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OPTIMIZING PATIENT CARE SYSTEM BY IMPLEMENTING PHARMACY ROBOT AND MEDICATION DISPENSING TECHNOLOGY

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ABSTRACT

Hospital pharmacies play a vital role in ensuring patients receive correct and timely medication. But, the increasing number of prescriptions places significant pressure on pharmacy staff, reducing the time available for individual prescriptions and increasing the risk of human error. To overcome this issue, robotic-assisted pharmacy systems have been introduced to automate drug distribution and enhance medication safety. Pharmacy automation, including automated and semi-automated drug distribution systems (DDSs), helps and streamlines the medication dispensing process, reduces errors, optimizes time management, and lowers operational costs. By integrating robotics into hospital pharmacies, healthcare facilities can ensure that medications are dispensed accurately and on schedule, following healthcare professionals' instructions. This paper systematically reviews the implementation of automated and semi-automated DDSs in hospitals, which not only minimizes risks associated with manual handling but also allows pharmacists to focus more on patient care rather than administrative tasks. As healthcare demands continue to grow, adopting robotic-assisted pharmacy solutions is becoming essential for improving patient safety and enhancing the overall efficiency of hospital pharmacy operations.

Keywords: Automated Drug Distribution, Enhance Medication Safety, Robotic-assisted Pharmacy, Reduces Errors, and Optimized Time Management.

I. INTRODUCTION

The primary objective of a hospital pharmacy is to ensure that patients receive their prescribed medications accurately and in a timely manner, in accordance with healthcare professionals' instructions. However, achieving this goal is increasingly challenging due to increasing patient numbers and the potential for human error in medication dispensing. Errors such as incorrect dosages or delays in medication administration can have serious, even fatal, problems. Additionally, hospital pharmacies face logistical complexities due to the diverse methods and delivery routes required for dispensing medication to various hospital units.

Technological advancements have played a crucial role to overcome these challenges. Various technologies within the hospital pharmacy framework aim to enhance patient safety by reducing prescription errors and medication shortages. One of the most significant innovations is the implementation of pharmacy robots, which have revolutionized hospital pharmacy operations. Pharmacy robots demonstrate near-flawless precision in medication administration, significantly minimizing human error. By employing sophisticated algorithms, these systems uphold the "five rights" of medication administration: ensuring the correct patient receives the correct medication and dosage via the correct route at the correct time.

The integration of robotic systems in hospital pharmacies has led to notable improvements in efficiency, reducing dispensing times, costs, and medication wastage. Additionally, these systems contribute to advancements in pharmaceutical and biological research by enhancing accuracy and resource management, inventory management. This introduction explores the impact of automation, particularly pharmacy robots, on hospital pharmacy operations, features their role in improving patient safety, reducing errors, and optimizing logistics. Moreover, the challenges associated with their implementation and the future potential of automated pharmacy systems will be discussed.

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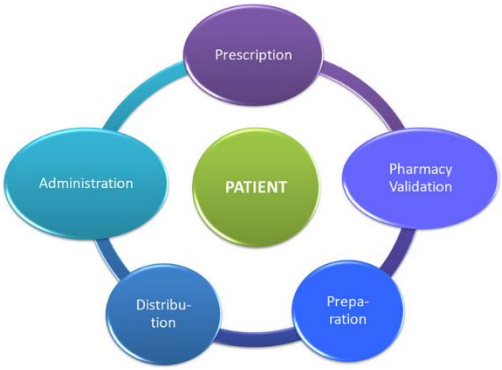
II. METHODOLOGY

Introducing a new generation of pharmaceutical robotics. This new technology offers faster, more robust and greener services than classic solutions. This concept will surpasses human invention. This fact represents a new paradigm between classical architecture and this new architecture robot control area. The current work system in the hospital today is computerized as tables and other necessary drugs are arranged on racks and shelves, these numbers are accessed by software on the computer that can only be accessed by human intervention. Another way robots can handle this process is by user itself in the hospital where the robots receive input from them. This complete system is majorly divided into 3 different steps:

1. Web development - Web development plays a crucial role in automated pharmacy systems, which enables features like online medication ordering, real-time inventory tracking, and secure e-prescription processing by doctors which ultimately streamlining operations and improving patient care and safety.

2. User interface (UI) - In automated pharmacy systems, the UI (user interface) is crucial for pharmacists and technicians to interact with the system to dispense medications, manage inventory and access patient information, ensuring accuracy, efficiency and safety

3. Back end Control - In an automated pharmacy system, back-end control include managing the core processes and data that support medication dispensing, commands to robotic arm, inventory, and patient information which ensure accuracy, efficiency.



III. MODELING AND ANALYSIS

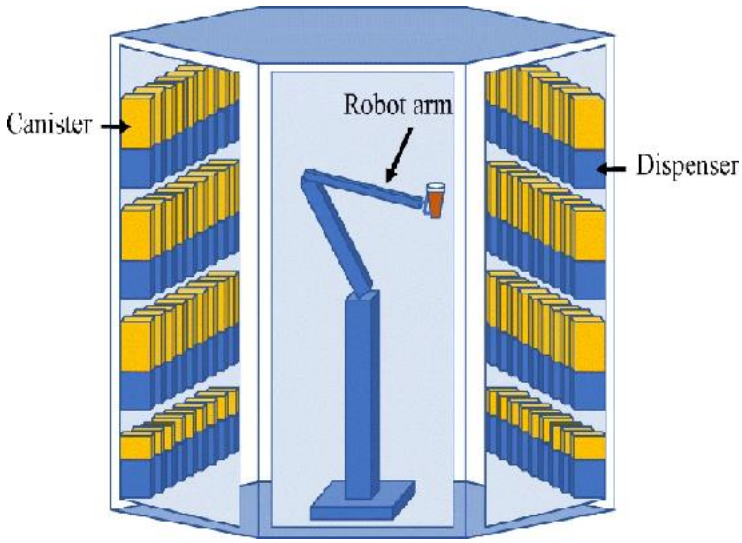


Figure 1: Model of Drug Distribution System (DDS).

In Proposed system different hardware components like Arduino Board, Node MCU, Motors, Barcode reader can be used. Along with this some softwares like Arduino IDE can be used for programming.

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IV. RESULTS AND DISCUSSION

The implementation of the robotic drug dispensing system had a significant impact on the pharmacy's operations. It improved medication dispensing accuracy and reduced dispensing time, leading to faster medication delivery to patients. It also reduced the risk of errors and increased patient safety. The system was able to fill up to more prescriptions per hour, which was a significant improvement over the manual process. It also reduced the need for manual labor, which allowed pharmacists to focus on other tasks such as patient counselling and medication therapy management. The system also had a positive impact on patient satisfaction. Patients reported receiving their medications faster and with greater accuracy, which led to increased confidence in the pharmacy's services.

V. CONCLUSION

In conclusion, automation and robotics in pharmacy aim to improve efficiency, accuracy, and patient care while adhering to strict safety and regulatory standards. These technologies have become essential in modern pharmaceutical practice, shaping the future of pharmacy services and drug manufacturing. The integration of automation and robotics in pharmacy practice represents a transformative leap towards efficiency, accuracy, and patient-centered care. As pharmacists embrace these technologies, they have the opportunity to redefine their roles as healthcare providers who leverage cutting-edge tools to deliver exceptional patient experiences.

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