Review Article

Challenges Faced by Health Facilities in Implementing Antimicrobial Stewardship Program: A Narrative Review

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A B S T R A C T

Background: Antimicrobial Resistance (AMR) has become a significant world-wide health problem. Antimicrobial use though necessary, overusing/misusing can have detrimental long-term effects. Managing AMR involves a lot of challenges, therefore appropriate strategies must be developed to overcome them.

Methods: We conducted a comprehensive search using web-based search engines employing a combination of search terms. The search yielded 404 papers between 2000 and 2021. We took up Forty-four papers fulfilling the inclusion-exclusion criteria for review.

Results: The challenges identified from studies in implementing the Antimicrobial Stewardship Program (AMSP) include the administration's lack of knowledge, a deficit of resources, staff turnover, resistance to change, delay in Culture and Drug Sensitivity Testing (CDST), inadequate training, patient expectations, and insufficient Electronic Medical Records (EMR).

Conclusion: Antimicrobial resistance is a growing public health concern that all stakeholders must address. Improvements in antimicrobial consumption reporting and locally tailored guidelines can help to ensure successful implementation.

Keywords: Antimicrobial Resistance, "Drug Resistance, Microbial," Infection Control, Antimicrobial Stewardship, Delivery of Health Care

Introduction

The discovery of antimicrobials was historical, they revolutionized contemporary medicine by increasing average human life expectancy in just over a century.[1] Over the years, their consumption increased by 91% worldwide and 165% in Low and Middle-Income Countries (LMIC) between 2000 and 2015.[2,3] Antibiotics overuse and misuse over time accelerated the otherwise naturally occurring process of Antibiotic Resistance (AMR), leading to more deadly infections and difficult-to-cure illnesses.[4]

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AMR has become a worldwide health problem with significant health, political, and economic consequences.[2] Globally, it has been attributed to around five million fatalities in 2019, making it one of the worst risks to human health.[5] India has one of the highest AMR burdens, expected to kill around two million people by 2050.[3] To address this rising problem of AMR, the World Health Assembly endorsed the Global Action Plan (GAP) in May 2015. It urged its member states to align National Action Plan (NAP) on AMR with GAP-AMR by May 2017.[6] Antimicrobial Stewardship (AMS) is a key priority under NAP-AMR. It includes a coherent set of actions, implemented through the Antimicrobial Stewardship Program (AMSP), a system-wide healthcare strategy to promote the appropriate use of antimicrobials.[7]

To aid the implementation of AMSP, the World Health Organization (WHO) has developed a practical toolkit. It includes priority interventions such as preauthorization, prospective audits, and feedback. It has specified core elements for implementing AMSP, including leadership commitment, responsibility and duties, Antimicrobial Stewardship (AMS) actions, education and training, monitoring and surveillance, and reporting and feedback. It also mentions about the requirement of an AMS team for its implementation, consisting of interdisciplinary healthcare professionals (clinicians, Infectious Disease physicians (ID), pharmacists, nurses, and infection control team) or an AMS leader if resources are limited.[8]

This review aims to understand the challenges faced by healthcare facilities worldwide, in implementing the AMSP. We undertook this current review to provide a more comprehensive picture of the factors that need to be addressed to reduce AMR.

Methodology

We included studies exploring the challenges and barriers to implementing the AMSP.

1. Search Strategy and Eligibility Criteria

We searched relevant literature on PubMed using specific keywords, e.g., "Antimicrobial stewardship," "antimicrobial stewardship program," "antimicrobial stewardship metrics," "attitude of health personnel," "perception," "barriers," and "challenges." We conducted the last search on 13/07/2022, followed by a manual search in Google Scholar. We reviewed original studies, editorials, perspectives, short or unique communications, and policy papers on AMR and AMSP between 2000 and 2022. We identified articles cited in relevant review studies using the snowball technique.

Inclusion Criteria

1. Original studies, short or unique communications, and surveys that explored knowledge, practices, and barriers concerning AMSP.
2. Availability of full-text articles.

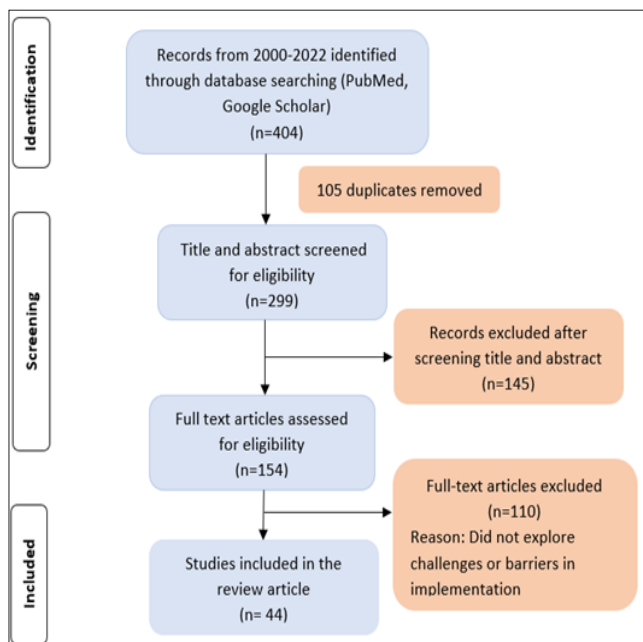### Exclusion Criteria

1. Articles not written in the English language.

Figure 1.Diagram of Article Retrieval & Inclusion

2. Data Extraction

Our literature search yielded 299 items after eliminating duplicates. A title & abstract screening resulted in the exclusion of 145 articles. Finally, after reviewing their full texts based on the inclusion-exclusion criteria, we took 44 papers for review (Figure 1).

Data were extracted from each study into a data extraction table using Microsoft Excel. We collected the following variables as part of this process; title, author, study setting, country setting, year of study, study design, study participants, and result (challenges/barriers).

Results

Study Demographics

The studies included consist of 54% of studies from Asia, followed by Europe (17%), Africa (13%), North America (10%), and Australia (6%). (Figure 2) Forty-five per cent of studies were qualitative followed by cross-sectional (34%) (Figure 3).

Challenges faced in the Implementation of AMSP

As described in the various studies, the challenges faced in implementing a sustainable AMSP are multifactorial. We classified them based on healthcare facility core

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elements for AMS programs. The common trends regarding implementation issues are explained under the following headings: Leadership commitment, Accountability & Responsibilities, AMS actions, Education & Training, Monitoring & Surveillance, and Reporting & Feedback.
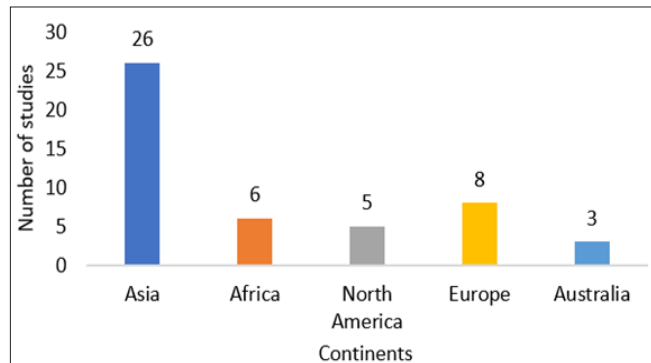

Figure 2.Continent-wise Distribution of Studies
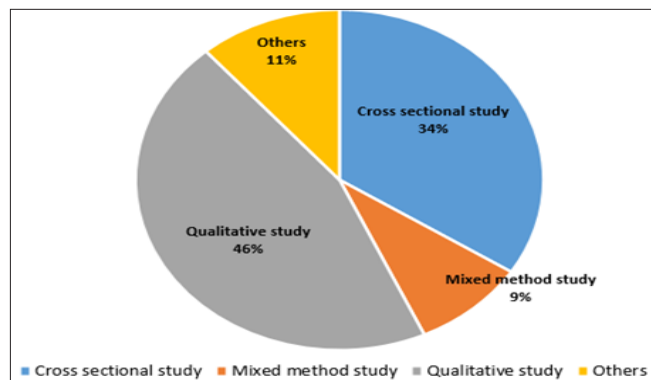*Some studies were conducted in multiple countries

Figure 3.Study Types Distribution

Figure 4.Frequency of Studies based on Challenges in the Implementation of AMS
**studies have explored multiple challenges

1. Leadership Commitment

The administration's support is crucial for implementing AMSP, it encourages the workforce to adopt the program. Allocating financial and personnel resources for AMSP operations is also under the administration's purview. More than 25% of the studies concluded that a critical difficulty in implementing AMSP was the administration's lack of knowledge and cooperation regarding the existence of the AMS program and strategies. The lack of interest in AMSP is due to insufficient data concerning lowering rates of AMR and improving patient outcomes.[9,11]

In addition to administrative issues, challenges reported in 50% of the studies were lack of resources to adequately support AMS programs, including finances, human resources (ID physicians, pharmacists, and clinicians), microbiology facilities to support Culture and Drug Sensitivity Testing (CDST), and IT support required to maintain the electronic medical record system (EMS).[9,28]

2. Accountability & Responsibilities

As mentioned in the WHO practical toolkit, a dedicated team of health workers and a leader (administrative or clinical) accountable for the program and outcomes are required at the facility to implement AMSP. Collaboration between the team is essential for its successful implementation.[7]

A study reported a lack of motivation among the stewardship team. They are prone to giving up, especially when they cannot convince their colleagues regarding the implementation of the measures.[29] Another reason, as reported by two studies was staff turnover or the continuous rotation of doctors who are often unaware of guidelines owing to a lack of periodic training.[14,30]

One of the studies has also raised concerns about having a dedicated AST physician in the team as it might create conflicts with the existing ID physicians.[15,31] Another study reported that 60% of pharmacists have limited time to participate in AMSP due to other daily work.[17] This additional time seemed to be the major obstacle to healthcare professionals' willingness to implement it.[26,32]

One of the identified concerns is a vague job description, which prevents the right person from being held accountable. It also leads to hierarchical structures becoming the instructing body in making recommendations about prescribing practices rather than the qualified ID physician.[11,13,17,33,34]

Other concerns include ineffective coordination among the AMSP team, inequalities in perceived power relations, and a lack of trust in antibiotic recommendations given by AMSP members.[24,31]
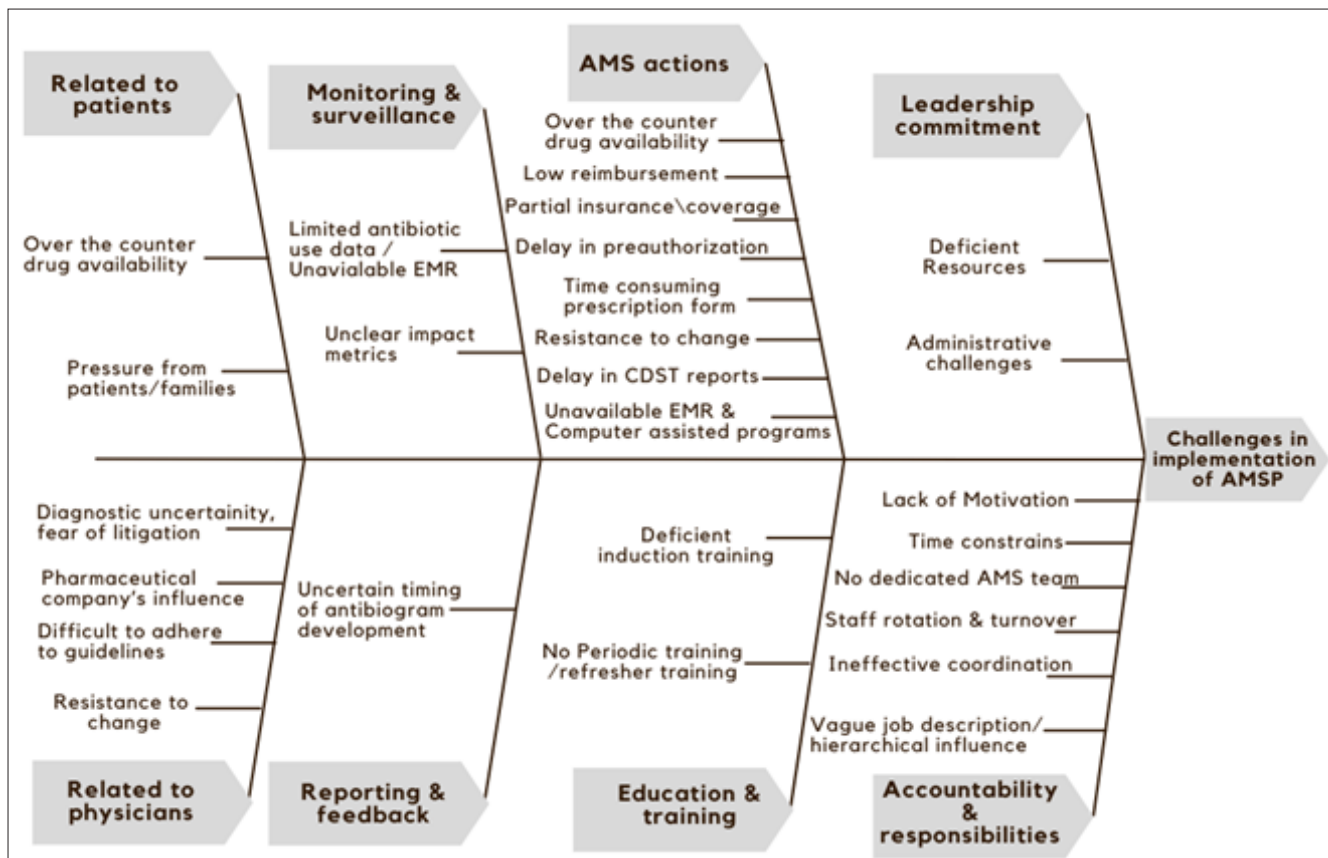
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Figure 5.Challenges faced in the Implementation of the Antimicrobial Stewardship Program

3. AMS Actions

WHO toolkit has identified multiple action items to move forward with the implementation of AMSP. It includes the availability of up-to-date standard treatment guidelines, auditing of specified antibiotics, feedback to prescribers, and accessibility to the lab and IT services.[7]

Four studies reported difficulty in identifying relevant stakeholders for AMSP implementation. Long waiting time for CDST reporting decreases the clinicians' keenness to utilize the available laboratory services.[13,30,35,38] Healthcare workers' resistance to changing their routine practices also affects AMSP implementation.[10,14,18,39] Some studies reported concerns that insurance would not cover the entire patient management if funds were spent on diagnostic tests, which hinders the fulfilment of AMSP guidelines.[23,30] Low reimbursement is an additional factor that demotivates the staff.[17]

AMS actions also involve documenting prescribed medicines using standardized prescription charts. The inconvenient nature of this dedicated prescription form was cited as a problem.[32] Significant delay in assessing the antibiotic justification form was an additional drawback.[40] Seven studies found the unavailability of EMR and computer-assisted programs, particularly at government facilities, as a barrier, making auditing difficult and hindering the stewardship program.[18,24,28,29,35,38,41]

Lack of continuity of treatment, availability of over-the-counter medications, and private practitioners have all been stated as obstacles to effective implementation.[16]

4. Education & Training

Two challenges identified in education and training were inadequate induction training and no periodic /refresher training. Fifty-nine per cent of studies reported inadequate training of working and potential healthcare workers like ID physicians, nurses, microbiologists, and clinical pharmacists. One of the studies also mentioned the lack of structure in undergraduate and postgraduate teaching on AMR and AMS.[42]

Studies on pharmacists' involvement in AMSP reported that even though they have theoretical knowledge about antimicrobials, there is a lack of proper training for pharmacists after graduation to be able to dispense antimicrobials appropriately.[19,43]

The absence of periodic and refresher training is another problem hindering AMS activities leading to newer employees in AMSP remaining inadequately trained.[10]

5. Monitoring & Surveillance

WHO toolkit describes the responsibility of the AMS

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team as monitoring the quantity and types of antibiotic use (purchased/prescribed/dispensed) at the unit and health-care-facility level, along with antibiotic susceptibility and resistance rates.[7] AMS team is also responsible for monitoring compliance with interventions put in place for AMSP, including education, development and updating a standardized medical record, and reviewing antibiotics and doses.[8]

According to the literature reviewed, inadequate monitoring contributes to misleading perceptions of the severity of the issue. Studies reported that the metrics used to quantify the impact of AMSPs are not well defined[44,45] leading to incomplete availability of data on antibiotic use and resistance rates.[18,30,46] Hence, it is difficult to evaluate the effectiveness of interventions and develop local treatment guidelines.[47]

6. Reporting & Feedback

WHO toolkit states that the information gathered from monitoring the number of antibiotics purchased/prescribed/dispensed, antibiotic susceptibility, and resistance rates need to be reviewed and analysed to communicate critical findings with specific action points to prescribers. The aggregate antibiogram for the facility is created based on a review and analysis of the facility's antibiotic use and antibiotic-resistant bacteria.[7]

One of the reasons identified for inadequate reporting was uncertain timings in the development of antibiogram.[13,20,29,30,35,38] One study found that, due to delays in antibiogram reports, doctors typically ask for a culture only when a patient's condition does not improve after taking the prescribed medication. If the patient is currently taking antibiotics, the antibiogram will often show sensitivity to high-end antibiotics. Therefore, it is challenging to obtain an antibiogram that accurately depicts the community's resistance and reduces dependability on the antibiogram.[29]

The information generated on antibiotic use and resistance after analysis is useful in giving feedback to prescribers, but gaps are beginning from collecting information to analysing, generating feedback, and monitoring compliance with feedback.[14,40,45]

7. Others

1. Challenges Related to Physicians

Physician plays a major role in AMSP as they are the first point of contact with the patients. Their knowledge, compliance with guidelines, and sincere efforts can greatly reduce irrational prescribing. However, many physicians are not even aware of such policies, and those who are, find it difficult to adhere to them because of the routine prescribing patterns.[11,48]

Nine studies reported that some prescribers are hesitant because they are not convinced of the efficacy of interventions for reducing AMR, and as a result, they fail to follow hospital regulations regarding AMSP.[10,47] Another difficulty was the lack of time due to workload, which causes doctors to overlook antibiotic de-escalation. A few physicians feared autonomy loss, decision-making interference, and restrictive measures.[10,12,13,16,17,21,31,32,49]

In nine studies, the health professional's perception of patient expectations and satisfaction, risk of hospital-acquired infections, fear of treatment failure, delay in CDST test findings, diagnostic uncertainty, and fear of litigation were described as reasons for prescribing broad-spectrum antibiotics. One challenge identified in private health facilities was physicians' fear of reduced patient footfall and income if they do not prescribe antibiotics.[18,29,37,48,50,53]

Pharmaceutical companies also have a great influence on prescribing patterns as physicians experience pressure to buy and use specific products.[32]

2. Challenges Related to Patients

Studies have quoted that doctors experience undue pressure from patients or their families to prescribe antibiotics even when they do not require them or/ start treatment before CDST.[27,36,41]

Some of the studies also mentioned difficulty in maintaining track of patients' antibiotic use because of alternate ways to obtain antibiotics, such as over-the-counter purchases of medicines.[18,29,48] One study reported the reason for the counter purchase as a patient's inability to pay for the doctor's visit.[43]

Table 1. Frequency of Studies based on Components of Core Elements

Core Elements	No. of Studies
1. Leadership commitment (n = 23)	
• Deficient resources	20
• Administrative challenges	03
2. Accountability & responsibilities (n = 15)	
• Vague job description/hierarchical influence	05
• Time constrains	03

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•	Staff rotation & turnover	02
•	No dedicated AMS team	02
•	Ineffective coordination	02
•	Lack of Motivation	01
3.	**AMS actions (n = 23)**	
•	Unavailable EMR and Computer-assisted programs	07
•	Delay in CDST reports	06
•	Resistance to change	04
•	Partial insurance coverage	02
•	Time consuming prescription form	01
•	Delay in preauthorization	01
•	Low reimbursement	01
•	Over the counter drug availability	01
4.	**Education & training (n = 28)**	
•	Inadequate induction training	26
•	No Periodic training/refresher training	02
5.	**Monitoring & surveillance (n = 9)**	
•	Limited antibiotic use data	07
•	Unclear impact metrics	02
6.	**Reporting & feedback (n = 7)**	
•	Uncertain timing of antibiogram development	07
7.	**Others**	
i.	Challenges related to physicians (n = 20)	
•	Resistance to change: not convinced with efficacy, loss of autonomy	09
•	Diagnostic uncertainty, fear of litigation	08
•	Difficult to adhere to guidelines	02
•	Pharmaceutical company's influence	01
ii.	Challenges related to patients (n = 7)	
•	Pressure from patients/families	03
•	Alternate ways to get antibiotics	03
•	Patient's socioeconomic status: reason for over-the-counter purchase	01

Discussion

The rising issue of AMR developed the need for the implementation of AMSP at a global level. It was launched to narrow the gap between evidence and clinical practice and ascertain the clinical results.[54,55] Recent developments in policies show growing political commitment to action on AMR and support for surveillance to contain resistance.[56] There is a growing body of literature concerning AMSP in health facilities. We conducted this review to provide comprehensive information from various settings to help in guiding policies and new frameworks.

The most commonly reported challenges in AMSP implementation among all studies included problems with key personnel, financial resources, and microbiology resources. Other commonly reported issues were coordination between the team, insufficient data, and lack of IT support. These challenges must be addressed to decrease irrational prescribing and improve clinical outcomes.

A phased implementation of antimicrobial stewardship strategies has been shown to improve hospitals' operational and financial outcomes. This tiered strategy allows facilities to focus their efforts on more urgent targets. It helps health workers to implement things gradually and reduces effort and load on the available resources.[57]

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In resource-constrained nations, having a dedicated team or resources to conduct this program may be difficult. It is also not practical for health workers to adopt new interventions while dealing with a heavy patient load. Studies have suggested the gradual integration of planned intervention into regular clinical routines to address this issue and provide sustainable change.[58] Prescribers may still be reluctant due to several reasons, including a lack of administrative support, inadequate information about the effectiveness of interventions, and impractical and inaccessible guidelines. Therefore, it is critical to adapt national recommendations to local settings to enhance patient outcomes.[9] Accessibility can be improved by displaying guidelines in health facilities and also making it available as a smartphone application.[38] Along with this, monetary compensation for the time involved in AMSP can further motivate staff.[34]

Coordination among health workers from different backgrounds, such as pharmacists, ID physicians, and clinicians, can be complex due to the existing hierarchical structure. To overcome this defining the duties and responsibilities of each team member from the start may promote a good working environment.[31] Furthermore, having someone senior with clinical expertise and academic stature from the facility as an AMS leader can solve the hierarchical issues.[29] Coordination with the microbiology department for timely CDST testing can be improved by making laboratories robust, especially around laboratory infrastructure, and provision of ideal laboratory reagents and equipment to decrease the time required for results.

Health facilities should choose interventions namely prospective audit and feedback, preauthorization, and facility-specific treatment guidelines, that will best address gaps in antibiotic prescribing.[7,59] According to studies, prospective audit and feedback interventions are probably the most widely practised, as accepting the recommendations is voluntary.[55,60,61] Therefore, physicians do not perceive the loss of prescribing autonomy.[62]

Medical institutions have a diverse group of health professionals, including medical students, who, with the proper training, may be leveraged to tackle AMR successfully. Basic induction training with regular workshops focusing on upskilling can make these interventions effective, and also enable physicians to work on a rotational basis.[15] Refresher training is the most preferred way of updating the knowledge of participants, followed by the internet and journals.[41] Easily comprehendible training manual can be created for easy access by AMSP members.[30] Information campaigns targeting patients and their families on AMR can be an additional benefit.[63]

Monitoring & surveillance systems can be strengthened by designating a centralized place for microbiological findings and standardizing the monitoring indicators across the country.[64,65] Consumption metrics like DDD can be used to track antimicrobial consumption and measure the effectiveness of stewardship activities.[66]

Antibiotic usage and resistance statistics should be provided to prescribers regularly. Periodic staff meetings, newsletters, hospital bulletins, rounds, and regular e-mails can all help to strengthen the feedback system in health facilities.[14]
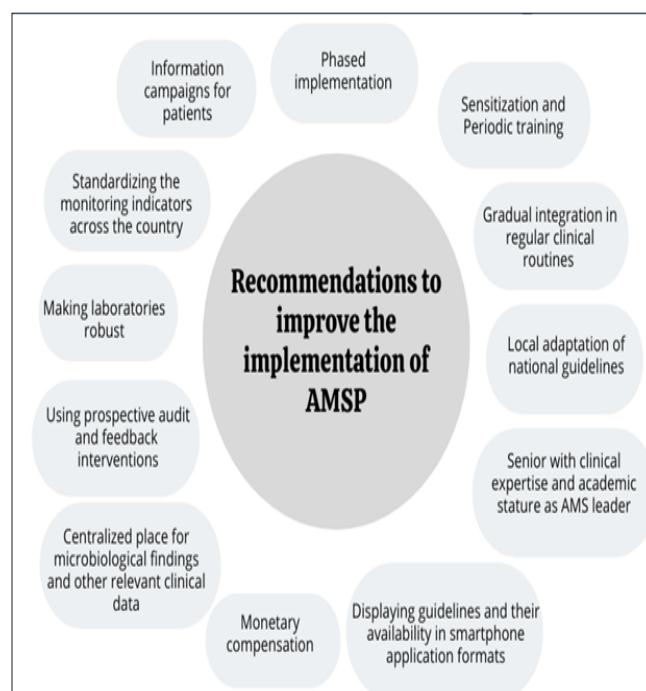

Figure 6.Recommendations to Improve the Implementation of AMSP

Conclusion

AMR is a growing public health problem that needs attention in terms of the availability of resources, continuous participation from all stakeholders, frequent follow-up, and proper budgeting, and a dedicated leader is required for successful AMSP implementation. Improvements in antimicrobial consumption reporting and comparison with similar institutions can help in illustrating the benefits of AMS programs. We can ensure effective implementation of AMS actions by tailoring the antimicrobial prescribing guidelines to the needs of individual health boards or hospitals and their uniform implementation.

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