International Journal of Leading Research Publication (IJLRP)
E-ISSN: 2582-8010 ● Website: www.ijlrp.com ● Email: editor@ijlrp.com

Role of Retail Pharmacist in Antimicrobial Stewardship

Dr. Nirlepkumar Patel

M.S Rph
Nirlepkumar1987@gmail.com
Pharmacist, Independent researcher, Tennessee USA

Abstract

Retail pharmacists are relatively unambiguous and central in the global struggle against antimicrobial resistance (AMR) through antimicrobial stewardship (AMS) initiatives. Due to being involved in the nursing care of patients and being responsible for medication administration, they play a key role in promoting the proper use of antimicrobials. However, several barriers limit their effective integration into AMS initiatives; these include education, regulations and restrictions, and poor access to technology. Feasibility and opportunities for retail pharmacists in AMS are investigated in this article while focusing on goals to address these barriers. They include incorporating AMS topics into the pharmacy curriculum, providing workshops and online certification programs, and restricting OTC antibiotic sales. Improved methods like the EHR, Mobile AMS Application, and Artificial Intelligence can add to the help pharmacists receive when making decisions and evaluating antimicrobials. Such approaches as healthcare workers' engagement with other activities, such as health promotion and stakeholder meetings, enhance AMS activities. Also, patient actualization through perceptive counseling and decision-sharing promotes adherence to therapy regimens. Specifically, the system should provide funding and resources for the training of AMS and the community to increase the roles of pharmacists in AMS. With these challenges considered and tailored intervention, retail pharmacists can play a crucial role in preventing AMR, improving patients' health, and cautiously threatening public health.

Keywords: Retail Pharmacists, Antimicrobial Stewardship, Antimicrobial Resistance, Pharmacy Education, Healthcare Collaboration, Technology Integration

1.Introduction

Antimicrobial resistance (AMR) is one of the disease complexeshumanity faces in the 21st century. The World Health Organization (WHO) recognized antibiotic resistance as one of the biggest health threats, reversing the gains made in the last fifty years in controlling infectious diseases. AMR is mainly caused by the strategic abuse of antimicrobial agents, resulting in pathogenic organisms that are hard to eliminate. If left unchecked, it is likely to put all of society back to the condition it was in during the time before the introduction of antibiotics, where such things as minor infections, routine surgeries, and other similar situations are dangerous for one's life[1], [2].

Therefore, antimicrobial stewardship (AM, S) programs are essential to fighting AMR. These programs, thus, seek to enhance the rational prescribing and utilization of antimicrobials, combat the dissemination of resistance, and enhance client status. Previous studies have mainly focused on the extent of AMS in hospital-based settings. However, there is an increasing appreciation of the potential roles of retail pharmacists in delivering AMS. Community-leaning retail pharmacists are, most of the time, the initial port of call for patients, especially those in the community. They are well-placed to change the prescribing rate, teach patients how to use antimicrobials correctly, and even follow through on a treatment plan. Nevertheless, there lies considerable untapped and unrecognized potential for the engagement of retail pharmacists in AMS[3].

This article will explain several essential aspects that may affect AMS, focusing on retail pharmacists' role. It outlines the key roles of different stakeholders in spreading prudent use of antimicrobials, defines the difficulties they face, and discusses how their effectiveness may be optimized. Using the skills of retail pharmacists, healthcare systems can enhance their intervention against AMR and ensure that antimicrobials remain helpful to future generations.

2. Antimicrobial Stewardship

AMS is a scientifically proven best practice for managing antimicrobial products to maximize their effectiveness against infections while minimizing the development and proliferation of AMR. With antibiotic-resistant microorganisms (AMR) ranking as one of the most significant emerging threats to humankind's health, AMS has emerged as one of the most critical global public health approaches. The key objectives of AMS include antecedent improvement of patients' prognosis, decrement of healthcare charges, and maintenance of the efficiency of antimicrobials throughout the succeeding generations. Complex measures such as education, surveillance, and cooperation between healthcare providers, patients, and policymakers are applied to achieve these objectives. Studies have established key principles that form the tenets of AMS, defining them as follows: The first includes using the correct antimicrobial agent at the right dose, for the right duration, and for the right infection. This principle insists on refraining from prescriptions that are not required or justified. It prefers using agents that act on a specific range of body systems and processes against those that have a broader impact on the body and other factors gathered from evidence and diagnostics. Second is the effort to minimize resistance; This means making all efforts towards preventing resistant pathogens from developing and spreading due to improper use of antimicrobials and non-adherence to the course-prescribed regimen. Lastly, AMS aims to improve patient outcomes by ensuring that antimicrobial therapies are adequate and appropriate to the specific patient needs to decrease adverse effects and secondary infections. These principles can be the foundation for a strong AMS program[4].

AMS programs must also meet several goals, which include the following. One of the biggest goals is to address the lack of prudent use of antimicrobials, which initiate AMR development. This entails observation and scrutiny of prescription frequencies to detect behavioral trends that may be associated with improper prescription practices and the development of measures that can be taken to correct such problems. Further, an effective prescribing indicator demonstrates that AMS encourages prescribers to base their prescription on research evidence and the current medical literature. Another Amr strategy is education, which focuses on healthcare workers and the general public to make them aware of antimicrobial resistance and prudent use of these drugs. Through these measures, AMS programs can

develop and/or advance an environment of careful use of antimicrobials for public health [5].However, the call for addressing,g AMR has called for many international activities in AMS. The WHO continues to be the primary player in these efforts, piloting the Global Action Plan on AMR to tackle the problem on an intergovernmental level. This plan focuses on expanding the use of AMS at the hospital and primary care levels and in community pharmacies. Besides the WHO's engagements described above, many countries have set up their National Action Plans based on national healthcare and AMR profiles. These approaches consist of protocols regarding antimicrobials, consumer education, and education and training of health care personnel. For this reason, it has embraced multi-stakeholder efforts in developing strategies for addressing AMR by engaging all stakeholders, including governments, healthcare providers, and the public[6].

Privacy in pharmacy, including AMS efforts, is vitally affected by the Health Insurance Portability and Accountability Act (HIPAA). Retail pharmacists sit between patient care, data and medication management and work in compliance with HIPAA to safeguard Protected Health Information (PHI). [7].

Retail pharmacists have a broad role in AMS, as mentioned below. They are the first line in patients' general education regarding health-related concerns, specifically about the correct usage of antimicrobials. This ranges from arguing why a list of prescribed courses should be followed to when one is free from the ailment to urging the public that antibiotics should not be used to treat viral illnesses such as the flu. Pharmacists can reduce misuse and excessive expectations for antimicrobials by correcting misconceptions people may have about these drugs. Also, retail pharmacists are responsible for checking the prescriptions to see if they are proper and researched. This includes reviewing drugs' correct amount, time, and purpose, and talking to the prescriber to clarify doubts or offer an alternative course of action when needed[8].Furthermore, it will be noted that retail pharmacists play an essential role in the oversight of patient compliance with antimicrobial therapy. Such professionals can also chase patients to ensure they complete their prescription courses and educate them on side effects to avert early termination.

With regard to refill patterns, the authors also note that this data can help the pharmacists in the given study detect incomplete treatment regimens and related problems. Another component of their working description is the interaction with other healthcare practitioners. Retail pharmacists have crucial information about prescription frequency changes and patient activity that can enhance future AMS strategies[9].

However, the implications of retail pharmacists in AMS are not without some challenges, as this paper seeks to reveal. These challenges include restricted access to patient records, lack of training on AMS principles, and patient expectations to prescribe antibiotics. However, all these barriers show that AMS's growing ambit means that retail pharmacists must be supported to deliver on what is a vital public health program. It is, therefore, essential to empower the pharmacists through adequate provision of resources, investment in training, and support to enable them to champion the responsible use of antimicrobials and fight against AMR. The use of appropriate antimicrobials is an urgent public health issue that cannot be effectively managed without involving different stakeholders[10]. This knowledge of AMS' principles, objectives, and international actions will enable retail pharmacists to step into a new age of transformation in health systems to bridge between the public and health care systems. Through their vested participation in matters concerning education, prescription, and handling support, such stakeholders remain valuable assets in the fight against AMR. [11].

3. Retail Pharmacist's Role in AMS

Thus, retail pharmacists play a strategic role as they are primary caregivers to the rightful owners of retail medications – community members. These frontline physicians are strategically positioned to play a tremendous part in AMS initiatives that seek to control or contain AMR. Patient education, prescription monitoring, focusing on the proper use of antibiotics, and synergism with other healthcare workers' successes remain within the purview of retail pharmacists and outline a noble path leading to more responsible usage of antimicrobials and, thus, improving public health.This makes the responsibility of retail pharmacists in AMS among the most important. Patient awareness of antimicrobials and their appropriate use is limited, and they apply the drugs for ailments they know they will cure, such as the flu[12]. Pharmacists can correct this on the understanding that antimicrobials are appropriate only when prescribed by a doctor and prevent self-administration of the drugs. Also, they can amplify to the patients the necessity of adherence to prescribed courses, including the cessation of symptoms, to reduce the risk of resistance and ensure all the infections are gone. For this reason, pharmacists can also explain the side effects likely to be experienced when using antimicrobials and the steps to be taken in handling simple adverse effects to avoid early discontinuation of treatment despite the impact experienced by the patient[13].

Apart from patient counseling, retail pharmacists have another responsibility of evaluating prescriptions given by doctors for relevance. This entails ensuring the proper dosages and duration of use and mainly focusing on using a narrow-spectrum agent when possible. Pharmacists help prevent antimicrobial prescribing by highlighting conditions when broad-spectrum antimicrobials are contraindicated, such as viral infections. Another essential feature of this position is working with prescribers. Through its notification to physicians to ensure prescription clarification or modification wherever necessary, pharmacists are part of a more logical trend of antimicrobial use.

Additionally, through prescription reviews, they are able to uncover trends of overprescribing and support activities that reflect the principles of AMS[14].It is also essential for retail pharmacists to proactively enforce compliance with several dosage regimens. Adherence monitoring can feature post-prescription check-ups to ensure patients have taken all their doses and are symptom-free. Refill data can also be monitored regarding feedback to determine patients who have stopped their medication early. Such engagement enhances the treatment success and decreases the chances of having strident infections resulting from partial treatment[15].

Retail pharmacists are strategically located to engage other stakeholders in enhancing AMS-related activities. They can provide information on patient behaviors and prescriptions that can contribute to adjusting the prescriber's antimicrobial management. Furthermore, their involvement in the committees or task force enables them to contribute knowledge in formulating a community-centered approach to intercession and strategy. All these collaborations help to enhance the general healthcare system to fight AMR.Whenever antibiotics are available as OTC medicines, retail pharmacists are in a central position to regulate the use of such products. They can also provide even more rigid reins requiring antimicrobials only when necessary[16]. Forbidding the sale of antibiotics without a prescription should go hand in hand with policy changes that would require their prescription in the first place. Closely connected with public awareness, retail pharmacists can be the key organizers of community-based health interventions and AMR promotion. This could involve using leaflets and posters for the general public or using the Internet to pass on the various AMS messages to society[17].

As part of the insight, introducing technology into AMS operations has provided an opportunity to improve activities focused on by retail pharmacists. Electronic health records empower pharmacists with the patient's complete hospital records, so correct assumptions will be made if antimicrobials are supplied. Mobile applications developed to assist patients in remembering to take their medicine and mark compliance can also be prescribed by pharmacists to support AMS objectives.However, retail pharmacists have added value to AMS by performing more than dispensing prescription drugs[18]. Because they promote patient education, prescription scrutiny, medication compliance, cooperation with caregivers, and public health campaigning, these stakeholders fit prominently into combating AMR. For the most significant impact of these tasks, relevant further training, appropriate materials, and informational support for retail pharmacists should be provided. In this way, the healthcare systems are optimizing this experience and creating a culture of rational use of antimicrobial agents to save these valuable medicines for future generations[19].

4. Challenges faced by retail pharmacists

Because of the many barriers in practice, retail pharmacists play a significant role in AMS. However, they continue to be confronted with several obstacles that limit their contribution to efforts against AMR. These are factors related to the system, professionals, and patients, respectively, and each requires specific approaches to solve them. This is one of the main challenges because, to date, no specific training programs in AMS are available for students. Most pharmacists are poorly prepared for such tasks as addressing the problem of inadmissible use of antimicrobials as a pharmacotherapy element. In many countries, regular education curriculums still pay little attention to AMS and AMR; many opportunities for continuing education or certification are confined, especially in the LMIC. Due to a lack of training, retail pharmacists may be unable to give the best advice or actions in specific episodes relating to AMS[20].Other conditions include legal and political issues, which add to those challenges in a country's regulatory and policy frameworks. OTC antimicrobial usage continues to persist in several countries, thus limiting the power of perused pharmacists to use appropriate antibiotics. No strict measures provide prescriptions for antimicrobials; hence, their misuse is rampant. Furthermore, prescriptive authority for pharmacists still remains a subject in many healthcare systems; therefore, they cannot rectify the situation directly should prescriptions be encouraged for health risks. This lack of flexibility or capacity to deny such prescriptions negates their capacity to act as pressures of rational use of antimicrobial agents[21].

These challenges are even heightened by the rigorous characteristics of practice in retail pharmacy settings. A study found that high patient traffic hampers pharmacists from 'doing' AMS interactions such as adherence checks or patient counseling. The amount of paperwork and inventory management only adds to the time already consumed by general administrative roles that should instead be devoted to AMS functions. These workload pressures limit AMS activities because pharmacists cannot dedicate much time even though they understand that the tasks are essential.Patients' and prescribers' resistance is another major challenge faced during the program's implementation [22]. Most of the patients have poor knowledge regarding the use of antibiotics, especially for viral conditions such as colds and flu, and come begging for antibiotics. Such behavior creates scenarios that promote illegitimate use and put the pharmacists in a compromising position whenever their recommendations are disrespected. Likewise, some prescribers may feel that pharmacists' suggestions infringe on their professional jurisdiction and

may resist partnership. These dynamics can put pressure and slow down the effective integration of AMS measures across the value chain[23].

Lack of resources and support expands the possibility and impact of retail pharmacists in AMS. Many community pharmacy centers do not have access to computers, EHRs, or updated antimicrobial prescribing guidelines to support their decisions. This is especially true with staffing shortages in pharmacies, which means that pharmacists are primarily on their own with little or no opportunity to invest sufficient time in AMS or Community Outreach Programs[23].Lack of public understanding concerning AMR and the proper ways to use antibiotics contributes to the multifaceted picture. The patient community is still poorly informed regarding the potential risks associated with AMR. Because of this, such things as ignoring prescribed dosage or using medicines on their own without consulting their doctor are not uncommon among many people. Whereas self-medication is a norm in many populations, it becomes tough for a pharmacist to convince people not to use OTC antimicrobials and how to use them responsibly. These awareness deficiencies not only maintain misuse but also reduce the effectiveness of the educational interventions by pharmacists[23].

Another area of AMS is that economic considerations in the retail pharmacy model can be unconstructive for objective accomplishment. There are some problems in the reimbursing mechanisms of pharmacies since pharmacies are interested in selling, and it can personate pharmacists to sell, for example, antimicrobials. Other hindrance factors include the Cost Control Act, which limits the charges a patient can pay; hence, a patient can abandon the mid-treatment or embrace a cheaper and less potent drug to balance the costs[23].Overcoming this challenge can only be done through the various discussed below. Specific AMS training and continuing education should be developed to prepare pharmacists for adequate knowledge and skills to fight AMR. A possible way of enhancing AMS is by increasing measures to restrict the scope of OTC antimicrobial sales and broadening the pharmacist's role in this respect. Pharmacists' effectiveness could also be enhanced by including them in the healthcare system more closely, for example, by giving them access to EHR or encouraging cooperation with prescribers[24].

Additionally, since retail pharmacists are so convenient for healthcare professionals, they are instrumental in applying DUR to make the most of antimicrobial use. They follow best practices, they train patients in taking their medications, and they work with prescribing physicians to adapt therapy regimens as necessary. When pharmacies incorporate DUR into their retail pharmacy operations, they’re enabling AMS in many ways by preventing antimicrobial resistance, optimizing therapeutic outcomes and increasing patient safety[25].Arming retail pharmacists with the appropriate gamut of resources, assistance, and sanction gives them the key to breaking these barriers and performing optimally towards AMS. When these key barriers are removed, when education is enhanced, and when multisectoral healthcare cooperation is developed, the role of the community retail pharmacists can change the world and minimize the use of antibiotics, containing the spread of AMR at the community level[26].

5. Opportunities and Strategies for Enhanced AMS

Community retail pharmacists have a broad, untapped ability to enhance AMS programs through their contact and knowledge in the field. Nevertheless, the victims face the following challenges, which must be overcome through intervention. The most critical area that demands enhancement is Education & Training. Pharmacists should be aware of topics related to AMS and AMR; including the subject in

education curricula or creating specific courses to prepare for those situations may be helpful. Workshops/certification courses and online courses will also assist pharmacists in keeping up to date in their practices, particularly in other practice models[27]. Open forums, webinars, and online courses are convenient and cheap modes of training pharmacists to be abreast with today's knowledge in areas of lesser resource input.Another critical approach is regulatory support, which also increases pharmacists' responsibilities in AMS. Enhancing the measures on the legal purchase of antibiotics available over the counter reduces misconceptions and self-prescription, a common cause of AMR. Providing limited prescription rights to pharmacists to practice according to specific guidelines would enable them to make informed decisions regarding antimicrobials and improve patient status. The infection control measures adopted eliminate the risk of cross-transmission, offering a better environment for patients to recover from illness. This is true; positive reinforcement instruments like incentives to pharmacists to encourage them to advocate for the rational use of antimicrobials would have the budgetary impact of advancing AMS goals since their parochial interests would align with the AMS objectives[28].

Automated data systems also present considerable prospects for pharmacists' reinforcement of AMS practices. EHR information helps pacifists view prescriptions, patients, and histories and even make decisions. Mobile antimicrobial stewardship applications assist pharmacists in selecting the right antimicrobial drugs, monitoring compliance, and patient counseling. Besides, AI and data analytics can also aid in identifying the likely resistant patterns, which ensures pharmacists develop informed decisions to improve AMS.Healthcare practitioners, when involved, play a vital role in increasing the strength of AMS programs[29]. AMSA committees and hospital and community partnerships are examples through which retail pharmacists can contribute as members of multidisciplinary teams to learn and formulate community-based initiatives. Optimization of the doorknob communication between the pharmacist and the prescriber enables the identification of discrepancies or problems with the prescriptions. Concerning organization and coordination of care, well-developed referral processes allow pharmacists to approximate patients with the right specialist for unique care, making treatment efficient[30].

The other essential chance for pharmacists' involvement in AMS initiatives is prominence at the community level and in raising awareness campaigns. Pharmacists are senior healthcare professionals who can mobilize communities, using healthy campaigns, stakeholder meetings, and awareness-creating sessions to make people understand the dangers of AMR and the need to use antibiotics rightly [31].

Conclusion

This paper provides evidence on why retail pharmacists are strategic AMS and AMR prevention actors. Based on the pharmacists' direct contact with patients, they could inform, supervise, and advocate for appropriate AMR. In this article, Pharmacists' success stories and case studies prove that they have significantly contributed to patient compliance, eliminating weak prescriptions and increasing public awareness. Retail pharmacists can enhance AMS at the community level when education, technology col, elaboration, and regulatory support are incorporated. Organizational antecedents and barriers such as poor training, legislation, time, culture, and patient-related factors must be addressed. The problems can be eliminated or minimized if pharmacists are granted full access to continuous education, technological support, and potential for cooperation. Furthermore, additional policy changes, specifically

those regarding a more aggressive role of pharmacists in prescribing and monitoring antimicrobials, will also strengthen AMS programs.

Lastly, developing the capability of retail pharmacists and strengthening collaboration with other healthcare professionals will play an enormous role in AMR prevention internationally. Accordingly, retail pharmacists have a rare chance to safely achieve lasting improvement in the appropriate use of antimicrobials, securing public health in the future.

REFERENCES

[1] I. Roca *et al.*, "The global threat of antimicrobial resistance: science for intervention," *New microbes new Infect.*, vol. 6, pp. 22–29, 2015.

[2] M. Ferri, E. Ranucci, P. Romagnoli, and V. Giaccone, "Antimicrobial resistance: A global emerging threat to public health systems," *Crit. Rev. Food Sci. Nutr.*, vol. 57, no. 13, pp. 2857–2876, 2017.

[3] M. A. A. Majumder *et al.*, "Antimicrobial stewardship: fighting antimicrobial resistance and protecting global public health," *Infect. Drug Resist.*, pp. 4713–4738, 2020.

[4] F. Khan, J. Arthur, L. Maidment, D. Blue, A. U. A. M. U. S. T. Group, and 2015 Communicable and Infectious Disease Steering Committee, "Antimicrobial Resistance (AMR): Advancing antimicrobial stewardship: Summary of the 2015 CIDSC Report," *Canada Commun. Dis. Rep.*, vol. 42, no. 11, p. 238, 2016.

[5] N. Weier *et al.*, "An international inventory of antimicrobial stewardship (AMS) training programmes for AMS teams," *J. Antimicrob. Chemother.*, vol. 76, no. 6, pp. 1633–1640, 2021.

[6] A. J. Brink, "Antimicrobial stewardship (AMS) in the community," *Clin. Pulm. Med.*, vol. 23, no. 1, pp. 1–10, 2016.

[7] A. Andy, "The Role of HIPAA in Protecting Patient Privacy in Pharmacy Practices: Challenges and Innovations in the Digital Age," International Journal For Multidisciplinary Research, 2020Volume 2, Issue 2 Apr. 27. doi: 10.36948/ijfmr.2020.v02i02.6997.

[8] D. P. Chetty, "Exploring the Attitudes, Knowledge and Perceptions of Clinical Pharmacists' on Antimicrobial Stewardship (AMS) Participation and the Discord Between Pharmacy Education and Actual Clinical Practice." University of the Witwatersrand, Johannesburg (South Africa), 2022.

[9] E. Darj, M. S. Newaz, and M. H. Zaman, "Pharmacists' perception of their challenges at work, focusing on antimicrobial resistance: a qualitative study from Bangladesh," *Glob. Health Action*, vol. 12, no. sup1, p. 1735126, 2019.

[10] A. C. Kalungia *et al.*, "Antimicrobial stewardship knowledge and perception among physicians and pharmacists at leading tertiary teaching hospitals in Zambia: implications for future policy and practice," *J. Chemother.*, vol. 31, no. 7–8, pp. 378–387, 2019.

[11] M. Mendelson, A. M. Morris, K. Thursky, and C. Pulcini, "How to start an antimicrobial stewardship programme in a hospital," *Clin. Microbiol. Infect.*, vol. 26, no. 4, pp. 447–453, 2020.

[12] K. Lim, A. Olsen, A. Broom, and H. Seale, "Review of position statements on antimicrobial resistance and stewardship from professional pharmacy organisations," *Res. Soc. Adm. Pharm.*, vol. 18, no. 11, pp. 3974–3979, 2022.

[13] M. H. F. Sakeena, A. A. Bennett, and A. J. McLachlan, "Non-prescription sales of antimicrobial agents at community pharmacies in developing countries: a systematic review," *Int. J. Antimicrob. Agents*, vol. 52, no. 6, pp. 771–782, 2018.

[14] M. H. F. Sakeena, A. A. Bennett, and A. J. McLachlan, "Enhancing pharmacists' role in developing countries to overcome the challenge of antimicrobial resistance: a narrative review," *Antimicrob. Resist. Infect—Control*, vol. 7, pp. 1–11, 2018.

[15] E. D. Hermsen, E. L. MacGeorge, M.-L. Andresen, L. M. Myers, C. J. Lillis, and B. M. Rosof, "Decreasing the peril of antimicrobial resistance through enhanced health literacy in outpatient settings: an underrecognized approach to advance antimicrobial stewardship," *Adv. Ther.*, vol. 37, pp. 918–932, 2020.

[16] V. Belcheva, E. Grigorov, and S. Balkanski, "Rational use of antibiotics and the importance of pharmacists' support," *Scr. Sci. Pharm.*, vol. 9, no. 1, pp. 21–28, 2022.

[17] C. V Hayes *et al.*, "Mixed-Method Evaluation of a Community Pharmacy Antimicrobial Stewardship Intervention (PAMSI)," in *Healthcare*, MDPI, 2022, p. 1288.

[18] N. J. Mercuro *et al.*, "Pharmacist-driven transitions of care practice model for prescribing oral antimicrobials at hospital discharge," *JAMA Netw. open*, vol. 5, no. 5, pp. e2211331–e2211331, 2022.

[19] S. K. Saha, K. Thursky, D. C. M. Kong, and D. Mazza, "A novel GPPAS model: guiding the implementation of antimicrobial stewardship in primary care utilising collaboration between general practitioners and community pharmacists," *Antibiotics*, vol. 11, no. 9, p. 1158, 2022.

[20] S. Rogers Van Katwyk, S. L. Jones, and S. J. Hoffman, "Mapping educational opportunities for healthcare workers on antimicrobial resistance and stewardship around the world," *Hum. Resour. Health*, vol. 16, pp. 1–18, 2018.

[21] T. G. Jacobs, J. Robertson, H. A. van den Ham, K. Iwamoto, H. Bak Pedersen, and A. K. Mantel-Teeuwisse, "Assessing the impact of law enforcement to reduce over-the-counter (OTC) sales of antibiotics in low-and middle-income countries; a systematic literature review," *BMC Health Serv. Res.*, vol. 19, pp. 1–15, 2019.

[22] D. A. Erku, "Antimicrobial Stewardship: A Cross-Sectional Survey Assessing the Perceptions and Practices of Community Pharmacists in Ethiopia," *Interdiscip. Perspect. Infect. Dis.*, vol. 2016, no. 1, p. 5686752, 2016.

[23] I. Hoxha *et al.*, "Are pharmacists' good knowledge and awareness on antibiotics taken for granted? The situation in Albania and future implications across countries," *J. Glob. Antimicrob. Resist.*, vol. 13, pp. 240–245, 2018.

[24] W. H. Organization, *Health workers' education and training on antimicrobial resistance: curricula guide*. World Health Organization, 2019.

[25] A. Andy, "The Role of Drug Utilization Review (DUR) in Enhancing Patient Safety and Reducing Medication Errors in Pharmacies." Jul. 2020.

[26] W. M. Sweileh, "Global research publications on irrational use of antimicrobials: call for more research to contain antimicrobial resistance," *Global—health*, vol. 17, no. 1, p. 94, 2021.

[27] J. Gallagher, "Economic evaluations of clinical pharmacy services in Ireland, 2007-2015," 2016.

[28] J.-C. Arnold *et al.*, "Exploring the barriers and incentives towards effective surveillance for antimicrobial and anthelmintic usage (AMHU) in beef cattle and sheep in Great Britain.," 2021.

[29] O. J. Ogunbayo, *Self-care support of long-term conditions and community pharmacy*. The University of Manchester (United Kingdom), 2015.

[30] E. Oviawe, "Cognitive Task Analysis: Guide to the Development of an Interprofessional Simulation Based Instruction," *J. Am. Osteopath. Assoc.*, vol. 120, no. 3, p. e7, 2020.

[31] M. R. Sarwar, A. Saqib, S. Iftikhar, and T. Sadiq, "Knowledge of community pharmacists about antibiotics, and their perceptions and practices regarding antimicrobial stewardship: a cross-sectional study in Punjab, Pakistan," *Infect. Drug Resist.*, pp. 133–145, 2018.