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# Pharmacists as Patient Advocates: Enhancing Medication Adherence and Health Outcomes

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**Abstract:** *This is a study of the pharmacists who are the advocates of patients' health. The study deals with enhancing medication adherence and improving the health outcomes of the patients. Using technology this can be done easily. Technologies such as Electronic Prescription Service (EPS) and Robotic Process Automation (RPA) provide efficiency to operations. The several benefits of automated dispensing have also been covered along with a drawback of using this technology. The benefits to the patients and pharmacists come with a reduction in dispensing errors and overall improved healthcare. Lastly, the study gives future research directions with fields to work towards.*

**Keywords:** *Robotic Pharmacy, Automated Dispensing Systems (ADS), Robotic Dispensing Systems (RDS), Electronic Prescription Services (EPS), Artificial Intelligence (AI), Augmented Reality (AR).*

## 1. INTRODUCTION

### 1.1 Background

The UK has always been a country that focuses on its people. To take care of their health is a duty of a country and to improve the conditions of its patients the country has taken several steps in the healthcare and medication field. The Electronic Prescription Service (EPS) is used to automatically dispense the medicine required by the patient and makes the process of prescribing and dispensing efficient. In the year 2023, more than 91% of the UK's prescriptions were by EPS [1]. Technology can help the pharmacy sector in the UK to grow further. Pharmacists in England lack digital resources [2]. The UK needs to implement technology in Medication Adherence.

### 1.2 Purpose

The study focuses on the aspect of pharmacists and how they can play a much better role in making sure that patients are adhering to their medical regime and thus help in the betterment of the overall health outcome of the state.

## Literature Review

### 1.3 Robotic Pharmacy and Augmenting Service of Pharmacy

The term robotic pharmacy refers to automated or any kind of robotic dispensing systems to make use of technology in the tasks related to pharmacy. The future of robotics in pharmacy is very engaging. Routine tasks are automated by AI and robotics, which improves patient care and lowers costs while increasing the efficiency of healthcare delivery [3]. Further, another field where technologies are having a big impact is pharmacy robotic process automation (RPA). Data entry and back-office tasks, among other manual, repetitive, time-consuming, and highly structured tasks, are automatically handled by RPA software.

The robotic pharmacy is a solution to very effective pharmacy solution. A study revealed that the robotic pharmacy led to a decrease in wait time, improvement in patient satisfaction, and productivity gain for pharmacists [4]. The systems of the facility must also be completely integrated with the automated solutions to fully benefit from the improved system.

### 1.4 Principles and Mechanisms of Automation and Robotics in Pharmacy

There are five major principles of automation and robotics in pharmacy which are “Integration, Accuracy and Safety, Compliance, Data Management, and Cost-effectiveness”. Systems are made to fit in perfectly with the workflows of the pharmacies already in place, causing the least amount of disturbance and increasing productivity. Moreover, accuracy and safety are to improve the safety of the patients by reducing mistakes made while preparing and administering medication. Furthermore, automated systems follow strict legal guidance which guarantees that the pharmacies fulfil the quality standards. Data management is how systems gather information, evaluate and use it to help make decisions, manage inventory, and enhance overall patient outcomes. Lastly, cost-effectiveness also happens through labour cost reductions and the avoidance of mistakes that could have expensive repercussions [5].

The mechanisms of automation in robotics include various aspects. Automated Dispensing Systems (ADS) handle medication inventory, ensuring that the right drugs are available for dispensing. They can also provide medication labels and instructions to patients. Robots compound sterile medications to guarantee precise dosages and reduce the possibility of contamination. Automation makes it possible to remotely verify prescriptions and provide patient counselling through telepharmacy, which involves expanding pharmaceutical services to underserved areas. Prescription filling, medication interactions, and patient profiles are all handled by pharmaceutical management software, which improves pharmacy operations. Medication packaging and labelling can be done automatically by machines, which reduce the need for human labour and the chance of error. Pharmacy robotic systems can handle prescription vials, precisely dispense medication, and even instruct patients.

### 1.5 Pharmacy Robotics Usage and Improved Patient Outcome

The robotics usage in the pharmacy is very much looked into in today’s date with the increase in the technological advancements in this era. The systems run by robots in a pharmacy such as robotic dispensing systems (RDS) are part of the reason for the improved health conditions of the patients as it reduces errors in medicine dispensing. It has been observed that the technology of medication dispensing has enhanced self-reported physical and mental health

and reduced the frequency of hospitalisations, ER visits, and physician appointments [6]. Thus, improved health conditions are observed by the use of pharmacy robotics.

### **1.6 Automation in Medication Dispensing**

In the UK previously there has been a mixed dispensing profile due to the NHS Trusts (now CCGs - Community Care Groups) that operated in the UK. Now the country is using more Electronic Prescription Services (EPS) and it has increased the efficiency, effectiveness, and accuracy of medication dispensing. The UK is leaning towards the usage of robotics systems even though there are not many outcomes of their use, but the improvement in the dispensing efficiency and reduction in dispensing errors have led to the decision [7]. Thus, the country is moving towards utilising the technology of automated dispensing cabinets (ADCs).

## **2. RELATED WORKS**

**The Related Works for the Study Were as Follows:** “Innovative robotic technologies and artificial intelligence in pharmacy and medicine: paving the way for the future of health care—a review” by M. Stasevych and V. Zvarych.

“Robotic pharmacy implementation and outcomes in Saudi Arabia: a 21-month usability study” by [4] H. Momattin, S. Arafa, S. Momattin, R. Rahal and J. Waterson.

“Pioneering Pharmacy Practice: The Integration of Automation and Robotics for Enhanced Patient Care” by S. K. Munjaji, K. S. Santosh, M. Ameen and J. Ahmad.

## **3. METHODOLOGY**

This study uses qualitative research methods for the researching purpose along with quantitative secondary research methods. For the analysis of the study thematic analysis is done. Thematic analysis is a way to analyse the qualitative data such as articles that are selected in the study. The approach of the research is problem-oriented and it used secondary research methods of both qualitative and quantitative data. So the study follows Pragmatism research philosophy.

## **4. RESULTS AND DISCUSSION**

### **4.1 Strategies Employed by Pharmacists for Patient Advocacy Using Digital Technology**

The technologies used by pharmacists are “Automated Dispensing Systems (ADS), Robotic Compounding, Telepharmacy, Pharmacy Management Software, Medication Packaging and Labelling, and Pharmacy Robotics for Dispensing” [5]. All of these technologies are used by pharmacists to the medication adherence of the patients they use medication therapy management software and remote monitoring tools to do so. Further, by the use of technology, they can identify potential drug interactions and this helps them to provide their patients with personalised drugs.

The usage of these virtual systems (AI, AR, and more) by patients, pharmacists, and clinicians has significantly increased [8]. These technologies help the patients in various ways and also ease the work of pharmacists. Technologies like augmented reality (AR), virtual reality (VR),



and artificial intelligence (AI) can simplify communication, boost patient safety, increase workflows, and improve patient engagement [9]. The technology of AI is believed to have transformative power in the enhancement of medical adherence and improvements of health outcomes.

#### **4.2 Case Study Analysis**

To find the advantages of electronic prescriptions those are connected to a robotic dispenser. This case involved the testing in a hospital and 1000 beds were kept under observation. The beds utilised a comprehensive electronic prescription system for 10 years and subsequently connected two robotic dispensing machines to the network. The results from this study were in favour of the technology used. The results showed that the implementation of these technologies satisfied the staff more than it was ideally planned.

The original results of the study exceeded the expectations as the outpatient department's results exceeded by 16%, in the in-patient dispensary 4 patients were freed up for further use, and the stockholding efficiency exceeded the expectation by £500,000 [10]. The results overall suggested that there were zero dispensing errors and increased speed of dispensing. Thus, by the case study, it can be concluded that electronic prescribing and robotics can enhance operations and help in the improvement of healthcare.

#### **4.3 Benefits and Drawbacks of Using Technology in Patient Advocacy**

There are various benefits to using technology for pharmacists. These benefits are mainly based on the reduction of dispensing errors and improving the patient's health in response. The benefit of using automatic dispensers and robotics has also enhanced self-reported physical and mental health and reduced the frequency of hospitalisations, ER visits, and physician appointments. The accuracy and safety of medication have also increased due to the use of these technologies. However, there has also been a drawback of the technology. According to a study, patients who used a pill organiser experienced improvements in depression, cognition, quality of life, and functional status under a nurse care coordination programme, while those who used a medication dispensing device did not. In this study, the researchers discovered that while the control participants did not perceive any improvements in their health, the MDS users' perceived health status improved over time [6]. Thus, there is a little drawback to using medication dispensing devices that might negatively impact depression, cognition, quality of life, and functional status of a patient.

#### **4.4 Future Direction**

The future direction of the study should be in the direction of researching why and how the use of medication dispensing systems has a negative impact on the depression, cognition, quality of life, and functional status of a patient. Further, the use of technologies such as AI, AR, and VR must also be given much quantitative research and outcomes should be based on found data. The research can also include various long-term and short-term benefits of these systems on the patients. Since there are not many concluding studies based on Electronic Prescription Services (EPS) it should be done for reference in any kind of a crisis.



## 5. CONCLUSION

### 5.1 Summary of Findings

The study has found that the UK has adopted the use of Electronic Prescription Services (EPS) and is observing positive results from the technology. Technologies such as robotic process automation have enhanced the operations of pharmacists. The use of EPS has also increased the efficiency, effectiveness, and accuracy of medication dispensing. The benefit of using automatic dispensers is enhanced self-reported physical and mental health and reduced the frequency of hospitalisations, ER visits, and physician appointments.

## 6. REFERENCE

1. NHS England, "NHS England» Electronic prescription service (EPS)," [www.england.nhs.uk](http://www.england.nhs.uk), 2023. <https://www.england.nhs.uk/long-read/electronic-prescription-service-eps/> (accessed Feb. 01, 2024).
2. ICP, "Pharmacies across England lack digital resources, reveals study," [www.independentpharmacist.co.uk](http://www.independentpharmacist.co.uk), 2022. <https://www.independentpharmacist.co.uk/news/pharmacies-across-england-lack-digital-resources-reveals-study/> (accessed Feb. 01, 2024).
3. M. Stasevych and V. Zvarych, "Innovative robotic technologies and artificial intelligence in pharmacy and medicine: paving the way for the future of health care—a review," *Big Data and Cognitive Computing*, vol. 7, no. 3 pp. 147, Aug. 2023. DOI: <https://doi.org/10.3390/bdcc7030147>
4. H. Momattin, S. Arafa, S. Momattin, R. Rahal and J. Waterson, "Robotic pharmacy implementation and outcomes in Saudi Arabia: a 21-month usability study," *JMIR Human Factors*, vol. 8, no. 3 pp. 28381, 2023. DOI: [10.2196/28381](https://doi.org/10.2196/28381)
5. S. K. Munjaji, K. S. Santosh, M. Ameen and J. Ahmad, "Pioneering Pharmacy Practice: The Integration of Automation and Robotics for Enhanced Patient Care," *JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)*, vol. 10, no. 9 pp. b874, Sept. 2023. Available: <https://www.jetir.org/papers/JETIR2309198.pdf>
6. M. A. Arain, A. Ahmad, V. Chiu and L. Kembel "Medication adherence support of an in-home electronic medication dispensing system for individuals living with chronic conditions: a pilot randomized controlled trial," *BMC Geriatr*, vol. 21, no. 56 pp.1, 2021. DOI: <https://doi.org/10.1186/s12877-020-01979-w>
7. A. O’Kane et al., "Implementing an automated dispensing system for the safe management of controlled drugs," *Hospital Pharmacy Europe*, Feb. 05, 2021. <https://hospitalpharmacyeurope.com/reviews-research/implementing-an-automated-dispensing-system-for-the-safe-management-of-controlled-drugs/#:~:text=UK%20hospital%20pharmacies%20have%20sought> (accessed Feb. 01, 2024).
8. S. J. Trenfield, A. Awad, L. E. McCoubrey, M. Elbadawi, A. Goyanes, S. Gaisford and A. W. Basit, "Advancing pharmacy and healthcare with virtual digital technologies," *Advanced Drug Delivery Reviews*, vol. 182, pp. 114098, 2022. DOI: <https://doi.org/10.1016/j.addr.2021.114098>



9. NABP Staff, "Rise of Digital Pharmacy: How Emerging Technologies Are Changing the Practice-," National Association of Boards of Pharmacy, Jul. 19, 2023. H t t ps: //nab p.phar m acy/news/blog/rise-of-digital-pharmacy-how-emerging-technologies-are-changing-the-practice/#:~:text=They%20include%20artificial%20intelligence%20(AI,patient%20safety%2C%20and%20simplify%20communication. (accessed Feb. 01, 2024).
10. R. J. Beard and P. Smith, "Integrated electronic prescribing and robotic dispensing: a case study," National Library of Medicine, 2013. DOI: 10.1186/2193-1801-2-295