following components:

1. Arduino Uno.
2. Power Supply.
3. Lcd Display.
4. Keypad.
5. Level Sensor.
6. MEMS Sensor.
7. Servo Actuator.

V. EXPECTED OUTCOMES

The performance of the proposed system was experimentally executed with a complete hardware setup, android application and a cloud storage. If a patient is admitted for an emergency medication due to sick condition, the first level of treatment is intravenous fluid for balancing the fluid level of the body or to compensate the body fluid to immune. When IV is used the saline bottle hanged should checked frequently the level of the bottle. It is difficult to monitor the flow at all times, due to insufficient nursing. So a system is designed to transmit the data of flow level of the saline bottle and electrolyte flow rate to a centrally controlling and monitoring unit in nursing station. If multiple saline fluid bottle is used for continuous saline flow or mixing of different intravenous fluid for same patient.

The bottle changer in this system will change the bottle automatically without any nurse interaction. In this developed model the multiple fluid can be mixed with proper ratio and proportion automatically programmed. Internet of things application and websites stores the commencing time of the electrolyte, rate of flow, patient abnormalities will be monitored by the doctor using IOT. The applications and the websites has a separate username and password so that only can access their medical details. The location can also be upload in the application and their profile can be customized by the user. The complete hardware prototype experimental setup of saline flow monitoring and container changing system which consists of solenoid valves with control module using Arduino controller and transmitting and receiving unit.

A. **ADVANTAGES**

1. Real time level monitoring and its display on LCD.
2. No need to attention on saline bottle.
3. The cost involved in developing the system is significantly low and is much less than the cost of gas detectors commercially available in the market.

B. **DISADVANTAGES**

1. Requires regular maintenance and calibration.
2. High maintenance costs.
3. Power failure could interrupt operation, risking patient safety unless there's a backup system.

VI. CONCLUSION

IoT based electrolyte monitoring system, the manual operation of the nurses is saved. As the entire proposed system is automated, it requires very less human intervention. It will be advantageous at hospitals there will be no such requirement for the nurses to visit patient bed instantaneously to check the electrolyte in the bottle. An alert notification will be sent to the nurses, doctors, caretakers, when electrolyte reaches the critical level. It will save the life of the patients. This automatic electrolyte level monitoring system provides more flexibility to the doctors, thereby the patients caring is enhanced. Hence its saves lots of time for doctor or nurse who is on duty. It also proposes system which can automatically monitor the electrolyte flow by using microcontroller. Both electrolyte flow time and flow speed are controlled by providing commands via keypad. This system check the purity of electrolyte. In case of any abnormalities occurred in the patient, such data can send the information to the nurses or doctors mobile and they can stop the fluid, such things required security password also. This system is reliable, cost effective and convenient for nurses. The saline monitoring system employed for not only to monitor the saline status but also to control the drop rate of the saline, which can be decreased as per the need. The system can further be improved in future for multiple patients with a single web application through which we can monitor the saline status of multiple patients and control their drop rates remotely.

VII. FUTURE SCOPE

1. It can send the wireless messages to doctors and nurses about the saline droplet rate.
2. It can also include the smart health system, which gives the information about body temperature, blood pressure, heart rate and also the pulse rate. This help in deciding whether the patient requires another saline bottle or not.

REFERENCES

[1] “Fully Automated Single Window Saline Fluid Flow Control and Automatic Container Changing System” S.Velmurugan, L.Raja, G.Shanthi, S.Nirmala, 2021 7th International Conference on Advanced Computing & Communication Systems (ICACCS), 2021 IEEE.

[2] Arunava Biswasl, Romil Royl, Sourya Bhattacharyya, Deepak Khaneja, Sangeeta Das Bhattacharyal, and Jayanta Mukhopadhyay “Android Application for Therapeutic Feed and Fluid Calculation in Neonatal Care - A Way to Fast, Accurate and Safe Health-care Delivery”. IEEE International Conference on Bioinformatics and Biomedicine (BIBM) 2016.

[3] D Kothandaraman, M Sheshikala, K Seena Naik, Y Chanti and B Vijaykumar 2019 “Design of an Optimized Multicast Routing Algorithm for Internet of Things”, International Journal of Recent Technology and Engineering (IJRTE) 8(2) 4048-4053.

[4] “IoT based saline level monitoring system”, G. Sunil1,6, Srinivas Aluvala2,6, G. Ranadheer Reddy3, Vedantham Sreeharika4, Parupally Sindhu5, and Sriramula Keerthana5, Department of Computer Science and Engineering, Sumathi Reddy Institute of Technology for Women, Warangal, Telangana, India.ICRAEM 2020, IOP Conf. Series: Materials Science and Engineering 981 (2020) 032095, IOP Publishing.