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Barriers to facilitate antimicrobial stewardship of hospital clinicians in Korea: a mixed-methods study using a qualitative study and survey results

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Abstract

Background Antimicrobial stewardship (AS) programs have the potential to improve antibiotic use and mitigate antimicrobial resistance (AMR). However, several challenges hinder the successful implementation of AS programs. The aim of this study was to explore hospital clinicians' perceptions and attitudes toward AS programs, as well as the associated barriers to facilitating their adoption in Korea.

Methods We conducted both focus group interviews and online surveys. In-depth focus group interviews were held with 14 physicians—comprising three otolaryngologists, three infectious diseases physicians, three pediatricians, three pulmonologists, one family medicine physician and one general surgeon—from three hospitals in South Korea in 2018. Additionally, a web-based survey was distributed to secondary and tertiary hospitals.

Results We identified several key barriers imposed by non-clinical factors, including hierarchical structures within hospitals, physicians' concerns about disease progression, and patients' expectations regarding antibiotics. As a result, participants reported a need for education targeting both patients and physicians. In the survey of 120 respondents, knowledge gaps were found to differ by hospital type and the presence of infectious disease specialists.

Conclusion This study examined the enablers and barriers to AS using a mixed-methods approach in Korea. Our findings provide insight into the current status of AS and identify areas where efforts should be focused to promote appropriate antimicrobial use and address barriers to AS.

Keywords Antimicrobial stewardship, Mixed methods, Qualitative study, Survey, Korea

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Introduction

Antimicrobial resistance (AMR) is widely recognized as one of the most pressing global health threats [1]. AMR is a top-tier concern, primarily driven by the inappropriate and excessive use of antimicrobials, which leads to the emergence and spread of antibiotic-resistant bacteria. This results in negative clinical outcomes such as patient morbidity, mortality, and substantial economic burdens [2–8]. According to the US Centers for Disease Control and Prevention (CDC), more than 2.8 million antimicrobial-resistant infections occur annually in the United States, causing over 35,000 deaths [9]. The World Health Organization (WHO) has declared AMR a major global health crisis threatening human life and, to address this issue, has recommended the implementation of antimicrobial stewardship (AS) programs [10]. In 2015, WHO adopted the Global Action Plan on AMR, subsequently launched the Global Antimicrobial Resistance and Use Surveillance System (GLASS) in 2016, and released the AWARe (Access, Watch, Reserve) classification to guide appropriate antibiotic use at the country level, making hospital-based AS a core component of global AMR efforts.

Evidence shows that AS programs improve antibiotic use, reduce healthcare costs, and decrease hospital length of stay [11–16]. AS programs involve a range of integrated activities, such as monitoring inappropriate prescribing, utilizing interventions like preauthorization or prospective audit and feedback, and promoting best practices through education [17–20]. Many countries, including Korea, have developed guidelines for AS program implementation and recommended integrating AS programs into hospital accreditation standards [21, 22]. However, previous studies have identified significant challenges in implementing AS programs, especially in smaller hospitals [23, 24].

In Korea, the Office of Government Policy Coordination has introduced the National Action Plan on Antimicrobial Resistance (AMR) since 2016 [25]. The 2nd Phase of Korea's National Action Plan on AMR (2021–2025) has since expanded the national framework to include hospital-based stewardship, and the National AS program pilot project was launched in Korean hospitals in 2024 as part of this plan [26]. Despite this, adoption across Korean hospitals has stayed uneven: many facilities lack the staff, budgets, and clinician buy-in needed to run a sustained AS program.

Before these policies can work effectively outside large tertiary centers, we need a clearer picture of why prescribing patterns are hard to change in the first place—especially in smaller hospitals where AS infrastructure is thin. This study therefore set out to document how Korean hospital physicians themselves describe the

pressures and conditions shaping their antibiotic prescribing, and what they see as the main obstacles to AS uptake.

Methods

Focus group interviews

In-depth focus group interviews were conducted with 14 physicians from three tertiary hospitals in South Korea, each with more than 1000 beds. The participants comprised three otolaryngologists, three infectious disease (ID) physicians (from internal medicine), three pediatricians, three pulmonologists, one family medicine physician, and one general surgeon. The interviews were organized into three group sessions held between October 5 and November 6, 2018. Each session lasted approximately 60 min and centered on key topics related to AMR and AS. Participants were divided into three groups by hospital (Hospital A: 4 participants; Hospital B: 5; Hospital C: 5), and each physician attended only one focus-group session; the three sessions were separate and did not involve repeated participation by the same individuals.

The purpose of the interviews was to explore physicians' perceptions and attitudes toward AMR, factors influencing antibiotic prescribing, current practices and strategies for teaching appropriate prescribing, the structure and content of AS programs in their respective hospitals, perceived enablers and barriers to AS implementation, and the perceived need for centralized feedback on prescribing behavior. The interview guide (Table 1) consisted of four main topics. The guide was developed based on the literature and the authors' experience.

Interviews were recorded and transcribed verbatim. Two team members coded the transcripts independently and then met to compare codes. We followed a framework approach [27].

Codes were grouped into categories and then into themes, with disagreements resolved in discussion. As shown in Table 2, the 14 participants ranged in age from 38 to 64 years; three were female and 11 were male.

Survey

A web-based survey was distributed to secondary and tertiary hospitals between October 15 and November 11, 2018. A total of 120 healthcare professionals responded, including 40 physicians, 52 nurses, 8 pharmacists, and 20 administrators.

The survey items were drafted from the focus-group findings and prior literature, then refined through discussion among the research team. Sections covered respondent demographics, perceptions of AS, the AS activities in place at respondents' hospitals, and perceived barriers to implementation.

Table 1 The interview guide

Main topic	Sub questions
Perception of antimicrobial resistance (AMR)	Personal: Have you ever personally encountered situations where antimicrobial resistance was a problem (for example, cases where antibiotics were ineffective)? Colleagues: What is the general perception of antimicrobial resistance among other medical staff in your hospital? Community: How do you perceive the issue of antimicrobial resistance in the broader community?
Antibiotic prescribing behavior and influencing factors	Personal/Institutional/National: Do you think you personally prescribe antibiotics frequently? Do you think antibiotics are prescribed frequently in your hospital? What is your opinion about antibiotic use in Korea overall? Diagnostic Uncertainty: What do you usually do when you encounter diagnostic uncertainty in prescribing decisions? How do you decide on the class or type of antibiotic to use? What sources of information do you rely on when making these decisions? Patient/Parental Pressure: How much pressure do you feel from patients or parents regarding antibiotic prescriptions? How strong is this pressure? What types of support (such as education or training) do you think would help in managing conflicts with patients or parents?
Information and education related to antibiotic prescribing	How do you keep up to date with new information about antibiotics, such as mechanisms of action or prescribing frequency? How do you access or interpret data on antimicrobial resistance rates? What forms of education or training do you find most helpful for antibiotic prescribing?
Governance and details of antimicrobial stewardship activities	Please describe your hospital's guidelines or stewardship activities in detail, including the timing of interventions by order communication systems (OCS) or infectious disease specialists. What is your opinion about your hospital's health information technology systems (including any related costs)? Is there any system for comparing or reporting antibiotic prescribing rates among physicians? How are antibiotic use and resistance rates reported to physicians, nurses, and pharmacists? What is the workload like for reviewing antibiotic prescriptions (for example, the number of cases reviewed, and the time required)? Are there any incentives or compensation for reviewing antibiotic prescriptions in your hospital? Are there educational programs for physicians and/or patients? Have you experienced interprofessional conflicts (for example, disagreements with infectious disease specialists)? How are such issues resolved? Do factors such as seniority or experience affect this?

Table 2 Characteristics of participants in the focus group interviews

Categories	Total	A hospital	B hospital	C hospital
No. of participants	14	4	5	5
Age range (years)	36–64	38–64	36–54	39–53
Gender: male	11	3	3	5
Specialty				
Pediatrician	3	1	1	1
Otolaryngologist	3	1	1	1
Infectious disease internal medicine specialist	3		1	2
Respiratory internal medicine specialist	3	1	1	1
Pediatric allergic internal medicine specialist	1	1		
Surgeon	1		1	

The survey was pretested with a sample of employees at a university hospital to ensure clarity and validity. It included questions on participants' knowledge, attitudes, and practices related to antibiotic prescribing, the current status of AS programs at their respective hospitals, and perceived enablers for successful AS program implementation. The survey was conducted anonymously.

Results

Four overarching themes emerged from the interviews, summarized in Fig. 1 and presented in subsections “Factors influencing antibiotic prescribing: external pressures

and clinical uncertainty”, “Status of AS program implementation: limited activities and infrastructure”, “Barriers to AS program implementation: lack of expertise and professional hierarchies” and “Addressing the barriers: education and feedback as key strategies” below.

1. Factors influencing antibiotic prescribing.
2. The current status of AS programs in each hospital.
3. Barriers to AS program implementation.
4. Challenges in addressing these barriers.

Factors influencing antibiotic prescribing: external pressures and clinical uncertainty

While diagnostic test results were considered in prescribing decisions, most physicians reported relying primarily on empirical judgment, particularly when immediate action was necessary. The decision to prescribe antibiotics frequently depended on the patient's clinical progression.

“It takes a lot of time to get a sputum culture, and even more to determine resistance from microbiological results.” (A4, B2).

“If symptoms are mild and the condition is stable, I can wait. But if the disease progresses, I prescribe antibiotics.” (A1, A4).

Confidence in withholding antibiotics increased with experience. Many physicians noted that less experienced doctors were more likely to prescribe antibiotics out of concern for clinical deterioration or legal liability.

Construct	Subconstruct
Factors affecting the decision to prescribe antibiotics	- Confidence vs. fears - Fears about worsening the patient's condition without antibiotics and taking the risk of sue - Patients' demands for antibiotics and relationships with patients
Status of AS components	- Prior authorization - Feedback on antibiotic resistance rate is only from national reports - Regular education program is not in progress - Tracking and reporting are usually not working
Barriers to AS programs	- Absence of human resources - Lack of hospitals' finances - Conflict of professionalism /or violation of professional expertise - Need for education of staff - Need for specialized consulting tailored to the medical department - Lack of individual education on decision support - Difficulty in systems of tracking and reporting

Fig. 1 Themes from physicians' interviews on AS programs

"I used to prescribe antibiotics for every cough or sputum case, but as I gained experience, I stopped. Young doctors prescribe out of fear that their patients won't recover. They need the confidence to wait." (C1, C3).

"Confident professionals can persuade caregivers not to use antibiotics. Those without confidence give in to pressure." (A1).

"There's always that fear that 99 patients will be fine, but 1 might develop a serious infection. Not prescribing antibiotics can feel like a legal risk." (B4, B5).

Patient and caregiver pressure also significantly influenced prescribing behaviors.

"Some parents insist on antibiotics, saying their child never gets better without them. Others oppose antibiotics even when they're necessary." (A2).

Status of AS program implementation: limited activities and infrastructure

Among AS program elements such as prospective audit and feedback, antibiotic restriction, tracking, and education, antimicrobial restriction was the most widely implemented in Korean hospitals. Based on the focus-group discussions, restriction was typically operationalized through a combination of (i) removing selected broad-spectrum agents (e.g., carbapenems, anti-MRSA agents, antipseudomonal β -lactams) from the open formulary, (ii) mandatory preauthorization by an ID specialist before the agent could be dispensed, and (iii) EMR-based criteria or pop-up alerts requiring clinical justification at the point of order entry. However, most facilities lacked comprehensive AS infrastructure.

"Most hospitals already use EMR and OCS, so adding restriction logic isn't costly." (A1, B1).

"Only about 2% of hospitals have tracking and reporting systems. It requires cooperation between infectious disease specialists and IT staff." (A1).

The lack of feedback mechanisms was also cited as a concern:

"There's a risk of prolonged antibiotic use without discontinuation. A pop-up alert for long-term use would help." (B3).

Interviewees indicated insufficient awareness of in-hospital antibiotic resistance trends, despite the availability of national data (e.g., KONIS).

"I see resistance trends in national reports, but not in my hospital. We need a centralized system to collect and share this data." (A3).

"We receive resistance data in ICU quarterly, but not everyone is aware of it." (C3).

"Only those interested actually check the data. More effort is needed to publicize it." (B1).

Regular education on antibiotics was lacking at all three hospitals, especially outside of internal medicine departments.

"There's no regular training—only 1:1 teaching during consultations." (C1).

"Education is limited to internal medicine. Other departments have few opportunities." (C3).

Barriers to AS program implementation: lack of expertise and professional hierarchies

Participants emphasized the importance of ID specialists for AS program success.

"Some hospitals run AS without ID specialists. Preauthorization doesn't work well when done by non-specialists." (A1).

Lack of motivation and financial incentives was a recurring barrier:

"There's no reward for AS work. It's hard to sustain without compensation." (B1).

Hierarchical dynamics also hindered implementation. Senior physicians often resisted change, perceiving AS as a challenge to their autonomy.

"Senior doctors sometimes say, 'Why are you questioning my professionalism?' That makes things difficult." (A1, B1).

Interdepartmental and senior-junior communication gaps further complicated AS implementation.

"Junior doctors avoid responsibility and just stop antibiotics without proper judgment. That's dangerous." (B5).

"It's difficult to assess a case without seeing the patient. We must rely on the primary team's judgment." (A1).

Addressing the barriers: education and feedback as key strategies

Respondents emphasized that education should target senior staff as well as trainees, as prescribing behaviors often cascade from senior to junior physicians.

"Staff need to change. Otherwise, any training for residents is only temporary." (C2).

"If senior staff prescribe based on experience or anxiety, their trainees will adopt the same habits." (C5).

Personalized feedback was viewed as more effective than group or online education.

"Group education doesn't work. Doctors don't pay attention unless it's urgent." (B1).

Table 3 General characteristics of respondents

Variables	Respondents (n = 120)	(%)
<i>Occupation</i>		
All physicians	40	(33.3)
Infectious disease physician	8	(6.7)
Pediatric infectious disease physician	26	(21.7)
Other clinical departments	6	(5.0)
Nurse	52	(43.3)
Administrator	8	(6.7)
Pharmacist	20	(16.7)
<i>Type of hospital where respondents are employed</i>		
Tertiary hospital	21	(17.5)
General hospital	37	(30.8)
Hospital	62	(51.7)
<i>No. of beds in hospital where respondents are employed</i>		
< 100 beds	41	(34.2)
100 to < 300 beds	41	(34.2)
300 to < 500 beds	7	(5.8)
500 to < 1000 beds	26	(21.7)
1000 to < 1500 beds	2	(1.7)
≥ 1500 beds	3	(2.5)

"Peer-led seminars within the hospital are more impactful." (A1).

"Physicians need to see how their prescriptions deviate from guidelines—'I was wrong.' That's the best learning." (A3).

There was general agreement that policy and financial support are essential, particularly for small and mid-sized hospitals.

"The ID department doesn't generate profits, so national policy support is essential." (B5).

"If the government incentivizes larger hospitals to consult for smaller ones, it could be very helpful." (C1).

Respondents also highlighted the need for department-specific infection control personnel, rather than relying on a single ID physician.

"One person can't cover every department. Just like there's an anesthesia specialist for ENT, we need AS specialists for each department." (B4).

Survey of personnel from hospitals

As shown in Table 3, 3.3% of the 120 respondents were physicians. Most survey participants acknowledged that AMR is a significant problem. 60% agreed that AS programs help reduce antibiotic resistance, and 64.2% believed such programs improve patient care and safety.

Despite this, only 35.8% of respondents reported having heard of AS programs. Awareness was particularly low among non-infectious disease specialists, with most other physicians and healthcare staff indicating unfamiliarity with the concept. When analyzed by type of medical institution, 81.0% of respondents from tertiary general hospitals were aware of AS programs, whereas awareness was significantly lower among staff from general and smaller hospitals.

As presented in Tables 4, and 98.3% of respondents recognized AMR as a serious problem, and 80% stated that they considered antibiotic resistance to be an important issue in their hospital. However, only 35.8% reported awareness of AS, and 20.8% indicated the existence of an operational organizational structure related to AS. Additionally, 19.2% reported that their hospital had an AS program in place, and 17% indicated the use of an antibiotic restriction protocol.

The most frequently cited barrier to AS program implementation and collaboration was a lack of knowledge, followed by challenges related to infection control, system inefficiencies, and financial concerns, including potential negative impacts on hospital revenue. In response to whether existing antibiotic management policies facilitated cooperation among departments or professional groups, 41 participants answered; of these, 56.7% reported poor interdepartmental cooperation, with lack of knowledge about antibiotic stewardship cited as the primary barrier.

Table 4 Knowledge and attitudes regarding AMR and AS programs

Question	Occupation						Type of hospitals					
	No. (%)	Physicians		Nurses	Administrators	Pharmacists	Tertiary hospital			General hospital	Hospital	
		All physicians	ID physicians including pediatric ID)				8	20	37			62
Total	120	40	7	52	8	20	21	37	62			
believe antimicrobial resistance is a serious problem	118 (98.3)	38	7	52	8	20	21 (100.0)	37 (100.0)	60 (96.8)			
believe antimicrobial resistance is considered important in our hospital	96 (80.0)	29	7	42	7	18	21 (100.0)	33 (89.2)	42 (67.7)			
believe that changing prescribing behavior can reduce antimicrobial resistance	111 (92.5)	33	7	51	8	19	20 (95.2)	37 (100.0)	54 (87.1)			
I have heard of AS	43 (35.8)	11	7	19	4	9	17 (81.0)	17 (45.9)	9 (14.5)			
believe AS programs help reduce antimicrobial resistance problems	72 (60.0)	22	7	33	5	12	20 (95.2)	23 (62.2)	29 (46.8)			
believe AS programs improve patient care and safety	77 (64.2)	20	7	36	6	15	19 (90.5)	25 (67.6)	33 (53.2)			
Presence of organizational structure for AS program implementation	25 (20.8)	8	5	13	4		14 (66.7)	11 (29.7)	(0.0)			
Monitoring antibiotic use	19 (15.8)	4	3	13	2		8 (38.1)	10 (27.0)	1 (1.6)			
Presence of AS program	23 (19.2)	9	4	11	2	1	13 (61.9)	11 (29.7)				
Presence of an antibiotic restriction	21 (17.5)	6	4	11	4		12 (57.1)	9 (24.3)				
Barriers to AS program cooperation												
Lack of knowledge about AS programs	9 (7.5)	1		7	1		2 (9.5)	6 (16.2)	1 (1.6)			
Lack of knowledge about infection control	2 (1.7)			2			(0.0)	2 (5.4)				
Ineffective management systems pose a threat to physicians' authority	2 (1.6)			2			1 (4.8)		1 (1.6)			
Cost issues												
AMR, antimicrobial resistance; AS, antimicrobial stewardship; ID, infectious disease	2 (1.6)	1			1		1 (4.8)	(0.0)	1 (1.6)			

Discussion

This mixed-methods study provides a clearer picture of how antimicrobial stewardship is implemented in Korean hospitals by combining qualitative insights from physicians with quantitative survey findings. Through this approach, we identified not only the structural and organizational barriers to AS uptake but also the underlying behavioral and cultural mechanisms influencing antibiotic prescribing behaviors.

One of the most notable findings was that antimicrobial restriction policies were the most widely implemented AS strategy, largely because of their compatibility with existing electronic medical record systems and relatively low resource demands. In contrast, core AS components such as prospective audit and feedback, monitoring of antimicrobial consumption, and routine education were infrequently practiced. These results reflect the uneven implementation of stewardship elements and suggest that AS programs in Korea are still at a nascent stage of development, particularly outside of tertiary hospitals, as demonstrated by a nationwide survey in 2020 [28].

Our participants were more receptive to antibiotic restriction than to prospective audit and feedback, which contrasts with international reports in which clinicians view restriction as a threat to clinical autonomy. This likely reflects not an acceptance of reduced clinical autonomy, but the fact that once restriction is built into the EMR through preauthorization and formulary rules, it becomes a structural default that does not require ongoing negotiation. Audit and feedback, by contrast, requires dedicated staff time and direct peer-to-peer exchanges that most Korean hospitals have yet to resource. Prior studies similarly report that audit and feedback interventions require substantial institutional commitment and human resources to achieve meaningful impact and are therefore less feasible in resource-constrained settings [17, 18].

Physicians reported that clinical uncertainty, fear of disease progression, and pressure from patients or caregivers strongly influenced their prescribing decisions. This aligns with earlier work showing that non-clinical pressures, particularly diagnostic uncertainty and perceived medico-legal risk, lead to defensive antibiotic prescribing [23, 29]. Our qualitative findings show how these pressures are amplified within Korean hospitals, where hierarchical culture and patient expectations shape prescribing decisions.

Interpersonal and organizational dynamics also emerged as major barriers to AS program implementation. Participants frequently cited challenges related to professional hierarchy, such as resistance from senior physicians to external oversight of prescribing behavior, as well as difficulties in interdepartmental communication. The lack of financial and institutional incentives

for ID specialists to lead AS activities further limits program sustainability. These challenges echo findings from a study by Broom et al. (2017) in Australia, where intraprofessional conflicts, blurred specialty boundaries, and hierarchical consultation processes were identified as impediments to stewardship uptake [30]. Comparable interprofessional dynamics have been described by Szymczak and colleagues, who examined the social context of stewardship decision-making [31], by Rynkiewicz, who explored the cultural logics shaping prescriber–stewardship interactions in a U.S. academic medical center [32], and in earlier work by Livorsi et al. on the factors influencing antibiotic-prescribing decisions among inpatient physicians [23]. In the Korean context, these hierarchical dynamics become particularly salient because stewardship interventions that rely on peer review or external oversight cut directly against the grain of senior–junior physician relationships. One implication is that stewardship models developed in Western academic centers cannot simply be copied; they need to be adapted to local professional culture.

ID specialists were described as essential to AS, but relying on them alone is not feasible in under-resourced hospitals. In Korea, the shortage and uneven distribution of ID specialists means that stewardship activities are often concentrated in large tertiary centers, leaving smaller hospitals without adequate expertise or support [33]. In our own survey, AS awareness and implementation differed sharply by hospital type, consistent with this uneven distribution of expertise.

Participants emphasized the need for leadership support, multidisciplinary collaboration, and the institutionalization of regular education programs targeting both physicians and patients. In particular, they called for tailored feedback mechanisms, such as individualized prescribing reports, to promote physician engagement and drive behavior change.

For smaller hospitals with limited access to ID specialists, respondents suggested that centralized support systems, including government-led feedback on antibiotic use or consultation networks with larger training hospitals, could serve as feasible alternatives. These findings highlight the need for national-level policies that move beyond guideline development and actively support implementation through infrastructure investment, workforce expansion, and financial incentives.

These results indicate that effective AS in Korean hospitals depends as much on organizational and cultural factors as on clinical expertise. Guideline development alone is unlikely to be sufficient; investment in workforce capacity and interprofessional coordination is also needed for stewardship programs to have a lasting effect. Future research should focus on evaluating AS models that are adaptable to different hospital contexts,

particularly in low-resource settings, and on developing mechanisms to monitor not only antimicrobial use but also the organizational conditions that support AS success.

Our findings are consistent with prior qualitative research suggesting that AS programs are more effective as advisory services rather than when implemented solely as resource-constrained programs [34]. Similar barriers, such as issues of clinical ownership, conflicts with traditional hierarchies, and interprofessional challenges, have been described elsewhere [30]. In particular, previous studies have identified patient expectations and diagnostic uncertainty as major drivers of inappropriate antibiotic prescribing, which aligns closely with the patterns observed in this study [15].

This study is notable for highlighting physicians' emphasis on staff education. Beyond documenting which stewardship activities are in place, it describes the behavioral and organizational factors that shape how these programs actually work in Korean hospitals.

Limitations

This study has several limitations. First, it was conducted in 2018, prior to the behavioral and systemic changes brought about by the COVID-19 pandemic, and also before the 2nd Phase of Korea's National Action Plan on AMR (2021–2025) and the 2024 National AS pilot project were in place. The findings should therefore be interpreted as a pre-reform baseline against which the impact of these more recent initiatives can subsequently be evaluated. Second, all focus-group participants were recruited from tertiary hospitals with more than 1,000 beds. Although the subsequent survey included secondary and smaller hospitals, the barrier framework derived from the focus groups may have emphasized issues salient to larger institutions and underrepresented concerns specific to small or community hospitals. Third, the study participants were voluntary respondents, which may have introduced selection bias.

Future research

Future research should evaluate AS models that are adaptable to different hospital contexts, particularly in small and community hospitals where ID specialist coverage is limited. Focus groups conducted within small and mid-sized hospitals would be a valuable complement to the current work and would help identify barriers that are under-represented when the initial framework is drawn only from tertiary centers. Longitudinal mixed-methods studies are also needed to re-assess barriers to AS implementation in Korea following the COVID-19 pandemic and the roll-out of the 2024 National AS pilot project, and to quantify the behavioral and clinical outcomes of tailored feedback, hierarchy-sensitive

education, and centralized consultation networks for smaller hospitals.

Conclusions

AS programs in Korean hospitals remain unevenly implemented, with antimicrobial restriction dominating and core elements such as prospective audit and feedback, routine monitoring, and education underdeveloped. Non-clinical pressures, professional hierarchies, limited ID specialist capacity, and the absence of financial incentives emerged as the principal barriers. Successful AS implementation will require structural support, cultural change, and targeted investment in workforce capacity and interprofessional coordination. These findings provide a pre-reform reference point against which the impact of Korea's 2nd Phase National Action Plan and the 2024 AS pilot project can be evaluated.

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Author contributions

DK conceptualized the study. GL curated the data. KL, DK wrote the original draft of the manuscript, while BK and DK were involved in the review & editing of the manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

This study was approved by the Institutional Review Board of the Health Insurance Review & Assessment Service (HIRA). Given the retrospective nature of the study and the anonymity of the data, the Institutional Review Board waived the requirement for written informed consent from all participants (approval number: 9-2023-0145).

Competing interests

The authors declare no competing interests.

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