



# INTEGRATED TRAINING PROGRAMS FOR ANTIMICROBIAL STEWARDSHIP AND INFECTION PREVENTION AND CONTROL FOR PRIMARY CARE PHYSICIANS: A REVIEW OF THE CURRENT LITERATURE

## BİRİNCİ BASAMAK HEKİMLERİ İÇİN ANTİMİKROBİYAL YÖNETİM İLE ENFEKSİYON ÖNLEME VE KONTROLÜNE YÖNELİK ENTEGRE EĞİTİM PROGRAMLARI: MEVCUT LİTERATÜRÜN BİR İNCELEMESİ

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### ABSTRACT

**Objective:** Antimicrobial resistance (AMR) is a growing global threat, recognized by the World Health Organization (WHO) as a silent pandemic. Its impact endangers health systems worldwide, compromising progress toward Universal Health Coverage (UHC) and the Sustainable Development Goals (SDGs). Primary health care (PHC) plays a crucial role in ensuring access to high-quality, affordable healthcare, disease prevention, and community health improvement. However, the risk of infection transmission in PHC settings highlights the need for robust infection prevention and control (IPC) measures alongside antimicrobial stewardship (AMS) to ensure responsible antibiotic use and optimal patient outcomes.

**Material and Method:** This research examines the current literature on AMS and IPC training programs for primary care physicians. A systematic search using PubMed, Google Scholar, and Scopus identified 95 relevant articles, excluding settings outside PHC and specific AMS or IPC interventions beyond training.

**Result and Discussion:** Despite the recognized importance of AMS and IPC, no integrated training programs addressing both strategies in PHC settings were identified. The findings suggest an urgent need for structured, evidence-based training programs to enhance AMS and IPC implementation in primary care. Developing and evaluating such programs could be a key step in combating AMR at the frontline of healthcare.

**Keywords:** Antibiotic resistance, antimicrobial stewardship, infection prevention and control, integrated training program, primary health care

### ÖZ

**Amaç:** Antimikrobiyal direnç (AMD), Dünya Sağlık Örgütü (DSÖ) tarafından sessiz bir pandemi olarak tanımlanan ve giderek büyüyen küresel bir tehdittir. Bu durum, sağlık sistemlerini dünya

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genelinde tehlikeye atarak Evrensel Sağlık Kapsamı (UHC) ve Sürdürülebilir Kalkınma Amaçlarına (SKA'lar) yönelik ilerlemeyi sektöre uğratmaktadır. Birinci basamak sağlık hizmetleri, yüksek kaliteli, erişilebilir ve uygun maliyetli sağlık hizmetleri sunarak hastalıkların önlenmesi ve toplum sağlığının iyileştirilmesinde kritik bir rol oynamaktadır. Ancak, birinci basamak sağlık hizmeti sunulan ortamlarda enfeksiyon yayılma riski, sorumlu antibiyotik kullanımı ve en iyi hasta sonuçlarını sağlamak için güçlü enfeksiyon önleme ve kontrol (EÖK) önlemlerinin yanı sıra AMD ile mücadele uygulamalarına duyulan ihtiyacı ortaya koymaktadır.

**Gereç ve Yöntem:** Bu araştırmaya, birinci basamak hekimleri için AMY ve EÖK eğitim programlarına ilişkin mevcut literatürü incelemektedir. PubMed, Google Scholar ve Scopus veritabanlarında yapılan sistematik bir arama sonucunda birinci basamak sağlık hizmeti dışındaki ortamlar ve eğitim dışındaki spesifik AMY veya EÖK müdahaleleri hariç tutularak 95 ilgili makale belirlenmiştir.

**Sonuç ve Tartışma:** AMY ve EÖK'nin önemine dair güçlü kanıtlar bulunmasına rağmen, birinci basamak sağlık hizmeti sunulan ortamlarda her iki stratejiyi bir arada ele alan entegre eğitim programlarına rastlanmamıştır. Bulgular, birinci basamak sağlık hizmetlerinde AMY ve EÖK uygulamalarını güçlendirmek için yapılandırılmış, kanıta dayalı eğitim programlarına acil bir ihtiyaç olduğunu göstermektedir. Bu tür programların geliştirilmesi ve değerlendirilmesi, sağlık hizmetlerinde AMR ile mücadelede önemli bir adım olabilir.

**Anahtar Kelimeler:** Antibiyotik direnci, antibiyotik yönetimi, birinci basamak sağlık hizmetleri, enfeksiyon önleme ve kontrolü, entegre eğitim programı

## INTRODUCTION

Antimicrobial Resistance (AMR) has been declared as a silent pandemic by World Health Organization (WHO). It's devastating impact puts immense pressure on health systems worldwide, threatening progress toward Universal Health Coverage (UHC) and the Sustainable Development Goals (SDGs).

In response, Member States have adopted the 2024 UNGA High-Level Political Declaration on AMR, building on the 2023 UNGA declaration on pandemic preparedness. This declaration makes it clear: preventing future pandemics and tackling AMR go hand in hand. Now more than ever, global action is urgently needed [1,2]. It reinforces global commitment through increased investment, stronger regulations, better surveillance, and equitable access to treatments—key elements for preventing future health crises and building resilient health system [2]. The strong association between the AMR and misuse of antimicrobials is widely demonstrated with the scientific evidence [3].

Multisectoral approach is needed for tackling AMR [1,2,3]. An OECD study highlights that simple infection prevention measures, such as vaccinations and improved hand hygiene in healthcare settings, can more than halve the risk of death and reduce AMR burden. Additionally, integrated policies promoting hospital hygiene, AMS, diagnostic tests, and public awareness campaigns could save 1.6 million lives by 2050 across 33 countries. The study also found these interventions to be cost-effective, with investments paying off within a year and generating annual savings of up to US\$ 4.8 billion [4].

Primary health care (PHC) plays a key role in making sure everyone gets the health services they need—safe, affordable, and high quality. It's the foundation for reaching UHC and the SDGs. Countries around the world have promised to take bold action: putting health at the center of all policies, building stronger PHC systems, giving people and communities more control over their health, and making sure efforts from all partners align with national plans. It's all part of the shared vision laid out in the Declaration of Astana [5].

Primary care plays a vital role in delivering healthcare, preventing diseases, and improving community health outcomes and safety. However, the potential for infections to spread in these settings, where diverse patient populations seek care, highlights the urgent need for evidence-based infection prevention and control (IPC) measures. Infection transmission can occur in health facilities that offer a variety of health services, such as those found in PHC Centers [6]. Therefore, it is crucial to assess the level of IPC knowledge among health care workers. Understanding the determinants and availability of administrative control measures is essential to interrupt the chain of infection transmission [7]. WHO issued guidelines on core IPC components in 2016, these primarily focused on acute healthcare settings. In response, the WHO has recently developed minimum IPC requirements and resources tailored to

primary care facilities, drawing on existing IPC guidance. Despite these efforts, there remains a significant need for tailored IPC guidelines and implementation strategies specifically designed for primary care settings to effectively address healthcare-associated infections (HAI) and AMR [8,9]. It has been demonstrated that effective IPC programs have the potential to reduce HAI rates by over 30%, while improved hand hygiene practices can decrease pathogen transmission in healthcare facilities by 50% [10].

Antimicrobial stewardship (AMS) is one of the important tools for tackling misuse of antibiotics while achieving the optimal patient outcomes during the treatment [11].

Stewardship's meaning in dictionary refers to the careful and responsible management of resources entrusted to one's care which meets the whole meaning for the responsible use of antibiotics. Strengthening the health care system requires an integrated approach which builds on three key pillars: AMS, IPC, and patient and medicine safety. Education and training serve as foundational components of effective AMS programs [12]. Although substantial advancements have been achieved in hospital settings, progress in primary care-where most antimicrobial prescriptions are written-remains comparatively limited [13]. It has been demonstrated that with 80-90% of antibiotic consumption occurring in outpatient settings, there is a significant and unmet need to promote AMS initiatives in the ambulatory care sector [14,15,16].

IPC, together with AMS, are essential strategies for combating AMR, the literature underscores the importance of ongoing training in AMS practices, focusing on the use of data-driven strategies combined with innovative clinical approaches to optimize antimicrobial use and tackle AMR challenges. Utilizing real-time data from routine healthcare facilitates continuous knowledge development, improves precision care, and reinforces public health protection [17].

It has been clearly demonstrated from both high- and low-income settings that AMS programs are significantly more effective in hospitals when implemented alongside IPC measures, particularly those aimed at improving hand hygiene (HH) compliance, compared to implementing AMS alone [18].

According to the WHO Guidance on AMS Activities, a systematic approach grounded in public health principles is necessary for implementing integrated AMS interventions. This involves crucially integrating core IPC practices within healthcare facilities. Furthermore, the WHO recommends that training for health workers should include basic principles of antimicrobial use and IPC, along with communication skills [19].

Effective collaboration, knowledge sharing, and capacity building are suggested as means to tackle disparities and enhance the implementation of IPC and AMS worldwide across various settings [20]. However, all the findings in the literature are derived from secondary and tertiary care facilities. Our review did not find any publications from primary health care settings that explore the synergistic effects between AMS and IPC implementation.

Purpose of our study is to analyze current training programs for AMS and IPC aimed specifically for physicians who are serving on primary care level and identify gaps or best practices in this regard.

## MATERIAL AND METHOD

First the initial search made for identifying the relevant key words. Search strategy was developed for the PubMed, Google scholar and scopus. During the literature search "Antimicrobial Stewardship & Primary Health Care & Training (243)" "Antimicrobial Stewardship & Infection Prevention and Control & Training (400)" Antimicrobial Stewardship & Infection Prevention and Control & Primary Health Care (271)", "Infection Prevention and Control & Primary Health Care & Training (1458)", keywords were used in the databases. The reference lists of relevant papers were screened to identify any additional studies. Mendeley was used as reference management system. Target settings other than the PHC, patient trainings, residential home care/long term care settings and specific AMS and IPC interventions other than training were excluded from the review. In total 95 articles were reviewed, and all the resources of this article have been analyzed. This review did not involve any human subjects, so institutional ethics approval was not needed.

## RESULT AND DISCUSSION

A systematic review of global studies conducted before 2019 identified 17 categories of policy interventions, with behavioral approaches, such as guidelines and professional engagement strategies, being the most commonly implemented internationally [21]. A recent systematic review, explores national interventions and policies implemented in England from 2013 to 2022 to optimize antibiotic use in healthcare settings, highlights the broad effort to reduce antibiotic prescribing, structural interventions like financial incentives showed the most significant impact on prescribing, albeit with a limited evidence base. Behavioral approaches, such as guidelines and training, were easier to implement but often lacked robust evaluations [22].

In the literature, some studies integrated AMS practices within IPC programs, particularly in hospital settings. Others combined IPC practices with measures like vaccination and social distancing under AMS activities to prevent infections and, consequently, reduce antibiotic consumption. However, none of these articles specifically addressed the unique challenges of primary healthcare or the training requirements of healthcare staff [23].

Lee et al. (2020) conducted a mixed-methods study in Canada to assess the need for, and effectiveness of, an educational tool designed to support AMS in primary care settings. The study explored healthcare providers' views on current AMS education and the accessibility of related resources. Results showed that more than 92% of respondents, across various professional roles, believed there is a significant need for increased public education on appropriate antimicrobial use. However, fewer than 58% felt they had adequate access to the tools or resources necessary to educate patients effectively. Despite this shortfall, over 80% of participants expressed strong interest in further educational opportunities, including seminars, workshops, and online learning, to strengthen their knowledge and capacity in AMS [24]. This study also highlights the need for primary health care providers to have access to and training in using educational tools that promote appropriate antimicrobial use.

March-Lopez et al. (2020) introduced a set of AMR interventions, including the development of local treatment guidelines and hands-on training workshops. These efforts paid off, leading to a 16.8% drop in antibiotic use between 2016 and 2018. The interventions focused on common conditions like pharyngotonsillitis, acute otitis media, sinus infections, bronchitis, and urinary tract infections-illnesses frequently diagnosed in their local setting and often linked to antibiotic overprescribing [25].

Gonen et al (2021) have presented comprehensive analysis of a quarter billion primary care prescriptions in Turkey as part of a nationwide AMS program in Türkiye. They have reported an average decrease of 8.33% in antibiotic prescriptions for acute upper respiratory infections (AURI) across the country with AMS interventions including feedback reports to physicians on their antibiotic prescribing patterns, educational programs, and public awareness campaigns. Authors suggested ongoing monitoring and adaptation of AMS strategies, reinforced by continuous education for healthcare providers and public engagement to sustain reduced levels of antibiotic prescriptions [26].

Muller et al. documented significant improvements in hand hygiene compliance and knowledge among healthcare workers in primary healthcare centers in Guinea, following targeted training and education. These improvements occurred after implementing the WHO's hand hygiene strategy [27].

Qureshi et al. reviewed the guidelines for occupational infection prevention and control (OIPC) training, which is meant to protect healthcare workers from infectious diseases. They found that while most guidelines push for mandatory trainings, there's not any standards on in how it's delivered, how often it happens, and what exactly gets covered-especially across different countries. Their study stressed the importance of making these programs more standardized and effective by incorporating adult learning principles and regularly evaluating their impact [28].

Truppa et al. (2023) emphasized a similar point on the need for tailor made AMS strategies in conflict-affected areas. They reflected that healthcare workers in these challenging settings need strong training and capacity-building programs to fight the growing threat of AMR. Without these measures, the fight against resistant infections becomes even tougher [29].

Baur et al. reported that studies implementing a hand hygiene (HH) intervention alongside an AMS programme achieved a 66% reduction in AMR bacteria, compared to only 17% in those without

such an intervention [30]. A systematic review and meta-analysis examining the impact of AMS programs in Asia found a significant reduction in healthcare-associated infections (HAIs) in studies that incorporated a hand hygiene (HH) program. Customizing educational strategies to address the needs of all disciplines simultaneously is a key enabler for fostering synergy between IPC and AMS [31]. Medical education faces significant gaps in infectious diseases and AMS training, with poor infection prevention practices, limited exposure to clinical ID rotations, and no consensus on optimal curriculum strategies, underscoring the need for improved and innovative educational approaches [32]. The findings of Mbamalu et al highlight the critical need for targeted training and customized IPC and AMS interventions to effectively address the gaps identified during pandemic responses [33].

Poje et al. have reported on the perspectives of primary care physicians on academic detailing (AD) for AMS regarding its feasibility and impact. According to their findings, primary healthcare physicians in Croatia recognized AD as a valuable tool for AMS. Participants highlighted the importance of continuous education, advocating for workshops, educational materials, and live lectures to reinforce AMS principles effectively [34].

Harrigan et al. (2024) took a similar approach, looking at how antibiotic prescribing for respiratory tract illnesses changed after an education and feedback intervention in primary care. Their study found that educational programs, combined with peer-comparison feedback, significantly reduced inappropriate antibiotic use. However, they also pointed out the challenge of keeping these improvements going over time [35]. Likewise, Dutcher et al. (2022) highlighted how these strategies can help cut down on unnecessary antibiotic prescriptions in primary care, presenting a scalable model for AMS efforts [36].

Motta et al. have highlighted the need of for local improvement in AMS across primary care: to work with prescribers to prescribe in line with guidance on recommended duration of treatment for common infections; to assist prescribers in understanding when macrolides are an appropriate choice; and to ensure relevant healthcare professionals are aware of the evolving focus on how primary care could manage potentially incorrect penicillin allergy labels [37].

Our literature search revealed a significant emphasis on the importance of AMS and IPC practices in PHC settings. However, these two approaches have not been addressed as a comprehensive, integrated strategy. We found no evidence of integrated training programs specifically designed for AMS and IPC practices in PHC settings. Implementing such training programs and evaluating their short- and long-term impacts could prove valuable in addressing the challenge of AMR in PHC settings.

This study had certain limitations. Our analysis included only English-language articles with accessible full texts, and we did not utilize paid databases for screening. Due to the absence of specific literature on Integrated Training Programs for AMS and IPC tailored to Primary Care Physicians, we broadened our scope. We analyzed AMS training for Primary Care Physicians, AMS and IPC training across various settings, and IPC training specific to Primary Care Physicians.

## **AUTHOR CONTRIBUTIONS**

Concept: M.K., M.Ç.; Design: M.K., M.Ç., C.H.H.; Control: C.H.H., F.N.B.A.; Sources: M.K., M.Ç.; Materials: M.K., M.Ç.; Data Collection and/or Processing: M.K., M.Ç.; Analysis and/or Interpretation: C.H.H., F.N.B.A.; Literature Review: M.K., M.Ç.; Manuscript Writing: M.K., Critical Review: C.H.H., F.N.B.A.; Other: -

## **CONFLICT OF INTEREST**

The authors declare that there is no real, potential, or perceived conflict of interest for this article.

## **ETHICS COMMITTEE APPROVAL**

The authors declare that the ethics committee approval is not required for this study.

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