

SECURE FLOW - “A Life Saving Intravenous Drip System”

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Abstract - Intravenous (IV) therapy is a common medical procedure that involves the delivery of fluids, medications, or nutrients directly into a vein. Intravenous drips are often used in hospitals and clinics to treat a variety of conditions, including dehydration, sepsis, and chemotherapy. Traditionally, Intravenous drips are controlled manually by healthcare professionals or nurses. In recent years, there has been growing interest in the development of automated Intravenous drip systems. These systems can help to improve the accuracy, efficiency, and safety of Intravenous therapy. The system “Secure flow” is proposed to use solenoid valve to control the flow of fluid, and the load cell is used to measure the weight of the Intravenous bag. If the weight of the Intravenous bag decreases below a certain threshold, the solenoid valve is activated to stop the flow of fluid and also sends an alert notification to the registered number. It also has a potentiometer which can be used to adjust the preset value of the liquid in the solenoid to flow through the patient’s body. Overall, this system has the potential to improve the safety, efficiency, and accuracy of Intravenous therapy. This system can be a valuable tool for hospitals and clinics that are looking to improve the quality of care that they provide to their patients.

1. INTRODUCTION

Intravenous (IV) drip and its working plays a very important role in the field of healthcare as it is used in everyday basis in hospitals. Intravenous therapy is administering fluids directly into a vein. It benefits treatment by enabling medication, blood, or nutrients to access the body faster through the circulatory system. During the procedure, a healthcare professional will insert a cannula (Fig 1.1) into a person’s vein, usually in the crook of their arm.



Fig 1.1 Cannula

Even though it has so many advantages, the Intravenous drip complications are enormous and needs to be rectified and looked into providing an affordable unit. Keeping the Intravenous drip for long term in the patients arm even after the liquid in the bottle is over can cause reverse flow of blood, blood clots, infections & air embolism.

2. PROBLEM STATEMENT

During Intravenous Drip for any patient, a caretaker or a nurse is necessary to be present to monitor the flow of fluids and to remove the Intravenous injection to halt the process. If not, it leads to severe conditions such as reverse flow of blood from veins and venous air embolism.

Reverse flow of blood, i.e., the patient’s blood would start to flow through the Intravenous tube in the reverse direction, towards the empty Intravenous bag. It is due to the pressure of blood in the human body is more than the pressure experienced by the empty Intravenous bag. Thus, it leads to blood loss and pain. Venous air embolism occurs when the air bubbles enter a vein.

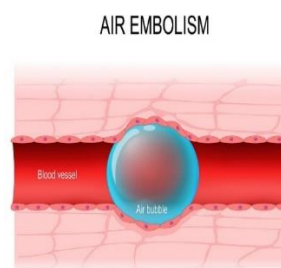


Fig 1.2 Air Embolism



Fig 1.3 Reverse Flow of Blood

3. OBJECTIVE OF THE PROJECT

The main objective of the proposed system is:

1. To provide secure intravenous therapy of the patients by eliminating complications with air embolism in blood veins.
2. To prevent reverse flow of blood by blocking the valve of the electrolyte bottle & to allow the flow of fluid for required quantity
3. To alert the nearest caretaker or nurse for the removal of the intravenous drip from the patient’s arm to

prevent allergies or infections.

4. METHODOLOGY

In the proposed system, Central to its design is a solenoid valve that functions as a failsafe, automatically blocking the IV drip pipe when the fluid supply is depleted, thus preventing the inadvertent delivery of air or inaccurate dosages. Complementing this, a potentiometer provides a user-friendly interface for setting the desired flow rate or volume of fluid to be dispensed, offering flexibility and precision tailored to individual patient needs. An integral aspect of the system is its alert mechanism, which promptly notifies caregivers when critical conditions are met, such as low fluid levels or completion of the preset infusion volume, ensuring timely intervention and continuity of care.

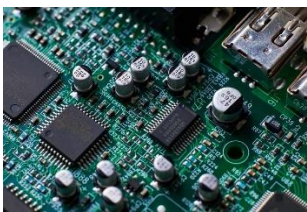
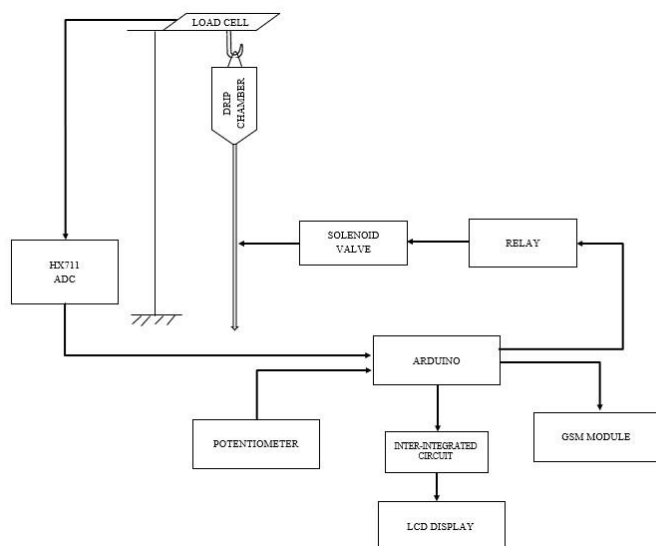


Fig 4.1 Embedded systems



Fig 4.2 Internet of Things

5. BLOCK DIAGRAM



6. WORKING

The proposed system is designed to automate the process of intravenous (IV) therapy by monitoring the weight of a saline bottle using a load cell. The system consists of several components working together to ensure the safe and efficient administration of fluids to patients.

Firstly, the load cell measures the weight of the saline bottle. This weight measurement is compared to a predefined threshold value, which can be adjusted using a potentiometer. If the weight exceeds the threshold value,

indicating that there is sufficient fluid in the bottle, the solenoid valve connected to the bottle's pipe is opened. This allows the fluid to flow through the patient's body, facilitating the IV therapy.

As the fluid is administered and the weight of the saline bottle decreases, the system continuously monitors the weight. When the weight falls below the threshold value, suggesting that the bottle is nearly empty, the solenoid valve is closed. This action stops the flow of fluid to the patient, preventing overdosing or interruption in therapy due to an empty bottle.

Additionally, the system incorporates an alert mechanism to notify the concerned person with a registered mobile number when the fluid level in the bottle reaches a critical level. It sends the alert notification with the help of the GSM module. This ensures timely intervention and allows for the necessary actions to be taken, such as refilling the saline bottle or halting the IV therapy if needed.

7. CONCLUSION

The project "SECURE FLOW: A life saving Intravenous Drip" is a significant advancement in healthcare technology. The proposed project addresses critical issues surrounding Intravenous (IV) drip therapy, aiming to enhance patient safety and minimize complications associated with the IV therapy. The objectives of the project underscore its commitment to secure IV therapy by implementing measures to block reverse blood flow, alert caretakers or nurses when intervention is required, and ultimately improve patient outcomes. By integrating a solenoid valve into the Intravenous drip system, control of the fluid flow is achieved, improving patient safety and treatment accuracy. Automating the Intravenous drip process not only enhances patient safety but also optimizes healthcare efficiency. By reducing the need for manual adjustments and constant supervision, healthcare professionals can focus on other critical tasks, leading to improved patient care and overall workflow. Furthermore, the automated Intravenous drip system can be connected to centralized healthcare systems, enabling seamless integration with patient records and facilitating data analysis.

In conclusion, the objective of this project has been accomplished with the help of Embedded Systems. The developed system reduces the Intravenous drip complications such as air embolism in blood veins, reverse flow of blood and blood clots.

8. REFERENCES

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