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Antimicrobial stewardship programme implementation in the UAE: perspectives of key stakeholders using Consolidated Framework for Implementation Research

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SUMMARY

Background: Many studies report antimicrobial stewardship programme (ASP) implementation, but these are limited by a lack of theoretical underpinning. This may lead to missing key factors that are likely to influence the successful or unsuccessful implementation.

Aim: To explore key stakeholders' perspectives of ASP implementation in UAE hospitals, with a focus on facilitators and barriers.

Methods: The study employed a qualitative approach using semi-structured interviews conducted with ASP stakeholders involved in clinical use of antimicrobials at the individual patient level and including ASP team members and non-members. An interview schedule based on published literature and grounded in the Consolidated Framework for Implementation Research (CFIR) was developed, reviewed, and piloted. Recruitment was via purposive and snowball sampling. Interviews were recorded, transcribed, and thematically analysed by two independent researchers using CFIR as a coding framework.

Findings: Data saturation was achieved at 31 interviews. Multiple CFIR constructs were identified as implementation facilitators or barriers. Facilitators included external policy requirements (both national and international), leadership support, stakeholders' engagement, collaborative culture, effective communication, and forward planning. Barriers included blame culture, complexity of ASP implementation, and a shortage of expert personnel.

Conclusion: Numerous facilitators and barriers to ASP implementation from a stakeholders' perspective were identified in this research. The value of early leadership engagement to support provision of required resources, a need for effective planning and establishment of multiple engagement techniques, and valuable communication with healthcare providers are the main recommendations emerging to support improvement in clinical practice.

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Introduction

An antimicrobial stewardship programme (ASP) is a bundle of actions aimed at optimizing antimicrobial prescribing, with multiple checklists and core elements identified to inform practice [1,2]. Despite the vast number of ASP effectiveness studies, there is an acknowledged gap in implementation research studies to transition from theoretically informed ASP practices to impactful ASP implementation [3,4]. Several factors are key challenges to ASP implementation, at both organizational and personal levels affecting an array of processes, groups, and individuals [5]. Implementation research has been prioritized by leading experts of the Joint Programming Initiative on Antimicrobial Resistance (JPIAR), to provide in-depth, comprehensive understanding of facilitators and barriers to ASP implementation [3].

Implementation research is defined as 'the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices (EBP) into routine practice, and hence, to improve the quality and effectiveness of health services' [6]. It has been increasingly adopted in healthcare systems to examine translation of research-based knowledge into practice, explore best implementation strategies, and to identify contextual factors impacting decisions to initiate or scale-up healthcare interventions [7]. A recently released statement by the Society for Healthcare Epidemiology of America (SHEA) highlighted the value of theoretically informed implementation research in leveraging ASP implementation, addressing multiple inter-related factors, thus leading to better understanding of ASP implementation processes [5].

Despite the multitude of studies exploring facilitators and barriers to ASP implementation in hospital settings, few had any theoretical underpinning [8—16]. The Theoretical Domains Framework (TDF) and the Capability, Opportunity, Motivation, Behaviour (COM-B) model have been reported, both of which are theoretical frameworks targeting identification of contextual factors impacting behavioural change [15—18].

Consolidated Framework for Implementation Research (CFIR) is a widely used framework in health sciences implementation research, that can be used flexibly in pre-, during, and post-implementation phases [19]. It is a 'meta-view, overarching typology' derived from 19 peer-reviewed theories of implementation and formed of 39 constructs organized in five domains of intervention characteristics, outer setting, inner setting, individual characteristics, and process. The use of CFIR supports identification and understanding of constructs that can be applied for specific contexts to guide exploration of facilitators and barriers to implementation process [20].

Barlam *et al*. employed CFIR to explore the perceptions of ASP personnel regarding team dynamics and organizational factors [21]. However, the focus was only on specific CFIR domains related to implementation culture, climate (Inner setting, CFIR domain III), characteristics of individuals (CFIR domain IV) and intervention (CFIR domain I). This same framework was also used by Hashad *et al*. to explore the impact of COVID-19 on ASP implementation. Multiple constructs beyond those used by Barlam *et al*. were identified as facilitators or barriers to ASP implementation, reflecting the need to take into account all CFIR domains when considering factors affecting ASP implementation [22].

To date, most of the studies exploring facilitators and barriers to hospital ASP implementation have been conducted in western countries [8,9,11,15,16,21], with fewer studies related to non-western communities [8,12—14], limiting the generalizability and transferability of results due to different healthcare systems.

The Gulf Cooperation Council (GCC) is a political and economic union of six states: Saudi Arabia, Qatar, Oman, Bahrain, Kuwait, and UAE [23]. The main differences between GCC and western healthcare systems are the diversity of workforce background and reports of lack of enforcement of hospital clinical guidelines [24,25]. A systematic review exploring hospital ASP implementation in GCC states mapped to international standards identified a small number of studies, reporting facilitators and barriers to ASP implementation at different levels (national, hospital organization, culture and environment) [26]. Of note, none of the studies included in the review were underpinned by implementation theory.

The aim of this research was to use CFIR to explore key stakeholders' perspectives regarding ASP implementation in UAE hospitals with a focus on facilitators and barriers.

Methods

Research design

A qualitative approach using online semi-structured interviews was adopted. This research was underpinned by the CFIR which was employed at all stages of research (planning, data generation, analysis, and reporting).

Setting

Data generation was conducted in five of the seven Emirates (Abu Dhabi, Dubai, Sharjah, Fujairah, and Ras Al Khaimah). Governmental and private hospitals of different sizes, funding sources, and governing health authorities were approached to ensure maximum variation sampling [27].

Participant inclusion and exclusion criteria

Two groups of stakeholders were included to provide all key perspectives in ASP implementation: (1) ASP team members who were both actively involved in ASP implementation and in managing antimicrobial therapy at patient level; (2) non-ASP team members who managed antimicrobial therapy at the individual patient level (i.e. medical practitioners, pharmacists, nurses, clinical microbiologists, infection control practitioners, and quality control professionals).

Sampling strategy and recruitment

ASP team members were identified via professional hospital networks of N.H. and N.A. Purposive sampling was used to identify participants from a range of specialties and years of experience in hospitals regulated by different health authorities. Snowball sampling was also used, with those interviewed asked to suggest others meeting the inclusion criteria. Sampling continued until the point of data saturation, defined as no new emerging themes extracted from interviews within the

adopted initial analytical framework based on CFIR domains and constructs [28,29].

Potential participants were approached via email by N.H., including an information leaflet and consent form and asked to contact N.H. if interested in participating. Interviews were conducted via Zoom®, Microsoft Teams® or Blackboard Collaborate®, with signed informed consent obtained prior to commencing the interview. Participants' confidentiality was maintained through anonymizing transcripts prior to data analysis.

Interview schedule development

Development of the interview guide followed an iterative approach informed by a systematic review exploring hospital ASP implementation in GCC states and CFIR (Supplementary Material I and II) [26,29].

To promote credibility, the interview guide was reviewed by two experts in ASP implementation and two academics with experience in the application of theory to qualitative research. Following piloting with two ASP members and two non-members, minor changes were made to the interview guide; hence the pilot interviews were included in the final dataset.

Data generation

Data generation ran from June to December 2020. The interviews were conducted in English by N.H., recorded (about 45—60 min) and transcribed verbatim. Accuracy of transcripts was verified and any identifiable data removed prior to analysis. Participants were offered the opportunity to review their transcripts to enhance credibility and dependability.

Data analysis

NVivo® software was used to facilitate data management [30]. Data were analysed thematically using the Framework Approach of transcribing, data familiarization, developing a working analytical framework, coding, charting data in framework matrix, and interpreting data [28]. The initial coding framework was deductively based on CFIR domains and constructs. Following completion of the initial coding, further analysis was conducted through iterative discussions between researchers to inductively identify emerging themes under each construct. Themes and CFIR constructs were labelled as potential facilitators or barriers for ASP implementation. Interviews were analysed independently by N.H. and one other (A.T., D.S., or D.P.). Any discrepancies were discussed and resolved. Iterative discussion also supported practising reflexivity to ensure that data analysis reflected participants' views [31].

Ethics

Ethical approval was obtained from Robert Gordon University Research Ethics Committee (reference S186), Ministry of Health and Prevention (MOHAP) Research Ethics Committee (reference MOHAP/DXB-REC/JAANo.32/2019) and Abu Dhabi health services company (SEHA) — Research Ethics Committee (reference SEHA — 003).

Results

Recruitment

Seventeen hospitals (11 governmental and six private) were approached; six did not respond and 11 granted ethical approval (eight governmental and three private). These were from Abu Dhabi ($N = 4$), Dubai ($N = 3$), Sharjah ($N = 2$), Fujairah ($N = 1$), and Ras Al Khaimah ($N = 1$). Hospitals were of variable bed capacities and governed by different local health authorities: Department of Health, Abu Dhabi ($N = 4$), Dubai Health Authority, Dubai ($N = 3$), and Ministry of Health and Prevention, Northern Emirates ($N = 4$).

Initial purposive sampling identified 11 ASP team members who agreed to participate and they nominated 29 potential participants (ASP members and non-members) through snowball sampling, of whom 21 agreed to participate, giving a total sample size of 32. Thirty-one interviews were used for analysis (one recording failure), where data saturation was achieved at interview 28 and a further three were conducted to confirm saturation. Participants' demographics along with participants' anonymous identity codes are given in Table I. A summary of the sampling strategy is given in Supplementary Material III.

Themes

The following section presents identified themes mapped to the most dominant CFIR domains and constructs that emerged.

CFIR domain I, complexity construct

Multiple participants perceived ASP complexity as a barrier to implementation, where complexity escalated with expansion due to involvement of multiple personnel and several areas. 'You say start simple but [ASP] gradually becomes complex because the more and more areas you involve to bring under your stewardship programme, the more difficult it becomes and the more challenging it becomes, because of the data gathering and number of people involved.' (P7).

CFIR domain II, external policy construct

Participants emphasized the publication of requirements by UAE health authorities and international accreditation bodies as facilitators for ASP implementation. 'We started in the summer of 2017. That was after the Department of Health in Abu Dhabi issued … a circular requiring that all the hospitals operating in the Emirate of Abu Dhabi have such a programme.' (P4).

CFIR domain III, implementation climate (tension for change) construct

Standardizing antimicrobial prescribing practices was a major motivation (tension for change) to strongly encourage ASP implementation, driven by prescribers' variability in background, and reflected on their antimicrobial prescribing practices. 'People are not using a standard protocol, each one is using his own protocol. Because we have the physicians who are trained in different countries. So, when we see the antibiotic usage, there are many things which were not consistent and standardized, so we wanted to standardize for our hospital also.' (P19).

Table I
Demographic characteristics of participants ($N = 31$)

No.	Participants' role	Age range (years)	Gender	Country of last qualification	Participant identity code
ASP team members					
1	Clinical pharmacist	31–40	M	UAE	P1
2	Clinical pharmacist	31–40	F	UK	P2
3	Clinical pharmacist	31–40	M	India	P3
4	Clinical pharmacist	41–50	F	USA	P4
5	Clinical pharmacist	31–40	F	Egypt	P5
6	Clinical pharmacist	31–40	F	UAE	P6
7	Clinical microbiologist	51–60	M	UK	P7
8	Clinical microbiologist	51–60	F	Egypt	P8
9	Intensive care consultant	41–50	M	Jordan	P9
10	Intensive care consultant	41–50	F	Saudi Arabia	P10
11	Infectious diseases physician	41–50	F	UK	P11
12	Infectious diseases physician	51–60	M	USA	P12
13	Infectious diseases physician	51–60	F	Iran	P13
14	Nephrologist	41–50	F	Egypt	P14
15	Nurse	41–50	F	Egypt	P15
16	Nurse	51–60	F	UK	P16
17	Nurse	41–50	F	India	P17
18	Quality officer	41–50	M	Lebanon	P18
19	Surgeon	51–60	M	UK	P19
20	Surgeon	>60	M	UK	P20
21	Surgeon	41–50	M	India	P21
22	Surgeon	51–60	M	Iraq	P22
Non-ASP team members					
23	General practitioner	21–30	M	UK	P23
24	Intensive care consultant	41–50	M	Egypt	P24
25	Internist	51–60	M	USA	P25
26	Nephrologist	51–60	F	India	P26
27	Pharmacist	31–40	M	Egypt	P27
28	Pharmacist	51–60	F	UK	P28
29	Pharmacist	21–30	F	Egypt	P29
30	Pharmacist	21–30	F	USA	P30
31	Quality officer	31–40	M	Egypt	P31

ASP, antimicrobial stewardship.

CFIR domain III, culture construct

Initial ASP implementation was hindered by physicians' resistance to change their antimicrobial prescribing habits. Participants perceived this barrier to be influenced by cultural beliefs and assumptions, including blame culture. 'Most of the physicians, especially the surgeons, are afraid to be blamed of postoperative infection, complications of surgery … [due to] … inadequate coverage of antibiotic or inadequate duration of antibiotic.' (P14).

Also, prescribers' embedded antimicrobial prescribing habits that developed throughout years of practice led to perceiving ASP as a restriction on prescribing rights contributing to resistance to changing prescribing practices. 'These doctors that [have] been prescribing antibiotic for the last 20–25 years. So, how we change the mentality. That was the challenge.' (P22).

Participants perceived a gradual acceptance of ASP, influenced by various factors such as a collaborative approach between ASP team members and non-members. 'Really, they're [prescribing physicians] accepting the changes. This [collaborative] culture helped to ease implementation of the programme, otherwise we cannot implement any programme if there is so much resistance and nobody is taking initiatives.' (P17).

CFIR domain III, available resources construct

A shortage of relevant specialized personnel such as infectious diseases (ID) physicians, clinical pharmacists, and microbiologists was identified by several participants. This, together with a lack of dedicated time allocated to ASP, contributed to an increased workload, and was considered a barrier to implementation. 'The thing which we are lacking is the clinical pharmacist who is dedicated to ASP activities and doing prospective audit along with an infectious disease consultant.' (P9).

To overcome this, some participants noted that referral was made to external hospitals where the required specialty was available. 'Our hospital didn't recruit an ID consultant, but it consulted with the ID [consultant] at hospital X as needed.' (P4).

Another approach was selecting ASP activities that match the hospital available resources, for instance retrospective audit and feedback to prescribing physicians was implemented instead of prospective antimicrobial auditing activities given the lack of some specialties. 'Prospective audit was not possible to do, rather we adopted retrospective audits and looking into our previous practice and learning from it and advising doctors accordingly based on the patterns of the prescribing.' (P9).

CFIR domain III, leadership engagement construct

Participants believed that hospital leadership engagement was a facilitator for successful ASP implementation. According to these participants, leadership became more engaged once presented with evidence of benefits of ASP such as cost savings. 'Cost was the motivation [for leadership engagement] because this data [cost savings data] was shared with … the senior management in order for them to … support the programme and justify ID [consultant] time.' (P15).

Evidence of leadership engagement provided by participants included making necessary resources available. 'They [leadership] actually hired an infectious disease physician to be responsible for ASP.' (P5) '[Leadership] purchased for us the access to many journals, to many links, to many papers, to many evidence[s] from the literature.' (P6).

CFIR domain III, networks and communication construct

The majority of participants indicated that both formal and informal communication had been extensively employed in hospitals to enable ASP implementation, gradually changing prescribing practices. Formal communication included documentation of ASP-related progress notes on electronic medical record (EMR) and informal, open discussions with physicians, and multidisciplinary clinical rounds. Participants considered informal communication imperative to successful ASP implementation with greater emphasis on the value of in-person communication. Notably, the value of effective communication skills between ASP members and the physicians prescribing antimicrobials at a patient level was highlighted as a major facilitator for ASP implementation. 'You don't come up as a policeman to police on them [physicians]. If you convey this message … we are not challenging … your clinical decisions … and you do in a timely way the … face-to-face communication, that is much better than sending an email.' (P3).

CFIR domain V, planning construct

Several participants recommended baseline analysis of available resources and antimicrobial prescribing behaviour before starting ASP implementation, reflecting future planning efforts to overcome ASP complexity. Stepwise implementation of ASP was recommended by many participants to ensure successful accomplishment of one objective before further expansion. There was also support for tailoring interventions to the hospital organizational structure. 'We collected baseline data for one year to help us to decide where to start. Based on our baseline data, we decided that critical care area is the highest priority.' (P6).

CFIR domain V, stakeholders engagement construct

Multiple engaging techniques for healthcare providers were used by ASP team members to enable implementation. These included face-to-face discussions aimed at promoting collaborative decision-making in management of infectious diseases and continuous training on ASP related policies and guidelines. 'So, we will do training, an ongoing process to create more [ASP] members in an indirect way, they are not ASP members but by training them, when they know how to do that, they will do it in a stewardship mind-set.' (P1).

Also, ASP personnel considered continuous feedback on ASP implementation outcomes and provision of incentives for implementation champions acknowledging their engagement. 'We … kind of appreciated them [nurses] and gave them some medals and certificates, just to ensure that they also are engaged as part of the team.' (P4).

Participants strongly supported involvement of consultant physicians at the development stage of hospital infection guidelines, to support ownership of guidelines by key individuals. 'So we standardized the antibiotic [surgical] prophylaxis guidelines. We used to have multiple meetings with the surgeons, with ID [infectious disease specialists], with microbiologists to create a consensus or an agreement where you know the surgeons are happy.' (P3).

Many strongly favoured engaging representatives from different specialties and professions such as pharmacists, critical care physicians, surgeons, and nurses into the ASP team. Their presence in turn was perceived as influencing and engaging their peers. 'We started to have ASP links in different teams. So like in the surgical, we have an ASP link. In the critical care, we have an ASP link and so on. So the team grew.' (P5).

An overall summary of constructs identified by the participantsc as facilitators or barriers for ASP implementation is presented in Table II.

Discussion

Multiple CFIR domains and constructs emerged throughout the interviews, categorized as facilitators and barriers to implementation. Key perceived facilitators were ASP requirements by local health authorities and international accreditation bodies, the need to standardize antimicrobial prescribing practices, collaborative culture, engaging leadership, effective networking and communication, and engagement of healthcare providers. Fewer barriers than facilitators emerged, specifically the perceived complexity of ASP implementation, fear of blame culture, and insufficient human resources. Few constructs were not represented, including: evidence strength and quality, patient's needs and resources, individual stage of change, and identification within the organization.

The merit of using CFIR is highlighted in the comprehensiveness of identified facilitators or barriers compared to previous implementation studies which did not have a theoretical basis. Facilitators reported by previous studies included: collaborative culture and effective communication, techniques for engaging healthcare providers, the importance of leadership engagement, and mandates by local health authorities [8,15,16,21].

Several additional facilitators to those already reported in the literature were identified. The provision of incentives by ASP team members to implementation champions was one such facilitator where participants adopted a local rewarding initiative within their hospitals to support engagement of healthcare providers. This may be expanded to allow for financial rewarding of hospitals. For example, the Commissioning for Quality and Innovation (CQUIN) launched by National Health Services (NHS) in England allowed financial rewarding for hospitals that share antimicrobial consumption data and demonstrate reduction in prescribing of specific antimicrobials, which reinforces the findings within our study about the importance of rewarding in engagement of stakeholders [32,33].

A desire to standardize antimicrobial prescribing practice was another facilitator, where participants were prompted by

Table II
Overall summary of CFIR constructs identified as perceived facilitators or barriers for antimicrobial stewardship programme implementation

CFIR domain	CFIR construct	Identified themes	Perceived facilitator/barrier
Domain I, Intervention characteristics	Complexity	Perceived complexity of ASP implementation	Perceived barrier
Domain II, Outer setting	External policy and incentives	ASP requirements by UAE health authorities and international accreditation bodies	Perceived facilitator
Domain III, Inner setting	Implementation climate (Tension for change)	The desire to standardize antimicrobial prescribing practices as a facilitator and motivator for ASP implementation	Perceived facilitator
	Culture	Influence of blame culture on initial resistance to change antimicrobial prescribing behaviour	Perceived barrier
		Collaborative culture to enhance acceptance of changing antimicrobial prescribing habits	Perceived facilitator
	Available resources	A lack of sufficient human resources	Perceived barrier
	Leadership engagement	Importance of engaging leadership using cost savings data	Perceived facilitator
	Network and communication	Establishment of effective formal and informal communication routes among ASP team members and healthcare providers	Perceived facilitator
Domain V, Process	Planning	Effective future planning for ASP implementation through selection of suitable interventions tailored to the specific organization	Perceived facilitator
	Engaging key individuals	Engagement of healthcare providers through multiple engagement techniques	Perceived facilitator

CFIR, Consolidated Framework for Implementation Research.

the prescribing inconsistency perceived to be driven by the variability in prescribers' background. This variability in background could be attributed to a working healthcare environment in GCC states that relies heavily on migrant expatriate workforce [24]. Previous GCC studies identified other drivers such as: limited previous physician training and experience, lack of physicians' knowledge about antimicrobial spectrum of activity, limited antimicrobial choices, and difficult to interpret hospitals' antimicrobial prescribing guidelines, making this a unique finding not previously reported [34–36].

Similar to other studies reported in the literature, including studies from Saudi Arabia and UAE, fear of blame culture, resistance to change antimicrobial prescribing habits, and a lack of sufficient ASP team members were identified by the participants as barriers [9,11,25,37]. None of the latter studies have identified ways to overcome these barriers. By contrast, participants in this study could identify the value of referral to healthcare providers from other facilities to overcome insufficient ASP expertise, as well as selecting the most suitable interventions based on the available resources. Notably, international guidelines, such as World Health Organization (WHO) practical toolkit for ASP implementation in healthcare facilities and the Australian National Centre for ASP, have also recommended arranging off-site expert access to overcome lack of specialized ASP team members and careful consideration of local resources and availability of competencies while selecting the most suitable ASP interventions to be implemented [1,38].

A scoping review investigating the use of complexity theory in ASP published research identified a shortage of studies examining complexity of ASP design, implementation, and evaluation [39]. Our study addressed this gap where the complexity of ASP implementation was identified as an additional barrier. Participants highlighted the value of effective planning, including baseline analysis of hospital culture and resources and stepwise implementation as solutions to counteract complexity. Adopting effective planning is a WHO recommendation, through conducting baseline analysis of antimicrobial prescribing habits, identifying challenges, human and financial resources, followed by creating a stepwise action plan which identifies short- and long-term priorities [1]. Few ASP studies described the adoption of planning along with gap baseline analysis and none was identified from GCC region, reflecting the importance of this aspect of our study findings [40].

Future research should consider reaching consensus among ASP experts on recommendations to support ASP implementation strategy tailored for the context of UAE hospitals, based on the literature review and findings of this study. This can serve as guidance for the main three categories of ASP stakeholders in UAE hospitals: local healthcare authorities; hospital leadership; and ASP personnel who are starting ASP implementation in their respective hospitals. Adopting a consensus-based approach, such as the Delphi technique, including ASP experts from these three categories, may be particularly useful in developing governance, promoting best practice, and

informing decision-makers to aid impactful ASP implementation.

There are several strengths to this study. The adoption of a qualitative approach allowed generation of rich in-depth data [41]. Maximum variation sampling promoted credibility of findings and supported holistic understanding of different experiences [42]. Adopting CFIR throughout data generation and analysis provided a comprehensive implementation framework to aid the identification of domains and constructs functioning as facilitators and barriers [19,20].

The main limitation is that data were generated in UAE, which may limit transferability of findings. However, the diversity of migrant workforce in UAE was represented, leading to inclusion of perceptions of participants from different backgrounds [24]. Detailed descriptions of participants and hospital demographics were also provided to support transferability.

In conclusion, this study contributed to filling the knowledge gap related to the employment of implementation theories as an underpinning for ASP research to identify the perspective of ASP key stakeholders. In fact, the research supported identification of numerous facilitators and barriers to ASP implementation when compared to other implementation studies that did not have a theoretical basis. It highlighted the need for ASP team members to seek early leadership engagement to support provision of required resources, a need for effective planning and establishment of multiple engagement techniques and valuable communication with healthcare providers. This can create a collaborative culture promoting ASP implementation and sustainability of the service.

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Conflict of interest statement
None declared.

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Appendix A. Supplementary data

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