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Clinical decision-making autonomy of pharmacists in decentralized models of healthcare administration and risk management

Moyosore Taiwo [1,*], Adebanjo Olowu [2], Yusuf Olanlokun [3] and Ojo Timothy [4]

[1] *Sanofi, Toronto, Canada.*
[2] *Jhpiego, Nigeria.*
[3] *Sanofi, Nigeria.*
[4] *Royal Bank of Canada, Toronto, Canada.*

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Abstract

As healthcare systems globally transition toward patient-centered and decentralized care models, the role of pharmacists has evolved from traditional dispensing functions to more autonomous, clinically integrated responsibilities. This paradigm shift, driven by the need for efficiency, accessibility, and personalized care, positions pharmacists as critical stakeholders in therapeutic decision-making, especially within primary and community-based health systems. In decentralized healthcare structures, such as those found in integrated care networks and rural outreach programs, pharmacists are increasingly responsible for clinical judgment, medication optimization, patient education, and adverse drug reaction monitoring—functions traditionally reserved for physicians. This study explores the extent and determinants of clinical decision-making autonomy among pharmacists within decentralized healthcare models. It examines how organizational structure, regulatory frameworks, risk management policies, and interprofessional collaboration impact pharmacists' ability to make independent clinical decisions. Particular attention is paid to the balance between autonomy and accountability, highlighting potential risks such as therapeutic errors and liability concerns, alongside opportunities for improving medication adherence and reducing hospital readmissions. Using a mixed-methods approach involving policy analysis, structured interviews, and clinical case reviews, the study uncovers significant variation in autonomy across regions and care settings. It proposes a framework for risk-informed autonomy, whereby pharmacists operate with expanded clinical responsibility under well-defined governance and support systems. Ultimately, this research underscores the importance of redefining pharmacists' roles in modern health systems and offers strategic recommendations for empowering them within decentralized models without compromising patient safety or care quality.

Keywords: Clinical Autonomy; Decentralized Healthcare; Pharmacist Decision-Making; Risk Management; Interprofessional Collaboration; Health System Governance

1. Introduction

1.1. Contextualizing Pharmacist Autonomy in Healthcare

Pharmacists have historically been positioned as dispensers of medication, with limited involvement in clinical decision-making or direct patient care. Traditionally confined to hospital pharmacies or behind-the-counter roles in retail settings, their duties centered on fulfilling prescriptions and ensuring regulatory compliance with drug handling protocols [1]. However, the landscape of healthcare delivery has changed significantly over the past two decades. The

* Corresponding author: Moyosore Taiwo

transition toward integrated, patient-centered care has prompted a reassessment of pharmacists' potential as active contributors to therapeutic strategy, medication optimization, and population health management [2].

The recognition of pharmacists' expertise in pharmacotherapy has led to a gradual expansion of their clinical scope. In many countries, pharmacists are now involved in tasks such as medication reconciliation, chronic disease monitoring, adverse drug reaction surveillance, and even prescribing under collaborative practice agreements [3]. These changes reflect growing confidence in pharmacists' capacity to improve health outcomes, reduce costs, and ensure patient safety through more autonomous, evidence-based practice.

Simultaneously, there has been a significant shift from centralized to decentralized healthcare systems, characterized by localized decision-making and multidisciplinary, community-based care teams [4]. This restructuring has opened new avenues for pharmacist-led interventions, especially in rural and underserved areas where physician availability may be limited. In such contexts, pharmacists serve not only as dispensers but also as front-line clinical decision-makers, health educators, and care coordinators.

As pharmacists increasingly function outside of centralized hospital environments, the need for defined boundaries of professional autonomy, risk governance, and accountability becomes critical. The evolving role of pharmacists within decentralized systems necessitates clearer regulatory frameworks and leadership models that support independent judgment while ensuring patient safety and legal compliance [5]. Understanding the intersections between decentralization and pharmacist authority is therefore central to designing responsive, resilient, and ethically governed health systems.

1.2. Decentralization and Health System Reform

Decentralization in healthcare refers to the redistribution of administrative, financial, and clinical authority from central institutions to peripheral units, often at the regional, community, or facility level [6]. This shift is driven by multiple factors, including the need for cost efficiency, responsiveness to local health needs, and the promotion of patient-centered care models. In the wake of global health financing challenges, decentralization is viewed as a strategy to reduce bureaucratic bottlenecks and enhance service adaptability [7].

One of the most profound outcomes of decentralization has been the emergence of community-led and distributed care models, where primary care teams operate in local health centers, mobile clinics, and pharmacies. These models prioritize accessibility, cultural competency, and collaborative care, often assigning significant responsibilities to allied health professionals such as pharmacists [8].

In such systems, pharmacists are increasingly tasked with initiating or modifying treatments, providing therapeutic monitoring, and leading health promotion initiatives. This evolution not only enhances patient access to care but also redistributes workload across the system, relieving pressure from overburdened physicians and hospitals [9]. However, it also raises new questions about the training, legal safeguards, and ethical frameworks needed to support pharmacist autonomy in complex clinical scenarios.

As decentralization continues to shape modern healthcare delivery, the pharmacist's role is no longer peripheral. Instead, pharmacists are emerging as central actors within decentralized care ecosystems—necessitating strategic policies and governance structures that recognize and support their expanding scope [10].

Aim and Scope

This study aims to explore the impact of decentralized healthcare models on pharmacist clinical autonomy and risk governance. Specifically, it investigates how shifts from centralized hospital-based care to distributed, community-based systems affect pharmacists' decision-making authority, professional accountability, and integration into multidisciplinary care teams.

The core objective is to assess whether decentralized health system reforms create enabling environments for pharmacists to exercise independent clinical judgment, and under what conditions such autonomy contributes to improved health outcomes and system resilience. The study also evaluates the regulatory, operational, and ethical dimensions of expanding pharmacist roles in non-centralized settings.

The scope includes a comparative review of high-income and low- and middle-income countries (LMICs), analysis of decentralization policies, and examination of pharmacy-led interventions in chronic care, medication therapy management, and emergency response. By addressing these elements, the study provides a nuanced understanding of

how decentralization shapes the professional boundaries, governance risks, and leadership opportunities for pharmacists [11].

2. Theoretical framework and conceptual foundations

2.1. Clinical Autonomy: Definitions and Models

Clinical autonomy refers to the capacity of healthcare professionals to make independent decisions regarding patient care, within the scope of their expertise and regulatory frameworks. In pharmacy practice, this autonomy encompasses the ability to assess therapeutic needs, adjust treatment regimens, and counsel patients without mandatory authorization from a physician or supervisor [6]. While traditional models placed pharmacists in supportive roles, recent shifts toward collaborative and integrated care have expanded their responsibilities and decision-making authority.

There are varying levels of autonomy, ranging from task-specific independence (e.g., renewing chronic prescriptions) to full prescriptive authority in defined therapeutic areas. Some systems operate under collaborative practice agreements (CPAs), where pharmacists are authorized to manage medication therapy in consultation with physicians, while others, particularly in military or rural health models, permit independent prescriptive practice under regulatory supervision [7].

One widely accepted model for integrating clinical autonomy is shared governance, which blends professional independence with institutional accountability. In shared governance frameworks, pharmacists operate within multidisciplinary teams, contributing to therapeutic planning while adhering to agreed-upon protocols and institutional quality metrics [8]. This model reinforces autonomy while ensuring alignment with broader health system goals.

Autonomy is also contextual; it is influenced by local laws, health system culture, and organizational readiness. In some jurisdictions, pharmacist autonomy is supported by formal postgraduate training and board certification, which serve as markers of advanced clinical competence [9].

Overall, defining and operationalizing pharmacist autonomy involves a balance between empowering clinical judgment and maintaining patient safety through structured oversight. As pharmacy practice evolves within decentralized systems, clarity on the boundaries and scope of autonomy becomes increasingly important for effective governance and interprofessional collaboration [10].

2.2. Healthcare Decentralization Frameworks

Healthcare decentralization involves the systematic delegation of administrative, financial, and clinical responsibilities from central authorities to sub-national or local levels. This redistribution can be vertical, shifting authority from central governments to regional or district health authorities, or horizontal, transferring control from one institution to another at the same level, such as from hospitals to community health centers [11].

In vertically decentralized models, regional health units often gain autonomy over resource allocation, personnel management, and service delivery design. This model allows for greater responsiveness to local health needs, enabling tailored interventions and more efficient use of limited resources. For pharmacists, vertical decentralization can mean increased leadership roles in formulary decisions, therapeutic committees, and health promotion campaigns at the local level [12].

Horizontal decentralization, on the other hand, emphasizes lateral shifts in responsibilities, often involving integration across service sectors. In this context, pharmacists may assume expanded responsibilities in chronic care coordination, transitional care, and patient education, particularly where community pharmacies are integrated with primary care networks [13].

Both forms of decentralization have profound implications for pharmacy service delivery. They can enhance access to medication counseling, optimize therapy at the community level, and reduce the burden on tertiary institutions. However, they also introduce variability in resource allocation, leading to discrepancies in pharmacist training, access to decision support tools, and remuneration models between regions [14].

Strategic decentralization requires standardized governance frameworks to ensure consistency and equity. Without clear protocols, decentralization may increase fragmentation and accountability gaps. Therefore, successful models emphasize balanced autonomy, cross-sector collaboration, and robust oversight mechanisms [15].

Table 1 Comparison of Centralized vs Decentralized Pharmacy Practice Models

Feature	Centralized Model	Decentralized Model
Decision-Making Hierarchy	Top-down; physician-dominant governance	Shared or distributed; includes pharmacist input in local care teams
Prescriptive Authority	Limited; often restricted to physicians	Expanded; pharmacists may have independent or collaborative prescribing
Clinical Integration	Low to moderate; pharmacists mainly in support roles	High; pharmacists embedded in care pathways and primary health services
Access to Data Systems	Fragmented; often limited to specific settings	Integrated; real-time access to EHRs, dashboards, and collaborative platforms
Flexibility of Care Delivery	Low; services standardized and protocol-bound	High; adaptive services based on community needs and pharmacist judgment
Response Time for Interventions	Slower due to hierarchical approvals	Faster due to frontline autonomy and protocol-based interventions
Patient Accessibility	Centralized locations; may involve longer travel or wait times	Localized services; pharmacists more accessible in community settings

2.3. Risk Management and Accountability in Pharmacy

With greater clinical autonomy comes a heightened need for robust risk management and accountability mechanisms in pharmacy practice. As pharmacists take on expanded roles in medication selection, initiation, and monitoring, health systems must ensure that their actions are aligned with patient safety, legal standards, and ethical principles [16].

One key strategy is the implementation of pharmacovigilance systems, which involve monitoring, detecting, and responding to adverse drug reactions (ADRs). Pharmacists play a central role in identifying and reporting ADRs, particularly in outpatient and community settings where early signs of complications often emerge. Autonomous pharmacists must therefore be trained not only in ADR detection but also in documenting and escalating cases appropriately within national reporting systems [17].

Another approach to managing clinical risk is through protocol-based prescribing. In this model, pharmacists operate under predefined clinical guidelines or algorithms that outline when and how specific medications can be initiated or modified. These protocols reduce variability in care and provide a safety net that supports consistent decision-making while preserving a level of professional independence [18].

Accountability is also governed by medico-legal boundaries, which define the extent of liability pharmacists face when exercising clinical judgment. In jurisdictions where pharmacists hold prescribing rights, either independently or under a CPA, legal frameworks must clearly articulate the responsibilities and protections involved. This includes access to malpractice insurance, scope-of-practice statutes, and standards for documentation [19].

Additionally, ongoing continuing professional development (CPD) and competency assessment are essential to maintaining safe practice. Autonomous roles must be supported by opportunities for pharmacists to update clinical knowledge, sharpen decision-making skills, and reflect on ethical dilemmas [20].

Ultimately, pharmacist autonomy and risk governance must evolve together. Clear protocols, legal safeguards, and supportive infrastructures ensure that pharmacists can operate confidently, making clinically sound decisions that uphold both patient safety and system integrity [21].

3. Pharmacists' roles in decentralized health systems

3.1. Primary Healthcare and Community Pharmacy Integration

The decentralization of healthcare has significantly elevated the status of community pharmacists within primary healthcare networks, empowering them to take on expanded roles in triage, prescribing, and chronic disease management. Traditionally seen as dispensers of medication, pharmacists are now integral to frontline care delivery in both rural and urban settings, especially where access to physicians is constrained [10].

One key area of role expansion is triage, where pharmacists evaluate patient symptoms and determine the urgency and type of care required. In several countries, protocols have been established enabling pharmacists to assess minor ailments and either provide direct treatment or refer patients to appropriate providers. This not only improves service accessibility but also reduces emergency department burden [11].

Pharmacist prescribing rights have also evolved, particularly under collaborative and independent prescribing frameworks. In the UK, for instance, qualified pharmacists are granted independent prescriber status, allowing them to diagnose and treat within their therapeutic scope. Similarly, in Alberta, Canada, pharmacists can independently adjust, initiate, or discontinue medications under regulated authority [12].

Another major contribution is in the management of chronic conditions such as diabetes, hypertension, and asthma. Through structured medication reviews, adherence counseling, and point-of-care testing, pharmacists provide ongoing support that complements physician-led care. Evidence shows that pharmacist-led interventions in chronic disease management lead to improved clinical outcomes and reduced hospital admissions [13].

These expanded roles are supported by digital infrastructure and evolving health policies, placing community pharmacists at the center of integrated, decentralized healthcare delivery. However, such integration requires alignment in training, documentation standards, and collaborative agreements to maintain continuity and accountability across care settings [14].

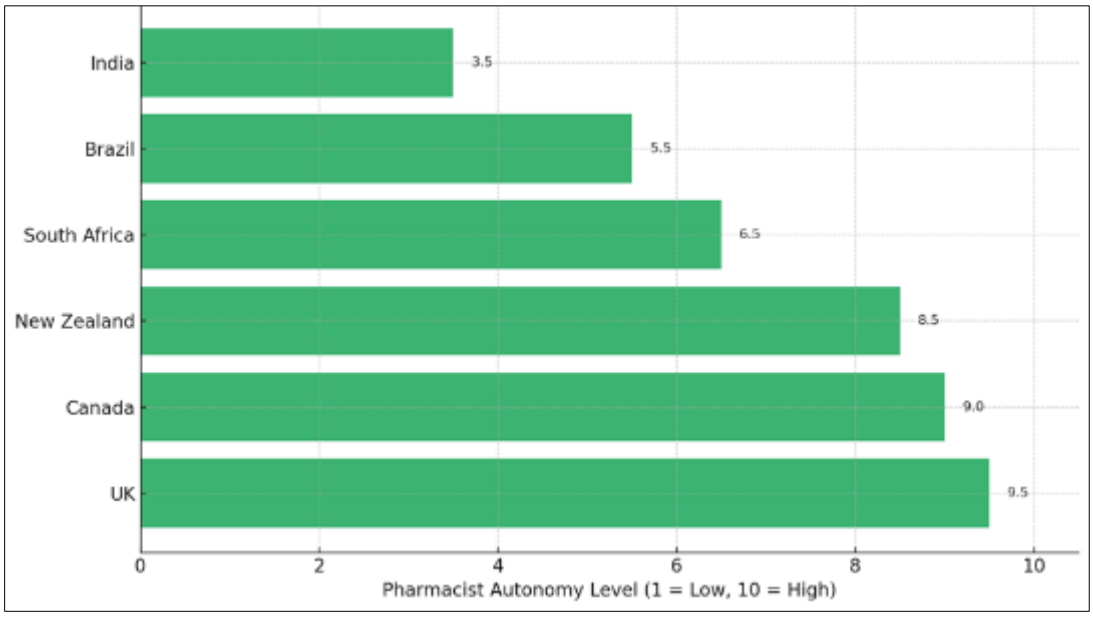

Figure 1 Levels of Pharmacist Autonomy Across Decentralized Systems

3.2. Interdisciplinary Decision-Making and Collaboration

As pharmacist autonomy increases within decentralized healthcare systems, it is critical to understand how interdisciplinary decision-making affects the boundaries of clinical authority. In team-based care, pharmacists must balance independent clinical judgment with collaborative accountability, contributing to decisions while respecting the expertise of other providers [15].

Autonomy in team settings often takes the form of therapeutic contributions during multidisciplinary rounds or within virtual care platforms. For instance, in hospital-at-home models, pharmacists play key roles in selecting antimicrobials, dosing chemotherapy, and managing drug interactions. Their input is frequently considered pivotal in optimizing complex medication regimens [16].

However, a distinction must be drawn between team-based autonomy—where decisions are made collaboratively—and individual case authority, where pharmacists are solely responsible for managing therapeutic choices. While some jurisdictions, like the UK and Canada, permit independent prescribing under defined competencies, others restrict pharmacists to recommendation-only roles, creating variability in actual clinical influence [17].

The United Kingdom presents one of the most structured models of pharmacist autonomy. Through its Independent Prescribing Program, pharmacists can manage entire treatment pathways for selected conditions. They are integrated into general practice teams and have access to shared patient records, enabling seamless communication and intervention [18].

In Canada, especially in provinces like Alberta and British Columbia, pharmacists have prescriptive authority and often lead chronic care programs under provincial funding. These frameworks emphasize outcome-based performance, reinforcing accountability through documentation and audit trails [19].

New Zealand employs a hybrid model, where clinical pharmacists work alongside general practitioners and are authorized to prescribe under collaborative agreements. Their autonomy is supported by national health strategies that promote interdisciplinary practice and decentralization of clinical authority [20].

These international models underscore the need for clear protocols, mutual respect, and shared information systems to optimize pharmacist autonomy while preserving patient safety and collaborative integrity [21].

3.3. Case Management and Telepharmacy Services

The rapid advancement of digital health has introduced telepharmacy as a transformative mechanism for extending pharmacist services into remote, underserved, or decentralized settings. Enabled by digital consultation platforms, secure messaging systems, and cloud-based records, telepharmacy supports remote case management and prescription decision-making with the same clinical rigor as in-person care [22].

Telepharmacy models allow pharmacists to conduct virtual consultations, assess medication therapy, and initiate interventions in collaboration with distant prescribers or independently, depending on jurisdictional laws. In the United States, for example, federally qualified health centers use telepharmacy to support chronic disease management in rural populations, with pharmacists conducting medication therapy management via video conferencing [23].

Remote prescribing is another evolving frontier. Where regulations permit, pharmacists use digital platforms to issue prescriptions for minor ailments, renew chronic medications, or adjust dosages following lab result reviews. In Australia, pharmacists operating under telehealth frameworks can provide e-prescriptions and integrate follow-up care through national e-health systems [24].

Digital case management tools facilitate longitudinal monitoring of patients, especially those with polypharmacy or complex regimens. AI-assisted dashboards and electronic decision support systems help identify non-adherence patterns, potential interactions, and therapy gaps in real time. Pharmacists can intervene by sending alerts, scheduling follow-ups, or recommending changes to prescribers [25].

Telepharmacy also enhances care continuity across transitions. For example, pharmacists can reconcile medications post-discharge via digital platforms, preventing readmissions and ensuring adherence. In settings where mobility is limited—such as for elderly or immunocompromised patients—this remote engagement preserves care quality without exposing patients to travel risks [26].

While telepharmacy amplifies pharmacist reach, it also raises concerns about data privacy, licensure across regions, and technological disparities. Addressing these challenges requires standardized regulatory guidance, training, and equitable infrastructure deployment to ensure consistency, quality, and trust in digital pharmacy services [27].

4. Clinical and organizational outcomes

4.1. Impact on Patient Safety and Medication Adherence

In decentralized healthcare systems, pharmacist autonomy has demonstrated significant positive impacts on patient safety and medication adherence. Empowered pharmacists—equipped to make clinical decisions, conduct follow-ups, and adjust therapies—serve as accessible, trusted points of contact for patients across diverse care environments. Their proactive engagement has led to measurable improvements in adherence rates and safety outcomes, both in high-income countries (HICs) and low- and middle-income countries (LMICs) [14].

In the United Kingdom, studies have shown that patients enrolled in pharmacist-led chronic disease management programs were 25–30% more adherent to their medications compared to those in standard care models. This was attributed to timely medication reviews, clearer counseling, and easier access to pharmacists at community locations [15]. In Canada, community pharmacists involved in independent prescribing and adherence monitoring for hypertension and diabetes reduced treatment gaps and reported fewer emergency department visits due to medication-related complications [16].

Evidence from LMICs is equally promising, despite limited infrastructure. In South Africa, a decentralization initiative that deployed pharmacists to rural health clinics resulted in a 45% reduction in dispensing errors and a 38% increase in medication pickup adherence for antiretroviral therapy [17]. In India, a pilot program integrating pharmacist-driven counseling into tuberculosis and cardiovascular clinics improved adherence scores and led to earlier detection of adverse drug reactions [18].

Pharmacist autonomy fosters real-time interventions when patients deviate from prescribed regimens or experience side effects. This capacity to act without unnecessary administrative delay has a direct impact on treatment continuity and safety, especially for vulnerable or remote populations. Moreover, pharmacists' role in patient education—enhanced by autonomy—enables personalized support that builds patient trust and confidence [19].

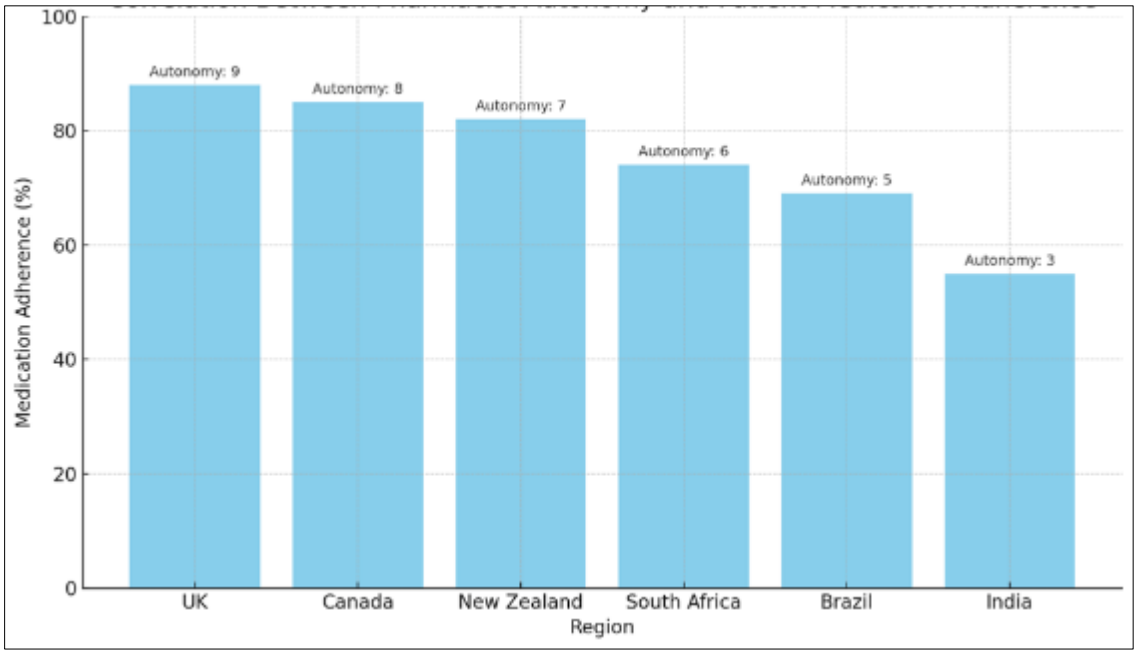

Figure 2 Correlation Between Pharmacist Autonomy and Patient Medication Adherence

4.2. Health Economics: Cost-Effectiveness and Efficiency

Pharmacist clinical autonomy in decentralized care models contributes not only to improved health outcomes but also to greater health system efficiency and cost-effectiveness. One of the most notable economic benefits is the reduction in hospital readmissions and preventable medication-related complications, which often result in significant downstream costs [20].

For example, in a decentralized program in the United States involving pharmacist-led transitional care management, 30-day readmission rates were reduced by 17%. Pharmacists conducted discharge medication reviews, ensured continuity of care, and collaborated with primary providers—demonstrating how autonomy in these roles contributes to system-level savings [21]. Similar findings were observed in Australia, where autonomous pharmacist interventions in aged-care settings led to a 21% drop in adverse medication events, yielding cost savings on emergency services and hospitalization [22].

Autonomy also enables streamlined workflows. By allowing pharmacists to initiate therapy changes, renew prescriptions, and perform clinical assessments without constant supervisory approval, administrative bottlenecks are minimized. This reduces the burden on physicians and increases service throughput, particularly in primary care networks where pharmacist-led medication therapy management (MTM) is embedded [23].

From a macroeconomic perspective, enabling pharmacists to operate with greater authority can help optimize health workforce distribution, reducing over-reliance on physicians in areas with critical shortages. This task-shifting approach aligns with World Health Organization (WHO) strategies for workforce resilience and universal health coverage [24].

Additionally, decentralized systems that leverage pharmacist autonomy experience better inventory management, lower rates of wastage, and improved rational use of medicines—all contributing to long-term cost containment. When aligned with performance-based financing models, such autonomy further incentivizes quality care delivery without escalating expenses [25].

Overall, pharmacist autonomy is not only a clinical asset but a strategic economic enabler in both resource-rich and resource-constrained health systems.

4.3. Professional Development and Job Satisfaction

Beyond system-level advantages, pharmacist autonomy in decentralized settings significantly enhances professional development, cognitive authority, and job satisfaction. With expanded responsibilities, pharmacists are increasingly recognized as clinical decision-makers, contributing not only to patient care but also to the design of therapeutic pathways, policy initiatives, and interdisciplinary education [26].

This expanded scope fosters professional identity and fulfillment, as pharmacists engage in meaningful, patient-focused interventions. Studies from the UK and New Zealand reveal that pharmacists with independent prescribing rights report higher career satisfaction, citing increased autonomy, collaborative respect, and clinical visibility as key drivers [27]. They also perceive their roles as more impactful, especially in chronic disease management and preventive care.

In LMICs, while infrastructure remains a challenge, pharmacists participating in decentralized outreach programs often express greater job satisfaction due to increased patient interaction and leadership opportunities. For instance, pharmacists involved in antiretroviral distribution programs in Kenya noted that having authority to manage therapy directly resulted in greater confidence, skill acquisition, and job retention [28].

Autonomy also encourages lifelong learning and specialization, as pharmacists seek credentials in clinical pharmacy, pharmacogenomics, and therapeutic risk management to expand their scope. This upskilling enhances workforce quality while supporting succession planning and team-based competencies [29].

Moreover, decentralized models with pharmacist-led services improve staff retention, particularly in underserved or rural areas. When pharmacists feel valued and empowered, they are more likely to remain in their posts, reducing turnover and maintaining service continuity. This is particularly crucial in healthcare systems with chronic staffing deficits [30].

In summary, pharmacist autonomy not only enhances patient outcomes and operational efficiency but also elevates professional standing, improves morale, and strengthens the long-term sustainability of the pharmacy workforce in both centralized and decentralized models.

5. Barriers and risks to clinical autonomy

5.1. Regulatory and Legal Ambiguities

Despite the expanding clinical roles of pharmacists in decentralized healthcare systems, significant regulatory and legal ambiguities remain, particularly regarding prescriptive authority and accountability. These uncertainties create inconsistencies in the application of pharmacist autonomy, leading to both underutilization and risk exposure in various jurisdictions [19].

In many countries, pharmacists lack full prescriptive rights, even in areas where they are extensively trained. Their ability to initiate or adjust therapy is often restricted by legislation, requiring approval from a supervising physician or falling within narrow disease-specific protocols. For instance, while UK pharmacists can prescribe independently after completing specific training, other nations like Germany and Italy limit pharmacist authority to dispensing and advice only [20]. These discrepancies hinder the global standardization of pharmacist-led services and limit their integration into broader clinical governance frameworks.

Legal frameworks also vary in defining accountability for clinical outcomes. Pharmacists operating under collaborative practice agreements may share responsibility with physicians, but clarity is often lacking in situations where adverse events occur. Questions persist regarding liability when pharmacists adjust doses, manage drug interactions, or provide triage in the absence of direct physician oversight [21].

Additionally, medico-legal standards related to documentation, informed consent, and malpractice coverage are frequently underdeveloped for pharmacists in autonomous roles. In LMICs, these gaps are more pronounced due to limited legislative infrastructure and regulatory oversight. As a result, pharmacists working in decentralized programs may face disproportionate legal risk without institutional protections or indemnity mechanisms [22].

These legal uncertainties can inhibit confidence among both pharmacists and their collaborators, ultimately deterring innovation and practice expansion. A harmonized, competency-based regulatory framework—supported by continuing professional development and risk-sharing protocols—is essential to operationalize pharmacist autonomy safely and effectively within decentralized systems [23].

5.2. Variability in Training and Credentialing

The global variability in training and credentialing standards poses another critical barrier to the full realization of pharmacist autonomy. While some nations have implemented structured clinical pharmacy pathways with defined competencies and postgraduate requirements, others offer limited clinical exposure or lack specialization tracks altogether [24].

For example, pharmacists in Canada, the United Kingdom, and Australia undergo rigorous training, including advanced clinical placements, prescribing modules, and therapeutic risk management assessments. In contrast, pharmacists in many LMICs follow a traditional curriculum focused heavily on pharmaceutics and dispensing, with minimal patient-facing experience during undergraduate education [25]. This disparity limits the readiness of pharmacists to take on autonomous clinical roles, particularly in high-stakes decision-making environments.

Moreover, postgraduate credentialing systems vary considerably. Some countries offer board certifications, clinical residencies, or continuing education requirements tied to prescriptive authority, while others lack formal mechanisms to evaluate or accredit clinical competence. Without standardized benchmarks, it becomes difficult to assess which pharmacists are prepared to assume broader roles in decentralized care models [26].

The inconsistency in training also affects interdisciplinary collaboration. Physicians and health administrators may hesitate to accept pharmacist-led decisions if they are unsure of the pharmacist's training background or if prior experience with pharmacist autonomy is limited. This lack of confidence impairs the trust necessary for successful integration.

Harmonizing educational pathways, introducing international accreditation standards, and expanding clinical residencies in LMICs can help bridge the competency gap. These measures would support equitable access to pharmacist autonomy while ensuring patient safety and workforce credibility across diverse health systems [27].

Table 2 International Comparison of Clinical Training Requirements for Pharmacist Autonomy

Country	Prescribing Modules	Clinical Rotations	Certification Bodies	CPD Mandates
United Kingdom	Required (Postgraduate Independent Prescribing Certificate)	Mandatory in community/primary care	General Pharmaceutical Council (GPhC)	Annual CPD portfolio with revalidation every 5 years
Canada	Required in provinces with prescriptive authority	Hospital and community placements	Provincial Colleges of Pharmacy	Mandatory annual CE hours (30–40)
Australia	Included in Advanced Practice Pharmacist credentialing	Required for hospital practice	Australian Pharmacy Council (APC)	CPD plan and minimum 40 credits annually
South Africa	Not nationally standardized; pilot modules emerging	Limited to certain academic programs	South African Pharmacy Council (SAPC)	Minimum annual CEU requirements (15 CEUs)
Brazil	Not mandatory; varies by institution	Optional in undergraduate programs	Federal Pharmacy Council (CFF)	Regional variation; national guidelines evolving
India	Not integrated in standard BPharm curriculum	Emerging in PharmD programs	Pharmacy Council of India (PCI)	CPD in early development; not nationally mandated

5.3. Cultural and Institutional Resistance

Even in settings where regulations permit pharmacist autonomy and clinical training is robust, cultural and institutional resistance often remains a formidable barrier. This resistance stems from longstanding hierarchies in healthcare that prioritize physician leadership and undervalue the clinical contributions of pharmacists [28].

A common challenge is physician dominance, particularly in systems where medical authority is deeply entrenched. In such environments, any expansion of pharmacist scope may be perceived as a threat to professional boundaries or clinical control. Studies in Europe and Asia have shown that physicians often express reluctance to accept pharmacist-initiated therapy adjustments, regardless of training or protocol adherence [29].

Organizational inertia also plays a role. Health institutions may lack the structural adaptability to accommodate new pharmacist roles, especially in rigidly tiered systems. Resistance may manifest in the form of outdated workflow designs, limited access to clinical records, or exclusion from multidisciplinary planning. Without institutional champions, efforts to redefine pharmacy roles frequently stall or revert to traditional functions [30].

Another dimension of resistance involves patient trust and public perception. In regions where patients are unfamiliar with pharmacist-led services, autonomy may be viewed with skepticism or confusion. Concerns about qualification, access to comprehensive care, and accountability can lead patients to prefer physician-managed models, even when pharmacists are more accessible or better positioned for follow-up [31].

Addressing these cultural and institutional barriers requires comprehensive strategies, including interprofessional education, public awareness campaigns, and leadership advocacy. By fostering mutual respect and understanding across healthcare roles, systems can unlock the full potential of pharmacist autonomy as a transformative element in decentralized care.

6. Governance and risk mitigation frameworks

6.1. Policy Enablers and Legislative Reforms

The successful expansion of pharmacist autonomy within decentralized healthcare systems depends heavily on policy enablers and legislative reforms that formally authorize and support advanced clinical roles. Key among these are scope of practice laws, standing orders, and overarching national health acts that clearly define the legal boundaries and expectations of pharmacist-led care [23].

Scope of practice legislation serves as the foundational mechanism by which pharmacists are empowered to perform clinical tasks such as prescribing, initiating therapy, conducting physical assessments, and ordering diagnostic tests. In the United Kingdom, for example, independent prescribing was made legally possible through amendments to the Medicines Act and supporting frameworks under the NHS, effectively enabling pharmacists to manage entire treatment pathways within their competencies [24].

In jurisdictions like the United States and Canada, standing orders and collaborative practice agreements (CPAs) have become practical tools to delegate prescriptive authority to pharmacists, particularly for vaccinations, minor ailments, and chronic disease management. These mechanisms are often embedded in public health mandates and offer flexible, localized approaches that facilitate pharmacist engagement without the need for legislative overhaul [25].

National health acts and pharmacy-specific reforms also play a pivotal role in institutionalizing autonomy. In Australia, the National Health Reform Agreement includes provisions for community pharmacy programs that recognize pharmacist clinical contributions and link funding to outcome-based metrics [26]. Similar approaches are emerging in LMICs, where decentralized health governance structures allow regional health ministries to authorize pharmacist-led services under pilot legislation or conditional clauses.

However, the mere existence of policy instruments is insufficient. Effective reform requires alignment with regulatory bodies, continuing education mandates, and digital infrastructure to support safe practice. Without these complementary elements, expanded roles risk being underutilized or inconsistently applied. Therefore, legislative clarity, stakeholder collaboration, and sustained policy advocacy are essential to embed pharmacist autonomy as a standard of decentralized healthcare delivery [27].

6.2. Clinical Governance and Decision-Support Tools

For pharmacist autonomy to yield optimal outcomes, it must be embedded within robust clinical governance structures and supported by intelligent decision-making tools. Governance frameworks ensure that autonomy is exercised responsibly and consistently, while technology enhances precision, accountability, and workflow integration [28].

One of the most transformative enablers of pharmacist-led care has been the integration of artificial intelligence (AI) and machine learning (ML)-based decision support systems. These tools offer real-time alerts, drug-interaction checks, personalized dosing algorithms, and risk stratification models that assist pharmacists in making complex clinical judgments [29]. For example, AI-powered platforms can suggest optimal anticoagulant regimens based on renal function and genetic profiles, enabling pharmacists to tailor therapy without awaiting physician input.

Moreover, clinical pathways and therapeutic algorithms provide structured frameworks for pharmacists to follow, ensuring that decisions align with evidence-based practice. In the UK and New Zealand, standardized care pathways for conditions like hypertension and asthma explicitly include pharmacist-led interventions and prescribing checkpoints [30]. These pathways are integrated into electronic health records, allowing seamless documentation, communication, and auditability.

Electronic clinical decision support systems (CDSS) also play a crucial role in mitigating risk. By incorporating lab results, allergy histories, and patient-specific parameters, CDSS can flag contraindications or therapy duplication before the medication is dispensed. Pharmacists in Canada and Australia have access to such systems through national or provincial health portals, enhancing their clinical autonomy without compromising safety [31].

However, the deployment of these tools must be accompanied by training, ethical standards for AI use, and routine system updates to reflect evolving guidelines. When combined with governance oversight, technology strengthens pharmacists' ability to act independently while maintaining system accountability.

Table 3 Decision-Support Systems Enabling Pharmacist-Led Interventions

System Type	Functionality	Country of Use	Integration with EHR	Safety Features
AI-Powered Clinical Decision Support (CDS)	Drug interaction checks, renal-adjusted dosing, predictive analytics	United Kingdom	Full integration with NHS EHR	Allergy alerts, contraindication flags, duplicate therapy detection
Pharmacogenomics-Based Decision Tools	Genetic marker interpretation, therapy optimization	Canada	Integrated with hospital EHRs	Risk stratification, toxicity prediction
Mobile Prescribing Dashboards	Remote prescribing, adherence monitoring, chronic condition management	Australia	Synced with cloud-based systems	Secure login, patient risk alerts, refill warnings
Automated Medication Reconciliation Platforms	Real-time comparison of patient medication history across care settings	United States	Linked to regional EHR networks	Discrepancy resolution, polypharmacy alerts
Chronic Disease Management Algorithms	Standardized care pathways for hypertension, diabetes, asthma	New Zealand	National EHR platform integrated	KPI tracking, outcome-based prompts, audit trail
Clinical Triage and Triage AI Tools	Minor ailment classification, escalation protocol support	South Africa	Partial integration via local EHR	Decision trees, referral triggers, red-flag warnings

6.3. Risk-Sharing Models and Interprofessional Accountability

The expansion of pharmacist autonomy within decentralized systems must be supported by risk-sharing models that clearly allocate responsibilities across the care team. These frameworks foster trust, legal clarity, and professional alignment, thereby enabling pharmacists to practice confidently while maintaining patient safety and institutional integrity [32].

One such model involves delegated authority protocols, where pharmacists are formally entrusted with specific clinical tasks under defined conditions. These protocols establish a chain of command and outline the scope, limitations, and supervision mechanisms involved. In South Africa and select US states, decentralized rural health programs use delegated authority to allow pharmacists to manage HIV and tuberculosis regimens, guided by national protocols and periodic reviews [33].

To support accountability, systems must also include provisions for malpractice insurance coverage specific to pharmacist-led clinical activities. In countries where pharmacists have prescriptive rights, such as the UK and Canada, professional indemnity is mandatory and often subsidized or embedded in licensing requirements. This ensures that pharmacists are protected from legal repercussions while operating within their authorized scope [34].

Another critical component is the establishment of interprofessional peer-review boards or oversight committees. These bodies evaluate clinical decisions, provide feedback, and mediate disputes between team members. They help maintain professional standards while encouraging reflective practice. Peer-review processes are increasingly being institutionalized in health networks that promote shared governance, particularly in teaching hospitals and public health initiatives [35].

Finally, interdisciplinary training enhances mutual understanding and delineation of roles. When pharmacists, physicians, and nurses are educated together, they develop a shared language for decision-making, reducing friction and overlap. Such collaborative education models have been linked to increased team cohesion and safer patient outcomes in decentralized settings [36].

By adopting a balanced risk-sharing approach, health systems can unlock the full potential of pharmacist autonomy while safeguarding professional accountability and patient trust.

7. Case studies and comparative analysis

7.1. UK's Independent Prescribing Pharmacists

The United Kingdom represents one of the most advanced global examples of pharmacist autonomy within a decentralized healthcare system, having formally introduced independent prescribing rights for qualified pharmacists over a decade ago. This reform followed the 2006 amendment to the Medicines for Human Use (Prescribing) Order, which authorized pharmacists—following completion of a postgraduate certificate—to independently prescribe within their clinical competence [26].

The UK's model is underpinned by a national regulatory framework, where pharmacist prescribers are registered with the General Pharmaceutical Council (GPhC), and their competencies are aligned with NHS standards. These pharmacists operate across various decentralized settings, including general practices, community health centers, and walk-in clinics. They manage conditions ranging from hypertension and asthma to minor infections and palliative care support [27].

Evaluations of independent prescribing have shown notable improvements in clinical and operational outcomes. A study conducted by NHS England found that pharmacist prescribers helped reduce general practitioner workload by 10–15% in high-traffic clinics, while patient satisfaction ratings for pharmacist-led consultations exceeded 90% [28]. Furthermore, audit data revealed increased medication adherence and reduced duplication of therapy in regions where pharmacists were embedded in primary care networks.

Health outcome metrics from local NHS trusts also indicated reductions in prescribing errors and medication-related hospital admissions. These findings demonstrate how regulatory empowerment, supported by training and oversight, can translate pharmacist autonomy into measurable health system benefits [29].

The UK's success has influenced other health systems exploring decentralization by offering a blueprint for integrating pharmacists as frontline prescribers, highlighting the interplay of legislative clarity, interdisciplinary collaboration, and patient trust in optimizing pharmacist-led care.

7.2. South Africa's District-Based Health System

South Africa's District Health System (DHS), rooted in decentralization principles, presents a compelling case for pharmacist engagement in public health through autonomous clinical roles, particularly in the management of HIV and tuberculosis (TB). Under this model, pharmacists have been increasingly involved in medication access, adherence monitoring, and even therapeutic decision-making in underserved districts [30].

A key policy enabler was the 2010 National Department of Health Pharmacy Strategy, which encouraged pharmacist participation in direct patient care as part of the country's push for universal health coverage. While pharmacists do not possess full prescriptive authority, provisions under standing orders and delegated care allow for autonomous decision-making in ART (antiretroviral therapy) adherence support and TB prophylaxis counseling [31].

Pharmacist clinicians stationed at community health centers and primary healthcare clinics are often the most accessible healthcare providers in rural settings. They conduct routine patient assessments, manage side effects, and escalate cases requiring physician review. In many instances, these pharmacists are the first point of contact for patients experiencing complications, playing a pivotal role in early detection and intervention [32].

A recent multi-district evaluation conducted by the South African Medical Research Council showed a 20% improvement in ART adherence rates and a 12% decline in TB treatment dropout rates in clinics where pharmacists provided structured follow-up and counseling sessions [33]. Additionally, these services reduced referral delays and improved medication supply chain efficiency through pharmacist-led inventory forecasting.

The South African case highlights how task shifting and decentralized governance enable pharmacists to extend their clinical reach while supporting overstretched physician networks. Although regulatory gaps remain, the DHS has demonstrated the feasibility and value of pharmacist-led interventions in complex, high-burden disease contexts [34].

7.3. Brazil's Family Health Strategy

Brazil's Family Health Strategy (FHS)—a flagship initiative under its Unified Health System (SUS)—offers a model for embedding pharmacist autonomy in decentralized, community-led care. Introduced in the late 1990s, the FHS aims to provide comprehensive primary care through multidisciplinary teams operating at the community level, particularly in underserved urban and rural regions [35].

Pharmacists integrated within these teams are not limited to dispensing functions but contribute meaningfully to diagnostic triage, therapeutic counseling, and medication-related decision-making. The Brazilian Ministry of Health has recognized clinical pharmacy as a central component of FHS, promoting pharmacist engagement in health promotion, disease prevention, and rational medicine use [36].

One policy catalyst has been the National Policy on Pharmaceutical Services (PNAF), which outlines the pharmacist's role in ensuring equitable access to medications and participation in therapeutic planning. While Brazilian pharmacists do not yet hold independent prescribing rights, several municipalities have adopted collaborative care protocols that grant pharmacists the authority to adjust therapy within predefined parameters, especially for chronic diseases such as diabetes and hypertension [37].

A 2021 study published in the *Revista de Saúde Pública* found that FHS teams with actively engaged pharmacists demonstrated better hypertension control and lower rates of medication errors compared to teams without pharmacist participation. Pharmacists' ability to monitor therapy closely, provide lifestyle counseling, and engage in follow-up improved both adherence and patient satisfaction [38].

Brazil's approach demonstrates how decentralized primary care structures, combined with supportive policies and team-based practice, can enable pharmacists to expand their clinical footprint. The FHS continues to evolve as a living example of how political commitment and structural inclusion empower pharmacists to shape population health at the local level [39].

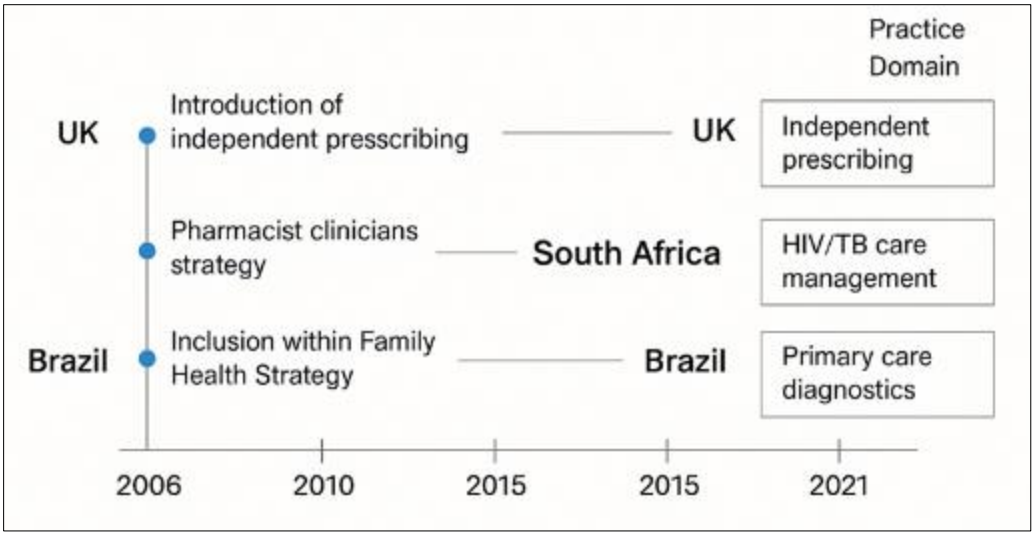

Figure 3 Country-Level Progression Toward Pharmacist Autonomy in Decentralized Models

8. Strategic implications for healthcare administrators and policymakers

8.1. Leadership and Workforce Development

The long-term success of pharmacist autonomy in decentralized healthcare models hinges on leadership cultivation and continuous workforce development. As pharmacists assume expanded clinical responsibilities, strategic investment in upskilling and structured mentorship is crucial to ensure competence, confidence, and sustainability of autonomous roles [29].

Leadership development initiatives must go beyond technical training to include modules on health system navigation, interprofessional communication, and clinical governance. Countries like the United Kingdom and Australia have

implemented advanced practice frameworks that recognize leadership as a formal domain of pharmacist competency, enabling experienced professionals to lead therapeutic teams and mentor junior staff [30].

Clinical mentorship programs provide the scaffolding for newer pharmacists to transition into autonomous practice. These programs pair experienced clinician-pharmacists with trainees or early-career professionals, guiding them through complex decision-making scenarios, documentation standards, and ethical dilemmas. Evidence from Canada's expanded scope programs indicates that mentored pharmacists report higher job satisfaction and lower error rates during early independent practice [31].

Investment in training infrastructure is also necessary, particularly in LMICs where pharmacist education may be oriented toward product management rather than clinical care. Establishing national centers for clinical pharmacy excellence, supported by universities and health ministries, can offer intensive, competency-based training to bridge gaps and standardize care quality [32].

Furthermore, health systems should encourage pharmacists to engage in policy discourse, research leadership, and public health initiatives. Empowering pharmacists to co-create care models and contribute to strategic planning enhances both legitimacy and effectiveness of autonomous practice. Through intentional workforce development, pharmacist autonomy becomes not only an operational reality but a driver of health system innovation and resilience [33].

8.2. Data-Driven Decision-Making and Evaluation

A critical enabler of safe and effective pharmacist autonomy is the integration of data-driven decision-making into clinical workflows and health system evaluation. Real-time access to data allows pharmacists to monitor patient outcomes, ensure adherence to protocols, and identify areas for service improvement [34].

Outcomes tracking tools such as electronic health records (EHRs), prescribing dashboards, and medication safety registries provide pharmacists with actionable insights. These systems enable longitudinal monitoring of key indicators such as medication adherence, therapy success rates, and adverse event incidence. In decentralized models where pharmacists operate independently, this level of tracking supports both accountability and care continuity [35].

Quality assurance frameworks built around autonomous pharmacist roles are essential for standardizing care. These frameworks include key performance indicators (KPIs), audit cycles, and feedback loops that assess both clinical effectiveness and service efficiency. In the UK, for instance, pharmacist prescribers undergo regular performance reviews based on patient outcomes and documentation accuracy [36].

Dashboards that display aggregated data in real time can also guide operational decisions. For example, a pharmacist managing a chronic disease clinic may use dashboards to identify high-risk patients, assess adherence patterns, and prioritize follow-ups. Such tools not only enhance individual clinical decisions but inform system-level planning and resource allocation [37].

When integrated properly, data systems strengthen pharmacist autonomy by ensuring that decisions are evidence-based, transparent, and measurable, thus aligning clinical freedom with institutional accountability in a decentralized context [38].

8.3. Integrating Autonomy into Health Planning

Embedding pharmacist autonomy into broader health system planning is essential to ensure scale, sustainability, and equitable access to decentralized care. Autonomy must be conceptualized not as an isolated reform but as a strategic pillar within multidisciplinary and community-based health architectures [39].

Scalable models for pharmacist autonomy rely on adaptable frameworks that can be replicated across diverse settings—from urban outpatient clinics to rural health posts. These models require alignment with national health objectives, financing strategies, and digital infrastructure capacity. For example, pilot programs in Kenya and India have demonstrated that decentralized pharmacist-led care can be scaled effectively when integrated into national essential health service packages [40].

Health system planners must also integrate pharmacists into decentralization roadmaps, ensuring their representation in policy consultations, regional health committees, and implementation teams. Pharmacists bring unique perspectives

on medication safety, supply chain optimization, and patient behavior that can enrich cross-sectoral strategies for universal health coverage [41].

Equally important is cross-professional engagement, where the planning process includes physicians, nurses, and allied health professionals. Collaborative policy design helps mitigate resistance and builds consensus around shared goals. In New Zealand, for example, integrated care planning explicitly recognizes pharmacists as clinical leaders, fostering smoother implementation and interprofessional harmony [42].

By embedding autonomy within health planning processes—supported by legal instruments, workforce development, and data systems—pharmacist-led care becomes a deliberate, structured, and sustainable feature of decentralized healthcare delivery rather than an ad hoc innovation [43].

9. Conclusion and future directions

9.1. Summary of Insights

This study explored the intersection of pharmacist clinical autonomy and decentralized healthcare systems, identifying pharmacist-led care as a critical enabler of system resilience, safety, and operational efficiency. Across a variety of global contexts—from high-income nations with robust policy infrastructure to low- and middle-income countries (LMICs) implementing localized health reforms—pharmacist autonomy emerged as a strategic lever for bridging gaps in access, improving therapeutic outcomes, and enhancing workforce distribution.

The evolution of pharmacy practice, from a traditionally product-centered profession to a clinically integrated discipline, has redefined the pharmacist's role in public health. In decentralized systems, this transformation is not merely conceptual but operational. Pharmacists now triage, prescribe, monitor, and manage therapy—often as the most accessible healthcare professionals in primary care settings. Whether managing chronic diseases in urban centers or coordinating antiretroviral therapy in rural clinics, autonomous pharmacists serve as decentralized gatekeepers of medication safety, continuity, and efficiency.

The study found that health outcomes improve measurably when pharmacists operate with expanded clinical authority. Increases in medication adherence, reductions in preventable hospitalizations, and faster therapeutic adjustments were observed across multiple case examples. Moreover, pharmacist autonomy was associated with better patient education, proactive adverse drug event mitigation, and stronger interprofessional collaboration.

Economically, pharmacist-led care yielded clear benefits in cost containment, especially through reduced physician burden, optimized prescribing practices, and more effective inventory management. Workforce satisfaction and retention were also positively influenced by autonomy, particularly when coupled with structured mentorship, clear accountability frameworks, and career development pathways.

Despite these gains, challenges persist. Legal ambiguities, variability in training, institutional resistance, and inconsistent access to digital infrastructure limit full realization of pharmacist autonomy in many regions. Nonetheless, countries that have overcome these barriers through legislative clarity, integrated health planning, and supportive technology ecosystems offer replicable models for others seeking to decentralize responsibly.

Ultimately, pharmacist autonomy is not a singular intervention but a composite innovation—one that integrates policy, professional development, technology, and governance. Its successful implementation requires holistic thinking and system-wide commitment. As health systems continue to shift toward more localized, patient-centered care, pharmacists are uniquely positioned to lead from the frontline, driving improvements in access, quality, and sustainability.

9.2. Recommendations for Future Research and Policy

The findings of this study suggest a clear and actionable trajectory for expanding pharmacist autonomy as a cornerstone of decentralized healthcare reform. However, future research and policy development must continue to evolve in tandem to support safe, scalable, and context-sensitive implementation.

First, there is a need for global consensus frameworks that standardize the competencies, accountability mechanisms, and digital infrastructure required for autonomous pharmacist practice. These frameworks should be adaptable to both

high-resource and low-resource settings, with built-in flexibility for local legal, cultural, and infrastructural realities. Establishing international benchmarks will enable more consistent training, credentialing, and patient safety protocols.

Second, implementation science should be leveraged to guide real-world application of pharmacist autonomy. Pilot studies and program evaluations should examine not only clinical outcomes, but also patient satisfaction, provider workload distribution, and health equity impacts. Special focus should be placed on understanding how autonomy functions in rural or underserved areas, where pharmacists may be the primary or sole healthcare touchpoint.

Third, policy roadmaps should integrate pharmacist-led care into national and regional health strategies. This includes defining scope of practice in legislation, allocating resources for upskilling and infrastructure, and embedding pharmacists in health planning bodies. Cross-sector partnerships involving ministries of health, academia, and professional boards can accelerate uptake and foster shared ownership.

Finally, investment should be made in digital tools and data systems that support autonomous practice. Decision-support platforms, integrated patient records, and remote monitoring capabilities not only enhance care quality but also provide transparency and evaluative insights for governance.

In sum, realizing the full potential of pharmacist autonomy in decentralized systems will require coordinated efforts across research, regulation, education, and technology—anchored by a commitment to patient-centered and sustainable healthcare delivery.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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