

# Pharmacist roles in antimicrobial stewardship: a qualitative study from India, South Africa and the United Kingdom

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**Objective:** To explore pharmacist roles in antimicrobial stewardship (AMS) in India, South Africa (SA), United Kingdom (UK) and the factors that contribute to their participation in the programme in these countries.

**Methods:** Data were collected between April 2019 and March 2022 through semi-structured interviews with key AMS stakeholders from India (Kerala); SA (Western Cape province) and the UK (England). Interviews were conducted face to face or via Zoom and Skype platforms, audio recordings were transcribed verbatim and thematically analysed using a grounded theory approach aided by NVivo 12 software.

**Results:** We interviewed 38 key AMS stakeholders (pharmacists and doctors). India and the UK have dedicated AMS pharmacists (Doctor of Pharmacy and Master of Pharmacy graduates with opportunities for additional post-graduate qualifications respectively). Pharmacists in the UK lead AMS programmes, while in India, predominantly in the private sector, pharmacists drive AMS in collaboration with clinicians. In SA, pharmacists (Bachelor of Pharmacy graduates) participate in AMS out of their own commitment in addition to their pharmacy responsibilities. Private sector pharmacists drive AMS while public sector pharmacists participate in clinician-led AMS programmes. Current pharmacy curricula do not provide adequate training in AMS, and this limitation shapes pharmacist roles and acceptance in AMS among clinicians in India and SA. Support of mentors (doctors/senior pharmacists) and self-motivated learning are key factors for effective pharmacist involvement in AMS.

**Conclusions:** A contextually developed, standardized and accessible AMS training programme along with pharmacy curricula modification to include AMS, may facilitate prominent pharmacist roles in AMS.

## Introduction

Antimicrobial stewardship (AMS) has been recommended as an effective strategy to improve the current use of antimicrobials and preserve their benefits for future generations. Evidence supports the delivery of AMS services by a multidisciplinary team.<sup>1–3</sup> Among the various stakeholders, infectious diseases (ID) physicians and clinical pharmacists with ID training have been recommended as key professionals of AMS teams.<sup>1</sup> Guidelines and recommendations from across the globe emphasize the pivotal role played by pharmacists in AMS programmes.<sup>1,3,4</sup> Some of the key responsibilities of pharmacists in AMS include optimizing and monitoring antibiotic prescribing, infection prevention,

education, training and public engagement.<sup>5</sup> In practice, these diverse roles for pharmacists in AMS are not recognized or implemented in different countries.

Since the early 2000s, studies published from various high-income countries have reported the involvement of pharmacists in AMS.<sup>6–8</sup> In many of these countries, pharmacists roles have expanded over the years to provide multifaceted services resulting in improved patient outcomes and reduced healthcare costs.<sup>9</sup> The evidence of pharmacists' involvement in AMS from lower-middle-income and low-income countries is gradually emerging and has been shown to positively affect patient care.<sup>10–12</sup> Despite these positive outcomes, the lack of defined roles for pharmacists and nurses in AMS has been noted as a

key implementation challenge by global participants in a massive open online course on social science approaches to antimicrobial resistance (AMR).<sup>13</sup> In a study from Singapore, key self-reported barriers for AMS participation by hospital pharmacists included limited knowledge, lack of empowerment, ineffective communication with physicians and resource constraints.<sup>14</sup>

The aim of this study was to explore pharmacist roles in AMS in India, South Africa (SA) and the United Kingdom (UK), and to better understand the factors that contribute to their participation in AMS programmes. These countries were selected because: (i) they represent different income settings, i.e. lower-middle, upper-middle and high incomes, respectively; (ii) AMS implementation is at a different stage of its evolution in each of these countries; and (iii) existing AMS research collaboration across participating sites. In 2012, the Indian Council for Medical Research initiated the Antibiotic Stewardship, Prevention of Infection & Control (ASPIC) programme with the intention of initiating and improving AMS in the country.<sup>15</sup> While the lack of clinical pharmacists was identified as a challenge to implement AMS in India previously,<sup>16</sup> evidence of clinical pharmacists' driven AMS is emerging.<sup>10</sup> In SA, AMS implementation with pharmacists' involvement has been reported across the public<sup>17</sup> and private sectors.<sup>18</sup> AMS started to evolve in the UK in the early 2000s and in 2003, the Department of Health announced a hospital pharmacy initiative aimed at improving the monitoring and control of anti-infectives.<sup>19</sup>

## Methods

### Ethical approval and consent

This study was conducted as part of V.N.'s (first author on this study) PhD study for which ethical approval was obtained from the Institutional Review Board of Amrita Institute of Medical Sciences, Kochi, Kerala, India (IRB-AIMS-2019-011). Written informed consent was obtained from participants before each interview.

### Participant recruitment

Participants were recruited from Kerala, India; Western Cape Province of SA and England, UK. The sectors in each country were selected to reflect where current AMS activities occur the most in each country. Pharmacists and physicians with a key role in AMS were invited to participate in the study. These professional groups were invited for their perspectives on the extent of pharmacist involvement in AMS. We only included participants working in existing AMS programmes where pharmacists were known to be involved in AMS to gather insights into the extent of their involvement and any reported or potential challenges.

In India, only stakeholders from private hospitals in Kerala were recruited as at the time of the study, pharmacists in the public hospitals were not involved in AMS. Data were collected from public and private hospitals in Western Cape, SA as involvement of pharmacists in AMS have been reported across these sectors. Since healthcare provision is predominantly through the National Health Service (NHS) in England, UK,<sup>20</sup> only healthcare workers involved in AMS in the NHS were included.

### Study design and data collection

Between April 2019 and March 2022, data were collected using semi-structured interviews with pharmacists and doctors. An interview guide was developed that covered areas including current state of AMS in their setting, pharmacists' roles and responsibilities in AMS, the facilitators and barriers for their participation in AMS and potential scope for improving pharmacists' participation in AMS programmes. Some questions in

the interview guide were tailored depending on the context and the professional being interviewed (sample interview guide is available as [Supplementary data](#) at JAC-AMR Online). All the interviews were intended to be conducted face to face, however, due to travel restrictions imposed by the COVID-19 pandemic, some interviews could only be conducted on-line via Zoom/Skype platforms. The authors do not anticipate any potential impact due to this variability in data collection. Interviews were conducted by V.N. who was trained in conducting semi-structured interviews. Co-author O.M. joined V.N. in conducting the face-to-face and on-line interviews in SA.

Participation in the study was voluntary. Participants were selected using purposive sampling and the interviews were scheduled at a date and time convenient for the participants. All the interviews were audio-recorded and transcribed verbatim. The average interview duration was 30–40 minutes.

### Data analysis

Anonymized interview transcripts were thematically analysed using grounded theory approach aided by NVivo12 software. Analysis of the transcripts was led by V.N. An initial coding framework was created by the first author after analysing the first five transcripts. This was then modified with input from co-authors. An inductive approach was used to analyse the transcripts. Data collection was iterative and recursive until thematic saturation was reached.

## Results

A total of 38 interviews were conducted (Figure 1). Analysis of data across the study sites showed that pharmacist participation in AMS varied across the three countries due to different factors such as opportunities for education and training in AMS, need for support from hospital leadership to facilitate pharmacists' participation in AMS, time and human resource limitations. These are discussed under the themes that follow. Relevant quotes of participants from the interviews are given in Table S1, available as [Supplementary material](#).

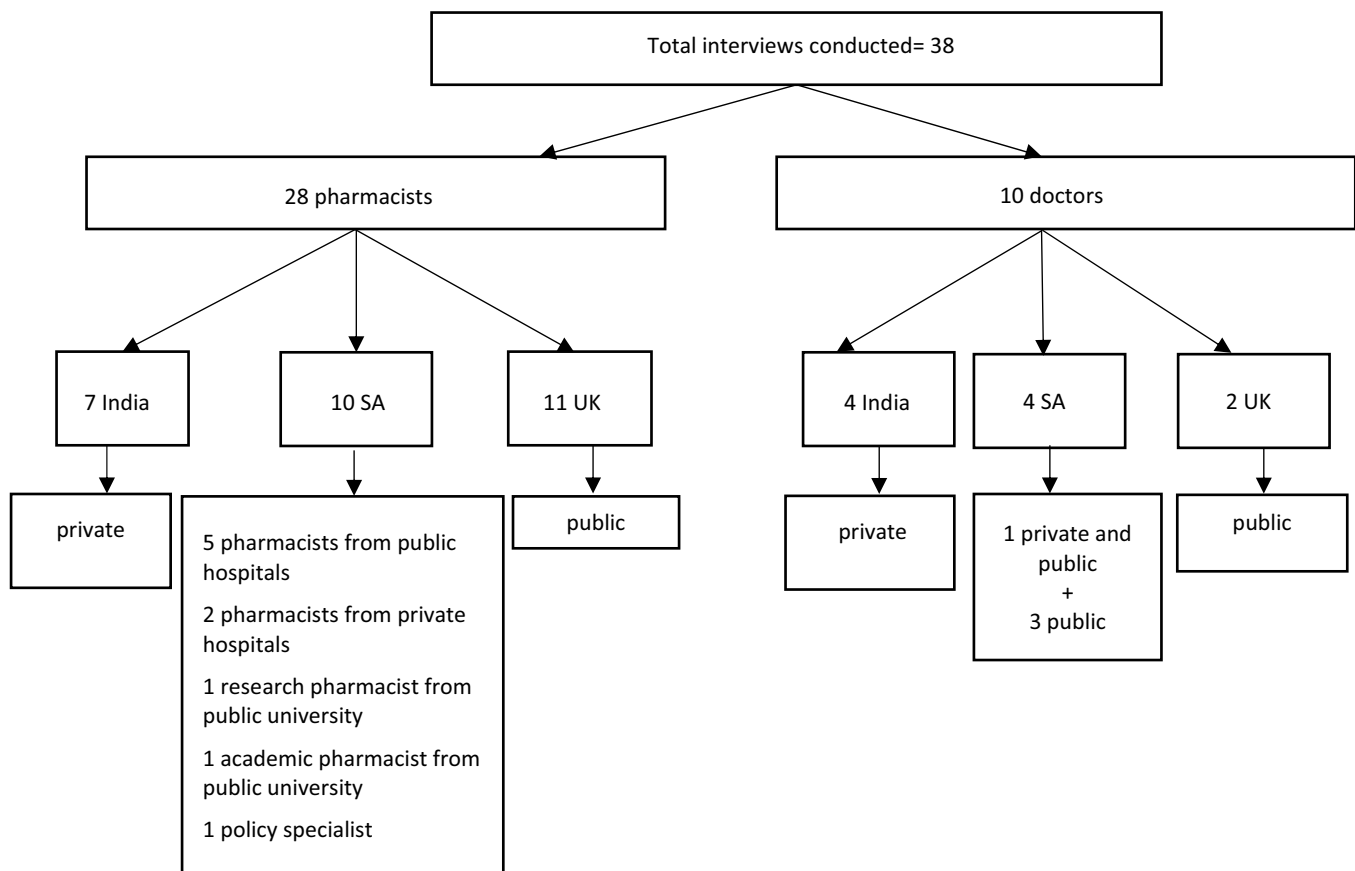
### Variation in roles and responsibilities of pharmacists in AMS in the three countries

Table 1 summarizes the key responsibilities delivered by pharmacists in AMS in the three countries as described by the study participants. Pharmacists were found to have similar responsibilities in terms of reviewing antimicrobial prescriptions, providing education and training and answering drug related queries in these countries, however, the extent to which they deliver these responsibilities varied.

In India, the pharmacist participants had institutionally recognized dedicated role in AMS enabling them to expand their scope of practice. Doctors who participated in the study suggested that pharmacists are the key drivers of AMS and they are responsible for ensuring the smooth running of the programme.

'Pharmacist is the backbone. If you ask me who is the most important person in a stewardship programme, it is the clinical pharmacist and this should be a full-time person, not a part time because everybody else is part time...' —Doctor, India

In SA, pharmacists participate in AMS out of their own passion, in addition to their responsibilities within the pharmacy. In the



**Figure 1.** Interview participants' details.

public hospitals, pharmacists participate in clinician-led AMS where some of them felt their role to be secondary in the presence of an ID physician.

'It is [pharmacist tending to take a secondary role in the presence of ID physician] a challenge. And that is why I think it is important that when the AMS team is developed in a health facility, I think a key start point is that they define their [each team member] role and responsibility within that AMS team.'—Pharmacist, SA

Pharmacists suggested that this probably could be due to their lack of training and knowledge (Q1, Table S1) and if they were clinical pharmacists, they may not have this challenge (Q2, Table S1). Doctors believed that pharmacists do not have the sufficient training to lead AMS (Q3, Table S1) and that they play relatively a passive role when it comes to AMS (Q4, Table S1).

Interview participants from the private sector in SA reported that in their setting, while the emphasis is on multidisciplinary AMS approach, pharmacists are the key drivers of the AMS programmes with some of these institutions assigning dedicated pharmacists for AMS.

'Yes [pharmacists are supposed to take part in AMS] in all hospitals but it varies from hospital to hospital and some of the hospitals got dedicated pharmacists just for stewardship, all day every day, but other does not...

It is a multidisciplinary approach, but the pharmacist, we do most of the work.'—Pharmacist, SA

Pharmacists can make interventions on antimicrobial prescriptions that are received in the pharmacy as well as during bedside review of prescriptions (Q5, Table S1). Recommendations to improve antimicrobial prescriptions are communicated either via text or phone call to the clinician (Q6, Table S1). There is also provision for uploading AMS recommendations to an electronic data base (Q7, Table S1). These data are presented to clinical teams at quarterly AMS meetings. The pharmacists considered themselves to be able to contribute to infection prevention and control (IPC) activities in hospitals by promoting contact precaution practices and source control wherever and whenever necessary (Q8, Table S1).

In the UK, the pharmacist's role in AMS has evolved over the years.

'...I think that the focus on stewardship specifically and pharmacist led stewardship has evolved over the last 9 to 10 years and there has been a huge drive to promote that in the UK...'—Doctor, UK

Pharmacists' roles in AMS were found to be more established in the UK, relative to the other two countries (Table 1), with some hospitals having pharmacist-led AMS programmes (Q9, Table S1), and others either having dedicated pharmacist teams or ward

**Table 1.** Key responsibilities delivered by pharmacists in AMS in the different countries included in this study

Key responsibilities handled by pharmacist	India	SA		UK
		Public	Private	
Review of antimicrobials	x	x	x	x
Communication of recommendations to clinicians	x	x	x	x
Making changes to prescriptions directly				x
Responsibilities within pharmacy		x	x	x
Ward based clinical pharmacy responsibilities				x
Outpatient AMS				x
Policy level work		x		x
Training of pharmacy interns and other healthcare professionals	x	x	x	x
In hospital quality improvement projects	x			x
Research projects in collaboration with other universities	x	x		x
Answering drug related queries	x	x	x	x
Development of antimicrobial guidelines	x	x		x
Diagnostic stewardship	x			
Therapeutic drug monitoring	x			x
Members of hospital level committees such as pharmacy and therapeutic committee, antimicrobial committee etc.		x	x	x
Academic role		x		

pharmacists involved in AMS (Q10, Table S1). Consultant pharmacists can intervene on their own while junior pharmacists are supported by senior pharmacists when providing recommendations to clinical teams (Q11, Table S1).

### Variation in education and training of pharmacists in AMS in the three countries

The educational qualification of the pharmacists in AMS varied in the three countries. In India, the pharmacists who participated in the study were Doctor of Pharmacy (Pharm D) graduates and only one pharmacist was undertaking an additional certification course in AMS and ID provided by an Indian institution and a certification by the Society of Infectious Diseases Pharmacists. In SA, all pharmacists who participated were Bachelor of Pharmacy (BPharm) graduates. Three pharmacists had additional qualifications such as PhD, Master of Public Health degree, Master of Pharmacy (MPharm) and Pharm D. The pharmacists with additional qualifications had greater research or policy level roles. In the UK, all pharmacist participants had a MPharm degree with most of them having additional qualifications such as a post-graduate diploma in clinical pharmacy, independent prescribing and PhDs. These additional qualifications, however, were not mandatory for them to take up roles in AMS.

Pharmacists from the three countries agreed that they did not receive sufficient AMS training as part of their pharmacy curricula (Q12, Q13, Q14, Table S1). The limited training provided was

theoretical, which the pharmacists found difficult to apply in clinical practice. Most of the AMS training was through self-motivated learning and hands-on training provided by other members in the AMS team (Q15, Q16, Q17 Table S1). In SA, pharmacists working in the private Netcare group of hospitals received training through an AMS module (Q18, Table S1). Mentorship was recognized as having a key role. Mentors were identified as senior pharmacists or doctors in the AMS team (Q19, Q20, Q21 Table S1). While training programmes for pharmacists are being implemented in SA, the participants did not consider them easily accessible (Q22, Table S1). The lack of formal training in ID was identified as a key challenge to optimal participation of pharmacists in AMS especially in India and SA.

‘...Challenge that I faced was the lack of education like primary education regarding stewardship. So I think when I joined like if I had a formal ID training I would have performed a lot better’—Pharmacist, India

‘...There is not enough advanced training for the pharmacist, so on the rounds they may not feel empowered enough’—Pharmacist, SA

Pharmacists from SA suggested that the BPharm graduate degree did not provide adequate clinical exposure to develop AMS skills.

‘...they are not clinical pharmacists, but they have tried to upscale themselves to be able to offer advice at the bedside or even to learn at the bedside of the patient... other [healthcare] professionals have to do a specific number of hours of work [in a clinical setting]. Pharmacists did not have that in the past...’—Pharmacist, SA

Pharmacists from India, who reported that the pharmacy curriculum does not train them to participate in AMS, suggested that this was a major barrier when interacting with clinicians in the hospital as they felt they did not have a complete understanding of the patient’s case. The discussions with AMS clinicians helped them to overcome this challenge (Q23, Table S1). Clinicians resisted accepting interventions provided by pharmacists who were junior to them in rank, which improved when doctors in the team started communicating their recommendations to the clinical teams.

‘...the doctors were not appreciating the fact that clinical pharmacist who were their students before are now correcting them... So I think that fact improved when the doctors in stewardship also started communicating with them...’—Pharmacist, India

### The need for support from hospital leadership to facilitate pharmacists’ participation in AMS

In India and SA, where the pharmacist’s role in AMS is still evolving, the major facilitator was the support provided by hospital leadership and doctors in the team wherein the acceptance of the pharmacist’s recommendation by senior doctors generally translated to acceptance by other members of the team.

‘There were doctors here that have good experience with clinical pharmacist abroad. So they knew how much a clinical pharmacist can do in the hospital. Even the administration was fully supportive of the clinical pharmacist...’—Pharmacist, India



‘But now with senior consultants giving a voice to the pharmacist, then other doctors tend to realize actually this is someone whose value, opinion I should, input I should listen to’—Pharmacist, SA

In the UK, the pharmacist’s role in AMS has evolved over the years through collaborative work, improving skills and showing the value of pharmacists’ contributions to patient care (Q24, Table S1).

### **Inadequate investment in pharmacists to optimally contribute to AMS programmes**

In Kerala, human resource constraints posed a challenge to pharmacists’ expansion of the scope of the AMS programme (Q25, Table S1). Pharmacists noted they were generally not given a sufficient salary on par with their responsibilities in AMS, leading to a high turnover of staff (Q26, Table S1).

Similar challenges were cited by pharmacists who participated from SA. Often pharmacists participated in AMS in addition to their commitments within the pharmacy, hence making dedicated time to see patients at the bedside and participate in AMS activities challenging.

‘Time is a constraint because obviously here you have X amount of time to do the wards...We’re not able to always carry it out, because we do not have time... AMS is one part of our job. I feel that people often thinks that it should be our entire job...’—Pharmacist, SA

There was also a shortage of personnel when consideration is given to the fact that pharmacists must be within the pharmacy (to attend to patients) as well as go to the wards to provide clinical services (Q27, Table S1).

In the UK, hierarchy and the physician-focused approach of the healthcare system in the country were cited as key challenges by participants.

‘Traditionally, the healthcare system in the NHS is very hierarchical, it is very sort of physician focused, and I think as we try and develop those more involved roles for clinical nurse practitioners or consultant pharmacists, this inevitably takes time for people to get used to that and understand the kind of the new team dynamic...’—Pharmacist, UK

While pharmacists’ recommendations are mostly accepted in the UK, there are still challenges from some departments such as surgery where hierarchies may influence the extent of pharmacist engagement in AMS (Q28, Table S1). Participants highlighted the importance of effective communication, tailored to suit the recipient by adapting AMS language to be more relevant to patient outcomes (Q29, Table S1). Time was highlighted as a challenge especially for pharmacists in the UK who have pharmacy responsibilities in addition to AMS as they are seen as a pharmacist first and only then as an AMS pharmacist (Q30, Table S1).

## **Discussion**

This study explored pharmacist roles in AMS in India, SA and the UK and the factors that contribute to their AMS participation in these countries. Pharmacists in the UK lead AMS programmes, while in India, predominantly in the private sector, pharmacists drive AMS

in collaboration with clinicians. In SA, private sector pharmacists drive AMS while public sector pharmacists participate in clinician-led AMS programmes. One of the key challenges to pharmacists’ participation in AMS was insufficient AMS training, which has shaped their roles in AMS, and their acceptance in the programme by clinicians especially in India and SA. Comprehensive training on AMR and the rational use of antibiotics has been reported as key initiatives in enabling pharmacists to take on lead roles in changing antibiotic prescribing behaviours.<sup>9</sup> The UK Clinical Pharmacy Association Infection Committee network has developed a professional curriculum to train antimicrobial specialist pharmacists in the country. This curriculum has also been endorsed by Royal Pharmaceutical Society, Public Health England (renamed in 2022 to UK Health Security Agency), British Society for Antimicrobial Chemotherapy, and the Scottish Antimicrobial Prescribing group.<sup>21</sup> Opportunities for pharmacists to be trained in AMS is gradually being implemented in SA and India. A collaborative ‘Train the Trainer’ antibiotic stewardship mentoring programme was established between a US hospital and SA hospitals in 2013 where selected pharmacists were given training with the goal of developing SA pharmacists capable of implementing sustainable antibiotic stewardship interventions to improve patient care.<sup>22</sup> This programme has, however, ceased to exist. Similarly, the Christian Medical College in India has established a 1-year ‘Fellowship in Antimicrobial Stewardship for Pharmacists’. However, due to limited availability, not many pharmacists would be able to enrol in this programme. Other barriers to pharmacists’ participation in the programme, as described by the study participants, include time constraints, deficiency of trained AMS pharmacists and lack of support from doctors. Similar barriers to AMS implementation have also been noted by pharmacists in Malaysia and Nigeria.<sup>23,24</sup>

Pharmacists who participated in the study also highlighted that the acceptance of pharmacists by senior doctors in the team and hospital leadership has been a major facilitator in enhancing the role played by pharmacists in AMS. Hospital pharmacists in Malaysia and the USA highlighted the support of hospital administration and leadership commitment as key facilitators of their roles and participation in AMS programmes.<sup>23,25</sup> Participants further emphasized the importance of effective communication of interventions as a key factor for AMS acceptance among clinical teams. Mortan *et al.* compared the acceptance of AMS recommendations by the method of communication used and found that verbal communication with prescribers was more effective than notes entered in patient’s electronic medical records in the implementation of AMS interventions.<sup>26</sup>

On the basis of the empirical findings of this study and the experience of the co-authors, who have led and contributed to national and international AMS activities, we have summarized recommendations for constructive and sustainable approaches towards optimized AMS contribution from the pharmacist workforce in hospital settings in Table 2. These recommendations would especially be beneficial for settings where pharmacists’ roles in AMS continue to evolve.

## **Reflexivity statement**

The first author who led the data collection and analysis is a female clinical pharmacist with experience in AMS from India. Before the interviews, she disclosed her professional background to the

**Table 2.** Recommendations for constructive and sustainable approaches towards optimized AMS contribution from the pharmacist workforce in hospitals

Institutional and professional level	Recommendations to support optimized AMS contribution from the pharmacist workforce in hospitals
Pharmacy colleges	<ul style="list-style-type: none"> <li>• Include practical training on AMR and AMS in the pharmacy curricula</li> <li>• Provide orientation to students on pharmacists' roles in AMS initiatives before being posted to hospitals for their internship/clinical postings</li> </ul>
Pharmacists	<ul style="list-style-type: none"> <li>• Clinical postings during internship in ID department and AMS programme</li> <li>• Work to have an understanding of their role in AMS and how they can contribute</li> <li>• Build collaborations with microbiologists/ID physicians and identify opportunities to contribute to the AMS programmes</li> <li>• Try to remain up to date in the field of ID, IPC and AMS by conducting journal clubs and identifying opportunities to attend seminars, webinars, online learnings and conferences</li> <li>• Apply for funding opportunities that support career development and improve AMS programme knowledge, skills and role</li> <li>• Try and network with AMS pharmacists working in other hospitals for bi-directional learning regarding clinical patient management</li> <li>• Promote evidence-based interventions and contribute to the published evidence from own practices</li> <li>• Maintain good rapport with clinical teams in the hospital. Present AMS data to clinical teams at a regular frequency and actively engage with clinical leads in different specialties</li> </ul>
Hospital administration	<ul style="list-style-type: none"> <li>• Actively and strategically support the pharmacists' contribution to the institutional AMS programme</li> <li>• Recognize the need and build dedicated time for AMS activities into job descriptions</li> <li>• Share published evidences of success stories regarding pharmacist's role in AMS and its outcomes from across the globe. Emphasize that pharmacists are not employed to question prescriber autonomy but with the goal of improving patient care</li> <li>• Sustainably invest in clinical pharmacy workforce. Ensure that pharmacists are provided sufficient pay with respect to their contribution and experience</li> <li>• Provide financial incentives and time for pharmacists to attend conferences/seminars that will help improve their knowledge and thereby enable them to better contribute to the programme</li> </ul>
Doctors in AMS teams	<ul style="list-style-type: none"> <li>• If pharmacists in the programme have not received any prior training on AMS, support them by providing formal or informal training. Create space for pharmacy team in existing AMS and IPC training opportunities</li> <li>• Facilitate pharmacists in data collection for AMS indicators e.g. audits, consumption data and encourage pharmacy input into prescribing decision making</li> <li>• Create opportunities for pharmacists to join clinical rounds that would give them better understanding of bedside patient management</li> </ul>

participants. Since most of the interview participants were pharmacists and others were doctors who worked closely with pharmacists, it is unlikely that her professional background would have posed a barrier to data collection. To reduce bias in the content of the interview questions, the interview guide was piloted and modified by co-authors. The participants in UK and SA were deliberately identified through the network of the co-authors to include potential healthcare workers with knowledge and experience of AMS in the country. In SA, co-author O.M. participated in the interviews, and this may have been a factor in participants' lack of inhibition in discussing their roles and challenges they faced.

## Limitations

Observing the clinical pharmacy activities in many of the study sites were not possible due to COVID-19 pandemic restrictions. Hence, data could only be gathered via virtual, web-hosted interviews. The participants in the study are those practising in institutions with well-established AMS programmes. Therefore, their

experiences may not be representative of pharmacists' roles in AMS in their respective countries. Nevertheless, the study provides a snapshot of pharmacists' roles in AMS in the participating countries.

## Conclusion

The role of clinical pharmacy in AMS remains ill-defined in many countries. A contextually developed, standardized and accessible AMS training programme along with pharmacy curricula modification to include AMS, may facilitate prominent pharmacist roles in AMS. This would be particularly beneficial in countries where the shortage of ID physicians is a major impediment to AMS.

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## Transparency declarations

E.C. has received honoraria for unrestricted educational lectures on antimicrobial stewardship and patient and public engagement from Pfizer. All other authors: No reported conflicts

## Author contributions

Conceptualization—V.N., E.C.; Methodology—V.N., E.C.; Investigation—V.N., O.M.; Formal analysis—V.N.; Writing—original draft—V.N.; Writing—Review and Editing—V.N., O.M., M.M., S.S., E.C.

## Supplementary data

Table S1 is available as [Supplementary data](#) at JAC-AMR Online. Sample interview guide is available as supplementary data.

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