


BMJ Open Reconsidering the nursing role in antimicrobial stewardship: a multisite qualitative interview study

Emma Kirby ¹, Alex Broom,² Kristen Overton,^{1,3} Katherine Kenny,² Jeffrey J Post,^{3,4} Jennifer Broom^{5,6}

To cite: Kirby E, Broom A, Overton K, *et al.* Reconsidering the nursing role in antimicrobial stewardship: a multisite qualitative interview study. *BMJ Open* 2020;**10**:e042321. doi:10.1136/bmjopen-2020-042321

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2020-042321>).

Received 02 July 2020

Revised 09 September 2020

Accepted 29 September 2020

ABSTRACT

Objectives This study responds to calls for greater focus on nursing roles, and the need for nursing integration within the antimicrobial optimisation agenda. The objective of this study was to explore Australian hospital nurses' views on antimicrobial resistance and antimicrobial stewardship (AMS) in a hospital setting, in order to better understand the opportunities for and challenges to integration of nursing staff in antimicrobial optimisation within hospital settings.

Design Qualitative one-on-one, semistructured interviews. Interview transcripts were digitally audio-recorded and transcribed verbatim. Data were subject to thematic analysis supported by the framework approach and informed by sociological methods and theory.

Setting Four hospitals (three public and one private), across metropolitan, regional and remote areas, in two Australian states.

Participants 86 nurses (77 females, 9 males), from a range of hospital departments, at a range of career stages.

Results Findings were organised into three thematic domains: (1) the current peripheral role of nurses in AMS; (2) the importance of AMS as a collaborative effort, and current tensions around interprofessional roles and (3) how nurses can bolster antimicrobial optimisation within AMS and beyond.

Conclusion Nursing staff are central to infection management within the hospital and are thus ideally located to enhance antibiotic optimisation and contribute to AMS governance. However, without increased interprofessional cooperation, education and integration in the AMS agenda, as well as addressing organisational/resource constraints in the hospital, the nursing role in stewardship will remain limited.

INTRODUCTION

Antimicrobial resistance (AMR) is one of the greatest global contemporary health threats,¹ as both low-income and high-income countries continue to use significantly more antimicrobials per capita than in previous decades.^{2 3} This includes suboptimal antimicrobial use in hospitals across high-income countries, where recorded rates of clinically inappropriate use range between 20% and 45%. This includes evidence of increasing use of broad-spectrum antimicrobial agents in

Strengths and limitations of this study

- Use of in-depth interviews to elicit rich data on hospital-based nurses' experiences and perspectives on antimicrobial resistance (AMR), stewardship and the optimisation agenda.
- Qualitative data are critical to better understand a range of professional's views on antimicrobial use and resistance, including the missed opportunities for meaningful nursing contributions to optimising antimicrobials in the hospital setting.
- Qualitative data hold significant potential for improving understanding of the potential of professional expertise in enhancing existing antimicrobial stewardship (AMS) programmes.
- This study is exploratory in nature and professionals' experiences and perspectives on AMR and AMS may differ across settings/contexts.
- The Australian healthcare system has considerable variability across contexts and geographical settings, and the issues and challenges across the settings are difficult to completely capture in a small qualitative sample.

hospitals in multiple countries.⁴⁻⁶ Optimising the use of currently available antimicrobials will not only allow *time* for the development of new alternatives but will also protect the *integrity* of still-viable antimicrobial options.⁷⁻⁹ In response, antimicrobial stewardship (AMS) programmes (sometimes referred to as ASPs) have been established and promoted in Australia and internationally as a way to improve judicious use of antimicrobials. While AMS initiatives often espouse a multidisciplinary approach,¹⁰ there has been relatively little research examining the experiences of hospital-based nursing staff beyond infection prevention and control. This paper, in response to increasing recognition of the need for engagement of nurses within the antimicrobial optimisation agenda, contributes to a growing body of work focused on better understanding the challenges for



© Author(s) (or their employer(s)) 2020. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

Correspondence to

Dr Emma Kirby;
emma.kirby@unsw.edu.au

integrating nursing expertise within this critical multidisciplinary context.

Background

AMS within hospitals

In the past decade, a range of clinical governance programmes aimed at optimising hospital antimicrobial use have been developed under the umbrella term of AMS.^{11–13} While strategies vary across local and clinical contexts, there is growing evidence that effective ASPs decrease unnecessary antimicrobial use and thus contribute to the slowing the emergence of AMR.^{14 15} ASPs commonly include restrictive and persuasive strategies and activities¹⁶—several of which are well suited to nursing roles—for example, ensuring appropriate dosing, alignment with therapeutic guidelines for common conditions and reporting of adverse events.^{16 17} While nurses are well-positioned to shape judicious antimicrobial use,¹⁸ the place of nursing within the optimisation agenda is not clearly articulated, nor is the impact of nurses on AMS clearly understood.^{17 19} Various AMS guidelines have been developed, internationally, that highlight the need for all healthcare professional groups to be actively engaged in strategies and initiatives aimed at reducing resistance.^{20 21} Nurses' professional involvement and active participation in ASPs is thus a source of untapped potential in securing the success of such programmes.¹⁴

Nursing and AMS: possibilities and opportunities

Despite the relative lack of research attention on nursing and antimicrobial optimisation, recent studies have underscored the less visible aspects of everyday work already done by nurses to influence antimicrobial prescribing and use within hospitals.^{22–24} Nurses' presence on the ward and their responsibilities for patient monitoring and advocacy highlight their relevance in terms of detection and documentation of changes to a patient's condition.^{17 23 25} Research has revealed the instrumental roles played by nurses in communication and management of antimicrobials, for example, in prompting, reminding, checking and querying prescribers' decisions. Nurses have been shown to hold considerable potential for optimising use, particularly in monitoring the choice of antimicrobial, the timing and duration of use and dosage.^{24 26} The close working relationship nurses have with doctors ideally positions them to affect change, as has been shown in infection management within the hospital.^{27 28} Moreover, nursing has a demonstrated record of implementing improvements in infection prevention practices through education, quality and safety initiatives.^{14 27 28}

Barriers to nursing integration: knowledge, professional jurisdictions and social dynamics

Although the potential for nursing to inform and advance AMS activities seems clear, recent research has identified numerous barriers that impede such involvement, including limited integration in training regarding AMS, interprofessional jurisdictional issues and enduring

hierarchical power relations within the hospital.^{19 29} A lack of full integration of AMS into formal nursing education has also been cited as one factor that can limit nurses' knowledge of AMR and engagement in AMS implementation.^{19 30 31} In a recent survey of Australian hospital nurses, more than half rated their antimicrobial-related knowledge as limited or minimal.²³ Another factor is the lack of clarity around the role of nursing in antimicrobial decision-making and 'medical prescribing', with nurses often situated as ancillary to medical and pharmacy expertise and authority.^{17 24 32} Monsees *et al*, for example,²² found that nursing involvement in AMS was often viewed as interfering with the decisions of (medical) prescribers. Such research points to how professional dynamics are inherent to practice, and serves as a reminder of the on-going significance of addressing professional relations and hierarchies in implementing practice change around key issues such as antimicrobial misuse.^{24 26 33} This includes how doctor's authority around decision-making may impede the willingness of nurses to question or talk about antimicrobial decisions and use within health settings.^{26 29 34–36}

METHODS

The analysis reported below is part of a broader qualitative programme of research designed to explore professionals' experiences and perspectives of antimicrobial use, practice and optimisation within the broader issues of AMS and AMR across four structurally and geographically different hospitals in two Australian states.³⁶ The objective of this paper was to gain a comprehensive understanding of hospital-based nurses' perspectives and experiences of antimicrobial use, resistance and stewardship. Drawing on interpretive approaches to research design, data collection and analysis, we used qualitative, semistructured individual face-to-face interviews, across four hospitals, including: a remote hospital (<100 beds), regional hospital (<200 beds), tertiary capital city hospital (<500 beds) and a regional private hospital (<200 beds). The metropolitan and regional public hospitals had specialist infectious diseases services and developed AMS programs, all hospitals had dedicated AMS pharmacists, and the metropolitan hospital used additional computer software to monitor and support antimicrobial prescribing decisions and AMS program activities. In Australia, as in many high-income countries, there are formal requirements for hospitals to have strategies in place to optimise antimicrobial usage. Every hospital must have a functioning AMS program as a requirement for national accreditation.³⁷

A purposive sampling strategy was used to gain representation from a range of institutions, departments and levels of experience. We approached, via email, all nurse unit managers (NUMs) working in departments regularly involved in infection management at each hospital, to request their participation in the study. NUMs (from departments who expressed an interest in participating

in the research) were provided with information sheets (some hard copy, some via email) containing details about the aims of the study, what participation involved and the researchers' contact details, and they in turn provided them to nursing staff within their departments. Nurses volunteered by contacting the research team or by adding their name to a convenient timeslot within scheduled fieldwork periods that were circulated by the research team. Participants were interviewed in a private space within each hospital, either during work hours, during breaks, or immediately before or after shifts.

Semistructured interviews, lasting between 20 and 60 min, were conducted by four research team members (three females, one male, all university-based sociologists from Anglo-Australian backgrounds, experienced in qualitative interviewing) between 2014 and 2019. Participating nurses worked within a range of departments and had various levels of experience and seniority (table 1 includes detailed participant characteristics). Following written informed consent, interviews were digitally audio-recorded and transcribed in full. An interview guide, informed by the existing literature, and the authors' previous experience in the field, was used during the semistructured interviews, which focused on the following domains: accounts of the significance of AMR and use in everyday nursing work, the nursing role in antimicrobial decisions, interprofessional dynamics around antimicrobial use and nurse's experiences and knowledge of ASPs in the hospital context.

Patient and public involvement

It was not appropriate or possible to involve patients or the public in this work.

Analysis

Data were analysed and systematically coded using the framework approach,³⁸ and organised using QSR NVivo V.11 computer software. This approach to thematic analysis included the following steps: (1) familiarisation—in which the researchers reviewed the manuscripts; (2) identification of the framework—key themes and issues identified around which the data were organised; (3) indexing—application of themes to text; (4) charting—use of headings and subheadings to build up a picture of the data as a whole and (5) mapping and interpretation—in which associations were clarified and explanations worked towards.³⁸ Once themes and codes had been established, the final stage of analysis involved checking and discussing the data interpretation among the academic and clinical research team members. Independent coding of the data was provided initially by members of the research team (KO, EK and KK), which was then cross-checked to facilitate the development of themes (KO, EK, KK, AB and JB), moving towards an overall interpretation of the data. Following several rounds of analysis, the researchers agreed that data saturation had been reached—namely, we reached the point when no new themes were identified relating

Table 1 Sample characteristics for interviews (n=86)

Characteristic	Number of participants (%)
Care setting	
Public	67 (78)
Private	19 (22)
Location	
Remote	15 (17)
Regional	49 (57)
Metropolitan	22 (26)
Seniority	
Senior (>10 years experience)	60 (70)
Mid-career (5–10 years experience)	17 (20)
Junior (<5 years experience)	9 (10)
Role	
RN	54 (62)
Nurse practitioner	2 (2)
Clinical nurse consultant	10 (9)
Clinical nurse educator	4 (5)
Nurse unit manager	10 (9)
Management/education roles (RN trained)	6 (7)
Specialty	
Anesthetics	4 (5)
Cancer outreach	1 (1)
Cardiology	9 (10)
Emergency	2 (2)
General medicine	15 (17)
Gynecology/obstetrics	4 (5)
Intensive care	5 (6)
Infectious diseases	3 (3)
Oncology/hematology	4 (5)
Pediatrics	3 (3)
Patient safety/clinical improvement	2 (2)
Plastics	1 (1)
Rehabilitation	2 (2)
Respiratory	15 (17)
Surgery	16 (19)
Gender	
Male	9 (10)
Female	77 (90)

RN, registered nurse.

to the focal areas of study.^{38 39} Verbatim transcriptions were used to preserve the accuracy of the original data. Analytic rigour was enhanced by searching for negative, atypical and conflicting or contradicting cases in coding and theme development. Several research team members were integrated into the final analysis, including clinical

Table 2 Indicative quotations: nursing inclusion/exclusion in AMS

Participant	Indicative quotation
RN, regional hospital	I've seen that written on a chart, 'ID approval' or on the boxes. I've seen the posters up for that antimicrobial thing [AMR] but I don't know what it is.
Clinical nurse educator, metropolitan hospital	One of the ID doctors came and I stayed with them and did part of the audit with them and only then did I realise we have access to [AMS/antimicrobial computer program].
NUM, metropolitan hospital	All of a sudden the antibiotics were taken off the ward and they kept saying that they need approval and we were like, 'Why do they need approval?' and things had changed and we weren't fully informed. This all happens very quickly. We did get education very quickly and we understood it then, but the nurse's role was really important in that because if we're looking at charts and we're administering things for patients we need to know why and what's this all about and what affect that antibiotic can have on the patient, even the side-effects, the uses, and the amount we're giving them, all of those things. We can't just be blindly giving stuff to patients and I think nurses do have a pivotal role.
RN, metropolitan hospital	Can we access it [AMS program]? I don't even know'.
RN, regional hospital	If I don't know what optimal is, I can't identify sub-optimal...
RN, regional hospital	I think we could possibly increase our knowledge... of the antibiotics and what we're using them for and making sure we are aware of the antimicrobial stewardship...so that we are thinking more about it.
NUM, metropolitan hospital	...empowering those health professionals to be able to speak up...[and] through actually developing their knowledge and I think that's really important. ... I think nurses need to be more educated and I think we should be able to speak up more.

AMS, antimicrobial stewardship; NUM, nursing unit manager; RN, registered nurse.

infectious diseases specialists (JB and JP). The Standards for Reporting Qualitative Research guidelines were used to ensure comprehensive reporting.⁴⁰

RESULTS

Participants

The sample consisted of 86 nurses, from a variety of departments and with a range of levels of experience (see [table 1](#) for details). We heard in-depth accounts of everyday practice, including how participants felt about their level of knowledge, access to information and education and role in AMS vis-a-vis other professional disciplines. Three main themes were derived from the analysis: (1) nursing knowledge and inclusion/exclusion in AMS initiatives; (2) interprofessional contributions to AMS as a collaborative effort and (3) perspectives on the potential role of nursing expertise in antibiotic and AMS. The themes are supported by qualitative excerpts from the interviews (see [table 2](#)); at times we also refer to the number or proportion of participants represented within each theme. These are not intended to be interpreted as statistically significant, but rather to give a sense of the proportion of participant accounts, interpreted through our analysis, which support each point.³⁶ While our thematic analysis was not designed to offer comparison between sites, departments or levels of experience, we were careful to note overall patterns within the data. Experiences were, for the most part, consistent according to sites and across departments, with three notable exceptions: first, the remote hospital nurses were more conscious of context-specific scenarios within their hospital, and the consequential

need for context-appropriate AMS activities and guidelines. Second, nurses in the private hospital positioned control and authority over antimicrobials as more heavily weighted towards doctors than in other settings. Third, junior or less experienced nurses, were, overall, less confident in their knowledge around AMS, and in their capacity to challenge doctors' or other professionals' decisions.

Nursing inclusion/exclusion in AMS: knowledge, information and integration

All participants gave detailed descriptions of their roles and experiences within the hospital, and their centrality in processes of administering and managing medications for patients. Yet, although participants felt considerable responsibility for direct patient care, the links between patient care and AMS were less clear. Many participants flagged their lack of inclusion in AMS activities in their hospital. This was most evident in accounts of uncertainty and curiosity around new protocols for restrictions and approvals of particular antimicrobials (see [table 2](#)). But rather than reflecting a lack of nursing knowledge, when read in the broader context of the interview data, these accounts are indicative of the lack of effective communication around the overall goals of AMS and integration of nurses in implementation. While there was a presence of general AMS-related and AMR-related messaging (eg, through posters), the meanings of acronyms and the messages behind them were not well recognised. This was further reflected within the interviews in the sense that ASPs were not designed *for nurses*, and we heard several queries or requests for clarification.

More than half of the participants felt that they received little in the way of formal AMS education, or information regarding local ASPs. Moreover, several participants, across hospital sites, described the knowledge and information that they had gleaned about AMS as reactive, indirect or incidental, as shown in the excerpts in [table 2](#). These excerpts highlight the difficulties nurses encountered in feeling excluded from education about new prescribing policies. The desire for more education to facilitate upskilling around AMS strategies was evident across the interviews, and was articulated as a necessary step towards empowering all healthcare disciplines to participate effectively in collaborative AMS. We also heard frequent accounts from participants who felt (partial) responsibility for optimising use and ensuring patient safety, but also felt a lack of authority in terms of prescribing. While knowledge was identified as one necessary element of AMS, so too was being empowered enough to ‘speak up’ so that AMS could be more of a team effort.

A team effort? Interprofessional collaboration versus AMS as ‘adding to’ nursing work

Although the vast majority of participants expressed a desire for greater inclusion in local ASPs, a range of institutional and bureaucratic issues was flagged in the interviews. The relationships between medicine, nursing

and pharmacy were discussed at length, particularly in relation to relative contributions, power and how social dynamics work ‘in practice’. A key tension emerged, between the desire for nursing inclusion and better integrated opportunities to contribute to AMS, and the additional workload for nurses that AMS entailed in practice (see [table 3](#)). Several participants described similar sentiments, including the deleterious effects of AMS in practice for nursing workloads. Indeed, the majority of participants’ described the double burden of AMS for nursing: both a lack of consultation or inclusion in ASPs, and additional work imposed on nurses by AMS procedures. Moreover, participants talked about the responsibility on nurses to ‘push back’ against other professionals because of AMS-related procedures, as part of their role as patient advocate. This was most evident in procedures designed to restrict/limit the overuse of certain antimicrobials.

There was a broad awareness of the need to be familiar with new bureaucratic processes for restricted antimicrobial approvals, yet this was often confounded by the lack of education or involvement in the purpose of such practices, as discussed above. We heard several accounts of nurses taking on new responsibilities in interprofessional relationships. One example was the additional (nursing) work of ensuring doctors correctly completed

Table 3 Indicative quotations: a team effort?

Participant	Indicative quotation
CNC, metropolitan hospital	I think what works well is being able to work closely, particularly with the registrars and advanced trainees. They are brilliant. To be able to talk to them or work closely with the ID regs and advanced trainees, I think that’s real helpful....It’s back to that relationship...
CNC, metropolitan hospital	I know they [AMS Team] round weekly... You don’t round with them. They don’t interact with you. They basically go through and stand in a huge cluster and then you can’t get through. That’s when you know that they’re around...They just take up the whole thing and you’re like, “What the hell?” and you can’t get through. Then you know that they’re around because then your drugs change and you’ve got to – You thought you were giving something and then you’re not and then you’ve got other things ordered up and so you’ve got to get those up quickly.
RN, metropolitan hospital	Pharmacy will only dispense one dose if the approval is not put in. So, if the doctor doesn’t follow-up on that and then it’s after hours then we can’t get our hands on this antibiotic.... If the approvals not done, we’re missing so then we’re trying to chase someone up or called the on-call pharmacist in and then the patient is missing their doses. So that can be a little bit annoying.
RN, regional hospital	Because that’s what pharmacy do, they just give you two doses that you’re allowed and then say ‘No you’re not having anymore’ and then that’s jeopardising the patient. So that’s why we end up pushing.
CNC, metropolitan hospital	The ward pharmacists would document ‘Needs ID approval’, on the medication chart...I think time probably has a big factor in it, time management. Say, if you’re on a night shift you don’t want to deprive a patient an antibiotic just because it’s not approved.
RN, regional hospital	Supply on a weekend, things that are authorised, we have to be authorised and we can’t get anyone to authorise it on a weekend after hours so then you go and beg, borrow and steal from places that you know have it.
CNE, metropolitan hospital	The less drugs we give, the less work my nurses have to do that are pointless...So, if we can cut them down, that’s fantastic.

CNC, clinical nurse consultant; CNE, clinical nurse educator; RN, registered nurse.

Table 4 Indicative quotations: optimising nursing influence

Participant	Indicative quotation
RN, metropolitan hospital	We ask them [doctors] about it. We ask them [doctors] why they're [patient's] on it. I think there's a pretty good culture of being an advocate for the patient and not being scared to question something that a doctor prescribed.
CNC, remote hospital	All nurses, as individuals, have that responsibility that says, 'If you're going to administer a medication, you know that it's the right medication for that circumstance' ...and be able to say at rounds or at handover or whatever, 'Can we have a look at this? Should we be moving to oral antibiotics? Is this the best thing?' looking up results and all of those sorts of things.
CNC, metropolitan hospital	The amount of times we pull up, 'Why are they on this dose? That doesn't make sense.' We get to know the kind of typical and atypical antibiotics that we're using and we talk to each other a lot and we very much get involved in thinking, 'Well does that make sense?' ... if we don't understand we always question and we push back. We're not robots. We don't just hand out everything that's written on a piece of paper.
CNE, metropolitan hospital	But with antibiotics it's kind of as per doctor... we don't have any authority to challenge, I guess. Challenge is probably the wrong word, but it's out of our scope of expertise when it comes to actually the length of it...That's the issue that we have sometimes is that it's ultimately up to the doctor's choice.
Manager, metropolitan hospital	In an organisation like this, I'm very much a support person. I don't have power over people. I'm the manager. I try and facilitate and support and I think when you're trying to change this kind of practice, strong clinical leadership and just the persistence of it is what matters.
RN, metropolitan hospital	I think the key to making a difference is getting the governance system right, the resourcing system right, the monitoring system right, the behavioural change, giving people feedback on their practices.

CNC, clinical nurse consultant; CNE, clinical nurse educator; RN, registered nurse.

authorisation processes, to avoid delays in administering medication. A majority (55/86) of participants described informal practices they felt no choice but to employ, to bypass what they viewed as cumbersome AMS procedures or to 'manage' acute scenarios, particularly overnight, or out of hours. There was widespread acknowledgement that AMS in practice imposed additional work for nurses, but we also heard accounts that highlighted the benefits of optimising antimicrobial use for nursing work.

Optimising nursing influence: patient advocacy, duty and responsibility

The final theme derived from our analysis was around participant views on the role of nursing in AMS, and the alignment of nursing identity with AMS. Discussion within the interviews included perspectives on the relative responsibility of nursing in optimising practice. While the majority of participants viewed optimising prescribing as beyond the remit or responsibility of nurses, it was clear that nursing values and expertise around patient advocacy and best practice represented a significant (potentially untapped) resource for AMS. We heard accounts from 76 participants of how nurses' patient advocacy influenced (and improved) everyday practice (see indicative quotations in table 4). Some of the more senior or experienced participants went further, stressing the duty and responsibility of nurses to advocate for patients. Others, as shown in table 4, described the need for nurses to question, push back and improve understanding.

These accounts also point to the complicated inter-professional jurisdictions in terms of authority for antimicrobials within the hospital. Participants discussed doctors as responsible for antimicrobials in terms of expert knowledge or liability, and with ultimate authority over decision-making. Pharmacists were described as responsible in terms of expertise, monitoring suboptimal use and enforcing guidelines. Nurses positioned themselves most commonly as also responsible for best practice, as team players, and patient advocates. Thus, even though participants frequently felt a lack of control around AMS strategies, they recognised the need to play a crucial role. A small number of participants discussed issues of leadership, with some pointing to the broader institutional responsibilities for AMS. Such accounts tied together issues of responsibility, jurisdiction, collaboration and inclusion in making meaningful improvements in practice.

DISCUSSION

Despite calls to better-integrate nurses in antimicrobial optimisation,^{25 41} to date there has been limited qualitative research, particularly in Australia, that explores nurses' own in-depth accounts of their roles and experiences within the optimisation agenda.^{24 41 42} This large study, encompassing multiple institutional contexts, provides important insights into interprofessional and collaborative dynamics and jurisdictional issues in AMS in hospital settings.⁴³ Our findings reveal several barriers to

nursing inclusion in AMS, including: a lack of input into AMS strategies/ASPs, limited authority to enact formal change, a lack of empowerment in terms of interprofessional roles and teamwork and a lack of clarity around the roles and responsibilities of nursing within new AMS-driven procedures.¹⁹ It was clear from the interviews that participating nurses wanted to know more, to learn more and to be more involved and included in AMS. Yet, the majority of nurses felt peripheral to AMS practice, as well as (and relatedly) inconvenienced and burdened by the additional work it represented.

Our qualitative study aligns with survey data from the Australian and New Zealand contexts that highlight the considerable and untapped potential of nurses to contribute to AMS.^{23 30} Our findings also extend previous work in other settings, pointing to the unrecognised and underused role of nurses in governing antimicrobial usage, including leadership within ASPs.^{44 45} As we have shown here and elsewhere,^{24 25} the significance of nurses' (seemingly informal) involvement and contributions to the broad improvement of practice in antimicrobial use is substantial. However, our findings serve as a reminder of the challenge of incorporating AMS into nursing workflow without simply attributing additional duties and responsibilities to nurses.^{18 19}

Our study thus adds to call for renewed emphasis on interprofessional cohesion, collaboration and the promotion of awareness of antimicrobial optimisation across all health professional groups.^{13 43 46} Integral to this focus must be recognition and acknowledgement of the work already done by nurses that may informally or indirectly contribute to judicious antimicrobial practice, and that currently lacks visibility within formal AMS strategies. Moreover, our findings highlight nursing roles, values and identities as ideally and uniquely situated for AMS. As Olans and colleagues¹⁸ (p62) note: 'many daily nursing activities are intrinsically interwoven into the fabric of antimicrobial stewardship'. The imperative to better integrate nurses into AMS, including reorienting programmes towards collective endeavour and patient advocacy, is gaining considerable traction.^{20 22 47 48} Our findings suggest that nurses who feel included, encouraged and valued in their contributions will be better positioned to enact (further) positive change.^{41 48–50}

The potential roles for nurses in AMS are considerable, including but not limited to, educating patients, communicating with and managing other staff, assessment, monitoring and review of prescriptions, durations, dosage, and initiating antimicrobials for septic patients, and initiating intravenous to oral switch.⁵¹ However, meaningful integration of nursing can only be achieved through inclusion and empowerment. It is not simply enough to add to the duties of nurses; it is vital that nursing staff feel part of the AMS agenda, and that their contributions are valued and recognised within multidisciplinary teams.^{18 50} Programmes that encourage collaborative decision-making, including between medical and nursing staff, may facilitate improved relationships and capacity to add value to existing AMS

activities.⁵² Fostering interprofessional relationships and a culture wherein AMS is viewed as a collective endeavour and as the responsibility of all professionals is vital.⁴³ AMS must resonate with existing identity work across professionals. Targeting optimisation to nurses' sense of identity, as patients advocates, is epistemologically consistent, and potentially beneficial for all professionals, yet also will challenge some existing power dynamics. Thus, it is crucial that ASPs afford collaborative authority to a range of professional groups, rather than working within the lines of authority of existing interprofessional dynamics.^{26 36}

Limitations

Our study has various limitations. The sample size, while large for a qualitative study, is limited to the accounts of self-selected nurses from four Australian hospitals. These accounts may in turn be shaped by the organisational or cultural context of the setting. Therefore, the findings cannot be transferred to other experiences in other settings, despite providing important themes and theoretical insights likely to have resonance in other contexts. The study was also conducted over a 5-year period, during which various AMS policies, organisational structures and context have evolved (we note here that we reviewed each hospital's AMS structure and staffing prior to submission of the article, and found only small staffing changes (eg, AMS staffing per hospital has grown by less than 2 FTE positions across medicine, nursing and pharmacy)). We also note that AMS accreditation standards are evolving in Australia, with the development and recent assessment against a clinical care standard around antimicrobial use³⁷). Further international multisite qualitative studies, particularly in resource-limited settings, including group-based designs to capture dynamics across individuals and professions, would be valuable in further informing antimicrobial optimisation strategies.

CONCLUSION

As frontline staff in inpatient care, nursing engagement in AMS presents considerable yet currently underused opportunities. Nursing identity is well aligned with stewardship identity, and thus significant missed opportunities currently exist for nurses to contribute to practice, education, research and policy efforts to reduce AMR. These missed opportunities exist largely because of interprofessional power imbalances within the social world of the hospital.³⁴ Expanding AMS to better empower nurses is crucial to ongoing attempts to curb the threat of AMR by improving judicious use of antimicrobials.^{22 23 50 52} Moreover, improving our understanding of the experiences of nurses will enable meaningful improvements in AMS activities through contributing interdisciplinary knowledge and expertise and leveraging nursing skills and expertise.^{22 23 52}

Author affiliations

¹Centre for Social Research in Health, University of New South Wales, Sydney, New South Wales, Australia

²School of Social and Political Sciences, University of Sydney, Sydney, New South Wales, Australia

³Department of Infectious Diseases, Prince of Wales Hospital and Community Health Services, Randwick, New South Wales, Australia

⁴Prince of Wales Clinical School, University of New South Wales, Kensington, New South Wales, Australia

⁵Department of Infectious Diseases, Sunshine Coast University Hospital, Birtinya, Queensland, Australia

⁶School of Medicine, The University of Queensland, Brisbane, Queensland, Australia

Twitter Emma Kirby @DrEmmaKirby and Katherine Kenny @kennykatherine

Acknowledgements This study was supported by the Australian Research Council, Sunshine Coast Hospital and Health Service, Prince of Wales Hospital Foundation, the Prince of Wales Hospital, the Australasian Society for Infectious Diseases, the Australian Society for Antimicrobials and the Australian Commission for Safety and Quality in Health Care. We also thank the participants who voluntarily gave their time to offer their considerable insights for this study.

Contributors All authors meet the ICMJE criteria for authorship. AB, JB, EK, KK and JJP conceived of and designed the studies. KO, EK, AB, KK, JB and JJP analysed and interpreted the data. KO, EK and AB drafted the article. All authors contributed to the development and refining of the article, and approved the final submitted version.

Funding This work was funded by Australian Research Council Linkage Grants (LP140100020 and LP170100300) and the Prince of Wales Hospital Foundation.

Disclaimer The funding bodies were not involved in the study design, analysis or write-up.

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval This research was performed in accordance with the World Medical Association's Declaration of Helsinki (2013, seventh revision), and adheres to Australia's National Health and Medical Research Council's National Statement on Ethical Conduct in Human Research (2007, updated 2018). Ethical approval for this study was given by the participating Hospital and Health Service ethics committees, The Prince Charles Hospital Human Research Ethics Committee (HREC/15/QPCH/50, HREC/18/QPCH/138), South East Sydney Local Health District Human Research Ethics Committee (HREC/15/POWH/246), Queensland Health, Central Office Committee Human Research Ethics Committee (HREC12/QHC/38) and UnitingCare Health Human Research Ethics Committee (2015.28.171). Written informed consent was obtained from all participants.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request. Data are available by contacting the authors, for researchers who meet the criteria for access to confidential data. Ethics approval for this project does not include provision for making full interview transcript data publicly available, so as to preserve participant anonymity. Ethics clearance for the project limits transcript access to only members of the research team. Data will be made available for researchers who meet the criteria for access to confidential data. Requests for data access can be made to the corresponding author.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iD

Emma Kirby <http://orcid.org/0000-0001-9754-0342>

REFERENCES

- 1 Prestinaci F, Pezzotti P, Pantosti A. Antimicrobial resistance: a global multifaceted phenomenon. *Pathog Glob Health* 2015;109:309–18.
- 2 Center for Disease Dynamics Economics & Policy (CDDEP). *State of the World's Antibiotics*, 2015. Washington, D.C.: CDDEP, 2015.
- 3 World Health Organization. Report on surveillance of antibiotic consumption, 2019 Retrieved from. Available: <https://www.who.int/medicines/areas/rationaluse/oms-amr-amc-report-2016-2018/en/>
- 4 National Centre for Antimicrobial Stewardship and Australian Commission on Safety and Quality in Health Care (NCAS & ACQSHC). Antimicrobial prescribing practice in Australian hospitals: results of the 2018 *Hospital National Antimicrobial Prescribing Survey*. In: . Sydney: ACSQHC, 2020.
- 5 European Centre for Disease Prevention and Control. *Antimicrobial consumption in the EU/EEA, annual epidemiological report for 2018*. Stockholm: ECDC, 2019.
- 6 Zarb P, Goossens H. European surveillance of antimicrobial consumption (ESAC): value of a point-prevalence survey of antimicrobial use across Europe. *Drugs* 2011;71:745–55.
- 7 Cassady KA, Newland JG, Saiman L. Encouraging antibiotic development and endorsing conservation: tandem approaches to our declining antibiotic reserves. *Infect Control Hosp Epidemiol* 2016;37:366–7.
- 8 World Health Organization. Antimicrobial resistance, 2018a Retrieved from. Available: <http://www.who.int/mediacentre/factsheets/fs194/en/>
- 9 World Health Organization. Antimicrobial stewardship: a competency-based approach, 2018b Retrieved from. Available: <https://openwho.org/courses/AMR-competency>
- 10 Charani E, Castro-Sánchez E, Holmes A. The role of behavior change in antimicrobial stewardship. *Infect Dis Clin North Am* 2014;28:169–75.
- 11 Charani E, Cooke J, Holmes A. Antibiotic stewardship programmes--what's missing? *J Antimicrob Chemother* 2010;65:2275–7.
- 12 Cooke FJ, Holmes AH. The missing care bundle: antibiotic prescribing in hospitals. *Int J Antimicrob Agents* 2007;30:25–9.
- 13 Toth NR, Chambers RM, Davis SL. Implementation of a care bundle for antimicrobial stewardship. *Am J Health Syst Pharm* 2010;67:746–9.
- 14 Manning ML, Pfeiffer J, Larson EL. Combating antibiotic resistance: the role of nursing in antibiotic stewardship. *Am J Infect Control* 2016;44:1454–7.
- 15 Levy Hara G. Antimicrobial stewardship in hospitals: does it work and can we do it? *J Glob Antimicrob Resist* 2014;2:1–6.
- 16 Davey P, Davey P, Marwick CA, et al. Interventions to Improve Antibiotic Prescribing Practices for Hospital Inpatients. *Cochrane Database Syst Rev*. 2017;2(2):CD003543. Published 2017.
- 17 Olans RD, Nicholas PK, Hanley D, et al. Defining a role for nursing education in staff nurse participation in antimicrobial stewardship. *J Contin Educ Nurs* 2015;46:318–21.
- 18 Olans RD, Olans RN, Witt DJ. Good nursing is good antibiotic stewardship. *Am J Nurs* 2017;117:58–63.
- 19 Abbas S, Lee K, Pakyz A, et al. Knowledge, attitudes, and practices of bedside nursing staff regarding antibiotic stewardship: a cross-sectional study. *Am J Infect Control* 2019;47:230–3.
- 20 Dellit TH, Owens RC, McGowan JE, et al. Infectious diseases Society of America and the Society for healthcare epidemiology of America guidelines for developing an institutional program to enhance antimicrobial stewardship. *Clin Infect Dis* 2007;44:159–77.
- 21 Centre for Disease Control and Prevention (CDC). *Core elements of hospital antibiotic stewardship programs*. Atlanta, GA: CDC, 2014 Retrieved from. <http://www.cdc.gov/getsmart/healthcare/implementation/core-elements.html>
- 22 Monsees EA, Tamma PD, Cosgrove SE, et al. Integrating bedside nurses into antibiotic stewardship: a practical approach. *Infect Control Hosp Epidemiol* 2019;40:579–84.
- 23 Mostaghim M, Snelling T, McMullan B, et al. Nurses are underutilised in antimicrobial stewardship – Results of a multisite survey in paediatric and adult hospitals. *Infect Dis Health* 2017;22:57–64.
- 24 Broom A, Broom J, Kirby E, et al. Nurses as antibiotic Brokers: institutionalized praxis in the hospital. *Qual Health Res* 2017;27:1924–35.
- 25 Gillespie E, Rodrigues A, Wright L, et al. Improving antibiotic stewardship by involving nurses. *Am J Infect Control* 2013;41:365–7.
- 26 Charani E, Castro-Sanchez E, Sevdalis N, et al. Understanding the Determinants of Antimicrobial Prescribing Within Hospitals: The Role of "Prescribing Etiquette". *Clinical Infectious Diseases* 2013;57:188–96.
- 27 Durant DJ. Nurse-driven protocols and the prevention of catheter-associated urinary tract infections: a systematic review. *Am J Infect Control* 2017;45:1331–41.
- 28 Moore WR, Vermuelen A, Taylor R, et al. Improving 3-hour sepsis bundled care outcomes: implementation of a Nurse-Driven sepsis protocol in the emergency department. *J Emerg Nurs* 2019;45:690–8.
- 29 Monsees E, Goldman J, Popejoy L. Staff nurses as antimicrobial stewards: an integrative literature review. *Am J Infect Control* 2017;45:917–22.
- 30 Padigos J, Ritchie S, Lim AG. Enhancing nurses' future role in antimicrobial stewardship. *Collegian* 2020.

- 31 Courtenay M, Castro-Sánchez E, Gallagher R, *et al.* Development of consensus-based international antimicrobial stewardship competencies for undergraduate nurse education. *J Hosp Infect* 2019;103:244–50.
- 32 Greendyke WG, Shelley AN, Zachariah P, *et al.* Exploring prescriber perspectives toward nurses' active involvement in antimicrobial stewardship: A qualitative study. *Infect. Control Hosp. Epidemiol.* 2019;40:1184–7.
- 33 Lorencatto F, Charani E, Sevdalis N, *et al.* Driving sustainable change in antimicrobial prescribing practice: how can social and behavioural sciences help? *J Antimicrob Chemother* 2018;73:2613–24.
- 34 Broom A, Broom J, Kirby E. Cultures of resistance? A Bourdieusian analysis of doctors' antibiotic prescribing. *Soc Sci Med* 2014;110:81–8.
- 35 Broom A, Broom J, Kirby E, *et al.* The social dynamics of antibiotic use in an Australian hospital. *Journal of Sociology* 2016;52:824–39.
- 36 Broom J, Broom A, Kirby E. The drivers of antimicrobial use across institutions, stakeholders and economic settings: a paradigm shift is required for effective optimization. *Journal of Antimicrobial Chemotherapy* 2019.
- 37 Australian Commission on Safety and Quality in Health Care (ACSQHC). *Antimicrobial Stewardship in Australian Health Care 2018*. Sydney: ACSQHC, 2018 Retrieved from: <https://www.safetyandquality.gov.au/our-work/clinical-care-standards/antimicrobial-stewardship-clinical-care-standard>
- 38 Pope C, Mays N. *Qualitative Research in Health Care*. Hoboken, NJ: BMJ Books, 2013.
- 39 Malterud K, Siersma VD, Guassora AD. Sample size in qualitative interview studies. *Qual Health Res* 2016;26:1753–60.
- 40 O'Brien BC, Harris IB, Beckman TJ, *et al.* Standards for reporting qualitative research: a synthesis of recommendations. *Acad Med* 2014;89:1245–51.
- 41 Van Bogaert P, Peremans L, Diltour N, *et al.* Staff nurses' perceptions and experiences about structural empowerment: a qualitative phenomenological study. *PLoS One* 2016;11:e0152654–14.
- 42 Carter EJ, Greendyke WG, Furuya EY, *et al.* Exploring the nurses' role in antibiotic stewardship: a multisite qualitative study of nurses and infection preventionists. *Am J Infect Control* 2018;46:492–7.
- 43 Courtenay M, Lim R, Castro-Sanchez E, *et al.* Development of consensus-based national antimicrobial stewardship competencies for UK undergraduate healthcare professional education. *J Hosp Infect* 2018;100:245–56.
- 44 Monsees E, Popejoy L, Jackson MA, *et al.* Integrating staff nurses in antibiotic stewardship: opportunities and barriers. *Am J Infect Control* 2018;46:737–42.
- 45 Olans RN, Olans RD, DeMaria A. The Critical Role of the Staff Nurse in Antimicrobial Stewardship--Unrecognized, but Already There. *Clin Infect Dis* 2016;62:84–9.
- 46 Edwards R, Drumright L, Kiernan M, *et al.* Covering more Territory to fight resistance: considering nurses' role in antimicrobial stewardship. *J Infect Prev* 2011;12:6–10.
- 47 Sumner S, Forsyth S, Collette-Merrill K, *et al.* Antibiotic stewardship: the role of clinical nurses and nurse educators. *Nurse Educ Today* 2018;60:157–60.
- 48 Chater A, Family H, Lim R, *et al.* Influences on antibiotic prescribing by non-medical prescribers for respiratory tract infections: a systematic review using the theoretical domains framework. *J Antimicrob Chemother* 2020. doi:10.1093/jac/dkaa335. [Epub ahead of print: 07 Aug 2020].
- 49 Slack SM, Boguslawski JM, Eickhoff RM, *et al.* Shared decision making: empowering the bedside nurse. *Clin J Oncol Nurs* 2005;9:725–7.
- 50 Lim R, Courtenay M, Deslandes R, *et al.* Theory-based electronic learning intervention to support appropriate antibiotic prescribing by nurse and pharmacist independent prescribers: an acceptability and feasibility experimental study using mixed methods. *BMJ Open* 2020;10:e036181.
- 51 Center for Disease Control and Prevention (CDC). *Redefining the Antibiotic Stewardship Team: Recommendations from the American Nurses Association/Centers for Disease Control and Prevention Workgroup on the Role of Registered Nurses in Hospital Antibiotic Stewardship Practices*, 2017 Atlanta, GA: CDC Retrieved from: Available: <https://www.cdc.gov/antibiotic-use/healthcare/pdfs/ANA-CDC-whitepaper.pdf>
- 52 Courtenay M, McEwen J. Applying an antimicrobial stewardship competency framework in nurse education and practice. *Nurs Stand* 2020;35:41–6.