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Antimicrobial Stewardship in Telemedicine: A Review

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ABSTRACT

The implementation of Antimicrobial Stewardship (AMS) to increase the appropriateness of prescriptions, optimizing infection treatments, and minimizing adverse events related to antibiotic use. The introduction of telemedicine as a patient education tool could help improve AMS practices in hospitals and ultimately reduce healthcare costs. However, sufficient data from pieces of literature addressing rational and appropriate prescribing and use of antibiotics using telemedicine as an educational intervention must be established to improve patient outcomes.

Keywords: Antimicrobial Stewardship, Telemedicine

INTRODUCTION

The World Health Organization (2019) declared that antimicrobial resistance (AMR) is a global public health threat that has been a focus of research and interventions at the international, national, and local levels. As identified by the Centers for Diseases Control and Prevention (*CDC, 2018*), one of the contributing factors in the emergence and spread of AMR is the misuse and abuse of antimicrobial agents and Antimicrobial Stewardship Programs (ASPs) have been developed as a strategy to promote appropriate use of antimicrobial agents and reduce the incidence of AMR. However, the implementation of ASPs in resource-limited settings can be challenging due to the lack of trained personnel, limited resources, and geographical barriers (Alghamdi *et al*, 2019*).* A study by Khan *et al.* (2019) found that the implementation of an ASP in a tertiary care hospital in Pakistan resulted in a significant reduction in antimicrobial consumption and cost, and a reduction in the incidence of AMR. Another study by Laxminarayan *et al.* (2016) estimated that the implementation of ASPs in India could reduce the incidence of AMR by 30-50% by 2050. In the local context, a study by Barcena *et al*. (2019) evaluated the implementation of an ASP in a tertiary care hospital in the Philippines and found that the implementation resulted in a significant reduction in antimicrobial consumption and cost and a reduction in the incidence of AMR.

METHODS

The researchers utilized available literature and references from various scholarly search engines such as Pubmed, Cochrane Library, and Google Scholar which includes previous publications and research, concepts, facts, and materials on antimicrobial stewardship program and telemedicine.

RESULTS and DISCUSSION

Antimicrobial resistance is a global health crisis threatening to reverse the gains in infectious disease control (WHO, 2019). The inappropriate use of antimicrobial agents is a major contributor to the development and spread of resistance, and promoting the appropriate use of antimicrobials is essential to address this issue (Gandra *et al.,* 2019). Antimicrobial stewardship programs (ASPs) have been developed to promote the appropriate use of antimicrobial agents and improve patient outcomes (Barlam *et al.,* 2016). However, implementing ASPs can be challenging, particularly in remote or underserved areas where healthcare resources and expertise may be limited (Fleming-Dutra *et al.,* 2016).

Telemedicine has been proposed as a potential solution to address the challenges of implementing ASPs in remote areas (Dorsey *et al.,* 2017*).* Telemedicine can provide access to educational resources and support for healthcare providers, enabling them to implement antimicrobial stewardship practices (Sine *et al.,* 2022). A systematic review and perspective by Pierce *et al.* (2021) found that telemedicine interventions have the potential to improve antimicrobial use, reduce resistance, and improve patient outcomes. However, there is a need for further research to evaluate the effectiveness of telemedicine interventions in improving antimicrobial stewardship practices, particularly in resource-limited settings (Pierce *et al.,* 2021).

Several studies have evaluated the effectiveness of telemedicine interventions in improving antimicrobial stewardship practices. A study by Madaras-Kelly *et al.* (2014) reflected that a telemedicine-supported ASP improved appropriate antimicrobial prescribing and reduced healthcare costs in a rural hospital. Another study by Ohl *et al.* (2018) reconnoitered that a telemedicine-based ASP was associated with a reduction in broad-spectrum antimicrobial use in a rural Veterans Affairs hospital. Furthermore, Keller *et al.* (2020) concluded in their study that a telemedicine-supported ASP was effective in improving appropriate antimicrobial prescribing and reducing antimicrobial costs in a rural critical access hospital.

In terms of factors affecting the effectiveness of telemedicine interventions, numerous studies have identified organizational culture, policy, and resource availability as important factors (Pandit *et al.*, 2019*;* Keller *et al.*, 2020). Whereas, Flemming *et al.* (2018) state that the implementation of a telemedicine-supported ASP was facilitated by a supportive organizational culture and leadership, as well as adequate resources such as trained staff and technology infrastructure.

Through research and explorations, studies have investigated the impact of educational interventions on improving antimicrobial stewardship practices among healthcare providers. A systematic review by Van den Bosch *et al.* (2015) viewed that educational interventions can improve antimicrobial prescribing practices and reduce antimicrobial use. In addition, research from Charani *et al. (2011)* states that interventions that combine education with other interventions, such as feedback and audit, are more effective in improving antimicrobial prescribing practices.

Deriving from the impact of educational interventions on healthcare provider knowledge and practice, an educational program improved healthcare providers' knowledge of antimicrobial resistance and appropriate prescribing practices Appiah *et al.* (2017). Significantly, an article by Lee *et al.* (2016) found that an educational program improved healthcare providers' knowledge of appropriate antimicrobial use and reduced inappropriate prescribing practices.

Proportionately, the factors affecting intervention effectiveness have also been included in the literature. Boel *et al.* (2016) confirm that the implementation of an ASP was more successful when there was a multidisciplinary team involved in the intervention, and when the ASP was embedded in routine clinical practice. Moreover, Davey *et al.* (2017) found that the success of an antimicrobial stewardship intervention was dependent on the engagement of healthcare providers, leadership support, and the availability of resources. Thereby, the deliberation led the literature to delve into healthcare provider and patient perceptions and the acceptability of antimicrobial stewardship interventions.

A study by Dyar *et al.* (2017) found that healthcare providers and patients were generally supportive of antimicrobial stewardship interventions, but identified challenges such as time constraints and lack of knowledge as barriers to implementation. Similarly, a study by Avent *et al.* (2018) found that healthcare providers and patients were supportive of telemedicine interventions, but identified concerns such as privacy and technical difficulties as potential barriers.

In the Philippines, a study by Caragay *et al.* (2018) found that a multifaceted antimicrobial stewardship program was effective in reducing antimicrobial use in a tertiary hospital in Manila. The program included education, antimicrobial use monitoring, and feedback to healthcare providers. Moralejo *et al*. (2017) also discovered that a pharmacist-led antimicrobial stewardship program is effective in reducing antimicrobial use in a tertiary hospital in Cebu. The program included education, prospective audit and feedback, and implementation of clinical practice guidelines.

In terms of healthcare provider knowledge and practice, Almario *et al*. (2017) noted that an educational program improved knowledge of antimicrobial resistance and appropriate prescribing practices among healthcare providers in a tertiary hospital in Manila. Factors affecting intervention effectiveness have also been investigated in local studies. A study by Natividad *et al.* (2019) found that the implementation of an antimicrobial stewardship program in a tertiary hospital in Batangas was hindered by limited resources and a lack of staff engagement.

Finally, healthcare provider and patient perceptions and acceptability of antimicrobial stewardship interventions have also been an interest in local studies. A study by Kim *et al.* (2019) showed that patients in a tertiary hospital in Manila were generally supportive of antimicrobial stewardship interventions, but identified concerns such as cost and availability of alternative treatments. Likewise, research by Bagaoisan *et al.* (2018) found that healthcare providers in a tertiary hospital in Quezon City were supportive of an antimicrobial stewardship program, but identified challenges such as time constraints and lack of resources as barriers to implementation.

Research by Legasto *et al.* (2016) found that a multifaceted educational intervention that included lectures, workshops, and guidelines was effective in improving knowledge of appropriate antibiotic use among healthcare providers in a tertiary hospital in Metro Manila. Another exploration by Fajardo *et al.* (2019) found that the implementation of an antimicrobial stewardship program that included education, guidelines, monitoring, and feedback was effective in reducing antimicrobial use and improving antimicrobial prescribing practices in a tertiary hospital in Cebu City. A study by Lee *et al.* (2018) investigated the impact of a pharmacist-led antimicrobial stewardship program on antibiotic use and costs in a tertiary hospital in Quezon City. The program included education, monitoring and feedback, and implementation of clinical practice guidelines. The analysis found that the program was effective in reducing antimicrobial use and costs.

In terms of factors affecting intervention effectiveness, a quest by Tan *et al. (2019)* found that leadership support, staff engagement, and resource availability were important factors in the successful implementation of an antimicrobial stewardship program in a tertiary hospital in Manila. Finally, another fact-finding study by Lumanog *et al.* (2018) investigated the perceptions and attitudes of healthcare providers towards antimicrobial stewardship interventions in a tertiary hospital in Cebu City. The study found that healthcare providers were generally supportive of the interventions, but identified challenges such as time constraints and lack of resources as barriers to implementation.

CONCLUSION

Collated from several research reviews and the telemedicine educational intervention for antimicrobial stewardship incorporated into our study, telemedicine is an effective tool for both healthcare providers and the community, especially in remote areas in eradicating the antimicrobial resistance threat by employing rational and appropriate prescribing and use of antibiotics thereby leading to effective treatment outcomes while reducing the cost of healthcare at the same time.

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CONFLICTS OF INTEREST

No conflicts of interest are declared.

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