



Qualitative study of the factors impacting antimicrobial stewardship programme delivery in regional and remote hospitals

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SUMMARY

Background: Many regional and remote ('regional') hospitals are without the specialist services that support antimicrobial stewardship (AMS) programmes in hospitals in major cities. This can impact their ability to implement AMS activities.

Aim: To identify factors that impact on the delivery of AMS programmes in regional hospitals.

Methods: Healthcare clinicians who have primary AMS responsibilities or provide AMS support to a health service or across health services with an Australian Statistical Geography Standard Remoteness classification of inner regional, outer regional, remote or very remote were recruited purposively and via snowballing. A series of focus groups and interviews were held, and the discussions were audiotaped and transcribed verbatim. The transcripts were coded by two researchers, and thematic analysis was undertaken using a framework method.

Findings: Four focus groups and one interview were conducted (22 participants). Six main themes that impacted on AMS programme delivery were identified: culture of independence and self-reliance by local clinicians, personal relationships, geographical location of the hospital influencing antimicrobial choice, local context, inability to meaningfully benchmark performance, and lack of resources. Possible strategies to support the delivery of AMS programmes in regional hospitals proposed by participants were categorized into two main themes: those that may be best developed or managed centrally, and those that should be a local responsibility.

Conclusion: AMS programme delivery in regional hospitals is influenced by factors that are not present in hospitals in major cities. These findings provide a strong basis for the development of strategies to support regional hospitals to implement sustainable AMS programmes.

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Introduction

Antimicrobial stewardship (AMS) has been defined as ‘a coherent set of actions which promote using antimicrobials responsibly’ [1]. It encompasses promoting the most effective treatment to optimize patient clinical outcomes, while minimizing the promotion of pathogens with antimicrobial resistance. Antimicrobial resistance has been recognized globally as an urgent health priority [2,3].

Since the National Safety and Quality Health Service (NSQHS) hospital accreditation standards were introduced in 2013, all hospitals in Australia are required to have AMS programmes in place [4]. Other countries have similar accreditation requirements [5,6]. According to the Australian NSQHS standards, the AMS programme must provide access to endorsed therapeutic guidelines on antibiotic usage, monitor antimicrobial usage and show evidence of action to improve outcomes [4]. Australian AMS programmes are also guided by resources such as ‘Antimicrobial Stewardship in Australian Health Care 2018’ which suggests four essential strategies: clinical guidelines consistent with national guidelines, formulary restriction and approval systems, review of antimicrobial prescribing (with intervention and direct feedback to the prescriber) and point-of-care interventions (such as intravenous-to-oral switching) [7]. The Australian Commission on Safety and Quality in Health Care’s Antimicrobial Stewardship Clinical Care Standard also outlines nine quality statements that describe the clinical care relating to microbiological testing and antimicrobial therapy that a patient should be offered [8].

Barriers to the delivery of AMS programmes have been identified in the Australian regional and remote (‘regional’) hospital setting [9]. These include lack of on-site infectious diseases (ID) expertise, limited pharmacy resources and difficulty recruiting staff to regional areas [9]. Many similar barriers are reported in the international literature [10–12]. Published examples of AMS programmes implemented in regional hospitals are now emerging [5,13–16]; however, these examples are generally limited to evaluation of a single site with limited qualitative content. This gap in research means that there are challenges in devising bespoke strategies to support AMS programme delivery in regional hospitals.

The purpose of this study was to identify the factors that impact AMS programme delivery (the programme’s ongoing provision, success and sustainability) in regional hospitals from the perspective of clinicians who have primary AMS responsibilities or provide AMS support.

Methods

The COREQ checklist for reporting qualitative studies guided the reporting of methods and results (see online supplementary material) [17].

Study participants and recruitment

Study participants were healthcare clinicians who have primary AMS responsibilities or provide AMS support to a health service or across health services with an Australian Statistical Geography Standard (ASGS) remoteness classification of inner regional, outer regional, remote or very remote [18]. These

classes of remoteness are based on a measure of relative access to services, known as the Accessibility and Remoteness Index of Australia (ARIA+) [19]. ARIA+ is recognized as a nationally consistent measure of geographic remoteness in Australia [19]. A very remote classification indicates the least access to services.

Purposive (through professional networks, online discussion boards and the National Centre for Antimicrobial Stewardship website) and snowball sampling were utilized to recruit participants [20,21]. Written consent to participate was obtained from all participants.

Design

A neo-positivist theoretical framework was adopted [22]. The study design involved focus groups lasting for approximately 90 min. One-to-one interviews were permitted where attendance at a focus group was not feasible. A minimum of three focus groups were planned to reach saturation of themes [23]. A guide was prepared for the focus group moderator which included the semi-structured questions (see online supplementary material). The same questions were used for any individual interviews. The questions were pilot tested with a clinician from a regional health service. To support the recruitment of time-poor general practitioner participants, an abridged interview guide that could be conducted in 15 min was utilized (see online supplementary material). The focus groups were conducted face-to-face, via teleconference and via videoconference in the presence of a focus group moderator (TS). The interviews were also conducted by TS. The moderator has been an ID physician for nine years, visited regional hospitals since 2010, and been involved specifically with AMS since 2014. The moderator did not know any of the participants. To avoid the possible influence of interprofessional hierarchy [23], medical staff (ID physicians, microbiologists and general practitioners) were allocated separate focus groups to the other health professionals. Allocation to a focus group was then based on convenience to the participant.

Analysis

All focus groups and interviews were audiotaped and transcribed verbatim. The transcripts were coded independently by two researchers (TS and JB) and then compared for consistency by JB. An initial coding guide was created with deductive codes derived from the literature [24]. Open coding was undertaken for the first transcript, and inductive codes were added to the coding guide as required [24]. The coding guide was revised iteratively for subsequent transcripts. Themes were derived from the data using a framework method [24] in NVivo Version 11 (QSR International Pty Ltd, Burlington, MA, USA). Data saturation was discussed by researchers as thematic analysis was undertaken.

Ethical approval

This study was approved by the Melbourne Health Human Research Ethics Committee (QA2017012) and registered with the University of Melbourne Human Ethics Advisory Group (ID: 1748757).

Table I
Demographics of participants and focus group composition (N = 22)

Characteristic	Number of participants
Profession	
Pharmacist	8
Infectious diseases physician/microbiologist	6
Infection control practitioner/nurse	3
General practitioner	3
Clinical administration (nursing) ^a	2
Australian Statistical Geography Standard Remoteness classification^b	
Inner regional	15
Outer regional	6
Remote or very remote	0
State-wide or region-based role ^c	3
Professions per focus group	
March 2017 (face-to-face)	
Pharmacist	3
Infection control practitioner/nurse	3
Clinical administration (nursing) ^a	2
April 2017 (teleconference)	
Pharmacist	5
May 2017 (face-to-face and teleconference)	
Infectious diseases physician/microbiologist	6
October 2017 (interview)	
General practitioner	1
October 2017 (web conference)	
General practitioner	2

^a Working in a health department or hospital management role with a clinical service focus.

^b Participants could work across more than one classification.

^c Includes services or advice to remote hospitals.

Results

All participants who signed a consent form participated in a focus group or interview. Four focus groups and one individual interview were conducted between March and October 2017. Twenty-two people participated (Table I). Six main themes which influenced the delivery of AMS programmes in regional hospitals were identified. Respondent professions and identification numbers are shown in brackets next to the supporting quote.

Independence of regional and remote clinicians

A culture of independence and self-reliance by clinicians working in regional hospitals was identified. Limited prescribing feedback for clinicians in regional hospitals compared with that received by clinicians practising in larger, team environments was proposed as a key difference:

'[General practitioners] haven't had much support from ID before and are used to making their own decisions and are comfortable with that.' (ID Physician, N19)

'It's the peer review you get in the major urban areas that you don't get.' (Infection Control Practitioner, N4)

Impact of personal relationships

Personal relationships were considered to impact the delivery of AMS programmes in regional hospitals both positively and adversely:

'If it's your friend and you know them out socially, I think that can work tremendously.' (Pharmacist, N5)

'In our towns, literally the GP [general practitioner] is your GP. So, you're not going to have a challenging conversation about "why did you order this antibiotic" and then go and see him for a sick certificate the next day.' (Clinical administration - nursing, N9)

The need to build rapport and personal relationships over time to gain the trust of the local clinicians was described:

'I think being someone who sticks around is really valued. They're used to people flying-in, flying-out, but never coming back again... I'm making more headway now that they know who I am and that I'm repeatedly turning up.' (ID Physician, N19)

'I think that you tend to ring established people that you know, links that you are aware of and whose medicine you trust. I don't know any ID people; we don't have people who have those links here.' (General Practitioner, N21)

Geographic isolation

The geographical location of the hospital was thought to impact antimicrobial prescribing choices. Participants described increased time to receive microbiological results at regional hospitals, and raised concern about the impact of this on patient care:

'Our blood cultures in some facilities we work in goes on a bus to another hospital and then from that hospital on the flight to a tertiary hospital to be processed.' (ID Physician, N20)

'Delayed, inadequate pathology system. How are they going to de-escalate in a timely manner and do this IV switch if we don't have any pathology results?' (Pharmacist, N5)

Participants indicated that the most appropriate antimicrobial therapies were not being selected because of delays in therapeutic drug monitoring:

'They have 47% MRSA [methicillin-resistant *Staphylococcus aureus*] and they're under an assumption that vancomycin is too hard to use simply because they don't have therapeutic drug monitoring.' (ID Physician, N20)

When antimicrobials requiring therapeutic drug monitoring were selected, there were concerns raised about safety:

'It can be dangerous too because we have to wait an extra day sometimes for vancomycin levels to come back.' (Pharmacist, N7)

Lack of understanding about the local context

The limitations of seeking advice from an externally located provider who may be unfamiliar with the local context (such as antimicrobial resistance patterns, availability of microbiology tests) were described:

Table II

Centrally driven and locally managed strategies to support antimicrobial stewardship (AMS) programme delivery in regional hospitals proposed by participants

Centrally driven strategies	Example of a participant quote
Networks to share expertise; formal and informal	'Having some sort of network capacity to share those expertise is an important one' (Pharmacist, N12)
Central 'go to' place for resources, ideas and advice	'Pooling resources, or pooling ideas, having like a central go to place....with clear examples of this is something that's working well and seeing if you can adapt to your place. I think everyone has got their own good ideas that work well and if you can learn from others' (Pharmacist, N13)
Australia-wide best practice AMS policy that is relevant for regional and remote hospitals	'Very clearly delineated Australia-wide best practice AMS – this is what you have to have, this is what you have to do, this is what your outcome measures are' (Pharmacist, N14)
Locally driven strategies	Example of a participant quote
AMS requirements in conditions of service for contracted and admitting medical officers	'Our medical directors looking at the contracts that they need to comply with the rules of our... the GPs we have down admit to XXX, they have to comply with x, y and z. So, that's done through re-toughening up of governance. Which is going to be great, that's really important' (Infection Control Practitioner, N8)
Inclusion of AMS in the hospital's statement of priorities	'Somehow the statement of priorities has to come in' (Infection Control Practitioner, N4)
Increased medical oversight	'Having a DMS [Director of Medical Services] more than one day a month would be perhaps beneficial' [Clinical Administration (nursing), N9]

'One of the other barriers that I've seen is this reliance still on some of the hospitals in calling tertiary hospitals for their antimicrobial advice and getting, what's often, inappropriate advice from a registrar who actually doesn't understand what the antibiogram is for country hospitals.' (ID Physician, N16)

Lack of meaningful comparisons of data

Participants described the inability to include meaningfully benchmarked antimicrobial prescribing data in their AMS programmes:

'One of the barriers to AMS, at least how it's traditionally thought of, is that a lot of the small facilities aren't even eligible to participate in things like [participant names a national program to compare antimicrobial usage by volume between hospitals.] (ID Physician, N20)

'We haven't been able to pair our service with a similar regional hospital to discuss what they're doing better or worse.' (ID Physician, N17)

Lack of staff resources

Resources for AMS in regional hospitals were described as lacking. The turnover of pharmacy staff was specifically highlighted as impacting the delivery of the AMS programme:

'They appointed somebody as the antimicrobial stewardship pharmacist. It was fantastic, we were so excited because they haven't got ID and they haven't got micro on-site. And so, that was all very good but two of the pharmacists left. So, now she is the chief pharmacist. So, of course she has got no time for AMS.' (Clinical Administration – Nursing, N2)

'I've been through three AMS pharmacists. We're going to be on to our fourth soon.' (ID Physician, N18)

Participants raised other possible strategies to support the delivery of AMS programmes in regional hospitals. There were two main themes: strategies that may be best developed or managed centrally, and strategies that should be a local responsibility (Table II).

Discussion

This study has provided key information on factors that influence the delivery of AMS programmes in regional hospitals. These factors include a culture of independence and self-reliance by local clinicians, personal relationships, geographical location of the hospital influencing antimicrobial choice, local context, inability to meaningfully benchmark performance and lack of resources.

A key implication of these findings is if experts are to provide off-site advice, they need to have familiarity with the local context (such as antimicrobial resistance patterns and local capabilities) at a given hospital. For example, they need to know whether there are delays in accessing microbiology and therapeutic drug monitoring results that impact treatment options. Centralized and readily available information for clinicians may help to address this challenge. For example, the AIMED website provides freely available antibiograms for some local regions within Australia [25].

Another significant finding is that the structure of the AMS programme for regional hospitals should take into consideration the high turnover of some staff (both in the regional hospitals and those delivering the service remotely). Difficulty in retaining health professionals in regional or remote communities is an ongoing challenge and is not unique to AMS or the Australian healthcare environment [26,27]. This study also

highlighted that trust was a strong factor in whether advice would be accepted, and this trust developed when regional clinicians observed investment in their community by the 'outsider' clinician over time. The trust needed to be frequently rebuilt because of the turnover in staff. These factors suggest that AMS programmes in regional hospitals need to build resilience by developing the capabilities of the local staff who are most likely to be retained in the regional service, such as nurses. Nurses have been described as having the lowest turnover and highest stability of all disciplines practising in Australian rural and remote locations [28]. The role of nursing staff in AMS continues to evolve [29], and greater detail on their roles is being described. For example, 'Antimicrobial Stewardship in Australian Hospitals' was published in 2011 and included sections on the role of microbiology, ID and pharmacists in AMS. The most recent version, titled 'Antimicrobial Stewardship in Australian Health Care 2018', now includes a comprehensive section on the role of nurses, midwives and infection control practitioners. Drawing on the stability of a network arrangement may be of value to create structure in a regional AMS programme. The concept of a network support structure has been explored in a recent American study involving 15 small hospitals in the Intermountain Healthcare Group [30]. The authors concluded that a system that centralizes AMS resources and shares them with affiliated small hospitals could achieve antibiotic usage reductions similar to those demonstrated in larger hospitals [30].

Also identified as important in AMS programme delivery in regional hospitals was the independence and self-reliance of local clinicians. This is likely a combination of professional autonomy (recognized to influence antimicrobial prescribing [31–33]) and the isolation of their practice compared with those working in hospital teams [33]. Strategies to influence prescribing choices may therefore be different to those utilized in a hospital operating with a larger team of clinicians. For example, individual prescriber feedback and peer-to-peer comparison may be more practical in regional hospitals than unit- or team-based measures. However, peer-to-peer comparison relies on access to suitable benchmarking. Locating facilities against which to benchmark and accessing sufficient quantities of meaningful data were described as challenges for regional hospitals. The Australian programme to compare volumes of antibiotic consumption between hospitals excludes the hospitals designated as Acute Group D by the Australian Institute for Health and Welfare [34]. Acute Group D hospitals are described as acute public hospitals that offer a smaller range of services relative to the other public acute hospital groups, and are mostly situated in regional and remote areas [35]. Internationally, the Centers for Disease Control and Prevention's (CDC) standardized antimicrobial administration ratio uses a risk-adjusted benchmarking approach which is described as allowing hospitals to compare their antibiotic use with similar facilities, including critical access hospitals. There is, however, a requirement to collect the numerator and denominator data electronically in order to participate, which may not be achievable in hospitals without an electronic medication administration record or adequate IT resources (known barriers in regional and remote hospitals) [12,27,36,37]. Therefore, simplified measures are being recommended for small hospitals with limited resources [12].

Strategies identified by the participants to support AMS programme delivery in regional hospitals warrant

consideration. An expanded role for centralized organizations such as the National Centre for Antimicrobial Stewardship (who undertake research and host forums) and the Queensland State-wide Antimicrobial Stewardship programme (who provide clinical advice and education) was identified by participants. Further exploration of how the reach and networking capacity of these and similar organizations could be increased would be worthwhile. VICNISS, an infection control surveillance programme funded by the state government, was highlighted as a programme to model as it is well embedded in smaller regional Victorian hospitals.

Further steps are required to improve the relevance of AMS policy and guidelines for regional hospitals. Reports such as the CDC's 'Implementation of antibiotic stewardship core elements at small and critical access hospitals' [38] provide a starting point. Debate continues on the resourcing requirements for AMS programmes [39], and consideration for regional hospitals is often lacking.

Locally, influencing the hospital's statement of priorities was described as a possible strategy. In Victoria, statements of priorities are annual accountability agreements between individual public healthcare services and the Minister for Health. Participants described ongoing resourcing of immunization staff because of influenza vaccination being included as a performance priority. Strong advocacy and robust performance measures would be required for any AMS-specific priorities to be included.

Purposive sampling and the small number of participants relative to the workforce are limitations of this study. Participants from the ASGS remoteness classification of inner regional comprised most of the sample, and there were greater proportions of ID physicians and pharmacists than other professions. The spread of participants' professions likely reflects the fact that Australian hospital AMS programmes are largely driven by ID physicians and pharmacists in inner regional hospitals. However, several participants could offer perspectives from more remote hospitals where the roles of nurses and general practitioners are more prominent.

The findings are consistent with a recent study of a single remote Australian health service which suggested that variability in resistance patterns, local 'know how', an 'us' vs 'them' mentality, and high rates of staff turnover impacted the ability to influence antimicrobial prescribing [40]. Despite the participants in this study being clinicians working in Australia, the responses could reasonably be extrapolated to regional or remote settings in other countries. A number of other countries now have AMS as a requirement of hospital accreditation [5,6]. Critical access hospitals in America display some similar characteristics to Australian regional hospitals in that they are not teaching hospitals, are not part of a larger hospital system, have difficulty recruiting healthcare staff, and often lack the personnel needed to maintain electronic systems [27]. Although delays in receiving microbiological results in regional hospitals are not well described or quantified in the published literature, it is reasonable to extrapolate that similar barriers could exist in other countries with large distances between hospitals and pathology providers.

The findings of this study suggest that the approach to AMS programme delivery in regional hospitals should be different to that utilized in hospitals in major cities, and serve to inform tools such as CDC's 'Implementation of antibiotic stewardship core elements at small and critical access hospitals' [38] and

the Australian Commission on Safety and Quality in Health Care's 'Antimicrobial Stewardship in Australian Health Care 2018' [7].

In conclusion, this study revealed that there are specific considerations for the delivery of AMS programmes in regional hospitals, including autonomy of local clinicians, personal relationships, local factors, geographic isolation, accessing suitable benchmarking and programme continuity. Expanding the role of existing centralized organizations to better share resources and support networking can supplement local actions such as increasing accountability of prescribers. However, the centralized organization must have a good understanding of local context and be allowed time to build rapport and trust. These findings provide a strong basis for the development of tailored approaches to support regional hospitals to deliver AMS programmes.

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Conflict of interest statement

DK has sat on advisory boards for Merck Sharpe & Dohme (MSD) and received financial/travel support unrelated to the current work from Roche and MSD. JB, TS and KB report no conflicts of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jhin.2018.09.014>.

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