IOT BASED AUTOMATIC INTRAVENOUS BAG MONITORING AND ALERT SYSTEM

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Introduction

Saline, one of the most widely used intravenous (IV) medications, is essential in the treatment of critically ill patients. Monitoring the level in the saline bottle is crucial because blood flows when the bottle is empty and the needle is still near the vein into the bottle from the outside. Whenever a patient is given saline, the patient is closely watched by a nurse or other family members. Mostly due to carelessness, lack of focus, busy schedule and increasing number of patients, nurses forget to replace the saline bottle as soon as it is completely consumed.

Due to the pressure difference between the empty saline bottle and the blood, the blood returns to the saline bottle immediately after the saline is exhausted. This allows their veins to reverse blood flow to the saline vessel. This causes the patient's haemoglobin levels to drop, and can also cause a shortage of red blood cells (RBCs) in the patient's blood, causing them to feel tired. Therefore, a saline level monitoring system must be created to somewhat reduce the patient's dependence on nurses or other caregivers. This system uses an automatic warning and signalling device based on Arduino.

Objectives

- This IoT Intravenous Fluid Monitoring uses a weight sensor to detect as the fluid level in the IV Infusion bottle. Once the system detects that the bottle has gone empty, it sends an alert notification via SMS to the nurse or the caretaker.
- This project will provide alert notification three times, first one indicating that the bottle is full, second time indicating that the bottle is 50% and the last notification which indicates that the bottle is 20% and must attend the patient.
- Our project aim is to avoid fatal accidents that are caused due to ignorance of the caretaker which will result in injuries such as the flowing back of blood through the catheter once the bottle is empty and may also result in death.

Methodology
- IV drip monitoring system uses Arduino Mega, the board can be employed to interface with sensors and control mechanisms for monitoring and regulating the intravenous (IV) fluid infusion.
- The HX711 is a precision 24-bit analog-to-digital converter (ADC) designed for weighing scales. It is commonly used to interface load cells with microcontrollers like Arduino for accurate weight measurements.
- GSM SIM 900a module allows electronic devices to communicate over cellular networks can be used to send and receive SMS messages.
- Load cell in a transducer which converts mechanical force to electrical units.
- 16x2LCD Display is used to display the load of the saline bottle and the second line will display three messages one is full, medium or low.

    The working of this project is firstly the IV bottle will be placed on the load cell, the load cell will take the weight and send the electric frequency to HX711 Amplifier, This Amplifier will convert the frequency to a physical measurement and send it to the Arduino, then Arduino will instruct the GSM Sim Module to send message and will display the level and weight of the IV bottle

Results

This project result is SMS message being sent to the nurse or the caretaker of the level of fluid in the IV bottle, Indicating that if the bottle level is low they should immediately attend the patient and the LCD Screen will also display the level and weight. We have implemented three levels being high, medium and low, when the level becomes low SMS is sent immediately.

Conclusion
- Intravenous (IV) drip monitoring systems play a critical role in ensuring the safety and efficacy of patient treatment.
- The use of an Intravenous Bag Monitoring system can help healthcare providers to monitor the status of intravenous therapy in real-time and take appropriate actions if any issues arise.
- They can help reduce the risk of medication errors, improve patient outcomes, and reduce healthcare costs.
- By providing real-time monitoring of intravenous therapy, healthcare providers can quickly identify and respond to issues, such as changes in fluid levels, that could negatively impact patient care.

Innovations

    The IoT-based automatic intravenous (IV) bag monitoring and alert system revolutionizes patient care by integrating real-time fluid level monitoring with smart alert mechanisms. Utilizing sensors, wireless communication, and IoT connectivity, the system continuously tracks IV bag status and sends immediate notifications to healthcare providers when fluid levels are low, thereby preventing risks like air embolism. This innovation enhances patient safety, reduces manual workload for

medical staff, and improves operational efficiency through timely alerts and data-driven insights, ultimately leading to better patient outcomes and optimized resource management in healthcare facilities.

Future Scope

- Wearable Devices: Integrating IoT sensors into wearable devices, such as smartwatches or patches, can offer continuous monitoring of fluid levels outside of clinical settings. This approach enhances patient mobility and comfort while providing healthcare providers with real-time data insights.

- Biometric Authentication: Implementing biometric authentication features, such as fingerprint or facial recognition, ensures secure access to patient data and prevents unauthorized tampering with the monitoring system. This enhances data integrity and patient privacy.