

A Framework for Community Pharmacist Engagement in Combating Antimicrobial Resistance Through Improved Antibiotic Practices

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Abstract: Antimicrobial resistance (AMR) represents a major public-health and health-system challenge in which inappropriate antibiotic use accelerates the selection and dissemination of resistant microorganisms. Community pharmacies occupy a strategically important position because pharmacists frequently serve as accessible healthcare professionals and may influence antibiotic acquisition, patient expectations, treatment adherence, and antimicrobial stewardship. This review-based research develops a conceptual framework for strengthening community pharmacist engagement in AMR prevention through improved antibiotic practices. The framework is derived exclusively from the six supplied references and integrates evidence concerning non-prescription antibiotic dispensing, pharmacist knowledge and attitudes, stewardship practices, global AMR threats, and the economic consequences of drug resistance. The methodology applies structured thematic synthesis to identify recurrent determinants of inappropriate antibiotic use and translate them into functional framework components. The resulting framework comprises five interconnected domains: pharmacist knowledge and competency, prescription-screening and dispensing practices, patient communication and education, stewardship-oriented monitoring, and institutional support and accountability. The synthesis indicates that pharmacist engagement should not be conceptualized merely as restriction of antibiotic access; rather, it requires a coordinated decision-support and stewardship model capable of balancing accessibility with clinically appropriate antibiotic use. Evidence from community-pharmacy research demonstrates that dispensing practices and professional perceptions are important intervention points, while the broader literature establishes the clinical and economic significance of resistance. The proposed framework provides a practical conceptual basis for future intervention studies, pharmacist training programs, and pharmacy-level antimicrobial stewardship policies.

Keywords: Antimicrobial Resistance, Community Pharmacists, Antibiotic Stewardship, Antibiotic Dispensing, Pharmacy Practice, Knowledge and Attitudes, Stewardship Framework, Rational Antibiotic Use, Public Health.

1. Introduction:

1.1 Problem Statement

Antimicrobial resistance is fundamentally associated with the selective pressure generated by antimicrobial exposure and is intensified when antibiotics are used unnecessarily, inappropriately, or without adequate clinical oversight. The consequences extend beyond individual treatment failure because resistant

organisms can increase the complexity, duration, and cost of managing infectious diseases. Dhingra et al. characterize antimicrobial resistance as a broad global public-health threat requiring coordinated countermeasures rather than isolated interventions (Dhingra et al., 2020). The economic dimension is similarly substantial, with drug resistance generating costs associated with healthcare utilization, treatment complexity, and broader societal consequences

(Howard and Scott, 2005).

Community pharmacies represent an important operational environment for addressing inappropriate antibiotic use. Their accessibility places pharmacists close to patients at the point where requests for antibiotics, questions about symptoms, and decisions concerning treatment frequently occur. However, evidence from different settings indicates that antibiotics may be obtained without a medical prescription, creating opportunities for inappropriate selection or use. Al-Faham et al. documented the sale of antibiotics without prescription in pharmacies in Damascus, while Llor and Cots reported similar concerns in Catalonia (Al-Faham et al., 2011; Llor and Cots, 2009). These findings position the pharmacy as both a potential contributor to inappropriate antimicrobial exposure and an important intervention point.

The professional knowledge, attitudes, perceptions, and habits of pharmacists are therefore central to the effectiveness of stewardship interventions. Vazquez-Lago et al. specifically examined these dimensions among Spanish pharmacists and demonstrated the relevance of pharmacist-level factors to antibiotic dispensing without medical prescription (Vazquez-Lago et al., 2017). Consequently, antimicrobial stewardship at community-pharmacy level must address not only formal dispensing rules but also the knowledge, decision-making patterns, communication practices, and contextual pressures influencing pharmacists.

1.2 Research Relevance and Objectives

The principal objective of this research is to develop a conceptual framework through which community pharmacists can contribute systematically to combating AMR by improving antibiotic practices. The framework seeks to connect individual pharmacist competencies with pharmacy-level processes and broader stewardship objectives.

The specific objectives are to identify major determinants influencing community-pharmacy antibiotic practices; synthesize the evidence concerning non-prescription dispensing and pharmacist behavior; establish a structured model for pharmacist engagement; and identify mechanisms through which education, dispensing controls, communication, monitoring, and institutional support

can operate collectively.

1.3 Scope and Significance

The study is conceptual and review-oriented rather than an empirical evaluation of a newly recruited participant population. Its evidence base is deliberately restricted to the references supplied for the research task. This limitation ensures that the proposed framework remains directly grounded in the specified literature while also preventing unsupported claims derived from external evidence.

The significance of the framework lies in its attempt to move from identifying inappropriate antibiotic practices toward designing an integrated professional response. Rather than treating pharmacists as passive distributors of prescribed medicines, the framework positions them as active participants in antimicrobial stewardship, particularly at the interface between patients, prescribers, and medicines.

2. LITERATURE REVIEW

2.1 Antibiotic Access and Community Pharmacy Practices

Evidence from community-pharmacy settings demonstrates that non-prescription antibiotic availability is not restricted to one geographical context. Al-Faham et al. investigated antibiotic sales without prescription in Damascus, Syria, identifying community pharmacies as an important setting for understanding patterns of antibiotic access (Al-Faham et al., 2011). Llor and Cots similarly examined antibiotic sales without prescription in Catalonia, Spain, illustrating the relevance of pharmacy-level practices to antimicrobial-use policy (Llor and Cots, 2009).

The cross-contextual nature of these observations is theoretically important. If inappropriate antibiotic access emerges under different healthcare environments, interventions should examine the interaction between regulatory expectations, pharmacist behavior, patient demand, and professional decision-making rather than attributing the problem exclusively to one factor. A pharmacy-centered framework therefore requires both behavioral and system-level components.

2.2 Pharmacist Knowledge, Attitudes, and Practices

Vazquez-Lago et al. investigated pharmacists' knowledge, attitudes, perceptions, and habits

regarding antibiotics dispensed without medical prescription, demonstrating the importance of understanding professional decision-making in the context of antibiotic access (Vazquez-Lago et al., 2017). This perspective expands the stewardship problem beyond simple compliance. A pharmacist may understand the risks associated with resistance while still facing practical pressures that influence dispensing behavior.

The theoretical implication is that knowledge alone may be insufficient to change practice. Effective stewardship requires alignment between knowledge, professional attitudes, dispensing procedures, communication skills, and organizational expectations. A framework that focuses exclusively on training may consequently produce limited behavioral change if the surrounding pharmacy system does not support appropriate antibiotic decisions.

Erku's assessment of antimicrobial stewardship perceptions and practices among community pharmacists in Ethiopia further supports the importance of examining pharmacists as active stewardship actors. The study's focus on perceptions and practices provides a foundation for considering the pharmacy as an organizational environment in which stewardship principles must be translated into routine professional behavior (Erku).

2.3 AMR as a Global and Economic Problem

Dhingra et al. frame antimicrobial resistance as a global public-health threat requiring coordinated strategies for mitigation (Dhingra et al., 2020). Their perspective supports a systems-oriented interpretation in which antibiotic use at individual points of care contributes to a wider resistance problem. Community pharmacies are therefore connected to a larger antimicrobial-use ecosystem.

Howard and Scott emphasize the economic burden associated with drug resistance, demonstrating why AMR should not be considered solely a microbiological or clinical problem (Howard and Scott, 2005). Inappropriate antibiotic practices may generate downstream consequences through treatment failure and increased healthcare requirements. Accordingly, improving community-pharmacy antibiotic practices may have implications extending beyond individual dispensing encounters.

2.4 Research Gap and Theoretical Positioning

The supplied literature provides evidence for three interconnected propositions: inappropriate non-prescription antibiotic access occurs in community-pharmacy environments; pharmacist knowledge, attitudes, and practices influence antibiotic dispensing; and AMR produces substantial public-health and economic consequences. However, these components are not automatically transformed into a unified operational framework.

The principal research gap addressed here is therefore **integration**. A framework is needed to connect pharmacist competency with prescription verification, patient communication, stewardship monitoring, and institutional accountability. The proposed model adopts a systems perspective: pharmacist behavior represents the proximal mechanism, pharmacy processes provide the operational environment, and AMR reduction represents the broader outcome.

3. METHODOLOGY

3.1 Research Design

This study employs a structured conceptual-review methodology. Because the objective is framework development rather than estimation of treatment effects or measurement of a newly recruited population, a thematic synthesis approach is appropriate. The six supplied references were examined according to their contribution to five analytical domains: antibiotic access and dispensing, pharmacist knowledge and attitudes, stewardship practice, population-level AMR implications, and economic consequences.

The methodological process consisted of three stages. First, evidence was categorized according to its principal research focus. Second, recurring relationships between pharmacist behavior and antibiotic-use outcomes were conceptually mapped. Third, these relationships were converted into an integrated community-pharmacist engagement framework.

3.2 Framework Architecture

The proposed framework consists of five sequential but interdependent domains.

Domain 1: Knowledge and Competency. Pharmacists require sufficient understanding of

antimicrobial stewardship principles, appropriate antibiotic use, and resistance-related consequences. Knowledge is treated as an enabling input rather than a final outcome. Evidence concerning pharmacist knowledge, perceptions, and practices supports the importance of this domain (Vazquez-Lago et al., 2017).

Domain 2: Prescription Screening and Dispensing Control.

The second component converts professional knowledge into a standardized dispensing process. Pharmacists should verify prescription status, assess the appropriateness of the requested antibiotic transaction within their professional authority, and avoid routine practices that facilitate inappropriate non-prescription access. Evidence from Damascus and Catalonia demonstrates why dispensing practices must remain a central framework component (Al-Faham et al., 2011; Llor and Cots, 2009).

Domain 3: Patient Communication and Education.

A stewardship framework cannot depend solely on refusing inappropriate requests. Patients may require understandable explanations concerning why an antibiotic is not appropriate or why professional evaluation is necessary. Communication therefore becomes a functional mechanism for transforming a dispensing encounter into a stewardship intervention. Pharmacist attitudes and habits are particularly relevant to this domain (Vazquez-Lago et al., 2017).

Domain 4: Monitoring and Feedback.

Pharmacy-level monitoring should examine antibiotic dispensing patterns, recurring non-prescription requests, and adherence to stewardship procedures. Feedback can identify inconsistencies between intended professional practice and actual behavior. The domain creates a continuous improvement loop rather than a one-time training intervention.

Domain 5: Institutional Support and Accountability.

Individual pharmacists operate within organizational and regulatory environments. Stewardship expectations therefore require management support, standardized procedures, documentation mechanisms, and appropriate accountability. Erku's emphasis on community pharmacists' perceptions and practices supports the need to consider the professional environment rather than focusing exclusively on individual knowledge (Erku).

3.3 Functional Model

The framework can be represented as:

Knowledge & Competency → Prescription Screening → Patient Communication → Appropriate Antibiotic Decision → Monitoring & Feedback → Continuous Professional Improvement

Institutional support and accountability surround all stages and provide the conditions required for consistent implementation.

For example, when a patient requests an antibiotic without a prescription, the pharmacist first applies professional knowledge, determines whether dispensing is appropriate under the relevant practice environment, communicates the rationale for the decision, and directs the patient toward suitable professional evaluation when necessary. The interaction can then be recorded within an appropriate monitoring system to identify recurring patterns. This example demonstrates that stewardship is a process rather than a single dispensing decision.

3.4 Analytical Assumptions

The framework rests on three theoretical assumptions. First, pharmacist knowledge influences professional decision-making but does not independently determine behavior. Second, dispensing practices are shaped by both individual and organizational factors. Third, sustainable stewardship requires feedback because antibiotic-use behavior can vary across patients, pharmacies, and contexts.

The framework also assumes that community pharmacists should function as partners within antimicrobial stewardship rather than as isolated enforcement agents. This distinction is important because excessive emphasis on restriction without communication may shift patient demand elsewhere without addressing the underlying drivers of inappropriate antibiotic use.

4. RESULTS

The thematic synthesis generated five principal findings that collectively define the proposed framework. First, **community pharmacies represent a critical intervention point for antibiotic stewardship**. Evidence from Damascus and Catalonia indicates that antibiotic sales without prescription can occur within pharmacy settings, establishing dispensing behavior as

a practical target for intervention (Al-Faham et al., 2011; Llor and Cots, 2009). The finding does not imply that pharmacists are the sole cause of inappropriate antibiotic use; rather, it demonstrates that pharmacy-level processes can influence antibiotic accessibility.

Second, **pharmacist knowledge and professional attitudes are core determinants of stewardship capacity.** The work of Vazquez-Lago et al. demonstrates that knowledge, attitudes, perceptions, and dispensing habits are interconnected dimensions of antibiotic practice (Vazquez-Lago et al., 2017). Accordingly, educational interventions should not be designed as isolated information-delivery programs. Their effectiveness depends on whether acquired knowledge is translated into consistent professional behavior.

Third, **dispensing control must be integrated with patient communication.** A purely restrictive model may reduce immediate inappropriate dispensing but does not necessarily address patient expectations or repeated requests. The literature supports treating the pharmacist-patient interaction as a behavioral intervention point. Pharmacists can therefore contribute to stewardship by explaining antibiotic-related decisions and reinforcing appropriate pathways for obtaining treatment. This approach is consistent with the professional-behavioral emphasis identified by Vazquez-Lago et al. (2017).

Fourth, **monitoring and institutional accountability are required for sustainability.** The evidence concerning pharmacist perceptions and practices suggests that professional behavior occurs within a broader practice environment (Erku). Consequently, training without monitoring may not guarantee consistent implementation. A feedback mechanism can identify repeated non-prescription requests, deviations from dispensing procedures, and areas where additional competency development is required.

Fifth, **community-pharmacy stewardship has implications beyond individual encounters.** Dhingra et al. establish AMR as a broad global public-health threat, while Howard and Scott demonstrate its economic significance (Dhingra et al., 2020; Howard and Scott, 2005). Thus, the proposed framework connects micro-level pharmacy behavior with macro-level consequences. Its central analytical proposition is that

improved antibiotic decision-making at the point of community dispensing can contribute to a wider stewardship architecture.

The findings therefore support a five-domain framework in which competency enables appropriate decisions, dispensing controls operationalize those decisions, communication manages patient expectations, monitoring measures implementation, and institutional support sustains the intervention. The model should be interpreted as a conceptual architecture requiring prospective empirical testing rather than as evidence of a quantified reduction in AMR.

5. DISCUSSION

The proposed framework provides a systems-based interpretation of community pharmacists' role in antimicrobial resistance management. Its central contribution is the integration of professional competency, dispensing behavior, patient communication, monitoring, and institutional support into one operational pathway. This integration is important because the supplied literature suggests that antibiotic access and use cannot be adequately explained through a single behavioral variable. Evidence from Syria and Spain demonstrates the existence of non-prescription dispensing concerns in distinct contexts, whereas research focused on pharmacists highlights the relevance of knowledge, perceptions, attitudes, and habits (Al-Faham et al., 2011; Llor and Cots, 2009; Vazquez-Lago et al., 2017).

A major theoretical implication is that stewardship should be understood as a **behavioral-system intervention.** The traditional assumption that professional education automatically produces improved practice is insufficient. Knowledge represents the cognitive foundation of appropriate practice, but dispensing systems, patient interactions, workplace expectations, and feedback mechanisms determine whether that knowledge becomes routine behavior. The framework therefore places knowledge at the beginning of the process while positioning monitoring and institutional support as mechanisms that sustain behavioral change.

The model also highlights a critical trade-off between **accessibility and antimicrobial control.** Community pharmacies provide accessible healthcare services, and

overly restrictive approaches may unintentionally reduce opportunities for patient engagement. Conversely, unrestricted antibiotic availability may facilitate inappropriate use. The framework addresses this tension by proposing pharmacist communication as an intermediate mechanism: inappropriate antibiotic requests should become opportunities for education, risk communication, and referral rather than merely transactional refusals. This orientation is particularly relevant given the findings concerning pharmacist knowledge, attitudes, perceptions, and dispensing habits reported by Vazquez-Lago et al. (2017).

The economic dimension strengthens the justification for intervention. Howard and Scott's analysis demonstrates that resistance imposes an economic burden, while Dhingra et al. position AMR as a global public-health threat (Howard and Scott, 2005; Dhingra et al., 2020). Improving pharmacy practices should therefore be considered an investment in prevention rather than merely a compliance exercise. However, the present framework does not claim that community-pharmacy intervention alone can resolve AMR. Resistance is a multifactorial phenomenon requiring coordinated action across healthcare settings.

Several limitations must be recognized. The framework is based exclusively on six supplied references, including one reference whose bibliographic information is incomplete. The evidence base also represents different geographical and methodological contexts, which limits direct generalization. Furthermore, the proposed framework has not been prospectively validated, and no numerical effectiveness estimate can appropriately be assigned to its components. Future studies should operationalize each domain into measurable indicators and test whether implementation changes dispensing behavior, pharmacist competencies, patient understanding, and antibiotic-use patterns.

Overall, the framework extends the literature from **problem identification toward structured intervention design**. It emphasizes that pharmacists should be equipped, supported, monitored, and integrated into stewardship systems. Such an approach is more sustainable than relying on individual professional discretion alone and provides a foundation for future empirical evaluation.

6. CONCLUSION

Community pharmacists occupy a strategically important position in efforts to improve antibiotic use and combat antimicrobial resistance. The supplied literature demonstrates that non-prescription antibiotic dispensing is a relevant pharmacy-level concern, while pharmacist knowledge, attitudes, perceptions, and practices influence how antibiotic-related decisions are made. At the broader level, AMR creates substantial public-health and economic consequences, strengthening the need for preventive interventions.

This research proposes a five-domain framework comprising pharmacist knowledge and competency, prescription screening and dispensing control, patient communication and education, monitoring and feedback, and institutional support and accountability. The framework's principal contribution is its integration of these components into a continuous stewardship pathway rather than treating education, dispensing regulation, and patient counseling as independent activities.

Implementation should prioritize competency development, standardized dispensing procedures, structured communication strategies, and pharmacy-level monitoring. However, the framework should be regarded as a conceptual model requiring empirical validation. Future research should examine its applicability across different healthcare systems, evaluate measurable changes in pharmacist behavior, and determine whether sustained community-pharmacy engagement produces improvements in antibiotic-use practices. Ultimately, strengthening pharmacists' stewardship role can provide an important operational component within the broader response to antimicrobial resistance.

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