

The Impact of Automation on Pharmacy Technician Workflows

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Abstract

The implementation of automation in healthcare has significantly transformed the workflows of pharmacy technicians in tertiary hospital settings. This study explores the impact of automated dispensing systems on pharmacy technician workflows, focusing on efficiency, accuracy, job satisfaction, and patient care. A mixed-methods approach was used, combining quantitative data on performance metrics before and after automation with qualitative interviews from pharmacy technicians. Quantitative findings showed substantial improvements in dispensing time, medication error rates, and inventory management. Qualitative analysis revealed enhanced job satisfaction, reduced physical burden, and increased opportunities for patient-centered activities, though some technicians reported increased stress due to new responsibilities. Overall, automation positively influenced pharmacy operations but presented challenges related to adaptation and training. The successful integration of automation requires comprehensive training and ongoing support to maximize the benefits and improve patient care.

Keywords: Pharmacy technicians, Automation, Hospital pharmacy, Workflow efficiency, Job satisfaction, Medication safety

Introduction

Automation has become an integral part of modern healthcare systems, reshaping the way services are delivered across various disciplines, including pharmacy. In recent years, the implementation of automated dispensing systems, robotic technologies, and advanced software tools has gained traction in tertiary hospital settings, transforming the traditional workflows of pharmacy professionals (Batson et al., 2021). As the healthcare industry continues to emphasize efficiency, safety, and cost-effectiveness, automation offers significant potential to streamline operations and reduce errors in medication management (Devin, 2023).

Pharmacy technicians play a crucial role in supporting the daily activities of hospital pharmacies, including medication preparation, dispensing, and inventory management. With the advent of automation, the responsibilities and workflows of pharmacy technicians have evolved considerably. Automated systems can handle routine and repetitive tasks, allowing technicians to focus on more patient-centered activities and quality assurance roles (Alshehri et al., 2022). This shift in responsibilities presents opportunities to enhance the technician's contribution to patient care while also raising questions about adapting to changing job requirements and maintaining job satisfaction (James et al., 2013).

Despite the growing adoption of automation, there is limited research on how these technologies impact the day-to-day roles of pharmacy technicians. Understanding these changes is crucial for optimizing the integration of automation and ensuring that pharmacy technicians are adequately trained to leverage these systems effectively. This paper aims to explore the impact of automation on pharmacy technician workflows in a tertiary hospital setting, examining both the benefits and challenges associated with these technological advancements.

Literature Review

The role of automation in healthcare has been a topic of increasing interest in recent years, particularly as hospitals seek ways to improve efficiency and safety in medication management. According to Batson et al. (2021), automated dispensing systems have transformed the traditional roles of pharmacy personnel by reducing manual errors and increasing the accuracy of medication dispensing. These technologies have been found to improve inventory control and decrease medication retrieval times, contributing to overall operational efficiency (Devin, 2023).

One of the key areas where automation has made a significant impact is in reducing medication errors. Devin (2023) highlighted that automated dispensing cabinets (ADCs) and robotic dispensing systems have been instrumental in minimizing dispensing errors, which has led to improved patient outcomes. By reducing human intervention in routine processes, these systems have also allowed pharmacy technicians to dedicate more time to tasks that require critical thinking and direct patient interaction, thereby enhancing their role in the healthcare team.

Alshehri et al. (2022) explored the evolving role of pharmacy technicians in the context of automation, noting that these systems have allowed technicians to transition from primarily operational roles to more patient-focused activities. This shift has created opportunities for pharmacy technicians to engage in patient counseling, medication reconciliation, and quality assurance tasks, which were traditionally reserved for pharmacists. However, they also pointed out that the integration of automation requires pharmacy technicians to develop new skills, such as troubleshooting automated systems and managing technological workflows, which may present challenges for those with limited technical training.

Job satisfaction and adaptability among pharmacy technicians have also been affected by the integration of automation. James et al. (2013) conducted a study that examined how the adoption of automated systems influences pharmacy technicians' job satisfaction. Their findings indicated that while automation reduced the physical workload and repetitive tasks, it also required technicians to adapt to new technologies and responsibilities, which could be a source of stress for some individuals. The study emphasized the importance of providing adequate training and support to help technicians adjust to these changes and maintain high levels of job satisfaction.

Despite the advantages of automation, several challenges have been identified in the literature. Batson et al. (2021) noted that the initial cost of implementing automated systems can be a significant barrier for some healthcare facilities, particularly smaller hospitals with limited budgets. Additionally, there is a learning curve associated with the adoption of new technologies, which may lead to temporary disruptions in workflow and decreased productivity during the transition period. Ensuring that pharmacy technicians receive proper training and ongoing support is crucial for overcoming these challenges and maximizing the benefits of automation.

Overall, the literature suggests that automation has the potential to greatly enhance the efficiency and effectiveness of pharmacy operations in tertiary hospital settings. However, the successful integration of these technologies depends on the ability of pharmacy technicians to adapt to new roles and responsibilities, as well as the provision of adequate training and support. Future research should focus on developing best practices for training pharmacy technicians in the use of automated systems and exploring the long-term effects of automation on job satisfaction and career advancement opportunities for technicians.

Methodology

This study was conducted in a tertiary hospital setting to examine the impact of automation on pharmacy technician workflows. A mixed-methods approach was used, combining quantitative data collection with qualitative interviews to provide a comprehensive understanding of the changes experienced by pharmacy technicians due to automation.

The quantitative component of the study involved collecting data on the efficiency of pharmacy operations before and after the implementation of automated dispensing systems. Data were gathered from hospital records, focusing on key performance indicators such as dispensing time, medication error rates, and inventory management efficiency. The data collection period spanned six months, three months prior to automation implementation and three months after. Statistical analysis was performed to identify any significant changes in these metrics, allowing for an objective evaluation of the impact of automation.

The qualitative component involved semi-structured interviews with pharmacy technicians working in the hospital. A purposive sampling technique was used to select 15 technicians with varying levels of experience and exposure to automated systems. The interviews were conducted in person, lasting approximately 30-45 minutes each, and aimed to explore the technicians' perceptions of how automation had affected their job roles, responsibilities, job satisfaction, and any challenges they faced during the transition. The interview questions focused on themes such as changes in workload, patient interaction, training needs, and overall job satisfaction.

The qualitative data were analyzed using thematic analysis. The transcripts of the interviews were coded, and emerging themes were identified to capture the experiences and perspectives of the pharmacy technicians. This analysis helped to provide context to the quantitative findings and offered insights into the human aspects of integrating automation in pharmacy workflows.

Ethical approval for the study was obtained from the ethics committee. All participants provided informed consent, and confidentiality was maintained throughout the study. Participation was voluntary, and technicians were assured that their responses would be anonymized to protect their identity.

Findings

Quantitative Findings

The quantitative analysis focused on three key performance indicators: dispensing time, medication error rates, and inventory management efficiency. The data collected before and after the implementation of automation are summarized in the tables below.

Metric	Pre-Automation (Mean)	Post-Automation (Mean)	Percentage Change
Dispensing Time (minutes)	15.4	8.2	-46.8%
Medication Error Rate (%)	3.1	0.9	-71.0%
Inventory Management Errors	12	5	-58.3%

The data indicate a significant reduction in dispensing time, from an average of 15.4 minutes to 8.2 minutes, representing a 46.8% decrease. Similarly, the medication error rate decreased by 71%, and inventory management errors were reduced by 58.3%. These results demonstrate that the implementation of automated dispensing systems has positively impacted the efficiency and accuracy of pharmacy operations in the hospital.

Qualitative Findings

The qualitative analysis identified several themes and sub-themes that reflect the experiences of pharmacy technicians in adapting to automation. Key themes, sub-themes, and representative participant quotes are summarized below.

1. Changes in Workload

- **Reduced Physical Burden:** Technicians reported that automation significantly reduced the physical burden of repetitive tasks.

- “Since the automated system was introduced, I don't have to manually pick and count every medication. It's much less tiring now.” (Participant 3)

- **Shift in Responsibilities:** There was a noticeable shift from operational tasks to more patient-focused activities.

- “Now that the system handles most of the dispensing, I have more time to help with medication reconciliation and patient counseling.” (Participant 7)

2. Training and Adaptation

- **Need for Technical Skills:** Many participants emphasized the need for additional training to effectively use the new technology.

- “It took me a while to get comfortable with troubleshooting the system. We could use more hands-on training sessions.” (Participant 12)

- **Initial Challenges:** Some technicians described challenges during the initial transition phase.

- “At first, it was a bit overwhelming to learn the new system, but once I got used to it, things became much smoother.” (Participant 5)

3. Job Satisfaction

- **Increased Job Satisfaction:** Technicians expressed higher job satisfaction due to the reduction in repetitive tasks and the opportunity to engage in patient-centered activities.

- “I feel more fulfilled now because I can actually contribute to patient care, not just count pills all day.” (Participant 10)

- **Stress Due to New Responsibilities:** Some technicians felt an increase in stress due to the added responsibility of managing automated systems.

- “While I enjoy the new roles, there's also added pressure to make sure the technology is working properly.” (Participant 8)

4. Perceived Impact on Patient Care

- Improved Accuracy: Participants highlighted that automation led to improved accuracy in medication dispensing, which they believed positively impacted patient safety.

- “There are definitely fewer errors now, and that makes me feel more confident about the work we do.” (Participant 2)

- More Patient Interaction: Technicians appreciated the increased opportunities for patient interaction.

- “With more time available, I can now talk to patients about their medications, which is very rewarding.” (Participant 9)

Discussion

The findings from this study provide valuable insights into the impact of automation on pharmacy technician workflows in a tertiary hospital setting. The quantitative results clearly demonstrate that automation has significantly improved efficiency and accuracy in pharmacy operations. The reduction in dispensing time, medication error rates, and inventory management errors suggests that automated systems can effectively enhance the quality and reliability of medication management processes. These improvements align with previous studies that have highlighted the benefits of automation in reducing manual errors and increasing operational efficiency (Devin, 2023; Batson et al., 2021).

The qualitative findings further illuminate the human aspect of automation's impact. The shift from repetitive, manual tasks to more patient-centered activities has enhanced the role of pharmacy technicians, allowing them to contribute more directly to patient care. This aligns with Alshehri et al. (2022), who noted that automation has enabled technicians to engage in activities such as medication reconciliation and patient counseling. However, the study also highlights the challenges associated with this transition. The need for new technical skills and the initial difficulties faced during the transition period indicate that adequate training and support are crucial for the successful integration of automation. Technicians who received proper training were better equipped to manage the new systems and experienced less stress, which underscores the importance of ongoing education and hands-on training sessions.

Job satisfaction among pharmacy technicians appeared to be positively influenced by the implementation of automation, as many participants reported a sense of fulfillment from engaging in more meaningful tasks. However, some technicians experienced increased stress due to the added responsibility of managing automated systems, suggesting that while automation can enhance job satisfaction, it can also introduce new pressures. These findings are consistent with James et al. (2013), who emphasized the dual nature of automation's impact on job satisfaction—reducing physical workload while potentially increasing cognitive demands. To mitigate this stress, it is important for healthcare institutions to provide comprehensive training and ensure that technicians feel supported throughout the transition.

The perceived impact of automation on patient care was overwhelmingly positive, with participants noting improvements in accuracy and safety. Automation reduced the likelihood of human error, which directly contributed to better patient outcomes. Additionally, the increased availability of pharmacy technicians to interact with patients and provide counseling is a significant benefit that enhances the overall quality of care. This is consistent with the literature, which has highlighted the role of automation in freeing up healthcare professionals to focus on patient-centered tasks (Devin, 2023).

Despite the benefits, several challenges were noted, particularly the high initial cost of implementing automated systems and the learning curve associated with their adoption. Smaller hospitals with limited budgets may struggle to implement such technologies, and the temporary disruptions in workflow during the transition period may affect productivity. Therefore, it is important for hospitals to carefully plan the implementation process, allocate sufficient resources for training, and provide ongoing support to ensure a smooth transition. Future research should focus on identifying best practices for training pharmacy technicians in automated systems and exploring strategies to minimize the challenges associated with their adoption.

In conclusion, automation has had a profound impact on pharmacy technician workflows, enhancing efficiency, accuracy, and job satisfaction while also presenting new challenges that must be addressed. The successful integration of automation in pharmacy settings requires a careful balance of technological implementation, comprehensive training, and support for pharmacy technicians. By addressing these factors, healthcare institutions can maximize the benefits of automation and improve the quality of care provided to patients.

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