Investigating infection management and antimicrobial stewardship in surgery: a qualitative study from India and South Africa

Sanjeev Singh 1, y, Marc Mendelson 2, y, Surya Surendran 1, Candice Bonaconsa 2, Oluchi Mbamalu 2, Vrinda Nampoothiri 1, Adam Boutall 3, Mark Hampton 4, Puneet Dhar 5, Tim Pennel 6, Carolyn Tarrant 7, Andy Leather 8, Alison Holmes 9, Esmita Charani 9, * on behalf of the ASPIRES co-investigators

1) Department of Infection Control and Epidemiology, Amrita Institute of Medical Sciences, Amrita Vishwa Vidyapeetham University, Kochi, Kerala, India 2) Division of Infectious Diseases & HIV Medicine, Department of Medicine, Groote Schuur Hospital, University of Cape Town, Cape Town, South Africa 3) Colorectal Unit, Groote Schuur Hospital, University of Cape Town, South Africa

4) Doctor Matley & Partners Surgical Practice, Cape Town, South Africa

5) Department of Gastrointestinal Surgery, Amrita Institute of Medical Sciences, Amrita Vishwa Vidyapeetham University, Kochi, Kerala, India

6) Chris Barnard Division of Cardiothoracic Surgery, University of Cape Town, South Africa

7) Department of Health Sciences, University of Leicester, Leicester, UK

8) King's Centre for Global Health and Health Partnerships, School of Population Health and Environmental Sciences, King's College London, London, UK 9) Health Protection Research Unit in Healthcare Associated Infections and Antimicrobial Resistance, Department of Medicine, Imperial College London, UK

Abstract

Objectives: To investigate the drivers for infection management and antimicrobial stewardship (AMS) across high-infection-risk surgical pathways.

Methods: A qualitative study ethnographic observation of clinical practices, patient case studies, and face-to-face interviews with healthcare professionals (HCPs) and patients was conducted across cardiovascular and thoracic and gastrointestinal surgical pathways in South Africa (SA) and India. Aided by Nvivo 11 software, data were coded and analysed until saturation was reached. The multiple modes of enquiry enabled cross-validation and triangulation of findings.

Results: Between July 2018 and August 2019, data were gathered from 190 hours of non-participant observations (138 India, 72 SA), interviews with HCPs (44 India, 61 SA), patients (six India, eight SA), and case studies (four India, two SA). Across the surgical pathway, multiple barriers impede effective infection management and AMS. The existing implicit roles of HCPs (including nurses and senior surgeons) are overlooked as interventions target junior doctors, bypassing the opportunity for integrating infection-related care across the surgical team. Critically, the ownership of decisions remains with the operating surgeons, and entrenched hierarchies restrict the inclusion of other HCPs in decision-making. The structural foundations to enable staff to change their behaviours and participate in infection-related surgical care are lacking.

Conclusions: Identifying the implicit existing HCP roles in infection management is critical and will facilitate the development of effective and transparent processes across the surgical team for optimized care. Applying a framework approach that includes nurse leadership, empowering pharmacists and engaging surgical leads, is essential for integrated AMS and infection-related care.

Introduction

Delivering safe surgical care across multidisciplinary and multi- locational (spanning the boundaries of primary and secondary care) perioperative pathways remains a challenge, particularly in low-and middle-income countries (LMICs) [1]. Infections are the most common postoperative complications, with LMIC patients more likely to be infected with antibiotic-resistant bacteria [2] and twice as likely to die due to infection-related complications than patients in high-income countries [3]. Surgical site infections, although preventable, are the most common healthcare-associated infections [4]. In LMICs, healthcare-associated infections remain a significant yet poorly quantified burden, compounded by a lack of surveillance and antibiotic consumption data [5,6].

Antimicrobial resistance (AMR) is becoming an increasing burden on healthcare organizations globally [7], and is spreading rapidly in Africa and Asia due to strains on the healthcare systems [8,9]. For actionable and impact-driven AMR research, it is essential to include all stakeholders, including different healthcare professional groups, patients and the public [10,11]. Variations in the social norms, values, and behaviours between surgical and medical teams have been re- ported, with different approaches to antibiotic decision-making [12]. The surgical teams attribute value to different outcomes and risks in relation to patient care: for example, attributing greater priority to infection prevention than to following antimicrobial stewardship (AMS) principles in order to prevent the emergence and spread of AMR in their patient populations [12,13]. Additionally, quantitative data demonstrate more broad-spectrum antibiotic use and longer course durations in surgical patients with no evidence of infection [14]. Most of this evidence is from high-income settings; less is known about the processes, behaviours, and drivers for AMS and infection prevention and control (IPC) in surgical specialties in LMICs [15], where due to lack of adequate healthcare infrastructure and cost implications patients may not always have access to health- care, including surgery [16]. We conducted a qualitative study utilizing non-participant ethnographic observations, face-to-face interviews, and in-depth case studies on infection management and antibiotic prescribing across surgical specialties in two academic institutions in South Africa (SA) and India.

Methods

The setting

This study was conducted across adult gastrointestinal and cardiovascular and thoracic (CVTS) specialties in two university hospitals with established AMS in SA [17,18] and India [6,19]. Hospital A in Cape Town is a 950-bed government-funded hospital which, in addition to being a tertiary centre, provides non-tertiary services to the local population. Hospital B in Kerala is a not-for-profit charitable 1350-bed tertiary centre. Data were gathered between July

2018 and August 2019. Ethical approval was granted by the University of Cape Town Human Research Ethics Committee (HREC ref. 499/2018) and the Amrita Hospital Institutional Research and Ethics Committee (IEC-AIMS-2018-INECONT-005A). All healthcare professionals in the selected surgical teams and their patients were eligible to participate in the study. Full informed consent was obtained from all study participants prior to inclusion in the study.

Inclusion and exclusion criteria

Using purposive sampling, all healthcare professionals involved in patient care in the included specialties and patients (medically cognisant, and able to provide a coherent account of their history) were eligible to participate in the study.

Study design

Ethnographic methods included non-participant direct observations, interviews (Supplementary Material Appendix 1).

Documentary analysis of handover sheets, multidisciplinary team meeting notes and existing policies provided contextual knowledge and supported cross-validation and triangulation of the findings. The interviews took place following the observations to ensure that healthcare participants could be questioned about their infection management without affecting their behaviours during the observations. The interviews were semi-structured using interview guides for healthcare professionals and patients (Supplementary Material) developed through review of literature, and drawing upon previous work of the research team [12]. The interviews were audio-recorded and transcribed verbatim and anonymized prior to analysis. Case studies were generated by in-depth documentary analysis of medical records and patient interviews. In India, several interviews were conducted in the Malayalam dialect. These interviews were transcribed in Malayalam, the transcriptions translated to English, and back-translated again to Malayalam (by VN and S. Surendran) for accuracy. One patient interview in SA was conducted in English and Afrikaans and the transcription was translated by CB. All other interviews were con- ducted in English.

Analysis

A grounded theory approach [20,21] using inductive inquiry was used to analyse data, aided by Nvivo 11® software. Grounded theory relies on simultaneous data collection and analysis in an iterative manner that enables theory construction, and does not rely on existing frameworks for analysis. The data from both set- tings were openly coded to identify key categories, which were developed into themes. The analysis was conducted through a process of moving between the coded data, data collection in the field, and the higher-level themes, until saturation was reached and no new themes emerged. Rigour and reflexivity were assured through regular discussions of the emerging themes between the researchers, and consensus on the emerging themes.

Results

In hospital A (SA), 72 hours of observations and 69 interviews (61 healthcare professionals, eight patients) were completed (Table 1). In hospital B (India), 138 hours of observations and 50 interviews (44 healthcare professionals, six patients) (Fig. 1) were completed. Six in-depth (two in hospital A, four in hospital B) case studies were completed. Two case studies are summarized in Fig. 2. These case studies provide a contextual anchor for understanding the findings, and represent two female patients who required treatment for postoperative complications. The case studies illustrate the complexity in infection management in the surgical pathway, highlighting the number of healthcare professionals involved in the infection-related decision-making. These case studies demonstrate that infections and antibiotic use remain a risk throughout the patient pathway and are not limited to the surgery itself.

The following key themes emerged from the analysis of the data.

Process driven, overlapping and shared roles and responsibilities for inpatient care

Though hospital A has a more developed AMS team, apart from removal of lines, the responsibilities in the surgical teams were similar across the two hospitals. Infection management and anti- biotic decision-making for surgical patients require overlapping input, responsibility and action from many healthcare professionals (Fig. 3). This can lead to lack of clarity about what needs to be done by whom (Table 2 Quotes 1e3). Identifying these implicit existing roles is important, as historically most AMS interventions target junior doctors, bypassing the existing roles that a wide range of healthcare professionals identify as theirs in relation to IPC and AMS (Table 2 Quotes 2 and 3), including the influence of the senior surgeons on one another (Table 2 Quotes 4 and 5).

Ownership for antibiotic management is focused within specialties

The bulk of decision-making about infection management and antibiotic use remains with the surgical and intensive care unit (ICU) teams; the pharmacists have a limited role. Nurses are not involved in decision-making, although they are responsible for the administration of antibiotics. An important factor highlighted by nurses in hospital A is how direct communication, or the lack thereof, between the prescriber and nurses impacts timely anti-biotic administration (Table 2 Quote 6). The anaesthetists are recognized as being responsible for ensuring timely surgical pro- phylaxis. Postoperative care is administered in the ICU or surgical wards, depending on the type of surgery and patient's condition (Fig. 2). Though the intensivists take major decisions in the ICU, the ownership of the postoperative antibiotic management can be tenuous. Other surgical colleagues avoid challenging or intervening in unless invited to do so by the operating surgeon, whilst intensivists usually make decisions on antibiotic therapy in collaboration with the operating surgeon (Table 2 Quotes 7e9).

Uncertainty and fear of failure influence how the surgeons manage infections, viewing antibiotics as a safety net more than a therapeutic cure (Table 2 Quote 10). The choice of postoperative antibiotics and targeting of therapy is driven and monitored by senior surgeons (Table 2 Quote 11). A similar approach is followed in the decision to send for culture and sensitivity. These decisions are often initiated by the junior surgeons, but a quick account is sought from and/or by the senior team. Follow-up of cultures and communication with microbiology is the responsibility of junior surgeons. However, senior surgeons lead decisions related to the removal of indwelling catheters and lines. Whilst the leadership for surgical decision-making is clear, there are gaps in the leadership for IPC and AMS outside of the ICU setting.

The most multidisciplinary and integrated model of care observed was in the ICU, where the surgical, intensivist, nursing, and pharmacy (in GI India) teams work together with microbiology and infectious diseases services to manage infections. This shared responsibility ensures patients are promptly diagnosed with infections and treated appropriately. The team dynamic between the specialties ensures that antibiotic decisions for patients in the ICU get reviewed and questioned, and surgeons recognize that this can have a positive impact on patient outcomes (Table 2 Quotes 12 and 13). The surgical teams recognize the input from microbiology and infectious diseases in targeting antibiotic therapy through the multidisciplinary ward rounds. Their input, however, is viewed as a consulting service, and the antibiotic decision-making for surgical patients remains within the surgical teams (Table 2 Quote 14).

Hierarchies restrict the integration of IPC practices

The patient case studies (Fig. 2) highlight the vulnerability of surgical patients to postoperative infections and the complexity of care pathways that include multiple healthcare professionals. Organizational policies and expectations in both settings consider IPC the responsibility of all staff. In practice, however, there is significant variation in terms of how much staff engaged with IPC as a core part of their role, or considered it their responsibility (Table 2 Quotes 15e19). As in the previous theme, the most integrated IPC care is in the ICU, where cohesive teamwork enables nursing staff to participate in and amplify their concerns (Table 2 Quote

16). Hand hygiene was sporadic across all specialties and units, and often not performed appropriately (Table 2 Quote 14). On ward rounds, senior surgeons would use alcohol gel between patient consults, although they had not examined the patient, performed a procedure or touched the patients' surroundings, whilst the junior doctors who had been carrying out these tasks would sometimes not adhere to hand hygiene. The responsibility for promoting and monitoring IPC is apportioned to nursing staff, who often due to entrenched hierarchies may not feel able to challenge deviations from expected behaviour (Table 2 Quotes 18e22). The existing hierarchies mean that, often, it is the head nurse or sister who is relied upon to feedback on IPC behaviours, causing a delay in correcting behaviours (Table 2 Quotes 16e18). Contact precaution measures and isolation rooms can have consequences for patients who may feel that they are responsible for their infection (Fig. 2, case study A), whilst clinicians consider it a barrier to patient rapport (Table 2 Quote 16).

Patients as drivers for antibiotic prescribing

Healthcare staff recognize that they need to consider individual patient factors, and that the patient can influence their decision- making. In hospital B, clinicians recognize the need to consider the financial implications of treatment decisions for patients, as patients are paying out-of-pocket or need procedures not covered by their insurance. In such cases, therapy is often tailored to meet financial capability (Table 2 Quotes 23 and 24). Additionally, if treatment is expensive, this may result in patients having to be transferred to state hospitals once their personal funding is depleted (Table 2 Quote 25). Where patients are able to choose the healthcare provider, it is difficult for clinicians to negotiate with patients to delay antibiotic treatment or take a more conservative approach to antibiotic use, as patients could choose to go elsewhere for their care if they were not satisfied (Table 2 Quotes 25e28).

Discussion

Infection management and AMS remain key priorities for safe surgery. As illustrated by the case studies, AMS should focus on postoperative antibiotic prescribing. The expectation placed on surgical teams to optimize antibiotics needs to be managed in the context of the way those teams work and the roles and responsibilities that individuals have in relation to infection management. To date, AMS programmes in hospitals have focused on medical specialties and taken a one-size-fits-all approach. This means that often an expectation is placed on healthcare professionals to adopt behaviours which may not be appropriate for the challenges they face within their practice and the resources available to them. Where surgical AMS programmes do exist, they tend to target junior doctors [22], overlooking the collective nature of clinical decision-making and the important role of senior surgeons in overseeing care and making critical decisions [12,13]. This may speak to a universal truth in surgery having a named surgeon responsible for the outcome of individual patients (and many accept that this is important). Individual surgeons cannot, however, be at the bedside at all times (and neither can members of their team); therefore we need shared responsibility and better inter-disciplinary team working for many decisions, particularly those not directly related to the surgery. There needs to be greater recognition of the role of the wider workforce (e.g. nursing) within surgical teams. Learning from models of care in the ICU and developing nurse leadership and other stakeholder engagement will enable their participation in infection management [23].

Engendering a sense of responsibility to ensure consistent practices requires clarity of expectations from staff and defining explicit roles and responsibilities. We propose a framework approach to help identify and fully utilize the existing roles of surgical team members within IPC and AMS programmes (Fig. 4). This can be supported by a better understanding of where individual staff feel responsibilities lie, and how they see their role in the process. Whilst stewardship teams can initiate this process, successful outcomes can only be achieved when there is local ownership for infection management and AMS. To support this, we need to broaden the definition of surgical teams to include pharmacy and nursing staff [24,25]. When developing AMS programmes for surgical teams, the proposed framework can be applied to ensure that the key components necessary for sustainable change are addressed. This framework builds on research from high-, low- and middle-income countries [9,26,27].

Patients' and carers' roles in self-care and their experience of infection-related care in the surgical pathway also need greater recognition. The dynamic of patient participation in and expectation of care is further complicated when the patients are paying for the healthcare services. The expectation to be given effective therapies often includes being prescribed antibiotics. An under- standing of the wider social and cultural determinants is required in order to effectively foster an environment where patients can be more involved in their own care. This is important in the preoperative preparation and postoperative wound care and recovery process. These findings are particularly pertinent in the current viral severe acute respiratory syndrome coronavirus 2 (SARS-CoV- 2) pandemic which has not only highlighted the critical need for IPC and AMS measures but has identified surgical populations at increased risk of poorer infection outcomes [28]. Applying a framework approach to integrating IPC and AMS practices in surgical pathways will help address these challenges, assure safe surgical outcomes, and track the long-term impact of this pandemic on infection-related outcomes.

Limitations

Collecting data across different healthcare organizations using multiple researchers posed challenges to systematic comparison of the data. To militate against this, we employed a rigorous extended- period face-to-face training for the researchers to ensure consistency in the data gathering and analysis processes.

The findings may not necessarily be generalizable to other hospitals in South Africa or India, where the availability and level of staff training, and increased demand on healthcare services, com- pounded by the limited infrastructure, may present significant additional challenges.

Conclusions

Effective and sustainable integration of optimized infection management and AMS in surgical pathways needs a framework approach that recognizes the structural foundations to support staff to be able to change their behaviours. We need to broaden the definition of surgical teams to recognize the role that nurses and pharmacists can play in patient care, leading to optimized out- comes. To optimize practices, inter- and intra-disciplinary models of care which recognize the critical need for co-management of surgical patients across professional boundaries and across the surgical pathway are needed.

Author contributions

SSingh, MM, CT, AH, and EC developed the study design. SSurendran, VN, CB, OM and EC were responsible for data collection. SSurendran, VN, CB, OM, CT, AB, TP, SSingh, PD, MM and EC assisted with data interpretation. EC, VN, CB, OM wrote the first draft of the paper. All authors have critically read and commented on draft versions of the manuscript and approved the final version.

Transparency declaration

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cmi.2020.12.013.

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