

## A statewide antimicrobial stewardship: what are the enablers and barriers for rural health?

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### Abstract

**Aim:** Gain an understanding of factors affecting the implementation of AMS programs in rural and regional Queensland.

**Methods:** A multidisciplinary team (medical, nursing, pharmacy) was established to engage with rural and remote hospital and health services (HHSs) in order to develop a statewide program to support AMS programs in rural facilities in Queensland. HHSs were identified who do not have an on-site Infectious Diseases Specialist support and report a high antibiotic utilisation rate. Engagement involved onsite visits by the multidisciplinary team to five facilities, across four HHSs. Pre-visit questionnaires, meetings with key AMS stakeholders were undertaken to explore the strategies for implementing or optimising existing AMS programs.

**Results:** Enablers for successful AMS programs were: relatively flat governance structures, engrained hub and spoke mechanisms within and between HHSs and well-established telehealth facilities. Barriers to implementing AMS activities were: no established AMS governance structure, institutional prescribing culture which was resistant to change, high turnover of clinicians, and lack of access to specialist Infectious Diseases advice. Key areas for AMS support identified included: access to specialist Infectious Diseases advice in real-time; use of telehealth for AMS ward rounds and education; assistance with monitoring of appropriate antimicrobial use with feedback to prescribers; and the prioritisation and implementation of AMS intervention strategies.

**Conclusion:** Ideally, an AMS program should be a combination of education, guidance, interventions and a supportive policy environment. The formation of a statewide AMS program consisting of a multidisciplinary team will hopefully facilitate the optimal implementation and sustainability of AMS programs in rural settings.

### Background

It is estimated that by 2050, deaths attributable to Antimicrobial Resistance will be greater than cancer.<sup>1</sup> A new report by the World Bank Group states that drug-resistant infections have the potential to cause a level of economic damage similar to that caused by the 2008 financial crisis.<sup>2</sup>

Research shows that up to half of antimicrobials prescribed in Australian hospitals are discordant with guidelines or microbiological results and hence considered inappropriate.<sup>3</sup> Inappropriate use of antimicrobials is thought to contribute to an increased risk of antibiotic resistant pathogens.<sup>4</sup> Patients with antibiotic resistant infections have an increased mortality as compared to patients infected with non-resistant organisms.<sup>5,6</sup> Unfortunately, new antimicrobials are not being developed at a pace that comes anywhere close to meeting the impending urgent need, therefore the healthcare system needs to undertake efforts that save one of medicine's most precious and long standing resources.<sup>7</sup> This was summarised by the World Health Day 2011 slogan "Combat Antibiotic Resistance: no action today, no cure tomorrow". Reducing the inappropriate use of antimicrobials in hospitals has been

shown to improve patient outcomes and reduce adverse consequences of antibiotic use (including antibiotic resistance, toxicity and unnecessary costs).<sup>8</sup>

Antimicrobial stewardship (AMS) is the coordinated set of actions designed to promote and increase the appropriate use of antimicrobials and is a key strategy to conserve the effectiveness of antibiotics.<sup>9</sup> The Australian Commission on Safety and Quality in Health Care (ACSQHC) has identified the implementation of an Antimicrobial Stewardship (AMS) program as a key initiative to address the prevention and control of healthcare associated infection.<sup>10</sup> In the United States of America the Joint Commission recently announced new medication management standards for hospitals and nursing care centres for AMS effective in January 2017.<sup>11</sup> Accreditation standards have already been successfully implemented in the hospital setting in Australia. However, there is an urgent need for resources to support the implementation of AMS programs in rural and regional areas<sup>12,13</sup> Little is currently known about what AMS activities are undertaken in these facilities and what additional resources would be required in order to implement an AMS program.

The aim of this survey was to gain an understanding of factors affecting the implementation of AMS programs in rural Queensland in order to identify gaps, barriers to implementation and opportunities for improvement.

## Methods

### Sample

This Needs Assessment Survey was conducted by a multidisciplinary team consisting of Infectious Diseases Physicians, Antimicrobial Stewardship pharmacists and a nurse in rural public Hospital and Health Services in a large decentralised state, Queensland. Queensland is Australia's second largest state measuring more than 1.72 million square kilometres and is 25% of Australia's land mass, which is nearly twice the size of the European Union, with a population of 4,560,060 representing 20 % of Australia's population. Queensland is Australia's third largest state by population behind New South Wales (7,290,350) and Victoria (5,623,490).<sup>14</sup> A survey of AMS activities was undertaken in 4 (out of 17) Queensland Health Hospital and Health Services (HHS) from June to December 2016 to identify areas requiring further support and assistance. These HHSs were selected because they do not have an Infectious Diseases Consultant and/or Clinical Microbiologist and have a high usage of antimicrobials.

### Survey

The survey was based on a Needs Assessment survey that was developed by a multidisciplinary team from the National Centre of Antimicrobial Stewardship, Australia and further refined by the Queensland Statewide Antimicrobial Stewardship program. The survey consisted of questions to address five essential strategies for effective AMS: implementing clinical guidelines; formulary restriction; reviewing antimicrobial prescribing; auditing antimicrobial use; and selective reporting of susceptibility results. Questions covering governance structure, availability of resources, workforce capacity and other possible cultural and organisational barriers to AMS were also included. A copy of the survey is available on request from the corresponding author. In addition, onsite meetings with an Infectious Diseases physician, pharmacist and/or nurse was conducted with key AMS stakeholders were undertaken to explore the strategies for implementing or optimising existing AMS programs.

### Data analysis

A descriptive analysis including cross tabulations was performed to examine frequencies of responses and key patterns in the data. A qualitative analysis was performed on open ended questions to determine key themes.

### Ethics

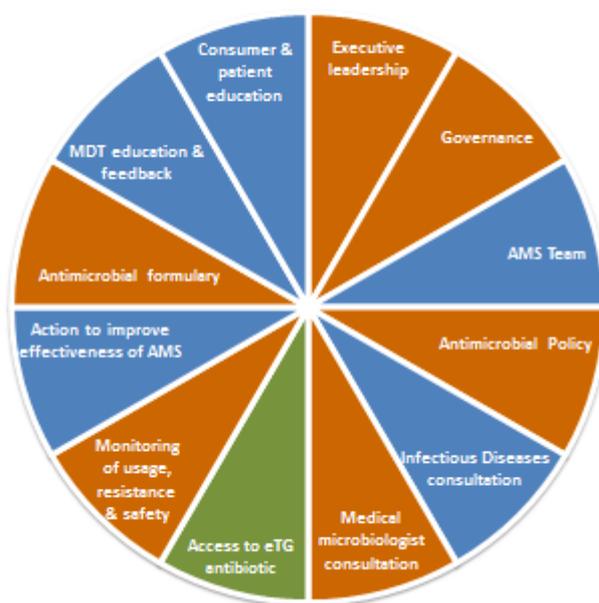
As the survey was determined by the Queensland Department of Health to be a quality assurance activity under the Australian National Health and Medical Research Council guidelines, ethics approval was not required. All hospital data were de-identified prior to reporting and involvement in the survey was voluntary.

### Results

#### Response rate

In total from four Hospital and Health Services were leaders. Respondents included physicians, pharmacists and nurses (infection control, senior leaders and patient safety). as well as executive directors of the institutions.

Figure 1 AMS Strategies provided by the HHSs



Key



### **Governance**

Although all four HHSs had a governance structure in place for their AMS stewardship program with the following committees having accountability for the program: Drug and Therapeutics; Medication Safety; Quality and Risk management; Infection prevention or the Executive office, not all the committees were active or functional and the HHSs did not have an overarching AMS policy, plan or implementation strategy that was regularly reviewed.

All the HHSs have a well-established hub and spoke model. The hub sites are responsible for providing services across the HHSs. These activities can range from patient management to developing guidelines, training and reviewing data about the appropriate use of antibiotics. None of the facilities had an AMS team as defined by a dedicated multidisciplinary team consisting of a medically trained staff member and a pharmacist. In addition, none of the HHSs had an infectious disease physician and/or clinical microbiologist on staff and none had access to a formally contracted infectious disease physician. Instead the clinicians utilised an informal/ad hoc arrangement for infectious disease services with another facility.

### **Guidelines**

All facilities had access to an electronic version of *Therapeutic Guidelines: Antibiotic. Formulary restrictions*. The Queensland Department of Health has a state-wide formulary called the List of Approved Medicines (LAM). Although they all had a system in place for advice/approval for restricted antimicrobials, this was not always enforced or adhered to. None of the facilities had an electronic online approval system in place.

### **Review antimicrobial prescribing**

The appropriate uses of antimicrobials were evaluated through point prevalence studies namely the National Antimicrobial Prescribing Survey (NAPS). Feedback to the prescribers was provided in the form of grand rounds at some facilities. One of the purposes of conducting a point prevalence study is to develop targeted AMS strategies. From this survey it was not clear if any AMS interventions were implemented as an outcome from these point prevalence studies.

### **Auditing antimicrobial use**

Antimicrobial usage data which are primarily generated by Queensland Health Enterprise Reporting Service (QHERS) (system for the creation, publication and delivery of reports) and/or pharmacy computer systems were not routinely reviewed on a regular basis.

### **Access to antibiograms and resistance surveillance data**

Antibiograms estimate the proportion of antibiotic-resistant bacteria of given species in a particular local area. Despite the fact that Queensland Health has a statewide antibiogram program, most of the facilities were not aware of the ability to access information about antimicrobial resistance.

### **Education**

In-house education on best practice in antimicrobial prescribing and resistance was provided to some of the health care professionals. However, none of facilities had a formal AMS educational program, or included it as part of the orientation for the junior staff.

### **Barriers**

A number of barriers were identified by the facilities to establishing an AMS program (Table 1).

Table 1 Common barriers to implementation of antimicrobial stewardship programs

Barriers
Inadequate pharmacy services
Other competing priorities to antimicrobial stewardship activities at the hospital
Insufficient financial support by hospital management
Insufficient training and education in antimicrobial use provided to clinicians
Lack of enforcement by hospital management
Doctors reluctant to change their prescribing practices
Workforce diversity (transient staff and reliance on locums, nursing prescribers)
Lack of leadership to promote antimicrobial stewardship at the hospital
Lack of support from senior clinicians
Lack of infectious diseases and/or microbiology services
Facility diversity ( residential aged care, primary health clinics, multipurpose centres)
Competing patient priorities
Insufficient time for implementing patient care activities relating to AMS

### *Promotion of an AMS program*

Key areas for AMS support identified included:

- access to specialist Infectious Diseases advice in real-time
- use of telehealth for AMS ward rounds and education
- assistance with monitoring of appropriate antimicrobial use with feedback to prescribers
- prioritisation and implementation of AMS intervention strategies

### **Discussion**

This survey was conducted to describe what AMS activities are currently being undertaken and identify gaps, barriers to implementation and opportunities for improvement in Queensland rural hospitals. The results are similar to findings of AMS surveys that have been conducted internationally and in Australia<sup>15-18</sup> which indicated that the facilities do have some of the key elements of an AMS program as suggested in the 2007 Infectious Diseases Society of America (IDSA) and the Society of Healthcare Epidemiology of America (SHEA) guidelines.<sup>19</sup> However, it appears that additional support is required for these rural facilities in order to support a sustainable AMS program.<sup>17,18</sup>

Although all four HHSs had a governance structure in place for their AMS stewardship program, with the formation of committees to oversee these programs, the HHSs did not have an overarching AMS policy, plan or implementation strategy that was regularly reviewed. In Australia one of the key requirements from Standard 3 of the National Safety and Quality Health Service which is a critical component of the Australian Health Services Safety and Quality Accreditation Scheme is that an AMS program is in place.<sup>10</sup> In addition, the appropriate use of antimicrobials is considered an essential part of patient safety that requires careful oversight and governance<sup>19-23</sup> and it is recommended that it be incorporated into the local clinical governance.<sup>24</sup> This is important as the overall accountability for an antimicrobial management control program lies with the hospital administration and executive support has been identified as an important strategy to promote a successful AMS programs.<sup>16</sup>

In our survey none of the HHSs had a multidisciplinary AMS team. Many rural facilities are under resourced and do not have ready access to specialised clinicians. In addition, the health care practitioners in these facilities are required to perform multiple tasks with AMS just being one of their

activities. It has been well established that the responsibility for implementing and managing an AMS program should reside with a multidisciplinary team<sup>19,24</sup> as they are better suited to implement the change management required for an effective AMS program.<sup>25</sup> It has been suggested that as ideally, a multidisciplinary team should include an appropriate clinician (an infectious diseases physician or clinical microbiologist) and a clinical pharmacist (with infectious disease training) as core team members.<sup>19,24,25</sup> In Queensland a centralised AMS team has been formed consisting of infectious diseases physicians, AMS pharmacists and a nurse. The purpose of the team is to provide support across the state to enhance the use of antimicrobials by advancing clinical practice, education and research.

None of the facilities that were surveyed had access to an on-site infectious diseases physician or clinical microbiologist and none had a formally contracted agreement in place to provide this support. Instead they relied on an informal/ad hoc arrangement for infectious disease support with another facility. It has been proposed, that in these circumstances, hospitals could negotiate appropriate external specialist advice to support the local AMS team.<sup>26</sup> One of the core strategies that the Queensland Statewide AMS program will provide is a hotline service to provide real time clinical support to clinicians in rural areas who do not have access to an on-site infectious diseases physician or clinical microbiologist.

A competent workforce is needed to perform the necessary tasks associated with an effective AMS program and they should have dedicated time to perform AMS activities.<sup>26</sup> The lack of staffing resources were one of the main barriers, in establishing an AMS program, that was reported in AMS surveys that have been conducted in Australia and the United States of America.<sup>16,17,23,27</sup> An AMS program's success and sustainability will be dependent on building effective workforce capacity which requires funding for dedicated AMS program staff, auditing and education campaigns.<sup>17</sup> None of the facilities that we surveyed have these resources and demonstrated that they were not able to provide a sustainable AMS program. Therefore, a centrally funded AMS program consisting of a multidisciplinary team has been implemented in Queensland to support these HHSs.

The ACSQHC recommends that the clinical workforce prescribing antimicrobials should have access to current endorsed therapeutic guidelines on antibiotic usage.<sup>10</sup> Prescribing guidelines for antimicrobials are an essential component of AMS programs. Several studies have shown that clinical pathways and guidelines can be effective in improving patient outcomes and cost-effectiveness of treatment.<sup>19,28,29</sup> Hospitals should have prescribing guidelines for treatment and prophylaxis for common infections relevant to the patient population, the local antimicrobial resistance profile and the surgical procedures performed in the institution.<sup>26</sup> The *Therapeutic Guidelines: Antibiotic*<sup>30</sup> are recognised as the national standard for antimicrobial prescribing in Australia.<sup>31</sup> In our survey all facilities have access to an electronic version of *Therapeutic Guidelines: Antibiotic*<sup>30</sup> However, these guidelines may need to be adapted to suit the resistance patterns and infectious disease conditions for the different geographical areas. In addition, it is important that guidelines should have an implementation plan that is well developed, executed, sustained and embedded in comprehensive programs for change to ensure an adequate uptake of guideline recommendations.<sup>32</sup>

It is important to note that uptake of AMS interventions does not happen spontaneously, rather an active implementation approach is required.<sup>33</sup> Gerber et al was able to show that a combination of clinician-specific education and audit and feedback significantly reduced prescribing of antibiotics in primary care.<sup>34</sup> Following the removal of audit and feedback, however, the initial benefits of this AMS intervention were lost.<sup>35</sup> By forming a centralised statewide AMS program, which will support AMS

strategies in rural facilities this will hopefully facilitate the uptake and implementation of AMS interventions in a sustainable manner in these areas.

The Queensland Department of Health has a state-wide formulary called the List of Approved Medicines (LAM) which includes antimicrobials. A formulary that includes a list of restrictive antimicrobials is a component of an AMS program.<sup>8,19,24</sup> Formularies can be used to influence patterns of antimicrobial use in hospitals<sup>26</sup> and should be appropriate to the needs of the hospital taking into account the range of antimicrobials required, the clinical orientation of the hospital and local antimicrobial resistance.<sup>24</sup> Formulary restrictions have been shown to decrease the amount of broad-spectrum antimicrobials prescribed, reduced adverse medication effects, decrease the development of secondary infections and thereby decrease health care costs.<sup>19,36-38</sup> They have also been associated with changes in local rates of some antibiotic resistant pathogens.<sup>39,40</sup> In our survey all the facilities have an approval system for restriction of broad-spectrum antimicrobials to patients on a clinical basis. The methods for administering the approval systems were varied and not always enforced. This may have been to the fact that the clinicians did not have ready access to specialist support. One of the core strategies that the Queensland Statewide AMS program will provide is a clinical hotline service to provide real time infectious diseases support to these clinicians in order to provide guidance about appropriate antimicrobial use.

None of the facilities surveyed utilised an electronic online approval decision support systems, which can provide many advantages including: reducing the work flow demands on the expert provider which allows the provider to focus on more complex conditions;<sup>26,41,42</sup> 24 hours a day access; providing consistent advice regarding approved indications;<sup>26</sup> providing access to guidelines and providing audits of antimicrobial use.<sup>26</sup>

In our survey antimicrobials were monitored, mainly by point prevalence studies with feedback given to prescribers during educational sessions such as the hospital grand rounds. The Infectious Diseases Society of America has identified practice review as one of the core strategies for the foundation of an AMS program<sup>19</sup> and has proven to be an effective strategy to influence prescribing behaviour.<sup>26</sup> Although evidence suggest that antimicrobial prescribing review undertaken by a single health professional can be effective, a multidisciplinary team (an infectious disease physician, clinical microbiologist and clinical pharmacist) is more likely to have a positive impact.<sup>26</sup> In our survey none of the facilities had an AMS team to undertake reviews primarily due to lack of staffing resources. By utilising resources such as telehealth these reviews can be facilitated by a multidisciplinary AMS team such as the Queensland Statewide AMS program.

Monitoring and analysis of antimicrobial usage data is critical to understanding antimicrobial resistance and measuring the effects of stewardship interventions with continuous surveillance of the appropriateness of antimicrobial prescribing being the ultimate aim.<sup>26</sup> In our survey antimicrobial usage data although easily accessible through a standardised reporting system was only reviewed on an ad hoc basis by the HHSs. Antimicrobial usage data should be interpreted together with infection control and antimicrobial resistance data.<sup>26</sup> Despite the fact that the Queensland Department of Health has a statewide antibiogram program, many of the respondents were not aware of the ability to access information about antimicrobial resistance data. This highlights the need for improved communication between disciplines about AMS services and resources that are available within the facility and also the need for a multidisciplinary approach to AMS.

Major reasons for inappropriate antimicrobial prescribing include a lack of knowledge about infectious diseases and antimicrobial therapy.<sup>43</sup> In the United Kingdom, poor prescribing has been linked to the

lack of an integrated scientific and clinical knowledge base, and the absence of practical prescribing instructions for undergraduates.<sup>44</sup> All the facilities in our survey reported that they do not provide any education on AMS activities to their practitioners. Lack of training and education in antimicrobial has been identified as one of the main barriers in establishing an AMS program.<sup>16,18,27</sup>

One of the key strategies that the Queensland Statewide AMS program will provide is an AMS educational program utilising telehealth and videoconferencing facilities in order to upskill the rural workforce about the appropriate use of antimicrobials.

Although this survey was only conducted in four HHSs they are representative of rural facilities in Queensland and the survey does provide valuable insight into current AMS activities and highlights key areas for improvement in these areas.

## Conclusion

This survey has identified a number of areas for support in rural facilities such as: access to specialist Infectious Diseases advice in real-time; use of telehealth for AMS ward rounds and education; assistance with monitoring of appropriate antimicrobial use with feedback to prescribers; and the prioritisation and implementation of AMS intervention strategies. Our findings also support the results of surveys conducted internationally and in Australia.<sup>15-18</sup> Ideally, an AMS program should be a combination of education, guidance, interventions and a supportive policy environment. The formation of a statewide AMS program consisting of a multidisciplinary team will hopefully facilitate the optimal implementation and sustainability of AMS programs in rural settings on a statewide basis.

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