

“They’re from another planet”: a reality check on the relational architecture of surgical site infection prevention – qualitative exploration for a social network analysis

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Abstract

Background.

Surgical site infections (SSIs) remain common, and adherence to preventive measures varies widely. Prevention spans multiple professional groups, and the social structures shaping how these groups coordinate have rarely been examined directly. Using social network concepts as a sensitising lens, we examined how SSI prevention is socially accomplished across surgical and infection prevention and control (IPC) teams, to inform a subsequent quantitative social network analysis.

Methods.

We conducted a qualitative study in five Swiss-German hospitals (two university, two local, one regional), selected to include different hospital types, professional roles, and surgical specialties. Eleven healthcare professionals took part in ten semi-structured interviews, including one joint interview, complemented by approximately 12 hours of operating room observations. Sample size was guided by information power. Data were analysed using reflexive thematic analysis with iterative inductive coding.

Results.

Five themes emerged. (1) Prevention was described as work distributed along the whole perioperative pathway, with formal responsibilities supplemented by informal vigilance beyond protocols. (2) The relationship between surgical and IPC teams ranged from alienation (“they’re from another planet”) to close partnership, with collaboration shaped largely by whether IPC staff were seen to understand the realities of clinical work. (3) Prevention information was of four kinds – policy, patient-specific information, feedback, and speaking up – each travelling differently; written guidance depended on conversation to take effect, while feedback on SSI and adherence rates reached leadership and individual surgeons but rarely nurses or anaesthesia. (4) Hierarchy influenced whether preventive measures were carried out and who could challenge whom; trust, team stability, and time pressure also mattered. (5) Participants differed markedly in which infection risks they considered important and which preventive measures they thought feasible.

Conclusions.

SSI prevention depends on everyday working relationships. Formal guidance becomes local practice through credibility, conversation, and the connections between people. These connections are structural as well as personal, yet may be overlooked by formal IPC governance and become fragile when key individuals move on. What appears to be non-compliance may reflect differing views of risk and feasibility rather than unwillingness, although knowledge gaps cannot be excluded.

Background

Surgical site infections (SSI) are among the most common healthcare-associated infections, contributing to prolonged hospitalisation, increased costs, and, in severe cases, permanent disability or death [1]. They often originate during the surgical procedure but become clinically apparent only days to weeks later [2]. Despite well-established preventive measures, a 2016 systematic review estimated that consistent application of evidence-based practices could prevent 31% to 84% of SSIs [3]. SSI risk is influenced by both extrinsic factors including surgical technique, wound class, operative duration, and adherence to perioperative protocols, and intrinsic patient-related factors including age, comorbidity, immune status, and underlying health [4, 5]. Evidence-based prevention spans the surgical patient journey – from preoperative antiseptic shower and antimicrobial prophylaxis through intraoperative asepsis and normothermia to postoperative wound care – as consolidated in international guidelines for SSI prevention from WHO, CDC, NICE and the SHEA/IDSA compendium [5–8]. The persistence of preventable proportions of SSIs raises the question of why adherence remains so variable.

Operating rooms are complex sociotechnical systems in which specialised teams deliver care in dynamic, time-pressured settings characterised by uncertainty [9, 10]. SSI prevention in these settings is distributed across multiple professional groups (surgery, anaesthesia, nursing/technicians, and IPC), but structured along different professional and organisational boundaries that can limit shared situational awareness, coordination, and collective ownership of prevention activities [11, 12]. Work system conditions – including environmental and ergonomic constraints – further shape how reliably preventive measures can be carried out during routine and non-routine workflow [13]. Collectively, these interprofessional and system-level factors likely contribute to variation in adherence.

SSI prevention may depend not just on what individuals know, but on how professional groups connect – how they share information, exercise authority, and coordinate across boundaries. Professional groups may also differ in what they treat as relevant knowledge about infection risk. Qualitative studies of SSI prevention have documented the persistent gap between evidence and practice [14–16], but have yet to draw on social network concepts to explain why and how information fails to cross professional boundaries in actionable form. Concepts from social network theory, particularly structural holes and brokerage [17, 18], boundary spanning as a relational practice [19], and the role of network structure in the diffusion of innovations within healthcare organisations [20, 21] provide a lens to examine how prevention guidance is translated into practice in the operating room. This perspective highlights the credibility required to work across professional groups, the management of ambiguity under time pressure, and feedback loops that sustain shared ownership of SSI prevention.

This study examined social structures, roles, beliefs, and information flow related to SSI prevention among surgical and IPC teams in Swiss-German acute care hospitals, using social network concepts as a guiding framework. The aims were twofold: to understand how SSI prevention is socially accomplished across professional boundaries, and to lay the foundation for a future quantitative social network analysis.

Methods

Study design and research team

We conducted a qualitative multi-site study combining semi-structured interviews and operating room (OR) observations. Data were analysed using reflexive thematic analysis (see Data analysis). This design enabled open, in-depth exploration of the social dynamics shaping SSI prevention across surgical and IPC teams. For researcher reflexivity explanations, see Authors' contributions below.

Participants

Healthcare professionals directly involved in surgical care and IPC were sampled for maximum variation and information power across three dimensions: professional role (surgery, anaesthesia, intensive care unit, nursing, IPC), hospital type (university, local, regional), and surgical specialty (neurosurgery, visceral surgery, orthopaedics). Within these dimensions, specific participants were recruited through convenience based on accessibility and willingness. The sample size was guided by the concept of information power [22], given the study's specific aim, participant diversity, and exploratory intent. All participants were unknown to KV and UB before this study, while HS knew two involved IPC heads professionally. The participants learned that we were interested in roles, information flow, collaboration, and beliefs around patient safety and SSI prevention, and we introduced ourselves as the doctoral student in this project (KV) and IPC expert (HS).

Data collection

Interviews. A semi-structured interview guide was developed by the research team to address social structures, information flow, roles, and beliefs related to SSI prevention (**Box 1**). The interview guide was refined after initial pilot tests and iteratively as ongoing analysis identified areas requiring deeper exploration. Interviews were conversational and conducted in person or via video call according to participant preference by two of the authors (KV, HS). All interviews were audio-recorded and transcribed verbatim using transcription software (Sonix Inc 2024); transcripts were checked for accuracy by two authors (KV, HS).

Observations. To triangulate interview accounts with work-as-done, two authors (KV, HS) conducted non-participant observations of eight orthopaedic and neurosurgical procedures at two participating hospitals, totalling approximately 12 hours. Access was arranged with an IPC nurse and an OR nurse, respectively. Before each observation, oral permission was obtained from OR staff. Observations were limited to team interactions and the operating room; patients were not identifiable, and no identifying staff or patient information was recorded.

Box 1. Interview guide

Interviewee role

Could you tell us what your role is in the surgical team?

Individuals/roles involved in surgical site infections (SSI) prevention

Who are the people involved in SSI prevention in your work environment?

Are there additional people who are essential in SSI prevention but are not officially responsible?

How about outside the OR, i.e. before and after surgery?

Information flow regarding SSI prevention

How do you and your colleagues know how to prevent SSIs?

How do you learn about a new SSI prevention measure, e.g., antibiotic prophylaxis?

How do you and your colleagues learn about the SSI rates?

How do you know how well you and your colleagues apply SSI prevention measures?

Collaboration

When you think about your day-to-day work, what aspects of collaboration within the team strengthen SSI prevention?

Beliefs about infectious risks and prevention measures

In your opinion, what are the most important risks of surgery, infectious and non-infectious?

What are the most effective prevention measures?

Data analysis

We conducted reflexive thematic analysis following Braun and Clarke [23]. Transcripts were managed in ATLAS.ti 9 (Lumivero LLC) to support systematic coding and retrieval. Two authors (KV, HS) undertook multiple rounds of coding. Coding was primarily inductive, informed by interests in social structures, information flow, and beliefs related to SSI prevention. Memoing was used throughout to document analytic decisions and emerging interpretations.

After iterative coding, codes were grouped into emerging themes and refined through team discussion to foreground analytically novel patterns. Field notes from observations were reviewed alongside transcripts; episodes that confirmed, contradicted, or extended interview accounts were identified and discussed between coders (KV, HS). Given the small number of sites and procedures, observations were used to triangulate and illustrate interview findings rather than being analysed as a standalone ethnographic dataset.

Interviews were conducted in German (n = 8) and English (n = 2). Coding and theme development were performed in the original interview language. For this publication, German transcripts were anonymised

and translated into English using DeepL (deepl.com), and translations were verified by two authors (KV, native English speaker; HS, native German speaker).

Use of large language models

During preparation of this manuscript, the authors used a large language model–based assistant (Claude, Anthropic) to support editing, restructuring of text, and reference management. The authors reviewed and verified all content, including all references, and take full responsibility for the final manuscript.

Results

Participants and data

We interviewed 11 healthcare professionals in 10 semi-structured interviews. Participants were recruited from five Swiss-German hospitals—two university hospitals, two local hospitals, and one regional hospital—and worked in surgery, anaesthesia, intensive care, and infection prevention and control (IPC). The sample included nurses (5), surgeons (2), and physicians (4) occupying clinical, managerial, and cross-departmental positions.

Interviewees represented visceral surgery (1), orthopaedic surgery (2), anaesthesia (3), intensive care (1), and IPC (4). Their roles ranged from frontline clinical practice to departmental leadership and coordination functions, including senior physicians, head nurses, IPC staff, and link nurses—frontline nurses who serve as departmental contacts between clinical teams and IPC services. Several participants held dual roles that extended beyond their primary clinical responsibilities and involved leading cross-departmental initiatives and supporting infection prevention activities across organisational boundaries.

In total, 354 minutes of interview recordings from 10 interviews with 11 participants were transcribed; one interview was conducted jointly with two participants (median interview duration, 41 minutes; range, 9–46 minutes).

We identified five themes. Although presented separately, the themes were closely connected and some aspects spanned multiple themes.

Theme 1 — “It’s quite a long chain”: prevention across professions and stages of care

Participants consistently described SSI prevention as work distributed across the perioperative journey and across professional groups. No one credited a single team with preventing infections. As one visceral surgeon explained:

We start preoperatively — we plan well, we decide which antibiotic and whether to give it before the operation. Anaesthesia has to make sure it's adjusted to renal function or body weight and given in time, before the incision, ideally finished 15 minutes before. Operating-theatre nursing does the disinfection with us. Postoperatively, nursing on the ward is responsible for the dressing changes; we look at the wound, but they do the actual work. For the whole thing, it's quite a long chain.

An orthopaedic surgeon estimated that *“at least 10 to 12 people”* were involved in ensuring the smooth conduct of a single operation.

Participants described distinct responsibilities across professional groups. Anaesthesia teams were responsible for antibiotic timing, body temperature management, and monitoring; scrub nurses maintained the sterile field and upheld team discipline; surgeons were responsible for operative technique and duration; and ward nurses managed dressings and catheters. Several participants emphasised that infection prevention begins before the patient enters the operating room and identified the central sterilisation unit as an essential, though often overlooked, part of the prevention chain: *“that the goods really come to the operating theatre sterile ... it's still not given enough attention that it's almost the most important thing.”*

The scrub nurse (OTA) was frequently described as the person with the broadest overview:

The operating-theatre nurse is particularly important — usually the one responsible for looking after all the hygiene, making sure everything runs properly, all the checks on the sterile goods and that the whole team really sticks to the rules. She's really the one who has the whole overview.

Several participants also identified the surgeon as a focal point within the team, shaping not only operative technique but also the atmosphere and pace of the operating room; an IPC nurse:

The surgeon is certainly the centrepiece from whom the whole thing radiates, whether an operation runs smoothly. And when an operation runs smoothly, there's of course less risk of infection, because then everyone is more careful than when you're all nervous and agitated.

Alongside these formal responsibilities, participants described informal forms of vigilance that extended beyond established protocols. Experienced nurses, in particular, monitored potential problems, raised concerns, and followed outcomes. One intensive care unit (ICU) link nurse explained that she *“sort of has a sensor and pays attention to such things and brings them up.”* An operating-theatre nurse described tracking patients who returned for repeat surgery:

Every single one who comes back is not good for me, because I wonder what went wrong at our end. I follow up on everyone who comes back to the OR — who was on the OR team?

Theme 2 — “They’re from another planet”: the gap between surgical teams and IPC teams

Participants described the relationship between surgical teams and IPC teams as a central element of infection prevention. Although both groups shared responsibility for preventing infections, they differed in how closely IPC work reflected frontline realities. Across hospitals, what distinguished productive collaborations from strained relationships was not the quality of guidelines, but whether IPC staff were seen as credible partners who understood everyday clinical work. An anaesthesia nurse offered the sharpest account:

They are hygiene specialists who look at how things are in general and do inspections. But for me, they're from another planet. They have a concept, and they don't consider whether it's compatible or not, or how much work and how much time it takes.

Where collaboration worked well, participants often attributed it to the clinical background and practical credibility of IPC staff. An ICU link nurse compared two IPC contacts. The first had ICU training: *"We could discuss things on a completely equal footing and realistically... it was always very feasible."* The replacement had no ICU background, and it showed:

Patients have isolation measures in their notes, described in more detail, but applied quite differently with us. There's confusion in the team, and it's an incredible amount of extra work that wouldn't be necessary.

An IPC physician who still spent 50–60% of his time as a bedside consultant described this as "street credibility": *"You imagine how it works on paper, then go back to the ward and think: great idea, but it just doesn't work – it doesn't translate to reality. The advantage is that you also see what's realistically feasible and what isn't."*

Link nurses were described as IPC's *"eyes on the ground."* Yet participants emphasised that the role varied considerably: *"it all depends on the link nurse – some are very active and motivated... others just do the bare minimum."* The link nurse position also involved a built-in tension between belonging to the surgical team and representing IPC. In one department, IPC staff deliberately communicated negative feedback themselves so that link nurses would not be seen as policing their colleagues: *"If something negative is noticed, they don't have to tell the staff – they can come to us, and we'll communicate it to the ward. So that we don't end up as the outsider in the team."*

Participants described this repositioning as deliberate. One link nurse reflected on an earlier approach that the IPC team was trying to leave behind: *"We're not police officers any more, and we don't want the old image of hospital hygiene to come back."*

In one hospital, the introduction of the link-nurse model was blocked for years by nursing management, who *"felt we IPC wanted to offload our work onto them"*, and only moved forward after a change in leadership.

The renaming of one department from "Hospital Hygiene" to "Infection Prevention" symbolised a broader shift from inspection towards collaboration and support: *"our working concept is no longer just being the*

watchdogs in the background, but supporting people to do the right thing.”

An IPC nurse described a patient body-temperature project as a way of entering the operating theatre in a different role:

I thought long and hard about how to get into the operating theatre without being the infection-prevention person, but just being on site because we have a project — to go in and see the whole picture, and not just count door openings.

Developed jointly with anaesthesia and OR link nurses, the project standardised operating-room temperature management, addressed a recognised risk factor, gave IPC staff a legitimate reason to be present in the operating theatre, and defused recurring disputes by referring to a committee-approved protocol. The nurse expected a “spillover effect” that would create opportunities to raise other issues in the future.

Accounts of relationships between surgical teams and IPC teams varied across hospitals. At one site, an IPC physician had known the head of surgery for years—*“we’ve been to two or three events together, so we know each other pretty well”*—and when he offered to become involved, the surgeon *“found it very positive”*. Elsewhere, relationships were under strain. One OR nurse could not identify who was responsible for IPC on the medical side—*“I could ask at the department leadership meeting... I don’t know”*—and described an OR-focused IPC programme that *“went dormant during COVID”* and had not yet been reactivated.

Theme 3 — “We aren’t informed about that”: where information stops

Participants described multiple channels through which prevention-related information travelled, but also numerous points where information stalled, fragmented, or failed to reach frontline teams (Fig. 1). Policies and procedural changes moved through parallel channels—including email, document systems, the intranet, committee minutes, and link-nurse cascades—yet dissemination often depended on organisational structures and local routines.

A surgeon described how even a simple change to dressing frequency required a long chain of communication involving the weekly spine surgery round, the infectious-disease specialist, the hygiene committee, nursing teams, and IT staff to update the digital order sets. Every hospital had a hygiene committee, although one participant characterised it as largely reactive: it *“only becomes active based on our proposals... it isn’t active on its own”*.

Not all prevention practices spread through formal IPC channels. One surgeon described how his team’s study linking urinary catheters to gram-negative infection led to a new rule: no catheter for procedures lasting less than two hours.

An anaesthetist said: *"Before, it was a bit random – one anaesthesia team would decide to insert a catheter, another team would decide to avoid it. Now, when a surgery is planned for two hours, that's automatically the trigger for the anaesthesia team."* Because anaesthesia staff rotated across specialties, the standardised practice spread into every operating room—not through a committee or email, but through the structural position of a professional group that worked with every surgical team.

In practice, written guidance was often bypassed in favour of direct communication. Guidelines were *"stored on the intranet, but usually people don't look there – in everyday work, they just phone."* Email was the default channel, but participants described it as overloaded: *"The flood is enormous. I don't read things thoroughly any more; I skim through, and if I'm in CC, I don't read those at all."*

An anaesthesia consultant concluded that dissemination *"has to be multimodal – as many different channels as possible,"* because *"there are people who 100% don't read their emails, and at team meetings only part of the team shows up."* For shift workers, the problem was structural. An ICU link nurse explained that during a weekend shift she *"never had a minute to check any emails"*, and a new isolation policy arrived while she was at the bedside: *"Such information needs to be given more weight and perhaps communicated in person, rather than just by email."*

The greatest differences between hospitals concerned feedback about SSI outcomes. At one site, surgeon-specific rates were published and discussed during rounds: *"If you have an infection rate above the average, you try to improve it. If you have no idea about your infection rate, you don't care about it – or much less. So it's important to have numbers."*

At another site, SSI data reached the hygiene committee, but *"from the operating theatre's side, I know they're not very well informed about the whole SSI matter"*. At a third site, an OR nurse said: *"We aren't informed about that. And when you're not informed, you assume there aren't any – but that's not true, is it?"* In the absence of formal feedback, she tracked re-operations herself: *"when I notice we have several revisions for infections, I prick up my ears – I go and look who was doing the instrumentation."*

According to a frontline nurse, hand-hygiene data revealed a persistent gap between professional groups: *"Hand disinfection before patient contact – we've recorded over 80%, and with the doctors it's about 30, and it's the same every year, it never changes."* These figures were discussed in a committee, where *"the doctors always agree something has to be done, but nothing is ever implemented."* A surgeon also noted that audits were influenced by observation, because IPC staff *"are known, so if they're in the OR, everyone knows they're being looked at."*

Theme 4 – "If I don't trust the person, it just doesn't work": hierarchy, trust, and collaboration

Whether preventive measures were carried out in practice depended on hierarchy, trust, team stability, and time. Observations highlighted several practices that supported collaboration across professional groups, including routine "four-eyes" checks for consequential decisions, first-name exchanges across roles, and pre-operative checklists that reliably reached the whole team. In one checklist, a surgeon

questioned whether the antibiotic dose was appropriate for an overweight patient, prompting the anaesthetist to verify it—a real-time, cross-professional correction of the kind participants often described as difficult.

Hierarchy nevertheless remained a consistent barrier to speaking up. One surgeon noted that junior doctors would rarely challenge senior colleagues: *“A resident would never say to an experienced attending, ‘I saw you, you scrubbed your hands for 15 seconds, wash your hands.’ It would never happen — he’d be too scared. We should come to a more open discussion about it... but in real life, it’s still different.”*

Another surgeon described how the timing of antibiotic prophylaxis was handled when the schedule was tight:

“There are people who say a bit casually, okay, let it go, I’ll make a parallel incision and it’s still running. That keeps happening. I think that’s also the reality, that it keeps happening. And there are surgeons who say, yeah, no, the antibiotics are only running now, let’s meet again in ten minutes or 15 minutes, then we’ll start. But to say something like that, when the surgery schedule is running and everything is tight, takes someone with that mentality to say, I don’t care what the others say, or someone who’s a bit higher up in the hierarchy.”

He did not think a resident would say to the head of anaesthesia: *“Yeah, hold on, I’ll be back.”* An IPC nurse similarly noted that although calling out a breach of sterility was generally accepted *“and there’s no discussion,” “there are always surgeons who won’t be told anything, and certainly not by a scrub nurse.”*

Some experienced staff deliberately limited whom they corrected. One ICU link nurse focused exclusively on nursing staff: *“I clearly distance myself from the doctors; if I also had to keep an eye on them, I think I’d give up this role. That’s not my patch, and I’ve really stepped back from it.”*

Trust and blame ran through several accounts. An anaesthesia nurse linked trust directly to teamwork: *“if I don’t trust the person I’m working with, then it just doesn’t work.”* She also described how professional groups could work against one another:

The surgeons blame the anaesthetists — not just for infections but for the time — and the anaesthetists blame the surgeons, and then they blame the positioning staff.

Others emphasised the role of leadership in shaping collaboration. An OR nurse argued that *“the culture of collaboration between all professional groups... is defined by the leaders.”* An IPC physician described using praise alongside correction:

For a long time, medicine was: as long as you hear nothing it’s fine, and as soon as it goes wrong you get scolded. I think we need to move away from that — to also tell people when they’ve done it well.

Team stability had contrasting effects. Stable teams fostered trust, feedback, and familiarity with one another’s strengths and weaknesses. As one OR nurse explained, *“the most important thing is that we’re a*

team that doesn't rotate, that we know each other's weaknesses and strengths, and cultivate a feedback culture." At the same time, continuity could reinforce resistance to change. An ICU link nurse contrasted her own unit, where feedback led to action, with a recovery room in which a colleague encountered persistent resistance when introducing isolation precautions: *"the team resists strongly... I wouldn't have had the patience."* She attributed this to *"a lack of clear leadership... constant changes in leadership, and many long-serving staff"* who were reluctant to change.

Time pressure further constrained preventive practice. An anaesthesia nurse described how delays quickly translated into pressure:

The patient is still nauseous, has a bad vein, and instead of fifteen minutes we take half an hour — and then we have to justify ourselves immediately... the trainees can't handle it any more.

An anaesthesia consultant similarly described time as *"the big criterion by which you're measured, and there's often not enough time for long discussions about antibiotics,"* although routine hand hygiene *"works very well"* and remained robust under pressure.

Theme 5 – "They'll get an infection no matter what we do": beliefs about infection risk

Although all participants viewed infection prevention as important, they emphasised different risks and preventive measures depending on their professional role.

One surgeon was *"quite relaxed"* about a superficial reddened wound that could be managed in an outpatient setting but described deep infections requiring prosthesis replacement as *"the dangerous ones"*. He also regarded operative technique as more important than antibiotic prophylaxis:

Antibiotic prophylaxis can only contribute a small part. What's most important is clean working — all the operating-theatre doors have to be closed, the ventilation has to work and be properly positioned.

A surgeon emphasised patient-related risk factors that lay largely beyond the team's control:

Infections aren't only caused by pathogens, but also by comorbidities — immunosuppression, insulin-dependent diabetes. We can do everything perfectly; if the patient has certain conditions, they'll get an infection no matter what we do.

Nursing and ICU staff, by contrast, framed infection risk in terms of everyday care practices. One link nurse pointed to a paradox: arterial catheters were inserted under strict sterile precautions, while peripheral intravenous lines—which, in one case, had led to fatal sepsis—were treated more casually:

A patient had a phlebitis, became septic and died, and it was clearly from the infection at the IV cannula. Arterial catheters are placed under sterile conditions, with sterile gloves and a face mask, but infections hardly ever occur with those. The venflons are just placed casually. Actually it should be the other way round.

Another participant questioned whether excessive sterility could itself be harmful: *“if people have no defences any more because everything is so sterile, that’s not healthy either – we should find a middle ground.”* An OR nurse identified the hospital elevator as an overlooked route of transmission, reasoning from patient contact, button-pressing, and shared surfaces.

When asked which measures were most effective, participants highlighted those closest to their own work. Anaesthesia staff emphasised antibiotic timing and temperature management; surgeons focused on operative technique and OR ventilation; nurses stressed hand hygiene and maintaining the sterile field. IPC staff, in contrast, described prevention in terms of coordination across the entire system:

It’s very broadly defined – it’s a team effort, with extremely many different factors. It’s not just the surgeon’s fault or responsibility, but every little cog has to mesh together for it to work.

Observed practice reflected the different ways in which professional groups viewed infection risk. In one knee replacement, a patient arrived wearing nail polish. The IPC nurse asked for this to be documented in the operation report, whereas the rest of the team regarded it as unimportant because *“the pulse oximeter worked fine”*. In another case, the surgical team used adhesive incise drapes despite guidance from the hospital’s IPC authority against their use, arguing that the drapes helped stabilise both the operative field and the dressing material. In both observations, participants drew attention to different aspects of infection risk and prevention.

Discussion

Using social network concepts as a sensitising lens to guide our analysis, rather than as a formal network analysis, this study explored how SSI prevention is enacted across surgical and IPC teams, and provides the foundation for a subsequent quantitative network study. Drawing on ten interviews with 11 participants in five hospitals and on operating-room observations, we found that prevention depends not only on guidelines and formal responsibilities, but also on the network of relationships, conversations, and shared beliefs that connect different professional groups across the perioperative pathway. Much of this work remains only partly visible within formal IPC structures. What follows steps back from the individual themes to consider SSI prevention from a broader systems perspective.

Guidelines and practice

Our starting point is a familiar problem. The measures recommended to prevent SSI are well described in international guidelines, yet adherence remains inconsistent across settings. This gap between evidence and practice is not unique to infection prevention. Research on healthcare quality has long described a persistent disconnect between what is known and what is done, while safety science distinguishes work-as-imagined, reflected in policies and guidelines, and work-as-done in everyday practice [24]. In their study on speaking up about safety concerns, Wu and colleagues described an elaborate formal apparatus of policies, procedures and designated roles that staff experienced as frustrating and ambiguous [25]. Producing sound, evidence-based recommendations is therefore only one part of

prevention; whether they become routine practice depends on the relationships, interactions, and organisational structures through which they are enacted.

Surgical and IPC perspectives

Participants often described IPC and the operating room as different worlds. IPC staff were referred to as people “from another plante”, and feedback from IPC on SSI prevention and performance reached frontline teams mainly through leadership rather than through direct contact. These findings suggest that the divide was more than a communication problem: the two groups occupied different positions within the hospital, with different kinds of information, responsibilities, and day-to-day experiences. IPC staff were responsible for preventing infection across the organisation, drawing together surveillance data and infection rates across wards, specialties, and time. The operating team, by contrast, was

Responsible for the patient in real time – this patient, this operation, this hour – in circumstances where uncertainty could not always be removed. Each group therefore saw only part of the wider picture. These were not competing views but complementary ones, and both were needed for SSI prevention. The separation nevertheless appeared to reinforce an inherited tension between the two groups. Shaping how prevention was understood and enacted in everyday practice.

The distance participants described does not mean that all differences in approach were justified, and the boundaries between the two groups were not fixed, since some participants worked across both settings. Yet the separation is perhaps unsurprising in a system where one group develops guidance that another is expected to put into practice. This arrangement may itself reinforce the sense of different worlds, with IPC defining prevention at a system level and operating teams adapting that guidance to the realities of patient care. Similar tensions have been reported in European and US studies of IPC and the implementation of central line-associated bloodstream infections (CLABSI) and SSI prevention bundles [26, 27], suggesting that the divide has organisational as well as interpersonal dimensions.

Brokerage across professional boundaries

SSI prevention depended on different forms of bridging between surgical teams and IPC. The clearest bridge was the person who moved between both worlds. Participants described an intensive care link nurse who was also a shift leader, as well as an IPC physician who continued to work at the bedside and attributed his effectiveness to “street credibility”. When an IPC contact who knew intensive care was replaced by one who did not, decisions slowed and directives were “applied quite differently”.

These individuals occupied brokerage positions between surgical and IPC teams, connecting groups that would otherwise have limited contact [17, 28]. In network terms, these positions bridged structural holes: gaps between groups with few direct links. Research suggests that people in such positions contribute more than information. Their advice is also more likely to be accepted [18]. This matched what participants described. Advice from people with clinical credibility carried weight, whereas the same role was less effective when that credibility was absent. Where communication between IPC and surgical teams depended on only a small number of such individuals, these connections were effective but also

vulnerable if those individuals moved on or were replaced. Boundary-spanning was also identified as a meta-theme in PROHIBIT, a study on CLABSI prevention [26].

Conversation and informal ties formed another bridge between surgical teams and IPC. Although written policies were widely available, participants described how questions about SSI prevention were usually resolved by telephone, at the operating table, or at the bedside. This reflects the way clinical knowledge commonly operates in practice, as captured by Gabbay and le May's concept of "mindlines" [29]. From a network perspective, these informal interactions created the ties through which knowledge circulated in everyday practice. Such informal exchanges supported good practice when the right people were involved, but they could also reinforce workarounds.

A third bridge concerned the practicalities of SSI prevention in everyday clinical work. Participants described how preventive measures were adapted to fit existing ways of working and the time available. This echoes observations that antimicrobial prescribing is shaped by an unwritten "prescribing etiquette" [30]. From this perspective, much of what audit records as non-compliance may be better understood as clinicians' judgements about what is feasible in the context of everyday practice, rather than simply a failure to follow guidance. By contrast, a rule that originated at the frontline required almost no translation. Participants described how the two-hour catheter rule spread across specialties through the routine movement of anaesthesia staff between theatres, allowing the practice to be carried directly into different operating rooms.

Together, these findings support Wu and colleagues' observation that informal organisation helps formal organisation to function [25]. They are also consistent with relational coordination theory, which argues that effective coordination depends less on formal instructions than on communication, shared understanding, and mutual respect [31]. Tørring and colleagues studied 39 surgical teams and found that collaboration depended on both professional roles and the people filling those roles [12]. This matched what our participants described, i.e., the same role could be more or less effective depending on who occupied it.

Information that crosses the IPC–surgery gap

Participants described four kinds of information moving between surgical teams and IPC, each encountering different obstacles. Policies and guidelines were distributed widely but easily disappeared in crowded email inboxes. Patient-specific information, such as isolation status, was not always available when it was needed. Feedback on adherence and SSI rates was often discussed at leadership level or with individual surgeons and rarely reached nurses or anaesthesia, creating what might be described as a "feedback desert". Similar patterns have been reported elsewhere: in a survey of 1105 surgeons and operating-room nurses across 11 professional associations, half reported receiving no feedback at all on their own SSI rate [14]. Trial evidence indicates that feedback is most effective when it is repeated, comes from a supervisor or colleague, and carries explicit targets and an action plan [32]. Participants rarely described feedback with these characteristics.

Participants also described speaking up as a form of information exchange. Although usually discussed as part of safety culture [33], speaking up can also be understood as the most immediate form of communication in the operating room, conveying what should be done at that moment to the person who can still act. It was also the most socially difficult. Professional hierarchies shaped who spoke up to whom. Junior staff were reluctant to challenge senior colleagues, while one experienced link nurse explained that she would challenge nurses but not doctors.

Hierarchy and trust

The interviews highlighted two factors that influenced how surgical teams and IPC worked together in practice. The first was hierarchy. Participants described hand-hygiene rates that differed by profession year after year without consequence, while concerns were often raised during scheduled leadership meetings rather than addressed directly in the operating room. Hierarchy influenced not only who spoke up, but also whose concerns carried weight in practice. One surgeon described prophylactic antibiotic timing as a question of authority. Some colleagues would “let it go” and proceed with the incision while the antibiotic was still running, and “that keeps happening”. Preventing this and insisting on waiting another ten or fifteen minutes depended on who was present and who had the standing to delay the operation: “someone with that mentality ... or someone who's a bit higher up in the hierarchy”.

At the same time, participants described examples of cross-professional checking. These included a routine “four-eyes” principle and a pre-operative checklist in which a surgeon questioned an antibiotic dose and the anaesthetist verified it. These examples suggest that professional boundaries did not prevent staff from intervening altogether. Rather, hierarchy shaped when such interventions occurred and who was in a position to make them. Challenging colleagues across professional boundaries was therefore not impossible, but it came at a social cost that was not shared equally [34]. The importance of hierarchy has been noted in previous studies of SSI prevention and perioperative care. Tanner and colleagues identified power and hierarchy as factors affecting SSI prevention in cardiac surgery [16], while operating-room nurses in Qvistgaard’s study described the hierarchical traditions of the theatre as both protective and restrictive, concluding that confident relationships and clear communication create the conditions for prevention [15]. Our findings extend this work by suggesting that hierarchy shaped not only whether concerns were voiced, but also whose judgement carried sufficient authority to influence practice.

The second factor was local culture. Participants in two units within the same hospital described very different experiences, despite having the same link-nurse model in place. One welcomed feedback, whereas the other encountered a “defensive circle” of long-serving staff amid repeated changes in leadership. The contrast suggests that formal structures alone were insufficient to sustain collaboration between surgical teams and IPC. The same organisational arrangement could support trust in one setting while reinforcing established ways of working in another, echoing descriptions of normalisation of deviance in the perioperative literature [35].

Participants also described attempts to build connections between surgical teams and IPC. One IPC specialist used a shared project on temperature management to create opportunities for repeated contact with clinical teams, gradually building relationships across professional boundaries. These efforts suggest that connections between surgical teams and IPC could be strengthened deliberately, but this work remained largely informal and relied on the initiative of individual staff members.

Different beliefs about risk and SSI prevention

The interviews also revealed marked differences in what participants believed about infection risk and which preventive measures mattered most in practice. Participants gave confident and markedly different answers when asked which measures they considered most effective. No one reproduced the full set of evidence-based SSI prevention measures spontaneously; instead, participants emphasised those closest to their own work. Their views on risk diverged further, ranging from the hospital elevator button as a route of transmission, to the routine insertion of peripheral cannulas while arterial lines receive full sterile precautions, to the belief that patient comorbidity determines the outcome “no matter what we do”.

An obvious interpretation would be to see these differences as evidence of knowledge gaps alone. However, our study was not designed to assess participants’ knowledge. Participants were asked which measures they considered most effective, rather than to list all evidence-based measures. The interviews nevertheless suggest that beliefs about risk and prevention differed according to where people stood in the perioperative pathway. Similar findings have been reported elsewhere. In cardiac surgery, Tanner and colleagues identified the relationship between evidence, personal beliefs, and perceived risk as one of the factors shaping SSI prevention [16]. Several participants also emphasised factors that are not part of most clinical SSI prevention guidelines [5–7], such as a stable team or a culture of collaboration, although both have counterparts in the WHO core components for IPC programmes and the SHEA 2022 SSI prevention guidelines [8, 36].

One participant ranked functioning ventilation and closed theatre doors above antibiotic prophylaxis, arguing that the latter could “only contribute a small part” to the prevention of deep prosthetic infection. Antimicrobial prophylaxis is among the strongest recommendations in SSI guidelines [5], yet the ordering he described reflected his own assessment of risk. He was not unaware of prophylaxis, but weighed it against other measures and placed it lower. Similarly, one team continued to use adhesive incise drapes that their own infection prevention service had advised against because the drapes helped to stabilise both the surgical field and the dressing. The guidance was known, but outweighed by other practical considerations.

Participants also judged preventive measures in terms of feasibility. One anaesthetist described hand hygiene as remaining robust under pressure, whereas discussions about antibiotic timing became secondary when time was short. Across the interviews, recommendations were not simply accepted or rejected; they were weighed against competing risks, existing routines, and the practical realities of everyday work.

We therefore interpret these differences primarily as matters of perspective rather than profession, with participants placing greater emphasis on the parts of SSI prevention closest to their own work. At the same time, because most professional roles were represented by only one or two participants, we cannot distinguish broader professional patterns from individual views, nor can we exclude the possibility that differences in knowledge contributed to some of the variation.

Strengths and limitations

The study included participants from different hospital types, surgical specialties, and professional backgrounds. We sought participants in comparable roles across different hospitals and deliberately included staff in dual or cross-boundary positions, such as link nurses and staff in leadership roles. Interviews were combined with direct observation in the operating room. This approach allowed us to examine aspects of SSI prevention that are difficult to capture through surveillance and audit data alone, including informal practices and everyday interactions between surgical teams and IPC.

The limitations are equally clear. Eleven participants from a single region and language cannot represent the full range of organisational arrangements, and we make no claims about prevalence. Participation was voluntary and may have attracted professionals with a particular interest in infection prevention. Observations covered two of the five sites and are best understood as complementing the interview data rather than validating them, while interviews themselves are subject to social-desirability bias.

Our data cannot establish whether the relationships and patterns we describe influence SSI outcomes, as we relied largely on participants' own accounts and judgements. Finally, our assumptions shaped the questions we asked. The interview guide approached IPC as the route by which prevention reaches the frontline teams, and consequently our data provide a richer account of this route than of practices spreading between peers or emerging from the frontline itself.

Conclusions

These findings reinforce the importance of the evidence base for SSI prevention while drawing attention to the network of relationships through which prevention is enacted across surgical and IPC teams. Although we approached the study with an interest in relationships, information flow, and the wider hospital system, the interviews revealed a broader and more complex picture than our interview guide anticipated. SSI prevention depended on connections across the divide between surgical teams and IPC, on the conversations through which different parts of the hospital remained linked, and on the different ways in which staff understood risk and prevention along the perioperative pathway. These connections receive less attention than guidelines, audits, and surveillance data, yet they shaped how prevention was understood and carried out in everyday practice. Making them visible was the purpose of this study; understanding how they influence SSI prevention across the hospital system is the work that follows.

Box 2. Key messages — the network behind SSI prevention

SSI prevention ran across the whole perioperative pathway and depended on the connections between surgical and IPC teams, not only on written guidance.

1. **Two planets — different views of risk.** Surgical and IPC teams did not always agree on which infection risks mattered most, or which preventive measures were most important. Some apparent non-compliance may reflect different judgements about risk and feasibility rather than unwillingness.

2. **Oral culture — information travels through conversation.** Written policies were widely available, but questions were often settled by phone, at the operating table, or at the bedside. Hierarchy also shaped who could speak up to whom.

3. **Brokers — a few people hold the connection.** Individuals with credibility in both surgical and IPC teams connected groups that otherwise had limited contact. These connections could work well but were fragile when they depended on particular people.

4. **Feedback desert — results do not reach everyone.** SSI and adherence data often reached leadership and individual surgeons but rarely nurses or anaesthesia staff, leaving some of those involved in prevention without a clear picture of their own performance.

List of abbreviations

CDC Centers for Disease Control and Prevention

CLABSI Central line-associated bloodstream infections

ICU Intensive care unit

IDSA Infectious Diseases Society of America

IPC Infection prevention and control

NICE National Institute for Health and Care Excellence

OR Operating room

OTA Operation technical assistant (scrub nurse)

SHEA Society for Healthcare Epidemiology of America

SSI Surgical site infection

WHO World Health Organization

Declarations

Ethics approval and consent to participate

The Ethics Committee of the Canton of Zurich waived a formal ethics evaluation as the study did not meet the legal criteria for research on humans (No. 2023-00823). Informed consent was obtained from

all participants before involvement. Confidentiality and anonymity were maintained throughout.

Consent for publication

Not applicable. No identifiable participant data are reported.

Availability of data and materials

The interview transcripts are not publicly available because they contain information that could compromise participant confidentiality. The interview guide is included in Box 1.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

KV (female), HS (male), and UB (male) conceived the study protocol. KV and HS conducted the interviews and observations; KV and HS analysed the data, in ongoing discussion with UB throughout design, data collection, and analysis. KV holds a Masters in Medicinal and Industrial Pharmaceutical Science and conducted this study as part of her PhD thesis; she has extensive experience in qualitative interviewing. Prof HS is an Internal Medicine and Infectious Diseases board-certified physician with over 25 years of experience in acute care leadership positions in infectious diseases and IPC, and qualitative research and epidemiology. Prof UB is a computer scientist, social scientist, and network scientist known for his work on centrality, cluster analysis, and graph drawing. The complementary disciplinary backgrounds — pharmaceutical sciences, clinical epidemiology and infection prevention, and social network analysis — shaped data interpretation, with KV bringing an interpretive distance from the clinical-IPC field, HS providing clinical and IPC contextual familiarity, and UB providing the network-analytic lens that informed the guiding framework. KV and HS wrote the first draft of the manuscript. All authors revised and approved the manuscript.

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Figures

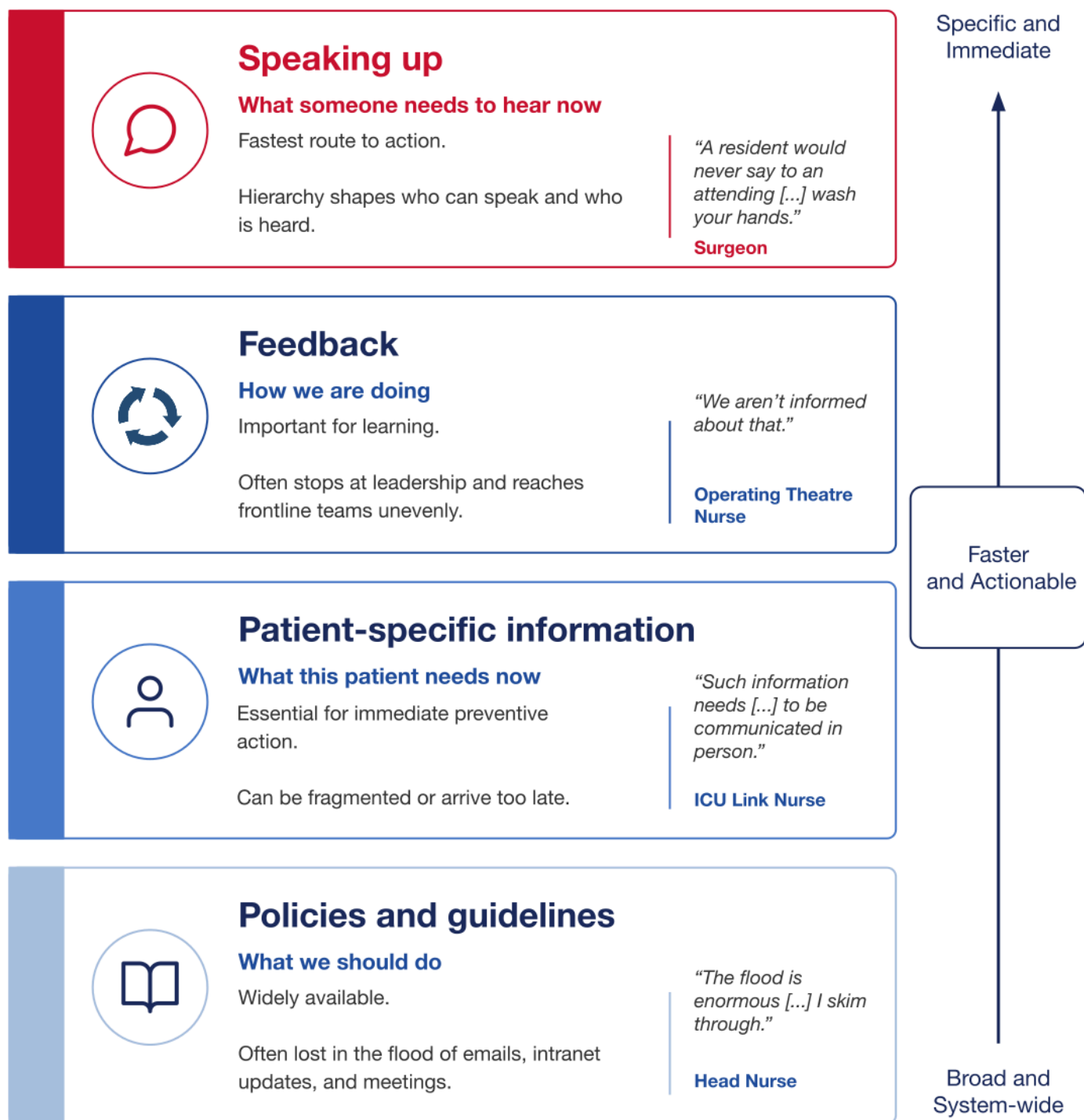


Figure 1

Four kinds of infection prevention information moving between surgical and IPC teams, each with a typical point of failure, ordered from broad and system-wide to specific and interpersonal. Quotes are abridged from participant interviews.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [COREQChecklistVallonthaieI2026.pdf](#)