Interdisciplinary strategies to reduce surgical infectious risk in the operating theatre: A scoping review protocol

Dominique Joubert, Sylvain Boloré, Carelle Baroni, Hans Anne-Sophie, Aline Wasser, Selin Kivrak, Audrey Ringot, Claude Dussard

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Abstract

Background: Surgical site infections (SSIs) are among the most common and serious complications following surgery, prolonging hospital stays and delaying patient recovery. Recent international consensus recommendations have identified evidence-based practices to reduce SSIs, but not how to apply them efficiently and in an interdisciplinary manner in the operating theatre. Therefore, further efforts are needed to identify and study the best interdisciplinary organisation to prevent SSIs.

Objective: To map the extent, diversity and nature of research on interdisciplinary strategies to reduce SSIs and to analyse the impact of interdisciplinarity on the effectiveness of preventive interventions

Methods: Using the JBI methodology for scoping reviews, the databases Embase (including MEDLINE and PubMed-not-MEDLINE), Cochrane Library will be searched, with manual searches of references cited in the included articles. Studies published in English or French only will be included.
Inclusion criteria: Based on the Participants, Concept, and Context (PCC) framework, the eligible population will include surgical teams. The concept of interest is interdisciplinary strategies to prevent the risk of infection. The context will be that of adult surgery in the operating room during turnover. Studies with experimental, quasi-experimental, pre-experimental, observational, case-control and cross-sectional designs will be considered.

Results: Of the 1,679 articles identified, 45 were selected for in-depth analysis by four reviewers. The reading of the articles included will be completed by the end of October.

Conclusions: Emerging interdisciplinary strategies show promising potential to prevent surgical site infections. This approach is part of a global project aimed at co-constructing a standard procedure during preoperative preparation in the operating room to reduce SSI. This literature review will be followed by a qualitative survey and a pre/post quasi-experimental quantitative study to assess its integration into current practice. Clinical Trial: The review protocol will be registered in Open Science Framework (OSF) on 2024.

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Review

Interdisciplinary strategies to reduce surgical infectious risk in the operating theatre: A scoping review protocol.

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Abstract

Background: Surgical site infections (SSIs) are among the most common and serious complications following surgery, prolonging hospital stays and delaying patient recovery. Recent international consensus recommendations have identified evidence-based practices to reduce SSIs, but not how to apply them efficiently and in an interdisciplinary manner in the operating theatre. Therefore, further efforts are needed to identify and study the best interdisciplinary organisation to prevent SSIs.

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included.
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The review protocol will be registered in Open Science Framework (OSF) on 2024.

Keywords: Surgical site infection; infection risk management; surgical team; operating theatre; standard operating procedures

Introduction

The transition to advanced healthcare technologies, is associated with increased patient safety risks in acute care hospitals[1]. Operating theatres are places where several risk factors contribute to adverse or even serious adverse events. The risk of infection is a primary concern and daily challenge, as infections are a leading cause of preventable hospital death[2]. These infections are responsible for significant morbidity and mortality, as well as additional healthcare costs[3]. In Switzerland, surgical site infections (SSIs) are the most common healthcare-associated infections in healthcare facilities[4].

Respecting evidence-based practice (EBP) can reduce infection rates, and their respective levels of evidence for SSIs are published[5]. In the operating theatre, both standard and specific precautions are essential to prevent infections[6].
SSIs are nosocomial and occur post-surgery, primarily due to the pre-, intra-, and post-operative environment, host immunity, and surgical cleanliness. Pathogens are mainly transmitted via contact, particularly by healthcare workers' hands. Hand hygiene is essential for preventing infections, especially in acute care, to avoid bacteraemia, urinary tract infections, SSI and ventilator-associated pneumonia[3, 7].

Key strategies include ensuring the quality of medical device disinfection, biocleaning and surface cleaning[8]. Monitoring compliance with disinfection protocols during turnover time is critical to assessing interdisciplinary organisation and contamination risk[9]. Adherence to current guidelines is essential due to the rapidly evolving EPB, many practices previously considered acceptable are now contraindicated[10, 11].

WHO and SHEA recommendations for SSI prevention differ slightly in the level of evidence[2, 10], but agree on key practices eg: hair removal, surgical hand preparation, alcohol-based skin antiseptics (CHG solutions), optimal timing of antibiotic prophylaxis and glycaemic control [7, 12, 13]. Emphasis is also placed on soft skills, checklists, adherence bundles, SSI monitoring and feedback to

operating theatre staff to improve patient safety[5, 12, 14-24].
Low compliance with SSI prevention persists due to challenges in applying clinical guidelines. Only 29% of tertiary hospitals in 133 countries have an infection prevention and control (IPC) programs. In Switzerland, 93% of 35 out of 300 institutions have deficiencies in procedures, training, hygienist presence, and cognitive dissonance in operating theatres.

Operating theatres require the coordinated efforts of surgeons, anaesthetists, technicians and nurses to ensure quality care. Effective IPC relies on collaboration, communication, teamwork and efficient logistics between different hospital disciplines[21]. The complex, technical environment and diverse professional backgrounds require effective interprofessional teamwork, especially under time-sensitive conditions[23]. The management of human error in the perioperative period remains a major challenge[18, 19, 25, 26].

Interprofessionality involves practical collaboration between skilled professionals, while interdisciplinarity integrates knowledge from various academic disciplines to solve complex problems. Both are crucial for effective IPC in healthcare settings.
Expert guidelines from WHO, SHEA, IDSA, APIC, and AHA lack specifics on interdisciplinary application for SSI prevention in operating theatres[10]. A preliminary search found no recent systematic reviews, highlighting the need to explore and evaluate effective interdisciplinary strategies to reduce SSIs.

Study Aim

The aim of this scoping review is to map the extent, diversity, and nature of research focused on interdisciplinary strategies to reduce SSIs. The goal is to identify patterns, gaps, and innovations in research and to assess how the integration of different disciplinary approaches contributes to improved outcomes in SSI prevention.

Methods

The proposed scoping review will be conducted in accordance with the JBI methodology for scoping reviews[27] and in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR)[29].

Search strategy

A three-step search strategy will be utilized. First, an initial limited search of and MEDLINE (PubMed) was undertaken to identify articles on the topic. The text words contained in the titles and abstracts of relevant articles, and the index terms used to describe the articles are listed for use as search terms. A second, more detailed search will be conducted, including all identified keywords and index terms, will be adapted for each included database and/or information source. The databases to be searched include, Embase (including MEDLINE and PubMed-not-MEDLINE), Cochrane Library, (Multimedia Appendix 2). Thirdly, the reference lists of all included papers will be hand-searched for additional studies that meet the inclusion criteria. Studies from January 2016 onwards will be included due to frequent changes in hospital hygiene practices. In 2009, the WHO published a guide to reduce SSI, highlighting the global issue with an international action plan. Teamwork is emphasized in these recommendations. Updated in 2016, these are now supported by other organizations. Only studies in English or French will be included.

Review questions

- 1) What are the interdisciplinary strategies to reduce SSIs in the operating theatre?
- 2) What are its characteristics?
- 3) What improvements have been observed in relation to the interventions and their evaluation?
- 4) Would it be possible to apply a model that considers the culture and the local specificities?

Inclusion criteria

The Participants, Concept, and Context (PCC) framework was used to identify studies for inclusion in this review[27].
Participants: The eligible population will be surgical teams, which includes all surgical teams involved in the preparation of patients in the room immediately prior to surgery. This includes surgeons, anaesthetists, anaesthetist nurses, registered nurses, scrub nurses, instrument technicians and nursing assistants. Articles are included if they cover at least three disciplines [28].
Concept: The focus is on their interdisciplinary strategies for IPC. Here, the notion of interdisciplinarity does not refer to the different characteristics of personnel, such as education or profession, but to a synchronised frame of reference of common action, such as standard operating procedures. These interdisciplinary concepts use mental models, images, and their synchronisation is activated by such triggers. These reference frameworks have been described and proven in other industries, including Standard operating procedures in Airbus task sharing in the cockpit. Articles will be included if reporting at least one interdisciplinary strategy.
Context: The specific context is adult surgery in operating theatres during turnover, the period between closure of the surgical wound and the incision of the next patient. This period is critical for the prevention of infection through antibiotic prophylaxis and skin preparation. In adult surgery, turnover involves high-risk procedures that require effective infection control strategies. Only studies reporting on interventions during turnover in adult surgery will be included; those not relevant or focusing on paediatric surgery will be excluded. There is a substantial body of EBP aimed at reducing the risk of infection during this critical transition period.

Types of Sources

This scoping review will consider both experimental and quasi-experimental study designs including randomized controlled trials, non-randomized controlled trials, before and after studies and interrupted time-series studies. In addition, analytical observational studies including prospective and retrospective cohort studies, case-control studies and analytical cross-sectional studies will be considered for inclusion. Publications excluded: editorials, commentaries, letters, conference proceedings and gray literature because we are looking for effective and proven interdisciplinary models.

Study/Source of Evidence selection

Following the search, all identified citations will be collated and uploaded into EndNote 20 and duplicates removed. Following a pilot test, titles and abstracts will then be screened by two reviewers for assessment against the inclusion criteria for the review. Study selection was based on dual review of titles and abstracts, followed by full-text analysis. In case of discrepancies, another reviewer will be consulted as necessary. Potentially relevant sources will be retrieved in full and their citation details imported into the JBI System for the Unified Management, Assessment and Review of Information (JBI SUMARI; JBI, Adelaide, Australia)[30]. The full text of selected citations will be

assessed in detail against the inclusion criteria by four reviewers. Reasons for exclusion of sources of evidence at full text that do not meet the inclusion criteria will be recorded and reported in the scoping review. Any disagreements that arise between the reviewers at each stage of the selection process will be resolved through discussion, or with an additional reviewer/s. The results of the search and the study inclusion process will be reported in full in the final scoping review and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for scoping review (PRISMA-ScR) flow diagram.

Data Extraction

Data will be extracted from papers included in the scoping review by four reviewers using a data extraction tool developed by the reviewers (Textbox 1. Data extraction instrument/ Multimedia Appendix 5).

The data extracted will include specific details about the participants, concept, context, study methods and key findings relevant to the review question. Information extracted will include General information, methods, characteristics and results.

The draft data extraction tool will be modified and revised as necessary during the process of extracting data from each included evidence source. Modifications will be detailed in the scoping review. Any disagreements that arise between the reviewers will be resolved through discussion, or with an additional reviewer/s. If appropriate, authors of papers will be contacted to request missing or additional data, where required.

Textbox 1: Data extracted from studies

General information	Methods	Characteristics	Results
• Author's name • Publication year • Country	• Design • Participants • Characteristic / sampling and analyse	• Location • Time around surgery • Team Framework/model • Patient partnership • Implementation strategies • Triggers • Cognitive aid • Nursing Care concept • Outcome process • Outcome patient • Key finding	• Positive • Negative • Level of proof

Results

Of the 1,679 articles identified, 45 were selected for in-depth analysis by four reviewers.

Identified preventive strategies are presented in narrative synthesis and summary tables, supplemented by graphs to illustrate the distribution of studies and emerging trends in relation to the questions of this scoping review.

General information and methods are presented in a descriptive table (Table 1) and detailed (Appendix 5: Data extraction instrument) for each category, including years of publication, study locations, study designs, sample sizes and participant demographics.

For the different strategies to reduce surgical site infections (SSIs) in the operating theatre, the interprofessional overview and the interdisciplinary interventional aspects will be detailed. It will be specified whether the interventions were introduced and developed using a specific implementation model or care concept. Key points of the triggers synchro bundle that facilitate safe organisation, proper sequencing and quality care delivery will be noted.

The various outcomes and evaluations are reported in detail, including indicators measuring clinical process, SSI rates, team functioning, quality of turnover. Among the types of interventions observed, we will indicate whether they are fully or partially compliant with EBP and international recommendations, whether they include hard and soft skills, whether they are innovative, whether they have been implemented in sectors outside of health care, and whether they are replicable in Switzerland.

Limitations

This scoping review is limited to adult patients. The articles included are in English and French and may not cover all the available evidence. In the selected articles, the outcome measure is sometimes not reported, which makes it difficult to understand the impact of interventions on the SSI rate. When the SSI rate is reported, the variability of the monitoring methods must be taken into account.

Conclusions

Emerging interdisciplinary strategies show promising potential to prevent surgical site infections. This approach is part of a global project aimed at co-constructing a standard procedure during preoperative preparation in the operating room to reduce ISC. This literature review will be followed by a qualitative survey and a pre/post quasi-experimental quantitative study to assess its integration into current practice.

Acknowledgements

Authors' Contributions

DJ is the principal investigator who conceived, designed, analyzed, and interpreted the work. He screened all selected articles and read all included articles in parallel with the co-reviewers. He takes responsibility for all aspects of the work and ensures that questions about the accuracy or integrity of the work are properly investigated and resolved.

AR and CD helped with the methodology, read back, and gave final approval of the version to be published.

SB read all the included articles in parallel with the co-reviewers, helped with the design and proofreading, and read the included articles as a co-reviewer.

AW screened all selections in parallel with DJ and read the included articles.

CB, AH and SK are among the readers of the included articles and each took time to discuss and compare their interpretation with DJ's in parallel, and then we exchanged to resolve the discrepancies.

Conflicts of Interest

none declared

Abbreviations

AHA: American hospital association
APIC: Association for professionals in infection control and epidemiology
CHG: chlorhexidine gluconate
EBP: evidence-based practice
IDSA: Infectious diseases society of America
IPC: infection prevention and control
JBI: Joanna Briggs Institute
PCC: participants, concept, and context
PRISMA-ScR: Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews
SSIs: surgical site infections
OSF: Open Science Framework
SHEA: Society for healthcare epidemiology of America
WHO: World Health Organization

Multimedia Appendix 1
Full search strategy

Multimedia Appendix 1: Search strategy from dec 2016 to may 2024

CINAHL: 10.06.2024

Concept	#	Research strategy	Number of references identified
A	1	(MH "Operating Room Personnel+") OR (MH "Operating Room Nurses") OR (MH "Surgical Technologists") OR (MH "Anesthesia Nursing") OR (MH "Scrub Nurses") OR (MH "Circulating Nurses")	10144
A	2	("Surgical Team*" OR "Surgeon*" OR "Anaesthetist*" OR "Anaesthetic Nurse*" OR " Instrument Technician*" OR "scrub Nurse*" OR "Nursing Assistant*" OR “circulating nurse*”)	41479
A	3	1 OR 2	44079
	4	(MH "Surgical Wound Infection") OR (MH "Infection/PC") OR (MH "Sepsis/PC")	7461
B	5	(“Infection Prevention” OR “Infectious Risk” OR “healthcare associated infection*” OR “surgical site infection*” OR “SSI” OR “infection control” OR “Infectious risk management” OR “strategies to prevent health care associated infection”)	24769
B	6	4 OR 5	27037
B	7	(MH "Multidisciplinary Care Team")	20963
B	8	(“Interdisciplinary Strateg* “ OR “Interdisciplinary practice*" OR "Interprofessional” OR “Multidisciplinary” OR “Multiprofessional” OR ”Workflow” OR “bundle” OR “bundle to prevent SSI” OR “Bundle of care“ OR “Standard operating procedures” OR tasksharing” OR “interdisciplinary strategy”)	68167
B	9	7 OR 8	68167
A+B	10	3 AND 6 AND 9	98

Multimedia Appendix 1

Embase: 11.06.2024

Concept	#	Research strategy	Number of references identified
A	1	('operating room technicians'/exp OR 'operating room nursing'/exp OR 'surgeons'/exp)	16462
A	2	('Surgical Team*' OR Surgeon* OR Anaesthetist* OR 'Anaesthetic Nurse*' OR ' Instrument Technician*' OR 'scrub Nurse*' OR 'Nursing Assistant*' OR 'circulating nurse*')	337962
A	3	1 OR 2	344299
	4	('Surgical Wound Infection'/exp OR sepsis/exp OR 'infection control'/exp)	233760
B	5	('infection prevention' OR 'infectious risk' OR 'healthcare associated infection*' OR 'surgical site infection*' OR ssi OR 'infection control' OR 'infectious risk management')	119388
B	6	4 OR 5	299328
B	7	('Interdisciplinary Communication'/exp)	4235
B	8	('interdisciplinary strateg*' OR 'interdisciplinary practice*' OR interprofessional OR multidisciplinary OR multiprofessional OR workflow OR bundle OR 'bundle to prevent SSI' OR 'bundle of care' OR 'standard operating procedures' OR tasksharing OR (interdisciplinary AND (studies OR study)) OR (interdisciplinary AND (strategie OR strategies OR strategy OR 'strategy s')))	440976
B	9	7 OR 8	442582
A+B	10	3 AND 6 AND 9	1022

Multimedia Appendix 3

MEDLINE 11.06.2024

	1	("Operating Room Technicians"[Mesh] OR "Operating Room Nursing"[Mesh] OR "Surgeons"[Mesh])	15924
A	2	("Surgical Team*" OR "Surgeon*" OR "Anaesthetist*" OR "Anaesthetic Nurse*" OR "Instrument Technician*" OR "scrub Nurse*" OR "Nursing Assistant*" OR “circulating nurse*”)	160164

A	3	1 OR 2	161165
	4	("Surgical Wound Infection"[Mesh] OR "sepsis"[MeSH] OR "Infection Control"[Mesh])	70437
B	5	(“Infection Prevention” OR “Infectious Risk” OR “healthcare associated infection*” OR “surgical site infection*” OR “SSI” OR “infection control” OR “Infectious risk management”)	62243
B	6	4 OR 5	114087
B	7	("Interdisciplinary Communication"[Mesh])	4781
B	8	('interdisciplinary strateg*' OR 'interdisciplinary practice*' OR interprofessional OR multidisciplinary OR multiprofessional OR workflow OR bundle OR 'bundle to prevent SSI' OR 'bundle of care' OR 'standard operating procedures' OR tasksharing OR (interdisciplinary AND (studies OR study)) OR (interdisciplinary AND (strategie OR strategies OR strategy OR 'strategy s'))))	430184
B	9	7 OR 8	431498
A+B	10	3 AND 6 AND 9	873

Multimedia Appendix 4

Cochrane library 03.06.2024

	1	("Operating Room Technicians" OR "Operating Room Nursing" OR "Surgeons")	436
A	2	(("Surgical" NEXT Team*) OR Surgeon* OR Anaesthetist* OR ("Anaesthetic" NEXT Nurse*) OR ("Instrument" NEXT Technician*) OR ("scrub" NEXT Nurse*) OR ("Nursing" NEXT Assistant*) OR ("circulating" NEXT nurse*))	641
A	3	1 OR 2	643
	4	[mh "Surgical Wound Infection"] OR [mh infections]	544

		OR [mh sepsis]	
B	5	("Infection Prevention" OR "Infectious Risk" OR ("healthcare associated" NEXT infection*) OR ("surgical site" NEXT infection*) OR SSI OR "infection control" OR "Infectious risk management")	210
B	6	4 OR 5	638
B	7	([mh "Interdisciplinary Communication"])	165
B	8	(Interdisciplinary NEXT Strategy OR Interdisciplinary NEXT practice OR Interprofessional OR Multidisciplinary OR Multiprofessional OR Workflow OR bundle OR bundle NEXT SSI OR Bundle NEXT care OR Standard NEXT operating OR tasksharing OR interdisciplinary NEXT strategy OR interdisciplinary NEXT strategies OR interdisciplinary NEXT study OR interdisciplinary NEXT studies)	557
B	9	7 OR 8	557
A+B	10	3 AND 6 AND 9	27

Multimedia Appendix 5 Data extraction instrument

neral ormation			Methods			Characteristics 1.1
hor's ne	**Publicati on year**	**Country**	**Design**	**Participants**	**characteristic / sampling and analyse**	**Location**
	E.g	E.g	E.g.	E.g	E.g.	E.g.
			Mixed-method Randomized controlled trial Non-randomized controlled trial Before and after	Surgeon Anaesthetist Anaesthetic Nurse Instrument Technician scrub Nurse Nursing Assistant circulating nurse Surgical Team	sizes/setting Single Centre Multicentre Interrupted time-series Qualitative analysis	Operating room Patient zone Anaesthetic area Turnover Post-surgery time

aracteristics 2					
ne around gery	**Team Framework/ model**	**Patient partnership**	**Implementation strategies**	**Triggers**	**Cognitive aid**
.	E.g.	E.g.	E.g.	E.g.	E.g.
nover aoperative iod t operative iod	CRM TeamSTEPPS Aeronautical SOPs+ Bundle of care Checklist Other industry model	Patient inputs Exchange of information and co-operation with the patient prior to the induction of anaesthesia	Education and training Simulation training E-Learning Team coaching Re-aim CFIR TDF Framework EPIS	Synchronized care practice Gesture Announcement Sonor or visual alarm	Icon, Graph Pocket card Pictogram

aracteristics 1.3				Results
rsing Care concept	**Outcome process**	**Outcome patient**	**Key finding**	**Level of proof/Positive/ negative**
.	E.g.	E.g.	E.g.	
engths-based sing (SBN) ient satisfaction tidisciplinary team DT)	Adaptation of the model Compliance with recommendation Adopting the care model	SSI Patient satisfaction Patient morbitiy Patient mortality Length of stay Number of day lost	Model Efficiency Innovation Quality improvement Skills and knowledge improvement Culture and adaptation Reproducibility in Switzerland	

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