ABSTRACT

This study aims to implement an infusion fluid monitoring and control system based on NodeMCU ESP32 technology. This system is designed to monitor and control the flow of infusion fluids in real-time to improve efficiency and safety in the use of infusion fluids in medical facilities. Internet of Things (IoT) technology is applied to integrate hardware such as fluid flow sensors and optical sensors with a website-based platform and mobile application. This allows medical workers to monitor remotely and provide automatic notifications if abnormal conditions are detected or the volume of infusion fluid is almost empty.

This system has advantages over conventional systems because it is able to combine monitoring, control, and notification functions in one integrated cloud-based platform, by utilizing Firebase as a real-time data storage and exchange center. This system relies on various main components, such as NodeMCU ESP32 as the main controller, optocoupler sensors to detect drip rates, and servo motors to automatically regulate fluid flow. All data collected is sent to Firebase and can be accessed in real-time by users via the website or mobile application.

With a modular design, this system is also easy to calibrate and maintain, thus supporting reliable operational continuity in the medical environment. The test results show that the application of IoT technology to this infusion system can improve the accuracy of fluid administration, reduce the potential for human error, and optimize the workload of medical workers. With automation and early detection features, this system is able to support improving the quality of patient care and is a cost-effective solution to be implemented in various health facilities.

Keywords: Infusion, IoT, NodeMCU ESP32, Firebase, real-time monitoring and control.