

Review

Patient understanding of and participation in infection-related care across surgical pathways: a scoping review



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ABSTRACT

Objective: To explore the existing evidence on patient understanding of and/or participation in infection-related care in surgical specialties.

Method: A scoping review of the literature was conducted. PubMed, Web of Science, Scopus, and grey literature sources were searched using predefined search criteria for policies, guidelines, and studies in the English language. Data synthesis was done through content and thematic analysis to identify key themes in the included studies.

Results: The initial search identified 604 studies, of which 41 (36 from high-income and five from low- and middle-income countries) were included in the final review. Most of the included studies focused on measures to engage patients in infection prevention and control (IPC) activities, with few examples of antimicrobial stewardship (AMS) engagement strategies. While patient engagement interventions in infection-related care varied depending on study goals, surgical wound management was the most common intervention. AMS engagement was primarily limited to needs assessment, without follow-up to address such needs.

Conclusion: Existing evidence highlights a gap in patient participation in infection-related care in the surgical pathway. Standardization of patient engagement strategies is challenging, particularly in the context of surgery, where several factors influence how the patient can engage and retain information. Infection-related patient engagement and participation strategies in surgery need to be inclusive and contextually fit.

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INTRODUCTION

Infection prevention and control (IPC) is an area within health-care where concerted efforts to include patient involvement and participation is critical to positive outcomes. Available policies and guidelines, mostly from high-income countries, provide strategies to engage patients in infection-related care, including antimicrobial

stewardship (AMS) (National Institute for Health and Care Excellence (NICE), 2011; NICE, 2015; NICE, 2019a; Wellcome Trust, 2019; World Health Organization (WHO), 2015). The National Institute for Health and Care Excellence (NICE) guidelines on AMS describe the need for effective communication with the patient, for instance, when antibiotic use may not be required (NICE, 2019b). The approach for patient engagement in infection care requires healthcare workers (HCWs) to be aware of the patient's role for effective patient empowerment (WHO, 2015, 2016) as it relates to IPC or AMS.

Patient participation in healthcare is associated with improved experiences and outcomes (Berger et al., 2014). Becoming active participants rather than passive recipients of care, though beneficial, may not be suitable for or acceptable by all patients (Levinson et al., 2005). For healthcare participation to be effective, patients need to feel able to participate through effective communication, education, and cooperation from HCWs. However, effective communication may be hindered by the patient's reluctance to participate and the imbalance between knowledge and experience of the HCW and the patient (Levinson et al., 2005; Longtin et al., 2010). Participation in their own care may empower patients through increased awareness of their rights and ability to voice needs and clarify queries. Cultural and contextual factors can also affect the degree to which patients are included in decision-making about their own health (Levinson et al., 2005). Excluding patients from the healthcare decision-making process has the potential to create misinformation, frustration, and anxiety. Patient involvement in healthcare and related outcomes has been reported for the long-term management of chronic diseases (Longtin et al., 2010); however, less is known about patient involvement in IPC and AMS to manage acute infections. While current evidence on the role of patients in care and its impact remains inconclusive, it is critical to investigate it, particularly if we are to improve patient adherence to healthcare interventions, including AMS and IPC-related patient behaviors.

Infections are a common complication of surgery (Biccard et al., 2018). In surgical specialties, the Enhanced Recovery After Surgery (ERAS) program engages patients to improve their care and recovery after surgery, with the patient involved, passively or actively, in the various elements prior to admission and through to postoperative care (Rauderwink et al., 2019). Patients also have a role to play in implementing the World Health Organization's (WHO's) Surgical Safety Checklist, widely advocated and employed to minimize errors and improve surgical safety (WHO, 2009). With these initiatives, patient engagement and participation are promoted; however, there is a need for granular data on how patients are engaged explicitly in infection care. Pre- and postoperative care are critical to positive surgical outcomes, key aspects of which, including surgical wound care, rely on patient cooperation and participation (Muir et al., 2020). We conducted a scoping review to investigate and synthesize the existing evidence on patient understanding of and participation in infection-related care across the surgical pathway. In this context, infection-related care refers to both IPC and AMS practices.

METHODS

Study design

A scoping review was conducted to identify studies on the surgical patient's understanding of, and/or participation in, infection-related care (IPC and AMS). Peer-reviewed publications and grey literature were included in the search strategy. The search terms for the review were developed by the research team following discussions and deliberations on emerging themes from a qualitative

study on infection management in surgical pathways (Singh et al., 2021).

Eligibility criteria

The inclusion criteria were: 1) research publications addressing patient's understanding of and/or participation in infection-related care (IPC and/or AMS) in surgical specialties; 2) grey literature including national or international policies and guidelines that included patient involvement and participation in infection care in surgical specialties; and, 3) papers published in English since 1990. Studies were excluded if they: 1) discussed the role of the patient in IPC or AMS but did not include patients in the research; 2) or did not have patients as (part of) the target audience.

Literature search strategies

Research studies

The terms used for the literature search were generated following consideration of the population of interest (surgical patients), the concept of interest (patient understanding of and/or participation in infection-related care), and the context (surgical pathway). The search strings used (Supplementary Table) were modified for each database or platform as required. The electronic databases: PubMed, Scopus, and Web of Science were searched. The reference lists of shortlisted studies were also manually searched to identify additional relevant studies.

Grey literature

Given the limited information on this subject in grey literature repositories, the authors reviewed the relevant policies and guidelines (including National Action Plans - NAPs) for evidence of patient engagement in care. The grey literature search was limited to countries represented by the included studies in this review.

Records screening and review

The literature search was undertaken in March 2020. The records of studies identified were imported into a reference management tool, Mendeley (version 1.19.4, © 2008–2019 Mendeley Ltd.). The imported references were scanned, and duplicate references were removed. The titles and abstracts of the remaining studies were independently screened against the eligibility criteria by two reviewers. Studies that met the eligibility criteria following title and abstract screening were selected for full-text review.

Using NVivo 12® Pro software, data from the Methods and Results sections of included studies were coded line by line deductively, i.e., assigned to previously defined codes though researchers could add additional codes as required. Two reviewers independently reviewed and coded data from each study. Disagreements between reviewers were resolved by discussion throughout every stage of the review process or evaluation by an appointed independent third reviewer. Included studies were evaluated against infection-specific patient-centered activities recommended by an expert panel (Tartari et al., 2017).

RESULTS

Study selection

The study selection flowchart is shown in Figure 1. The search identified a total of 680 articles from three databases – PubMed, Scopus, and Web of Science (WoS). After removing duplicates, 604

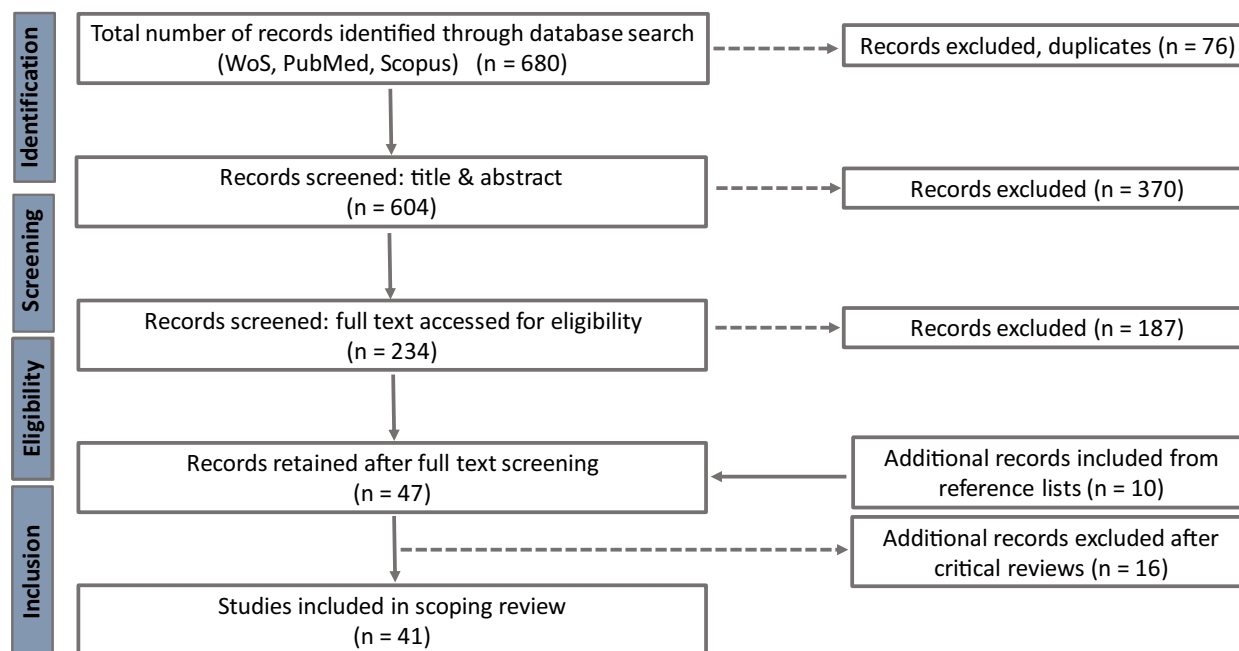


Figure 1. Flow chart of study identification and selection

articles were included in the title and abstract review. The full-text screening was conducted on 234 retained articles, of which 47 were retained after that (Figure 1). Sifting the reference lists of the 47 articles identified a further ten papers not picked up in the original search strategy. The 57 articles were included following a review of their full texts. Of these, 16 articles were excluded during appraisal. A final list of 41 articles was included for data extraction and synthesis.

General characteristics of the included studies

Details of data extracted from the included studies are shown in Table 1. Most of the identified studies (36/41, 88%) were from high-income countries, with almost half (20/41, 49%) from the USA. Five studies were conducted in low- and middle-income countries (four in Asia and one in Africa). All the included studies were published since 1997, with the majority (31/41, 76%) after 2010.

The sample size across the included studies varied from a single patient case report to 12,396 participants in an intervention study (Cottrill, 2013; Kelley et al., 2018). Most of the studies were conducted in hospitals, with limited data from primary care. Studies involving patients outside the hospital setting generally featured postoperative follow-up of patients. Surveys were commonly employed, most often evaluating surgical patients' knowledge and/or awareness of infection care. Some of the surveys or questionnaires were pilot studies to evaluate the use of specific technologies for postoperative wound care (Sanger et al., 2014a, 2014b; Gunter et al., 2016, 2018; Evans & Lober, 2017; Lavallee et al., 2019; Lee et al., 2019). Other research methods utilized in included studies were interviews, observations, case studies, and retrospective review/audit; some studies utilized more than one method for data collection. Many of the included studies sought to engage patients in some of the infection prevention recommendations proposed by Tartari et al. (2017), primarily focused on surgical wound care (Table 2). Where some aspect of AMS was included, the focus was generally on evaluating the patient's understanding of antibiotic use through questions, with findings highlighting a need for more patient-focused involvement in AMS (Rasmussen et al., 1997;

Mitchell et al., 1999; El-Alfy & El-Sayed, 2004; Tanner et al., 2013; Merle et al., 2011).

Grey Literature

The NAPs for the countries of the included studies (Figure 2) recognize the importance of raising public awareness on antimicrobial resistance (AMR) through education and/or mass media campaigns (Government of India, 2017; Government of Thailand, 2017; Government of Canada, 2018; WHO, 2017, n.d.). This message was evident in the NAPs of countries where antibiotics are prescription-only medicines and where antibiotics can be accessed without prescription. Some of the NAPs also noted the importance of behavior in addressing AMR: the NAPs for Australia, India, Ireland, and the UK included strategies to affect behavior change for promotion of appropriate antibiotic use amongst the public, prescribers, and/or healthcare systems (Ireland Department of Health, 2017; Government of India, 2017; Australian Government, 2019; HM Government, 2019; WHO, n.d.). The importance of engaging with and raising IPC and AMR awareness among children and/or youth was also noted in the NAPs of Australia, China, Ireland, India, Thailand, and the UK (China, 2016; Ireland Department of Health, 2017; Government of India, 2017; Government of Thailand, 2017; Australian Government, 2019; HM Government, 2019; WHO, n.d.).

All the reviewed NAPs highlighted the need for patient/public education and/or engagement in infection care; there was no disaggregation by the specialty under which the patient receives care (e.g., medical versus surgical). The NICE guidelines for the prevention of surgical site infections detail how patients can be engaged in infection-related care in the surgical pathway (NICE, 2019a).

Emerging themes from the literature

The thematic analysis highlighted patient education as critical for participation; however, its utilization as a patient engagement initiative varied in inclusiveness and details of such education provided. Though effort has been made to involve surgical patients in infection care, gaps remain, particularly in how current prac-

Table 1
Characteristics of included studies

	Study citation & country	Study design / method(s)	Aim	Outcomes
1	Rasmussen et al., 1997 (Denmark)	Cross sectional study	To assess asplenic patients' knowledge of measures to prevent severe infection	Asplenic patients are not sufficiently informed and aware of some simple infection prevention measures.
2	Mitchell et al., 1999 (Australia)	Prospective observational study (& survey)	To evaluate post-discharge wound surveillance, and to compare incidence and outcomes of wound infections that develop pre- and post-discharge	The majority of wound infections develop post-discharge, highlighting the need to optimise resources for post-discharge wound surveillance.
3	Hegarty et al., 2000 (Ireland)	Survey / telephone interview	To assess asplenic patients' knowledge of possible infections, and to determine category of healthcare professional better suited to educate patients on infection prevention and management	Education of asplenic patients is rated as poor. Haematologists and general practitioners are more effective in patient education than surgeons.
4	Henderson & Zernike, 2001 (Australia)	Questionnaire survey and follow-up telephone interview	To assess whether information provided to surgical patients pre-discharge equips them for own independent post-discharge care	Patient education provides some tools which patients can utilise for own independent care post-discharge; poorly informed patients are more likely to access post-discharge care.
5	Whitby et al., 2002 (Australia)	Prospective observational study	To assess patient's ability to diagnose surgical site infection (SSI) post-discharge	Patients have low positive predictive value and high negative predictive values for infections.
6	El-Alfy & El-Sayed, 2004 (Egypt)	Questionnaire / survey	To evaluate impact of asplenic patient's knowledge and compliance on post splenectomy infection	The quality of patient's knowledge significantly impacts the development of overwhelming post splenectomy infection (OPSI).
7	Huenger et al., 2005 (Germany)	2-center surveillance study	To assess post-discharge SSI surveillance following prosthetic surgery	A considerable percentage of SSIs occur post-discharge, supporting the need for the ongoing surveillance strategies.
8	Merle et al., 2005 (France)	Face to face interview (questionnaire)	To evaluate surgical patients' knowledge and perceptions of healthcare associated infections (HCAIs)	Surgical patients seem to have poor knowledge of HCAIs.
9	Pieper et al., 2007 (USA)	Comparative descriptive study	To evaluate patients' knowledge of and concerns related to wound care prior to discharge	Surgical patients' concerns about wound care highlight the need for effective and patient-tailored wound care education.
10	Whitby et al., 2007 (Australia)	Intervention study with control group	To improve patient's ability to diagnose wound infections post-discharge	Pre-discharge education resulted in over-diagnosis of infection.
11	Ferrús-Torres et al., 2011 (Spain)	Pre- and post-operative interviews/surveys	To assess patients' perceptions on informed consent, and ability to remember (post-operatively) information provided in the pre-operative stage	Patients have poor recall of pre-operative information provided before their consent to procedure.
12	Merle et al., 2011 (France)	Randomized single-blinded trial	To evaluate the impact of written SSI discharge information (leaflet) on patient recollection, satisfaction and SSI legal opinion	Using an information leaflet improved patient satisfaction, did not contribute to SSI information recall, and increased the likelihood of SSI-related litigation.
13	Riley et al., 2012 (USA)	Observational study	To reduce SSI risk using evidence-based interventions	Combination of evidence-based interventions, and healthcare worker-patient engagement significantly reduced SSI risk.
14	Skoufalos et al., 2012 (USA)	Multistakeholder approach	Multistakeholder contribution to development of patient-centred SSI education and SSI reduction initiative	Development of a patient-centred customizable resource for SSI reduction.
15	Anderson et al., 2013 (USA)	Survey	To determine patients' knowledge and awareness of SSI risks and consequences	Patient-centred interventions are needed to improve patient understanding of and participation in SSI prevention.
16	Ardizzone et al., 2013 (USA)	A quasi experimental, pre-test/post-test study	To investigate surgical patients' and nurses' views on hand hygiene (HH)	Hand hygiene improvement efforts, in addition to targeting healthcare providers such as nurses, should also target healthcare recipients (patients).
17	Cottrill, 2013 (Canada)	Case study	Application of guidelines to post-surgical wound care	Timely assessment, multidisciplinary collaboration and patient involvement can optimise care and improve surgical wound healing.

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Table 1 (continued)

	Study citation & country	Study design / method(s)	Aim	Outcomes
18	Ng et al., 2013 (Canada)	Prospective intervention study	To evaluate the effectiveness of multimodal patient education to reduce inappropriate hair removal pre-surgery (Caesarean section)	A multi-modal patient education initiative reduced inappropriate hair removal, and in combination with other infection prevention interventions, reduced SSI rate following Caesarean section.
19	Tanner et al., 2013 (England)	Narrative interviews	To access information for clinical practice improvement from patients' narrated experiences	Patients are generally unaware of SSIs. Measures to raise SSI profile may improve infection prevention practices by patients.
20	Sanger et al., 2014a (USA)	Mixed method design (semi-structured interviews and surveys included)	To explore patient's SSI experience and disposal to use of wound monitoring smartphone application (app)	Using a smartphone app can address some of the limitations experienced with traditional post-discharge surgical care, including SSI surveillance.
21	Sanger et al., 2014b (USA)	Semi-structured interviews	To explore patient perspectives of a post-discharge SSI monitoring app	The study highlighted limitations posed by lack of information and poor communication with patients in relation to their care; as well as the need for a patient-centred care app.
22	Schönenmeyr et al., 2014 (India)	Retrospective evaluation of intervention	Retrospective evaluation of patient education strategies on wound care following cleft lip surgery	Post-operative wound infections were found to be significantly reduced following a patient education strategy.
23	Kummerow Broman et al., 2015 (USA)	Prospective pilot study	To explore patient's and surgeon's views regarding acceptability of online post-operative care	Patients and surgeons deemed as convenient, the use of an online portal for post-operative follow up care.
24	Foertsch et al., 2016 (USA)	Questionnaire / survey	Assessment of a tool for patient's post-discharge self-assessment of surgical wounds	A revised patient education program contributed to improved identification of SSIs by discharged patients .
25	Gunter et al., 2016 (USA)	Prospective pilot study	Develop and test a smartphone app for post-discharge monitoring of surgical wounds	Surgical patients can employ a smartphone app for post-operative wound surveillance.
26	Holland et al., 2016 (USA)	Evidence-based practice improvement project	To reduce SSI rate associated with Caesarean surgery	An evidence-based protocol reduced Cesarean SSIs.
27	Johnson et al., 2016 (USA)	Prospective cohort study	Investigate impact of evidence-based intervention bundle on SSI rate	Implementation of evidence-based intervention practices reduced SSIs following gynecologic cancer surgeries
28	Kalogianni et al., 2016 (Greece)	Randomised control study	Impact of nurse-led preoperative patient education on anxiety and outcomes	Nurse-led preoperative education reduced anxiety and surgical complications such as sternal infection rates in cardiac surgery patients.
29	Evans & Lober, 2017 (USA)	Surgical Innovation Report	To introduce a mobile app for remote monitoring of surgical wounds	Use of a mobile health app increased the convenience of post-operative wound surveillance.
30	Taylor et al., 2017 (USA)	Prospective intervention study	Reduced SSI rate in gynaecological surgery	Implementation of contextually-fit evidence-based interventions with aspects of patient involvement reduced SSI rate following gynecologic oncologic surgery.
31	Xie et al., 2017 (China)	Cross-sectional study	To investigate health education knowledge needs and competence in transplant patients and their carers, respectively	Patients and carers can benefit from health education that covers the experiences that may be encountered in the surgical pathway.
32	Etz Korn et al., 2018 (USA)	Delphi process	To identify patient-centred complications and explore the fit between these and physician-identified complications	Patient input promotes the inclusion of patient priorities in outcome measures for more effective patient-centred care.
33	Gunter et al., 2018 (USA)	Prospective pilot study	Feasibility of mobile health app use (for surgical wound monitoring) among patients and healthcare workers	Use of a smartphone app by patients and caregivers can improve the surveillance of post-operative wound complications.
34	Kelley et al., 2018 (USA)	Prospective intervention study	Evaluate compliance to preoperative wellness bundle and investigate its impact on surgical outcomes	A patient-centred preoperative intervention for surgical patients reduced SSIs.
35	Money et al., 2018 (USA)	Prospective intervention study	To reduce SSIs following Caesarean delivery	An evidence-based protocol reduced SSIs for Caesarean patients.
36	Sutthiruk et al., 2018 (Thailand)	Cross-sectional survey	To investigate hospitalised patients' knowledge, perceptions and actions in relation to antibiotic use	Antibiotic use is high among patients in the community, with misconceptions related to antibiotic use. Enhanced access to required information can be used to engage patients in AMS.
37	Thorup et al., 2018 (Denmark)	Qualitative patient interviews	Patient experiences of SSI-related hospitalisation own participation in care	The organisational framework of a healthcare facility may pose challenges to patient's intention to participate in care.

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Table 1 (continued)

	Study citation & country	Study design / method(s)	Aim	Outcomes
38	Agarwal et al., 2019 (India)	Prospective interventional study	To assess efficacy of interventions bundles in SSI reduction	Implementation of evidence-based interventions significantly reduced SSI rate in gynaecological patients.
39	Cooper et al., 2019 (Australia)	Cross-sectional survey	To assess the effectiveness of standardised patient information to improve compliance with chlorhexidine preoperative washes	Application of appropriate research to practice can improve standardised approaches to use of chlorhexidine preoperative washes by patients.
40	Lavallee et al., 2019 (USA)	Scoping review and semi-structured stakeholder interviews	Patient engagement and experience with self-generated data for surgical wound surveillance	Patient involvement in the design of tools for SSI surveillance ensures that patient-centred priorities are reflected.
41	Lee et al., 2019 (USA)	Literature and technical app review, and stakeholder interviews	Evaluate SSI monitoring technologies	The timely involvement of individuals with direct interest in e-health innovations will ensure that developed technologies are fit-for-purpose.

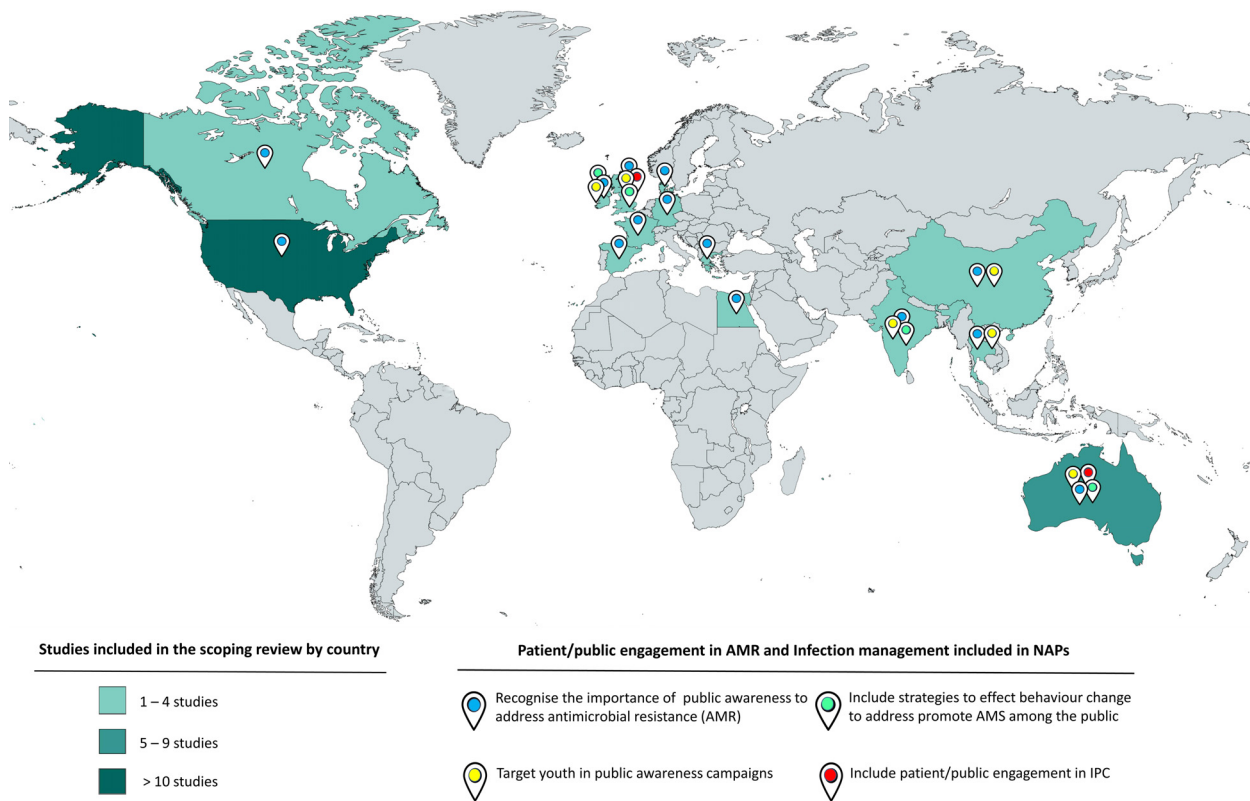


Figure 2. Geographical distribution of included studies and details of related national action plans (NAPs) on antimicrobial resistance.

tice measures against expectations in policy and recommendations from the grey literature.

The thematic analysis identified three overarching themes, which are discussed below.

Evidence of education and the gaps in current practice

Many studies that sought to actively involve the patient in IPC or AMS focused on patient education. Education included providing educational interventions such as information leaflets and directions on pre-and postoperative infection prevention measures to be undertaken by the patient (Table 2). Very few of the studies (Henderson & Zernike, 2001; Whitby et al., 2002, 2007; Cooper et al., 2019) included measures assessing the patient’s understanding of the information provided or the effect of the pro-

vided information on the patient’s understanding of IPC and/or AMS.

Educating patients in preoperative IPC and/or the care of their surgical wounds was associated with positive outcomes (related to optimized surgical wound care and healing, including reduced risk or rate of SSI) (Hegarty et al., 2000; Henderson & Zernike, 2001; El-Alfy & El-Sayed, 2004; Riley et al., 2012; Cottrill, 2013; Ng et al., 2013; Schönmeier et al., 2014; Foertsch et al., 2016; Holland et al., 2016; Johnson et al., 2016; Kalogianni et al., 2016; Taylor et al., 2017; Xie et al., 2017; Kelley et al., 2018; Money et al., 2018; Agarwal et al., 2019; Cooper et al., 2019); however, this needs to be interpreted with some caution as patient education was generally not the only intervention introduced or assessed but was frequently part of a multimodal intervention. Hand hygiene (HH) was not widely reported, though many of the studies that provided un-

specified patient education may have included HH or other IPC activities (Table 2).

While patient education has been noted to improve engagement in care, the need has also been stressed for training provided at the appropriate time (Skoufalos et al., 2012). The timing of information plays a crucial role in patient understanding and application of the information provided. The experience of hospitalization and surgery may also cause the patient to be less receptive to the educational material provided (Sanger et al., 2014a; Agarwal et al., 2019). The quality of the educational material is important, with generic (i.e., not specific/tailored to the surgical patient's needs) material limiting effective patient education (Sanger et al., 2014a). A multimodal approach to education delivery was preferred and more effective in patient engagement (Agarwal et al., 2019). In addition to oral or written directions, visual aids and practical means of engaging the patient were noted to improve understanding and hence, outcomes (Whitby et al., 2007; Schönmeyr et al., 2014).

Patient participation in infection-related care

Patients were involved in infection prevention measures, to variable degrees, across the included studies (Table 2). The engagement of surgical patients to prevent hypothermia was not captured in any of the included studies though this could have been covered in non-specific patient education or in the timing of and activities related to preoperative washing. Overall there is limited evidence of patient engagement to raise awareness of healthcare-associated infections (HCAIs), apart from efforts to prevent surgical site infections (SSIs). One study included *Staphylococcus aureus* decolonization of the nostrils (by patients) as part of pre-surgical interventions to prevent related complications (Kelley et al., 2018). Another study documented interactions related to the prevention of multidrug-resistant organism (MDRO) infection; in this study, patients differentiated between SSIs (which were perceived to be a non-threatening and unavoidable consequence of surgical admission) and multidrug-resistant *Staphylococcus aureus* (MRSA) infection, which they thought to be dangerous yet avoidable (Tanner et al., 2013). Though patients associate undergoing surgery with some level of risk (Tanner et al., 2013; Kalogianni et al., 2016), infection seems a widely unrecognized (Schönmeyr et al., 2014) risk amongst patients.

Facilitators of and barriers to patient engagement

Patient education was commonly delivered by nurses who were recognized as key HCWs involved with patient care and engagement for infection control. The included studies had a whole range of HCWs recognized as having responsibilities for and involvement in the surgical patient's education and engagement in infection-related care (Henderson & Zernike, 2001; Skoufalos et al., 2012; Schönmeyr et al., 2014; Money et al., 2018; Cooper et al., 2019). For postoperative care at home, family members or other carers sometimes assisted the patient in infection-related care (Cottrill, 2013; Sanger et al., 2014a; Holland et al., 2016; Gunter et al., 2018), highlighting the need for their inclusion in interventions targeting patients. Initiatives to address infection in surgical patients, especially where carers are present, have been noted to benefit from their inclusion (Sanger et al., 2014a; Gunter et al., 2018). From the environmental and contextual perspectives, a longer hospital stay facilitated familiarization with the care process and enabled more patient participation in care than shorter stays (Thorup et al., 2018). The use of different modes for patient engagement also contributed to better understanding and participation, as was the supplementation of patient education using visual aids and videos (Sanger et al., 2014a, 2014b; Schönmeyr et al., 2014; Holland et al., 2016).

A barrier to participation in care may stem from the perception of the patient's position in the healthcare team as subordinate

(Thorup et al., 2018). The delivery of care by different HCWs may also lead to a perceived lack of continuity in care by the patient (Thorup et al., 2018). This may make it challenging for the patient to discern who holds ownership of their care, further serving as a barrier to engagement and participation. The hospital environment can be an unfamiliar and confusing experience for some patients (Henderson & Zernike, 2001; Thorup et al., 2018), serving as a deterrent to effective communication with the patient and their understanding of the care they are receiving and its consequences.

DISCUSSION

This review has highlighted the paucity of evidence on understanding or utilizing the patient's role in AMS and the limited evidence of their role and participation in IPC. Effective and equitable patient engagement and education strategies in pre- and postoperative surgical care will empower patients and better prepare them for hospital admission and surgical care and recovery, including improving infection-related outcomes.

Infection is one of the most common postoperative complications, especially in resource-constrained settings (Biccard et al., 2018). Evidence is limited on surgical inpatients' awareness of the risks and potential for HCAIs, apart from SSIs (Tanner et al., 2013; Sanger et al., 2014a). As this review focused on surgical care, the majority of included studies were in hospitals. This has implications for IPC, given that surgical patients will be involved in self-care for surgical preparation and postoperative recovery. Therefore, the postoperative recovery period is critical, as is patient self-care, extending into post-discharge care. This, together with the increased risk of community transmission of infections, means that AMS needs to be integrated as a public health promotion initiative across the boundaries of care, e.g., tertiary, secondary, primary (File et al., 2014; Trivedi & Pollack, 2014).

In this review, improved outcomes resulting from patient participation highlight both the limited and the missed opportunities for patient engagement, emphasizing the need for more strategic, effective, and sustainable methods of developing inclusive patient communication protocols for IPC and AMS. Developing a standardised approach to delivering patient-centered infection prevention care and AMS to surgical patients remains challenging. However, while surgical specialties differ, infection remains a shared risk, highlighting the need for patient participation in infection care across all specialties.

This review of the existing literature and guidelines raises questions relating to surgical patients' engagement for participation in their own infection-related (IPC and/or AMS) care:

- When is the right time to provide information to surgical patients (before and/or after surgery)?
- How do we effectively engage patients: what types of communication methods and media will work best for different patient groups – infographics, face-to-face verbal communication, audio, video, traditional or digital media? How do we measure the impact of engagement activities on patient attitudes and behaviors, and ensure that positive behaviours are sustained??
- What strategies would effectively raise AMR awareness (and hence the need for IPC and AMS) among the public in line with the NAPs of different countries, and how can these be made contextually relevant?

Drawing on data from this review, Figure 3 illustrates the patient journey along the surgical pathway and the opportunities for patient engagement at different points along the pathway. Barriers to patient engagement need to be addressed for effective patient engagement. These barriers include current ineffective engagement with patients while in hospital (Bonaconsa et al., 2021). They may

Table 2
Patient participation methods (in relation to infection care) noted in the included studies

	Citation & year	Country	Aspects of patient engagement in IPC										AMS			
			Patient education (non-specific)	<i>Staph. aureus</i> (nasal) screen. & decolonisation [#]	Smoking [#]	Hair removal [#]	Hand hygiene [#]	Body temperature [#]	Preoperative washing [#]	Diabetes mellitus [#]	Postoperative wound care [#]	Multidrug resistant organism (MDRO) [#]	AMS			
1	Rasmussen et al., 1997	Denmark														x
2	Mitchell et al., 1999	Australia														
3	Hegarty et al., 2000	Ireland	x											x		x
4	Henderson & Zernike, 2001	Australia	x											x		
5	Whitby et al., 2002	Australia	x											x		
6	El-Alfy & El-Sayed, 2004	Egypt	x													x
7	Huenger et al., 2005	Germany												x		
8	Merle et al., 2005	France														
9	Pieper et al., 2007	USA			x			x						x		
10	Whitby et al., 2007	Australia	x											x		
11	Ferrús-Torres et al., 2011	Spain	x													
12	Merle et al., 2011	France	x		x					x		x	x			x
13	Riley et al., 2012	USA	x				x			x						
14	Skoufalos et al., 2012	USA	x		x					x				x		
15	Anderson et al., 2013	USA														
16	Ardizzone et al., 2013	USA														
17	Cottrill, 2013	Canada	x											x		
18	Ng et al., 2013	Canada	x													
19	Tanner et al., 2013	England														
20	Sanger et al., 2014	USA	x											x		x
21	Sanger et al., 2014	USA												x		
22	Schöenmeyr et al., 2014	India	x											x		
23	Kummerow Broman et al., 2015	USA												x		
24	Foertsch et al., 2016	USA		x												
25	Gunter et al., 2016	USA												x		
26	Holland et al., 2016	USA	x											x		
27	Johnson et al., 2016	USA	x											x		
28	Kalogianni et al., 2016	Greece	x											x		
29	Evans & Lober, 2017	USA														
30	Taylor et al., 2017	USA	x													
31	Xie et al., 2017	China	x													
32	Etzkorn et al., 2018	USA														
33	Gunter et al., 2018	USA														
34	Kelley et al., 2018	USA	x	x												
35	Money et al., 2018	USA	x													
36	Sutthiruk et al., 2018	Thailand														
37	Thorup et al., 2018	Denmark														
38	Agarwal et al., 2019	India	x													
39	Cooper et al., 2019	Australia	x													
40	Lavallee et al., 2019	USA														
41	Lee et al., 2019	USA														

[#] Recommendation by Tartari et al. (2017)

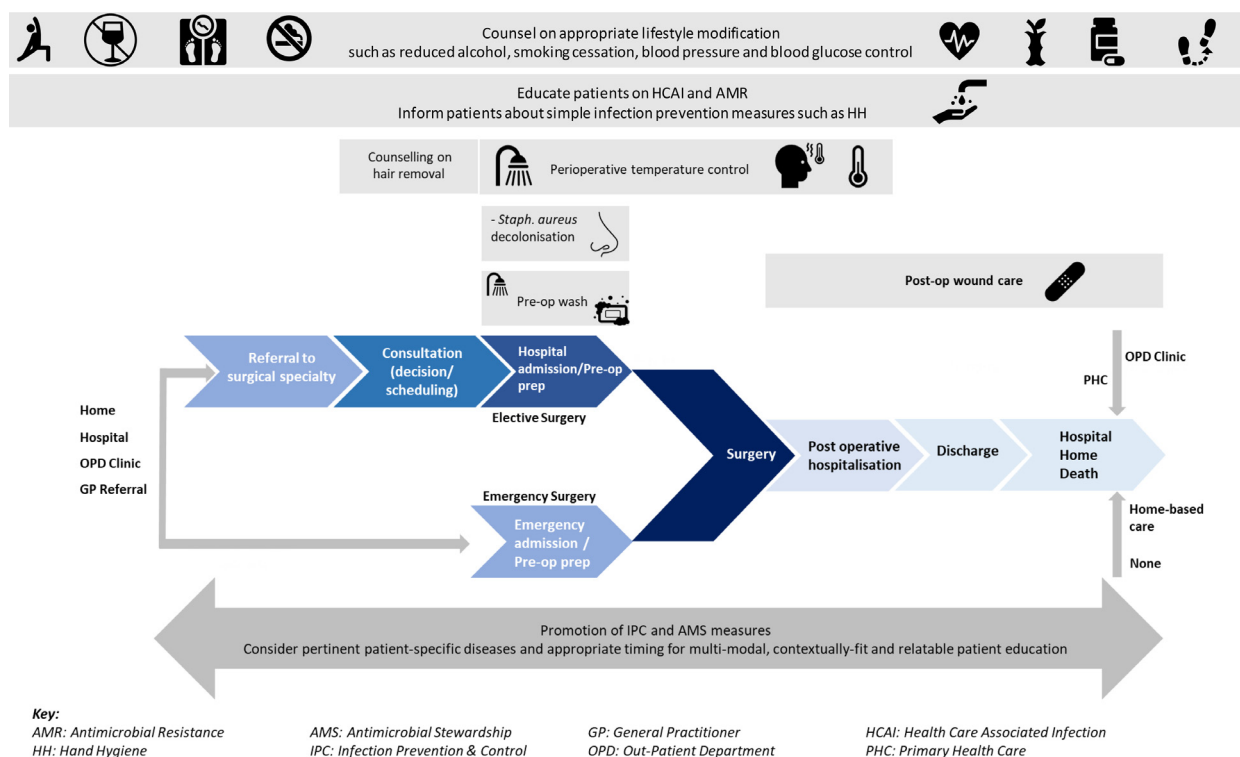


Figure 3. Opportunities for patient engagement along the surgical pathway.

also be related to gaps in the content and mechanism of communication and insufficient use of visual aids as a means of effective engagement (Schönmeier et al., 2014). Furthermore, this lack of inclusion of patients and their carers means that patients' and their carers' lay knowledge and expertise may not be fully integrated into their care (Surendran et al., 2021). A solution to better patient participation in infection care needs to include early and active engagement of the patient and their carers by the multi-disciplinary surgical team following the decision to proceed with surgery (Figure 3). This will facilitate identification of infection risks that may be associated with the patient's surgical procedure, considering patient-specific co-morbidities, and providing patient-centered, context-specific advice on how such risks can be minimized. Though this may not suit all patients, its strength lies in its flexibility and adaptation to specific patient needs related to infection care.

Many factors, some contextual, determine the patient's ability and willingness to participate in care (Levinson et al., 2005; Longtin et al., 2010). Defining the constituents of an appropriate patient engagement and participation strategy and its delivery will involve consideration of these factors. The prospect of surgery, with its potential risks and complications, has also been noted to loom large before the patient, impacting patient recovery and outcomes (Bailey, 2010). The dynamics between the traditional and currently promoted patient-centered model of care and its effects on ownership of care have been noted (Henderson & Zernike, 2001; Thorup et al., 2018; McLaren et al., 2013). Patients may be expected to take ownership of their care when they are not necessarily able to do so, creating a gap in care ownership that may promote inadequate IPC measures, further complicating care (Henderson & Zernike, 2001; Thorup et al., 2018). The gap of knowledge of the surgical patient's role in AMS also needs to be addressed to improve patient outcomes especially in the era of drug-resistant infections.

The key role played by nurses in inpatient care is important (Henderson & Zernike, 2001; Schönmeier et al., 2014; Money et al., 2018; Cooper et al., 2019). As the HCWs who are most in contact with hospitalized patients, their inclusion in patient engagement initiatives is likely to yield a significant positive impact. The importance of the nurse as a link between the broader healthcare team and the patient makes it crucial for nurses to be well-informed and trained about IPC and AMS, including infection-related postoperative management.

This scoping review has some limitations. We present findings only from 1990 and from three databases, which, although major research repositories, may not contain the whole body of literature available on this topic. As we only included studies in English, study selection may have had some elements of language and selection bias, possibly resulting in the exclusion of relevant literature, including non-peer-reviewed literature that may be available in other languages such as the vernacular, especially in low- and middle-income countries. The search term for context on infection-related care focused primarily on general and standard terms for IPC and AMS (Supplementary Table) and may have missed other more specific terms used for infection in the literature. Apart from the aspects of patient engagement in IPC recommended by Tartari et al. (2017), strategies such as early mobilization and breathing exercises such as incentive spirometry, have been advocated for reduced infection risk and improved outcomes following surgery, with other research reporting inconclusive evidence related to this (Hulzebos et al., 2006; Cassidy et al., 2013; Tyson et al., 2015). Our review did not include these terms in the search strategy. Lastly, the wide range of included studies, though fitting for a scoping review, does not allow for more specific conclusions about patient participation in IPC and AMS.

Nevertheless, this review presents an evidence-informed overview of existing literature on surgical patients' engagement

in infection care. It is further strengthened by the application of a rigorous process, guided by a protocol, and the independent review of each record by two reviewers.

CONCLUSION

While patient participation has been noted to improve care outcomes, its practical implementation is less well understood, particularly in infection-related care. This review of the limited and disparate evidence from surgical pathways has highlighted the gaps that need to be addressed to amplify patient participation in IPC and AMS. The lack of patient awareness about HCAI risks also speaks to a gap in knowledge that, if addressed, may facilitate optimized IPC practices in hospitalized patients, including those undergoing surgery. The successful implementation of effective strategies to improve patient participation in IPC and/or AMS will likely depend on many factors for which there is currently insufficient evidence.

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Ethical Approval

Ethical approval was not required for this research.

Declaration of Competing Interests

The authors declare no conflicts of interest.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.ijid.2021.07.039](https://doi.org/10.1016/j.ijid.2021.07.039).

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