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Evaluating the Impact of Pharmacy Technician Role Expansion on Dispensing Efficiency and Pharmacist Clinical Workload in a Saudi Tertiary Hospital: A Retrospective Comparative Study

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Abstract

Background:
In busy tertiary-care pharmacies, ensuring both speed and safety in medication dispensing is paramount. One promising strategy is to broaden the responsibilities of pharmacy technicians—allowing them to take on tasks traditionally handled by pharmacists. Although this approach has shown benefits elsewhere, evidence from Saudi Arabia's tertiary hospitals remains scarce.

Objective:
This study explores how expanding the scope of pharmacy technician duties affects two critical outcomes in a major Saudi tertiary hospital: (1) the efficiency of the dispensing process and (2) the workload of pharmacists.

Methods:
We conducted a twelve-month, retrospective comparative analysis encompassing two phases: before role expansion (January–June 2023) and after role expansion (July–December 2023). Quantitative measures—average turnaround time per prescription, number of prescriptions processed per shift, and dispensing error rates—were extracted from the hospital's electronic records and analyzed in SPSS v.26. To capture staff experiences, we carried out semi-structured interviews with pharmacists and technicians and performed thematic analysis in NVivo 12.

Results:
Following the role expansion, the average turnaround time fell from 18.5 to 12.3 minutes (p=0.004), while prescriptions processed per shift rose from 220 to 295 (p=0.001). Importantly, dispensing errors also declined significantly (2.1% vs. 1.2%, p=0.008). Qualitative insights highlighted smoother workflows, greater technician autonomy, and more opportunities for pharmacists to engage in clinical activities rather than routine dispensing tasks.

Conclusion:
Empowering pharmacy technicians to assume enhanced dispensing duties led to clear improvements in operational efficiency and a measurable reduction in pharmacist workload. These findings underscore the value of developing standardized training programs and clear policy frameworks—steps that would support wider adoption of expanded technician roles across Saudi Arabia in alignment with Vision 2030.

Keywords:
Pharmacy technician, Dispensing efficiency, Role expansion, Pharmacist workload, Hospital pharmacy, Saudi Arabia, Vision 2030

Introduction

Modern hospital pharmacies must balance ever-increasing demand with the imperative to deliver safe, timely medication therapy. In this context, pharmacy technicians have emerged as indispensable partners in the medication-use process, stepping beyond traditional support tasks to shoulder responsibilities that were once the sole domain of pharmacists. Around the world, empowering technicians to handle activities such as medication preparation, barcode verification, and inventory management has not only accelerated dispensing workflows but also reduced error rates—freeing pharmacists to devote more time to direct patient care and clinical decision-making (Mattingly & Mattingly II, 2018; Banks et al., 2020).

In Saudi Arabia, these efficiency and safety goals align closely with the ambitions of Vision 2030, which champions workforce development, operational excellence, and a patient-centered approach to healthcare delivery. Yet, despite clear international evidence supporting expanded technician roles, few studies have examined how such initiatives perform in Saudi tertiary-care settings. Early reports suggest that advanced technician duties can indeed translate into faster turnaround times and stronger clinical support (Sparkmon et al., 2023; Taylor & Mehta, 2020), but systematic evaluation within local hospitals is still lacking.

To bridge this gap, our study investigates the effects of a structured role expansion for pharmacy technicians at a major Saudi tertiary hospital. By comparing objective performance indicators—such as average dispensing time, prescription throughput, and error rates—alongside staff perceptions gathered through semi-structured interviews, we aim to generate robust evidence that can inform workforce planning and policy development. In doing so, we seek to guide strategic decisions on how best to deploy pharmacy personnel in a rapidly evolving healthcare environment.

Literature Review

Over the past decade, healthcare systems worldwide have looked to pharmacy technician role expansion as a means of streamlining operations and better allocating professional expertise. By shifting technical tasks—such as medication preparation, barcode verification, and stock management—from pharmacists to trained technicians, institutions have reported smoother workflows, faster dispensing, and a lighter burden on pharmacists (Mattingly & Mattingly II, 2018; Banks et al., 2020).

Mattingly and Mattingly II's (2018) systematic review synthesized data from multiple countries, revealing that when technicians assume advanced duties, pharmacy departments experience marked efficiency

gains—in some cases reducing turnaround times by up to 30%. Banks and colleagues (2020) built on this work by quantifying both clinical and economic benefits: expanded technician scope led not only to quicker prescription processing but also to cost savings through optimized staff deployment.

In community pharmacy settings, these gains have translated into more pharmacist-patient interaction. Taylor and Mehta (2020) found that when technicians handled routine dispensing tasks, pharmacists were able to devote extra time to medication therapy management (MTM), enhancing patient education and satisfaction. Similarly, Hohmeier et al. (2019) documented that technician support was a critical enabler for successful MTM implementation, allowing pharmacists to focus on complex clinical decision-making.

Hospital-based research underscores even more direct impacts on safety and staff morale. Sparkmon et al. (2023) used a consensus-building approach to show that expanded technician responsibilities correlate with lower dispensing error rates and higher overall staff satisfaction. Elliott et al. (2014) likewise demonstrated that technician-led interventions in inpatient pharmacies yield measurable improvements in both service delivery metrics and pharmacists' perceived workload.

Looking further back, Kalman and Witkowski (1992) provided some of the earliest evidence that broadening technician duties reduces pharmacist stress and enhances job satisfaction—findings that, despite their age, still resonate with today's emphasis on workforce well-being and error prevention.

Despite this robust international literature, evidence from Saudi Arabia is sparse. With Vision 2030 calling for a more efficient, patient-centered healthcare system, there is an urgent need to examine how technician role expansion performs in local tertiary-care hospitals. Our study addresses this gap by evaluating both objective dispensing metrics and staff experiences before and after a structured increase in technician responsibilities.

Methodology

Study Design and Setting

We undertook a retrospective, comparative evaluation at a 24-hour tertiary-care hospital in Saudi Arabia, which comprises a centralized inpatient pharmacy alongside multiple satellite dispensing units. This design allowed us to assess the real-world impact of expanding pharmacy technician duties on both operational performance and pharmacist workload.

Study Period

The investigation spanned the calendar year 2023, divided into two six-month intervals. The **pre-expansion** phase (January–June 2023) reflected standard technician responsibilities, while the **post-expansion** phase (July–December 2023) followed a formal rollout of enhanced technician roles in July.

Participants and Staffing Model

All pharmacists and pharmacy technicians working in the inpatient dispensing department during the study period were included.

- **Pre-expansion**: Technicians performed core support tasks such as medication preparation, stock management, and basic labeling.
- **Post-expansion**: Technicians assumed additional duties—independently assembling medication trays, conducting barcode verification, and performing initial order assessments under pharmacist oversight. Pharmacists in both phases retained ultimate verification authority and continued their clinical responsibilities.

Data Collection and Measures

A **mixed-methods** approach combined quantitative performance indicators with qualitative insights:

1. **Dispensing Efficiency**
   - *Average turnaround time* per order
   - *Prescriptions processed* per shift
   - *Dispensing error rate* (%)

These metrics were extracted electronically from the hospital's pharmacy information system.

2. **Workload Assessment**
   - Time-motion observations captured the distribution of tasks between pharmacists and technicians.
   - Shift-level task logs recorded the volume and type of activities completed.
   - A validated workload perception survey was administered to all staff at the end of each study phase.
3. **Staff Perceptions**
   - In January 2024, immediately after the intervention, we conducted semi-structured interviews with a purposive sample of five pharmacists and five technicians.
   - Interview topics explored changes in workflow, role clarity, job satisfaction, and perceived effects on service quality.

Data Analysis

- **Quantitative** data were analyzed in IBM SPSS Statistics (v. 26). For normally distributed variables, we applied paired sample t-tests; for non-parametric data, Wilcoxon signed-rank tests were used to compare pre- and post-expansion results.
- **Qualitative** interview transcripts were imported into NVivo 12 and subjected to inductive thematic analysis. Two researchers independently coded the data to identify recurring themes, resolving any discrepancies through discussion.

Ethical Considerations

The hospital's Institutional Review Board approved the study protocol. All interview and survey participants provided written informed consent. To protect confidentiality, we anonymized all data and stored it on secure, access-restricted servers, in accordance with national and institutional guidelines for human-subjects research.

Quantitative Findings

Our analysis demonstrated clear, statistically significant improvements in key dispensing and workload metrics following the expansion of pharmacy technician responsibilities. All continuous outcome variables were first assessed for normality using the Shapiro–Wilk test. For those meeting normality assumptions, paired sample t-tests were employed; non-normally distributed measures were compared using the Wilcoxon signed-rank test. All statistical procedures were performed in IBM SPSS Statistics (Version 26). The detailed pre- and post-expansion results are presented in Table 1.

Table 1. Comparison of Key Performance Metrics Pre- and Post-Technician Role Expansion

Metric	Pre-Expansion (Jan–Jun 2023)	Post-Expansion (Jul–Dec 2023)	P-Value	Test Used
Average Turnaround Time (minutes)	18.5	12.3	0.004	Paired t-test
Orders Processed per Shift	220	295	0.001	Wilcoxon signed-rank test
Dispensing Error Rate (%)	2.1	1.2	0.008	Wilcoxon signed-rank test

Qualitative Findings

In January 2024, semi-structured interviews with five pharmacists and five pharmacy technicians yielded three overarching themes reflecting the real-world impact of technician role expansion.

1. **Enhanced Workflow Efficiency**

Participants described a marked reduction in dispensing bottlenecks once technicians assumed pre-verification and tray preparation duties. As one pharmacist explained, “Previously, orders piled up waiting for verification; once technicians began pre-verifying and preparing trays, the dispensing line flowed seamlessly” (Pharmacist P4). Technicians similarly noted that the time from order receipt to delivery shortened significantly: “We can now complete prep and verification more quickly, so medications reach the wards sooner” (Technician T2).

2. **Redefined Professional Roles**

The expanded scope fostered greater technician autonomy and allowed pharmacists to reallocate their time toward clinical activities. Technicians reported feeling “more responsible and trusted when making guided decisions” (Technician T5), while pharmacists welcomed the opportunity to participate more fully in patient rounds: “With technicians handling routine dispensing, I’ve had time to join clinical rounds more frequently” (Pharmacist P2).

3. Job Satisfaction and Training Needs

Both groups expressed increased morale as technicians became integral to the care team—"It's motivating to know that I'm part of the patient care chain now" (Technician T1)—but also highlighted the imperative for uniform training. One pharmacist cautioned, "The expansion worked well overall, but not everyone was trained at the same level. We need a standardized protocol going forward" (Pharmacist P3).

Together, these insights mirror our quantitative findings of faster turnaround, higher throughput, and reduced errors—while underscoring the importance of robust, standardized training to sustain efficiency gains and support Vision 2030's workforce objectives.

Discussion

This study demonstrates that broadening pharmacy technician responsibilities can yield substantial gains in both efficiency and safety within a Saudi tertiary-care pharmacy. Quantitatively, we observed a striking reduction in average turnaround time—from 18.5 to 12.3 minutes—which mirrors international reports of 20–30% time savings when technicians handle advanced tasks (Mattingly & Mattingly II, 2018). Likewise, the 34% increase in prescriptions processed per shift aligns with findings by Banks et al. (2020), reinforcing the idea that redistributing routine tasks can meaningfully boost department throughput.

Perhaps most compelling is the drop in dispensing errors from 2.1% to 1.2%. This trend echoes Sparkmon et al. (2023), who showed that when technicians are both accountable and well-trained, medication safety improves without sacrificing speed. In our setting, technicians' involvement in barcode verification and initial order checks appears to have acted as an effective "second pair of eyes," reducing error risk before final pharmacist review.

Beyond the numbers, our interviews revealed how these operational gains translated into real-world benefits. Pharmacists reported feeling less burdened by repetitive dispensing tasks, enabling them to devote more time to clinical rounds and patient counseling—activities shown to improve therapeutic outcomes (Hohmeier et al., 2019). Technicians, in turn, expressed greater confidence and professional fulfillment when entrusted with expanded duties, reflecting similar job-satisfaction gains noted by Desselle et al. (2018).

However, the transition was not without challenges. Staff highlighted the unevenness of training, suggesting that without standardized protocols, role expansion may falter over time. This concern echoes Elliott et al. (2014), who warned that variability in technician preparation can undermine long-term sustainability. To address this, we recommend establishing uniform competency frameworks and ongoing education—a step that would bolster both safety and staff morale.

In the context of Saudi Arabia's Vision 2030, which prioritizes healthcare workforce development and operational excellence, our findings are particularly timely. By formalizing enhanced technician roles through clear guidelines and robust training programs, hospital pharmacies can achieve faster, safer medication delivery while freeing pharmacists to focus on complex, patient-centered care. Ultimately, such reforms promise to strengthen the overall quality and resilience of the Kingdom's healthcare system.

Conclusion

This investigation demonstrated that broadening the scope of pharmacy technician duties within a Saudi tertiary-care hospital substantially enhanced operational performance and workforce satisfaction. By shifting tasks such as tray assembly, barcode verification, and preliminary order checks to technicians, we achieved a marked reduction in average turnaround time, a significant rise in prescriptions processed per shift, and a noteworthy decline in dispensing errors. Equally important, technicians reported greater professional fulfillment, while pharmacists were able to redirect their efforts toward clinical activities, underscoring a successful reallocation of roles that aligns with contemporary best practices in patient-centered care.

These findings echo international evidence supporting the strategic delegation of technical responsibilities as a means of optimizing pharmacy services. In the context of Saudi Arabia's Vision 2030— which prioritizes workforce development, service efficiency, and high-quality patient care—our study offers concrete proof that investing in technician training and integration can yield both immediate operational gains and lasting clinical benefits.

Recommendations

1. **Establish Structured Technician Training**

Develop and mandate comprehensive education and competency assessment programs for pharmacy technicians assuming advanced roles. This will ensure consistent performance and safeguard patient safety.

2. **Define National Practice Standards**

Collaborate with regulatory bodies (e.g., the Saudi Commission for Health Specialties) to create clear, standardized guidelines delineating the scope of practice for pharmacy technicians across all healthcare settings.

3. **Evaluate Long-Term Impact**

Conduct follow-up studies to assess the sustainability of role expansion over time, including its effects on patient outcomes, staff retention, and cost-effectiveness.

4. **Foster Collaborative Workflows**

Implement formal communication channels and regular interdisciplinary meetings between pharmacists and technicians to reinforce teamwork, clarify responsibilities, and address emerging challenges.

5. **Expand Across Care Levels**

Use the positive results from this tertiary-care pilot as a template for secondary and primary healthcare facilities, promoting a unified, system-wide approach to technician role development.

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