**Antimicrobial stewardship in rural districts of South Africa: growing a positive culture**

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**Background:** The success of medical specialist-led antimicrobial stewardship activities in urban tertiary health care settings has been well documented. The issue of antimicrobial resistance remains an ongoing concern. This has particular relevance in primary health care communities treated from sub-district health services, which are organised around level-one district hospitals. District hospitals are typically staffed by generalist clinicians or medical officers with minimal access to the medical specialist physicians and pathologists who are available in the urban academic centres. Coordinated team-based activities aimed at implementing the South African Antibiotic Stewardship Programme (SAASP) principles of antimicrobial use are necessary.

**Methods:** This open forum article describes the process of growing an institutional culture around antimicrobial stewardship from the perspective of a 90-bed district hospital and a regional referral hospital located in the rural Garden Route District of the Western Cape province.

**Results:** A team of generalist health workers, inclusive of a family physician and medical officers, pharmacists and nursing colleagues, conducted weekly antimicrobial stewardship ward rounds. A clinical pathologist from the National Health Laboratory Service (NHLS), based at George Regional Hospital, consulted on these ward rounds monthly and provided guidance and advice to medical staff via telephone, email and WhatsApp. Undergraduate medical students and registrars in family medicine also attended these ward rounds and learnt from resulting discussions. This strengthened quality of care for patients and provided a platform for shared ongoing learning.

**Conclusion:** This model can be applied to similar settings within South Africa, and further afield.

**Keywords:** antimicrobial stewardship, hospitals, district, drug resistance, microbial, physicians, family, pathologists

**Background**

Antimicrobial resistance remains a global public health concern. The World Health Assembly stated in 2014 that access to effective antimicrobials is a prerequisite for most of modern medicine and that antimicrobial resistance threatens the sustainability of the public health response to many communicable diseases. South Africa has aligned itself with international actions to address antimicrobial resistance through a multi-pronged approach including a national hand-washing campaign, the launch of a South African Antibiotic Stewardship Programme (SAASP), and the publication of the South African antimicrobial resistance strategy framework. The recently published *Guidelines for the Prevention and Containment of Antimicrobial Resistance in South African Hospitals* forms part of national efforts that are aimed at preventing and containing antimicrobial resistance in healthcare facilities in South Africa, by the application of antimicrobial stewardship (AMS) practices at hospital level (Figure 1).

The success of medical specialist-led AMS activities in urban tertiary healthcare settings is well documented. Brink et al. studied the effect of AMS activities in the private hospital sector and noted that the real challenge for implementing an AMS culture lies in the public health sector facilities, particularly in the rural district health services, where access to adequate infectious diseases expertise and resources remains a challenge. An Australian literature review of rural regional and remote hospitals suggested that AMS programmes could be maintained in the absence of infectious disease specialists by being pharmacist-led, with information technology infrastructure a crucial facilitator.

AMS is important at primary, secondary and tertiary healthcare levels, as appropriate use of antimicrobials determines patient outcomes throughout the continuum of the referral pathway. A study in eight primary health care (PHC) clinics in Cape Town reported only a 45.1% adherence rate to national guidelines for antimicrobial prescriptions, which clearly needs improvement. Coordinated team-based activities aimed at implementing the SAASP principles of antimicrobial use are therefore necessary. We describe one such programme in the rural Garden Route District of the Western Cape province.

**Setting**

We aimed to grow a culture of team-based AMS from the perspective of George Hospital, a 272-bed regional referral hospital, and Mossel Bay Hospital, a 90-bed district hospital, both located in the Garden Route District of the Western Cape province.
George Hospital is a level-two regional referral hospital with primary, secondary and tertiary services serving the communities of the Garden Route and Central Karoo districts, with an estimated population of 695 000 people. The facility has specialists in most clinical disciplines, six pharmacists, four operating theatres, two day theatres, outpatient departments, a critical care ward and a robust outreach and support programme for its 12 outlying district hospitals. The hospital also employs an infection prevention and control (IPC) clinical programme coordinator. The on-site National Health Laboratory Service (NHLS) laboratory had a clinical pathologist at the time of the study. There is a strong commitment to the training of undergraduate and postgraduate students from the universities of Cape Town and Stellenbosch, as well as interns, international medical students, and nursing students and allied health professionals.

Mossel Bay Hospital is a level-one, 90-bed district hospital, which serves a population of 99 319. The district hospital drains 15 PHC facilities. A stable team of medical practitioners (one clinical manager, one family physician, nine full-time and six part-time medical officers, and two community service medical officers), nursing professionals (including one IPC coordinator), pharmacists and allied health workers provide the full scope of primary care and district health services, in partnership with the specialist departments at George Hospital. The family physician, with the support of the management and clinical team, ensures continuing professional development and clinical governance activities such as morbidity and mortality meetings, and supervises family medicine registrars and medical students, thus supporting a positive learning culture.

The process

George Hospital
The experience of AMS at George Hospital has been reported in detail. This was initiated and supported by Groote Schuur Hospital (specifically, the department of internal medicine), creating awareness and persuading local leadership to prioritise resources towards establishing an AMS programme. The internal medicine department at George Hospital championed the key changes that resulted in the programme becoming embedded in the hospital’s working environment. During the initial growth period, volunteers with a health professional background from the United Kingdom (UK) helped to give the programme momentum, whilst being mentored by local clinical leaders. As part of a collaborative leadership development initiative between the Western Cape Department of Health and the Improving Global Health (IGH) through Leadership Development Programme in the UK, George Hospital has been allocated a dedicated young doctor or other health professional for six-month periods, to partake in a local systems improvement project. Since 2015, an IGH fellow has been allocated to the AMS programme. We utilised project management principles from the quality improvement model, which included several components:

- weekly dedicated AMS ward rounds, attended by multi-professional teams including doctors, nurses, pharmacists and the clinical pathologist;
- a dedicated prescription chart for antimicrobials (taken from the SAASP initiative, which developed a dedicated AMS prescription chart);
- audit tools for pharmacy, IPC and ward rounds, using free software called Epicollect5® (https://five.epicollect.net/) to collect data;
- a hospital-wide education programme incorporating principles of AMS, with small-group discussions, posters, flash cards, and an e-training module;
- monitoring and evaluation via six-monthly audits by the AMS team: standards were set and adjusted during each successive phase of the programme. Data collected
included the implementation of and attendance at the AMS ward rounds, antimicrobial consumption, quality of prescribing (correctness and completeness), use of laboratory tests and antimicrobial chart compliance.

Weekly rostered AMS ward rounds in all disciplines have now become routine. Quarterly hospital AMS committee meetings have been integrated with the IPC and Pharmacy and Therapeutics Committee (PTC) meetings and facilitate AMS data reporting to the local leadership. A facility antibiogram has facilitated the tracking of AMS metrics: local resistance patterns of organisms to antibiotics were collected and presented to the clinical and management staff by the clinical pathologist. The George Hospital AMS education programme has both an internal focus (all local staff) and an external focus (outreach and support to district hospitals).

**Mossel Bay Hospital**

At Mossel Bay District Hospital, the clinical team have been conducting weekly AMS ward rounds since 2017. During 2017 and 2018, the clinical pathologist based at George Hospital joined these ward rounds on a monthly basis (see Figure 2). In addition, he provided guidance to the clinical team via telephone, email and WhatsApp®. This guidance helped to maintain adherence to the clinical microbiology principles of rural AMS, such as obtaining appropriate clinical specimens before initiating empiric antimicrobials. Knowledge about the facility’s antimicrobial policy was regularly and clearly communicated, taking into account the stock levels of the pharmacy. Close follow-up of microbiology results requires that the attending clinicians ensure sound continuity of care within the team-based care model, through communication and handover.

A key component of AMS is the dedicated antimicrobial prescription chart (see Figure 3), designed to remind the attending clinician of correct aspects of prescribing in the setting of various infectious diseases. It assumes a central role during AMS rounds, where the team reviews the antimicrobial prescription chart for all in-patients on antimicrobials. The more comprehensively this chart is completed, the more the patient will benefit and the easier it will be to practise prudent AMS. The chart contains discrete spaces for the working diagnosis, the collection of appropriate specimens, and the need for initiating an empiric intravenous antibiotic. The chart also assists the ward team with de-escalation from intravenous to oral administration, and reviews key patient information such as allergies and renal function. Use of the AMS chart was phased in over the past three years. Initially, the focus was on using the chart for intravenous antimicrobials only, and later this included oral antimicrobials. The need for weekly AMS ward rounds and new prescription charts was introduced to the clinical team through several educational meetings. The central principle of the ward round was audit and feedback. On the hospital administration side, the availability of the prescription chart had to be ensured in the appropriate clinical areas.

The data presented in Figures 4 and 5 were collected during the weekly ward rounds. Subsequently, these data were collated by

![Figure 2: Mossel Bay Hospital multidisciplinary team during an AMS ward round. From left to right: family medicine registrar, professional nurse, family medicine registrar, community service pharmacist, family physician and clinical pathologist. Source: lead author, 2018.](image-url)
the IPC nursing coordinator and analysed by the author (KvP) using MS Excel (Microsoft Corp, Redmond, WA, USA).

Discussion

A key lesson learnt is that the success of this type of intervention relies on relationships and respect, multi-professional teamwork and a supportive environment. A critical mass of local champions showing leadership in driving regular AMS ward rounds is essential. This is often the IPC nurse, pharmacist and/or a doctor. Ongoing training is needed, especially with feedback on data collected, the local antibiogram, resistance patterns and costs. A relevant quote: ‘Everyone who works in healthcare [should] recognise that they have two jobs when they come to work every day: doing the work and improving it.’

The roles of the team members were defined as the AMS activities evolved. The IPC nursing coordinator and family physician took the lead and involved the pharmacists from the start. Different team-based models of AMS activities have been described from the perspective of which cadre should occupy the ‘driver’s seat’, including pharmacist-driven team work. However, the micro-level context of the district hospital ensures that the small team of core role players all wear multiple hats. For instance, the IPC nurse manager is also tasked with

![Figure 3: The dedicated antimicrobial prescription chart. Source: SAASP stewardship tools, 2019.](image3)

![Figure 4: Percentage of patients found to have intravenous lines during the weekly AMS ward rounds at Mossel Bay Hospital. Source: lead author, 2019.](image4)
quality assurance, such as implementing national care standards. The family physician is tasked with coordinating clinical governance, building capacity through team-based learning and supporting junior clinicians as a clinical consultant.24 These shared roles enabled us to add on activities to the core AMS programme, such as attending to perioperative care aspects (such as urinary catheters and intravenous fluids and venous thromboembolism prophylaxis) and providing clinical input in patients’ care plans (including wound care and need for surgical source control). Figure 4 provides an overview of the decline in intravenous lines found during AMS rounds, which serves as an example of the add-on effect of implementing AMS.

Current challenges include making use of standardised metrics for audit and feedback. At present, the AMS activities are reported to the quarterly PTC meeting, as well as management meetings, but a functional data management tool at Mossel Bay Hospital is needed. The newly released national guideline5 discusses implementing and measuring two levels of tiered AMS interventions, which we have started to implement, including quantitative measurement of completeness of the AMS charts (see Figure 5).

Traditionally, undergraduate medical curricula do not focus sufficiently on AMS;25,26 however, attendance at the ward rounds helped to teach the rotating UCT and SU medical students. The students actively participated and actually enhanced the efficiency of the AMS ward rounds. They thus enhanced their understanding of pharmacology and microbiology by applying theory into practice. Registrars in family medicine also benefited through growing their experience as leaders in clinical governance activities by including facilitation of the AMS rounds and meetings as part of their learning plans.27

Conclusion and recommendations

We conclude that all clinicians need to participate in and understand the principles of AMS. There should be an accountable, delineated group driving AMS at the local hospital level, ensuring regular appropriate meetings and ward rounds. Hospital management needs to provide support including specific prescription charts, facilitating dedicated time for ward rounds and meetings, and encouraging attendance by clinical staff.

Early implementation of monitoring and evaluation tools to capture data helps to drive improvements. Access to a clinical pathologist assists where there is no access to infectious disease or microbiology specialists. South African higher education institutions need to train more clinical pathologists and family physicians for the rural South African healthcare platform. Our model was successful in the strengthening of quality care for patients and provided a platform for shared and ongoing learning. Coordinated team-based activities aimed at implementing the SAASP principles are needed nationally.

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