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A Narrative Review on the Impact of Pharmacy-Led Interventions on Nursing Workload and Efficiency in Hospital Management Systems

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Abstract

Background: Within complex hospital management systems, escalating nursing workload is a critical driver of burnout, medical errors, and patient safety risks. The optimization of interprofessional collaboration, particularly between nursing and pharmacy, presents a strategic opportunity to enhance system efficiency and care quality. Pharmacy-led interventions are increasingly recognized as essential components of hospital strategy to alleviate burdensome nursing tasks.

Aim: This narrative review synthesizes contemporary evidence (2010-2024) on the impact of pharmacy-led interventions on nursing workload and efficiency in hospital management systems, analyzing models, outcomes, and implementation factors.

Methods: A systematic search of PubMed, CINAHL, Scopus, and Web of Science databases was conducted. Peer-reviewed articles, reviews, and quality improvement reports published between 2010 and 2024 were analyzed thematically to evaluate interventions, workload metrics, and efficiency gains.

Results: Evidence confirms that structured pharmacy-led interventions, including decentralized clinical pharmacists, integrated medication reconciliation, pharmacist-driven protocols for high-risk drugs (e.g., anticoagulants), and automated dispensing cabinet (ADC) optimization, significantly reduce direct nursing time on medication-related tasks. Documented outcomes include decreased time spent on medication administration record (MAR) verification, order clarification, and intravenous preparation; reduced interruptions; and improved medication safety metrics. These interventions correlate with measurable improvements in nurse-reported workload, job satisfaction, and time for direct patient care.

Conclusion: Strategic integration of clinical pharmacy services directly enhances nursing efficiency and is a key lever for hospital management to improve workflow, patient safety, and staff retention. Future integration requires addressing role clarity, technological interoperability, and sustainable funding models.

Keywords: Clinical Pharmacy, Nursing Workload, Hospital Management, Interprofessional Collaboration, Medication Safety

Introduction

The contemporary hospital is a high-stakes ecosystem where the management of human resources, workflow efficiency, and patient safety are inextricably linked. Within this system, the nursing workforce shoulders an immense and escalating burden, with workload intensity being a primary predictor of burnout, turnover, and adverse patient outcomes (Aiken et al., 2017). A significant portion of this workload is intricately tied to the medication use process—a complex sequence involving prescribing, transcribing, dispensing, administering, and monitoring that is notoriously vulnerable to error and inefficiency (Elliott et al., 2021; Dykes et al., 2023). Nurses are often the final checkpoint in this process, yet they spend substantial time on tasks such as reconciling medication histories, clarifying ambiguous orders, retrieving drugs from automated dispensing cabinets (ADCs), preparing intravenous (IV) admixtures, and responding to drug-related questions. This "non-value-added" or "indirect" care time detracts from the core nursing mission of direct patient assessment, education, and therapeutic interaction.

In response, forward-thinking hospital management systems are strategically leveraging interprofessional collaboration to redesign workflows and optimize the roles of all healthcare team members.

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The integration of clinical pharmacists into direct patient care units represents a particularly powerful intervention. Moving beyond the traditional dispensary model, clinical pharmacists provide expertise in pharmacotherapy, medication safety, and system optimization at the point of care (Van der Linden et al., 2020). By proactively assuming responsibility for specific components of the medication process, pharmacists can directly alleviate cognitive and procedural burdens on nursing staff. This reallocation of tasks according to professional scope and expertise is a cornerstone of efficient hospital management, aligning with principles of Lean healthcare and the Quadruple Aim of enhancing patient experience, improving population health, reducing costs, and improving the work-life of healthcare providers (Bodenheimer & Sinsky, 2014).

This narrative review synthesizes the evidence from 2010 to 2024 to critically examine the impact of pharmacy-led interventions on nursing workload and operational efficiency within hospital management systems. It will define key workload metrics, explore specific intervention models—including decentralized pharmacist services, medication reconciliation programs, pharmacist-driven protocols, and technological optimizations—and analyze the reported outcomes on nursing time, error rates, and job satisfaction. Furthermore, it will discuss the barriers to implementation and the essential management strategies required to sustain these collaborative models, ultimately arguing that pharmacy-nurse collaboration is not merely a clinical nicety but a fundamental operational imperative for modern hospitals.

The Nexus of Nursing Workload, Medication Safety, and System Efficiency

To understand the impact of pharmacy interventions, one must first appreciate the nature and consequences of nursing workload related to medications. Nursing workload is multidimensional, encompassing quantitative measures (e.g., patient-to-nurse ratios, number of tasks), qualitative factors (e.g., patient acuity, task complexity), and cognitive load (e.g., decision-making, vigilance) (Carayon et al., 2021). Medication-related activities contribute heavily to all three dimensions. Studies utilizing time-motion analysis have consistently shown that nurses spend 25-35% of their shift on medication-related activities, with a significant portion dedicated to hunting for medications, resolving order discrepancies, and preparing IVs (Hendrich et al., 2008; Huynh et al., 2016). These tasks are frequently interrupted, further increasing the risk of error and cognitive strain.

The consequences of this burden are profound. High medication-related workload is directly correlated with increased rates of medication administration errors, missed nursing care, and nurse burnout (Kalisch & Xie, 2014; Westbrook et al., 2010). From a hospital management perspective, this translates into compromised patient safety, higher rates of preventable adverse drug events (ADEs), increased length of stay, and substantial financial costs from both errors and nurse turnover (Lake et al., 2019). Therefore, interventions that streamline the medication use process do more than simply save nursing minutes; they address a critical vulnerability in the hospital's safety and financial performance. The integration of pharmacy expertise directly at the care team level targets this vulnerability by applying specialized knowledge to prevent problems before they reach the nurse at the bedside (Lee & Kalisch, 2021).

Models of Pharmacy-Led Interventions to Support Nursing Work

Pharmacy-led interventions to support nursing efficiency can be categorized into several key models, each targeting different pressure points in the medication use continuum. These models are not mutually exclusive and are most effective when implemented in a complementary, system-wide strategy.

Decentralized/Unit-Based Clinical Pharmacy Services

This is the most impactful model for direct nursing support. Clinical pharmacists are physically stationed on patient care units, attending interdisciplinary rounds, reviewing patient charts in real-time, and being immediately accessible to nurses and physicians. Their proactive role includes performing comprehensive medication reviews, identifying and resolving drug therapy problems (e.g., inappropriate dosing, drug interactions), providing drug information, and counseling patients at discharge (Mekonnen et al., 2022). For nurses, this means having an on-demand expert to answer questions, verify unusual orders, and troubleshoot administration issues without making time-consuming calls to a remote pharmacy. Studies show that decentralized pharmacists significantly reduce the number of pages and calls to nurses from central pharmacy regarding order clarifications, thereby reducing interruptions (Sng et al., 2019).

Pharmacist-Led Medication Reconciliation (Med Rec)

Admission and discharge medication reconciliation are error-prone, time-intensive processes often delegated to nurses. Pharmacist-led Med Rec programs involve pharmacists obtaining the best possible medication history (BPMH) directly from patients, families, and community sources at admission, and reconciling all medications at care transitions (Killin et al., 2021). By assuming this responsibility, pharmacists generate a more accurate list, resolve discrepancies with the medical team, and produce a clear discharge medication list and counseling. This intervention directly removes a major administrative and clinical burden from nurses, allowing them to focus on executing the finalized plan

rather than investigating its creation. It also dramatically improves accuracy, reducing omission and commission errors that can lead to post-discharge harm (McNab et al., 2018; Cheema et al., 2018).

Pharmacist-Driven Protocols and Order Sets

Hospitals are increasingly granting pharmacists authority under collaborative practice agreements (CPAs) or protocols to manage specific, high-risk, or high-volume drug therapies. Common examples include pharmacokinetic dosing of vancomycin and aminoglycosides, managing warfarin and direct oral anticoagulants (DOACs), adjusting insulin regimens, and initiating or modifying antimicrobial therapy based on culture results (Tarasiuk et al., 2018). When pharmacists autonomously adjust doses within agreed parameters, it eliminates the need for nurses to identify the issue, page the physician, wait for a response, and transcribe the new order—a multistep process ripe for delay and miscommunication. This model streamlines care, improves therapeutic outcomes, and frees nursing time for monitoring and patient education.

Optimization of Medication Distribution Technology

The deployment and management of Automated Dispensing Cabinets (ADCs) and robotic dispensing systems are pharmacy-led initiatives with major implications for nursing workflow. Pharmacy-driven optimization includes streamlining ADC medication profiles to ensure high-use drugs are available while minimizing "stock-outs," implementing barcode-assisted medication administration (BCMA) compatibility, and configuring "nurse-override" protocols for urgent medications (Poon et al., 2010; Pruitt et al., 2023). When ADCs are poorly managed, nurses waste significant time searching multiple drawers, waiting for pharmacy restocks, or traveling to a central pharmacy. Effective pharmacy management of this technology creates a reliable, efficient point-of-use medication supply system (Shah et al., 2016).

IV Admixture and Hazardous Drug Compounding Services

Centralized or decentralized IV admixture services, where pharmacy technicians under pharmacist supervision prepare all sterile compounded medications, represent a fundamental shift in responsibility. This removes a technically complex, high-risk, and time-consuming task from the nursing domain. Studies consistently show that pharmacy-based IV programs reduce nursing preparation time, decrease IV medication errors, and improve sterility assurance (Zhu et al., 2024). For hazardous drugs like chemotherapy, centralized pharmacy compounding is also a critical occupational safety measure for nursing staff. Figure 1 illustrates key pharmacy-driven strategies—such as decentralized pharmacists, medication reconciliation, automated dispensing cabinet optimization, and pharmacist-managed protocols—that collectively reduce nursing workload, interruptions, and medication-related errors while improving workflow efficiency.

Table 1: Pharmacy-Led Intervention Models and Their Direct Impact on Nursing Tasks

Intervention Model	Core Pharmacy Activities	Nursing Tasks Reduced or Eliminated	Key Efficiency Mechanism
Decentralized Clinical Pharmacist	Proactive chart review; attendance at rounds; real-time drug info & problem-solving.	Paging/Calling for order clarifications; investigating drug interactions/therapy problems; patient education on complex regimens.	Provides on-unit expertise, preventing problems and answering questions at source.
Pharmacist-Led Medication Reconciliation	Obtaining BPMH; reconciling medications at admission, transfer, discharge; discharge counseling.	Gathering medication histories; reconciling lists; clarifying home meds with MDs; preparing discharge instructions.	Assumes full responsibility for a discrete, high-complexity process.
Pharmacist-Driven Protocols	Dosing of anticoagulants, vancomycin, insulin; renal/hepatic dose adjustments per protocol.	Identifying need for dose adjustment; contacting prescriber; awaiting/transcribing new order.	Grants autonomous authority for specific tasks, streamlining decision-to-action loop.
ADC & Technology Optimization	Managing ADC formulary & par levels; integrating BCMA; configuring override parameters.	Searching for medications; waiting for restocks; traveling to pharmacy; manually documenting.	Ensures reliable, tech-enabled medication supply at point of care.
Centralized IV Admixture Service	Preparing all sterile compounded IV medications in pharmacy-controlled environment.	Calculating doses; admixing IVs; labeling; sterility validation.	Transfers a high-risk, technical task to specialized personnel & environment.

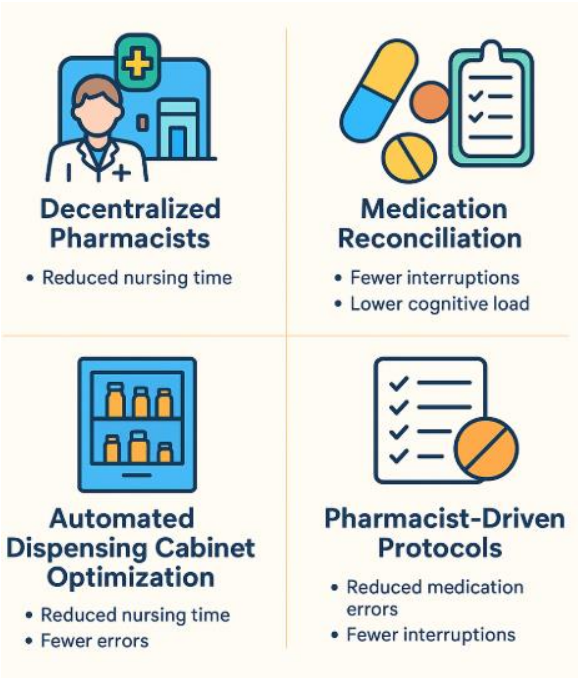

Figure 1: Pharmacy-Led Interventions That Reduce Nursing Workload

Measured Outcomes: Impact on Workload, Safety, and Satisfaction

The implementation of pharmacy-led interventions has yielded a robust body of evidence demonstrating tangible benefits across multiple outcome domains critical to hospital management.

Reduction in Nursing Time on Medication Tasks

Quantitative studies using time-motion analysis, workload surveys, and self-reporting consistently document time savings. For instance, the introduction of decentralized pharmacists has been shown to reduce the time nurses spend on medication-related activities by 30-60 minutes per nurse per shift, time that is often reallocated to direct patient care (Nickman et al., 2019). Pharmacist-led Med Rec at admission can save nurses 20-30 minutes per patient, a substantial gain when multiplied across a unit (Studer et al., 2023).

Decreased Interruptions and Cognitive Burden

The immediate accessibility of a unit-based pharmacist reduces the frequency of interruptions to nurses for medication questions. This preservation of cognitive focus is crucial for safe medication administration. Furthermore, knowing that a pharmacist has already reviewed and verified complex orders (e.g., chemotherapy, parenteral nutrition) provides nurses with greater confidence and reduces pre-administration double-checking time (Manzoor et al., 2017).

Improvements in Medication Safety and Quality Metrics

These interventions directly improve safety outcomes. Pharmacist participation on rounds is associated with a significant reduction in preventable ADEs (Mekonnen et al., 2021). Pharmacist-led Med Rec reduces unintentional medication discrepancies at discharge by over 50% (Al-Qahtani et al., 2022). Pharmacist-driven anticoagulation services achieve better time-in-therapeutic range (TTR) for warfarin and reduce bleeding and thrombotic events compared to physician-managed care (Perlman et al., 2019).

Enhanced Nurse Job Satisfaction and Perceptions of Safety

Qualitative and survey-based research indicate that nurses overwhelmingly value the presence of clinical pharmacists. They report feeling more supported, experiencing less frustration with the medication system, and perceiving a safer environment for their patients (Tran et al., 2019). This improvement in the practice environment is a key factor in nurse retention, addressing a major management challenge.

Financial and Operational Impact for the Hospital

While requiring investment in pharmacy staff, these interventions generate a positive return. Cost-avoidance from prevented ADEs, reduced length of stay from optimized therapy, and decreased nursing turnover due to improved workload and satisfaction contribute to the financial rationale. One systematic review found that for every dollar invested in clinical pharmacy services, hospitals saved over $4 in direct medical costs (Shrestha et al., 2022; Krstic et al., 2021). Figure 2 highlights the impact of integrated pharmacy services on hospital operations, showing improvements in workflow efficiency, medication safety metrics, interprofessional collaboration, and overall operational outcomes, including cost reduction and enhanced system performance.

Table 2: Documented Outcomes of Pharmacy-Led Interventions on Nursing and System Efficiency

Outcome Category	Specific Metrics	Representative Findings from Literature
Nursing Time & Workload	Time spent on Med Rec, IV prep, order clarification; frequency of interruptions; NASA-TLX workload scores.	30-60 min/nurse/shift saved with decentralized pharmacists (Nickman et al., 2019); 50% reduction in pages for order clarifications (Mekonnen et al., 2022).
Medication Safety	Rate of preventable ADEs; medication discrepancy errors at care transitions; anticoagulation TTR.	48% reduction in preventable ADEs with pharmacist on rounds (Mekonnen et al., 2021); 66% reduction in discharge discrepancies with pharmacist-led Med Rec (Al-Qahtani et al., 2022).

Process Efficiency	Medication order turnaround time, ADC "stock-out" frequency, and time from order to administration for protocol-driven drugs.	Faster initiation of antimicrobial therapy with pharmacist protocols; reduced nursing wait time for medications from optimized ADCs (Poon et al., 2010).
Nurse & Team Outcomes	Job satisfaction surveys, perceived safety climate, and nurse turnover intention.	High nurse satisfaction (≥90%) with unit-based pharmacist support (Tran et al., 2019); improved interprofessional collaboration ratings.
Economic Impact	Cost-avoidance from prevented ADEs; ROI of pharmacy service; nursing labor cost implications of time savings.	$4.81 saved for every $1 invested in clinical pharmacy services (Krstic et al., 2021); reduced costs associated with nursing turnover.

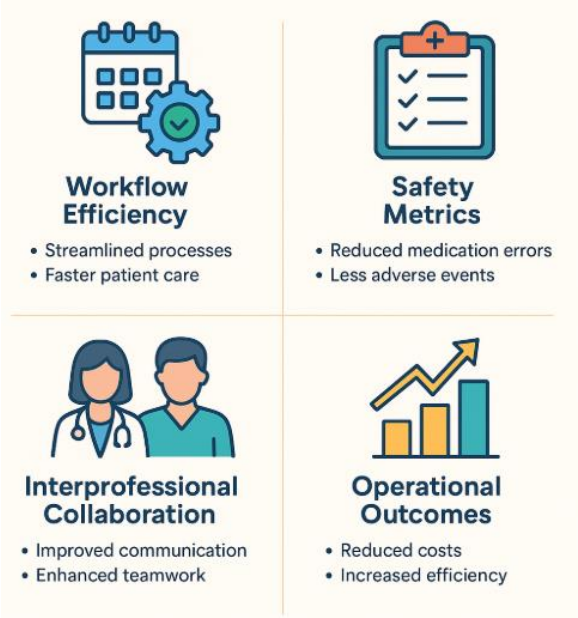

Figure 2: The impact of integrated pharmacy services on hospital operations

Barriers to Implementation and Enabling Management Strategies

Despite the robust evidence supporting the efficacy of pharmacy-led interventions in enhancing nursing efficiency, their widespread and sustained implementation within hospital management systems is frequently hindered by a complex interplay of financial, professional, and operational barriers. These challenges necessitate deliberate and strategic management to overcome, transforming a promising clinical model into an integrated, standard-of-care practice.

The most formidable obstacle is often **financial and reimbursement-related**. The upfront investment required to establish decentralized clinical pharmacy services, including the addition of specialized pharmacist full-time equivalents (FTEs), is frequently perceived as a significant cost center rather than a strategic investment. While comprehensive cost-effectiveness analyses demonstrate a strong return through avoided adverse drug events, reduced length of stay, and decreased nursing turnover, these returns manifest as cost-avoidance rather than direct revenue generation. This distinction complicates the business case in budget-constrained environments where direct revenue streams are prioritized (Phimarn et al., 2023). This challenge is compounded by the persistent lack of universal, robust reimbursement mechanisms for clinical pharmacy cognitive services under traditional fee-for-service payment models, leaving hospitals to absorb the direct labor costs without clear financial remuneration.

Beyond finances, **professional role ambiguity and interprofessional resistance** can stymie implementation. Some physicians may perceive pharmacist-driven protocols or proactive therapeutic recommendations as an encroachment on their clinical autonomy and prescribing authority. Simultaneously, some nurses, accustomed to owning the entire medication administration sequence, may experience reluctance or skepticism about transferring tasks such as comprehensive medication reconciliation to pharmacy colleagues. This resistance underscores the necessity for clear, ongoing communication about role boundaries, respective professional competencies, and the shared, overarching goal of patient safety and workflow optimization (Newsome et al., 2021). Without this clarity, collaboration can be undermined by territoriality and mistrust.

Successful integration is also heavily dependent on **seamless technological and workflow interoperability**. The benefits of having a pharmacist on the unit can be negated if the electronic health record (EHR) does not support efficient co-documentation, if communication platforms are siloed, or if physical workflows are not redesigned to facilitate easy consultation. Inefficient technology that forces duplicate data entry or fails to provide pharmacists with real-time access to nursing flowsheets and vital signs can create new inefficiencies and frustrate both professions, thereby undermining the very collaboration it is meant to enable (Ortmann et al., 2021).

Finally, constraints in **workforce capacity and educational preparation** pose a significant barrier. There is a documented shortage of pharmacists who possess both the advanced training and the inclination for direct patient care roles in acute settings. Furthermore, even when personnel are available, the success of the model hinges on mutual understanding. Both nurses and pharmacists often graduate from educational programs with limited exposure to interprofessional practice models, necessitating institution-specific education to clarify

each profession's capabilities, communication styles, and expectations within the new collaborative framework.

Overcoming this multifaceted array of barriers demands proactive, committed leadership and a structured management strategy. **Building a compelling, data-driven business case** is the foundational step, utilizing pilot project data to quantify nursing time savings, reductions in medication errors, and improvements in key quality metrics to demonstrate a clear return on investment to hospital administrators. A pragmatic approach involves **starting with high-impact pilot programs** in clinical areas with demonstrably high medication complexity and burden, such as intensive care units, oncology, or cardiology, where the value on safety and efficiency is most immediate and visible. To ensure practicality and secure frontline buy-in, the **co-design of workflows with end-users**—including staff nurses, nurse managers, and prescribing physicians—is critical; their involvement in planning ensures the model addresses real-world pain points.

Operationalizing the model requires **developing formal Collaborative Practice Agreements (CPAs)** that provide a clear, legally sound framework defining the scope of pharmacist-driven activities, protocols for communication, and documentation standards, thereby ensuring regulatory compliance and interprofessional clarity. Perhaps most fundamentally, success depends on intentional investment in relationship-building. Facilitating structured joint education sessions, interprofessional simulation training, and team-building activities between pharmacy and nursing staff is essential to move beyond a transactional relationship to one built on mutual trust, respect, and a shared professional identity focused on optimal patient care. Through these concerted management strategies, hospitals can effectively navigate the implementation barriers and fully realize the systemic benefits of integrated pharmacy-nursing collaboration.

Future Directions and Conclusion

The future of pharmacy-nurse collaboration in hospital management is poised for further integration and technological augmentation. Emerging trends include the expansion of tele-pharmacy services to support smaller or rural hospitals, allowing remote pharmacists to perform chart reviews and participate in rounds, thereby extending expertise (Ramachandram et al., 2023). Predictive analytics and clinical decision support (CDS) tools, developed with pharmacy input, can be embedded in the EHR to proactively flag drug-related risks (e.g., AKI risk with contrast), further reducing the cognitive surveillance burden on nurses. Furthermore, the evolution of advanced roles, such as the "tech-check-tech" model for final product verification and expanded technician roles in medication history, can free up pharmacist time for more complex clinical interventions directly supporting nursing.

In conclusion, the evidence is unequivocal: pharmacy-led interventions are powerful, evidence-based tools for hospital management to strategically reduce nursing workload, enhance medication safety, and improve system-wide efficiency. Models such as decentralized clinical pharmacists, pharmacist-led medication reconciliation, and protocol-driven therapy management directly address key pressure points in the medication use process, translating into measurable gains in nursing time, job satisfaction, and patient outcomes. For healthcare administrators, the challenge is no longer whether to invest in these services, but how to implement them effectively and sustainably. By fostering a culture of interprofessional collaboration, securing necessary resources, and leveraging technology, hospital leaders can unlock the full potential of the pharmacy-nurse partnership, creating a more resilient, efficient, and safe healthcare environment for both patients and providers. This strategic alignment is essential for navigating the complexities of modern healthcare delivery.

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