Barriers and facilitators associated with the implementation of surgical safety checklists: a qualitative systematic review.

PATERSON, C., MCKIE, A., TURNER, M. and KAAK, V.

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Corresponding Author:

Professor Catherine Paterson
Professor of Cancer Nursing,
Caring Futures Institute, Flinders University, Australia
Email: catherine.paterson@flinders.edu.au

PATERSON, C [A,B,C, D.] MCKIE, A. [A,] , TURNER, M., [A] , KAAK, V., [A,]

a Faculty of Health, University of Canberra, Bruce ACT, Australia

b Caring Futures Institute, Flinders University, Australia

c Central Adelaide Local Health Network, Adelaide

d Robert Gordon University, Aberdeen, Scotland, UK

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Catherine Paterson: Conceptualization, Methodology, Validation, Screening, Data Extraction, Formal analysis, Interpretation, Writing Original draft, Writing –Reviewing & Editing,
Vera Kaak: Methodology, Validation, Screening, Data Extraction, Formal analysis, Interpretation, Writing Original draft, Writing –Reviewing & Editing.
Amanda McKie: Interpretation, Writing Original draft, Writing –Reviewing & Editing
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Abstract

Despite the documented benefits of the World Health Organisation Patient Safety Checklist compliance rates with implementation continue to cause risk to patient safety. This qualitative systematic review aimed to explore the reported factors that impact compliance and implementation processes related to surgical safety checklists in perioperative settings. A systematic review using the Joanna Briggs Institute (JBI) approach to synthesize qualitative studies was conducted and reported according to PRISMA guidelines. Electronic databases were expansively searched using keywords and subject headings. Articles were assessed using a pre-selected eligibility criterion. Data extraction and quality appraisal was undertaken for all included studies and a meta-aggregation performed. 34 studies were included. Following synthesis of the findings there were multiple interrelating barriers to checklist compliance that impacted implementation. There were more barriers than enablers reported in existing studies. Enablers included effective leadership, education and training, timely use of audit and feedback, local champions, and the option for local modifications to the surgical checklist. Further research should focus on targeted interventions that improve observed compliance rates to optimize patient safety.

No Patient or Public Contribution as this was a systematic review.

Data availability: The data that supports the findings of this study are available in the supplementary material of this article.

Keywords: Surgical safety checklists, WHO surgical safety checklists, compliance, implementation, barrier, facilitator

Summary of relevance

Problem

Patient safety within the perioperative environment remains a significant issue.

What is Already Know

The World Health Organisation (WHO) Surgical Safety Checklist has been shown to decrease preventable surgical complications by performing key patient safety checks at three critical points of the surgical pathway, but uptake in practice remains poor.

What this Paper Adds

This qualitative systematic review identified multiple key factors that influenced the uptake of the Surgical Safety Checklist in operating theatres. Surgeon participation, hierarchical culture, complacency, and duplication of existing safety processes were identified which impacted the use and completion of the checklist.

Introduction

Patient safety within the perioperative environment remains a significant issue. Evidence underscores that over half of all surgical complications are preventable, with many preventable harms caused by human error (Gormley et al., 2018, World Health Organisation, 2009, Suliburk et al., 2019). Evidence has identified that patient safety issues are linked to higher mortality rates (Gormley et al., 2018). Preventable harms result in a considerable impact on patient morbidity, impacts on quality of life, and represent a significant liability on health care systems (The International Surgical Outcomes Study Group, 2016, Suliburk et al., 2019).

In response to inadequate patient safety practices in perioperative settings, the World Health Organization (WHO) released the WHO Surgical Safety Checklist in mid-2008 (World Health Organisation, 2009). The WHO checklist is commonly used in practice globally to decrease preventable surgical complications by performing key patient safety checks at three critical points of the surgical pathway (Westman et al., 2020, World Health Organisation, 2009). Multiple studies have reported an association between the use of the WHO Surgical Safety Checklist and a reduction in patient mortality, infections, sentinel events and postoperative complications (Abbott et al., 2018, Haynes et al., 2009). The Surgical Safety Checklist can improve patient safety culture, communication and teamwork amongst the perioperative multidisciplinary team (Wangoo et al., 2016). The WHO checklist consists of many items and processes to be followed by the peri-operative surgical team prior, during, and after the surgical procedure, and it is separated into three phases: sign in before induction of anaesthesia, time out/surgical pause before skin incision, and sign out before patient leaves operating room (World Health Organisation, 2009).

Successful implementation and compliance with the WHO Surgical Safety Checklist is vital optimize patient safety and maintain positive patient outcomes (Liu and Mehigan, 2021). The implementation of the Surgical Safety Checklist in perioperative setting is a challenging and requires active

participation from all healthcare disciplines at the defined checkpoints in the perioperative environment (Tostes and Galvão, 2019). Several studies report however, poor end user engagement and suboptimal compliance rates despite the well documented evidence on the benefits of the checklist to patient safety (Cornwall et al., 2018, Almeida and Rodrigues, 2019). Hospital reported compliance rates and actual observed compliance rates have also been noted to be significantly different in the reality of perioperative clinical practice, potentially putting patient safety at risk (Cornwall et al., 2018, Mahmood et al., 2019).

It is important to identify the factors which impact implementation of the WHO Surgical Safety Checklist to inform targeted interventions to improve compliance and prevent harm to patients. Noteworthy, a previous systematic review (Bergs et al., 2015) explored the barriers and enablers to the application of WHO surgical safety checklists, but there are several limitations to point out. Firstly, this review is clinically outdated by year of publication and has several methodological shortcomings in that the search only included one scientific database, and by omission studies might have been missed within the evidence synthesis (Bergs et al., 2015). Therefore, this comprehensive systematic review aims to update the previous review to identify all factors which are associated with the implementation of this checklist.

Aim

To identify the factors associated with the use of WHO Surgical Safety Checklist in the perioperative setting. The following clinically focused question was addressed:

- What are the reported factors that impact compliance and the implementation processes related to the WHO Surgical Safety Checklist?

Methods

This qualitative systematic review was conducted according to the Joanna Briggs Institute (JBI) methods for qualitative reviews and has been reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) checklist (Lockwood et al., 2015, Page et al.,

2021). A meta-aggregation of qualitative research was conducted to identify the factors associated compliance and implementation processes of the WHO Surgical Safety Checklist in perioperative settings. This review followed a priori systematic review protocol available upon request.

Ethical statement: not applicable

Eligibility criteria

Inclusion criteria

- All qualitative studies irrespective of research design.
- Mixed methods studies were included if the qualitative component was reported separately.
- English studies published in a peer-reviewed journal.
- Studies published after June 2008 with the rationale that the WHO Surgical Safety Checklist was not implemented before this timepoint.
- Relevant systematic reviews were scrutinized for additional potential studies.

Exclusion criteria

- Studies not published in English.
- Published abstracts, editorials, conference papers.
- Studies that did not report on the barriers or enablers associated with compliance and implementation processes related to Surgical Safety Checklist implementation.
- Studies that were quantitative in design given the meta-aggregation methodology.

Participants

- All healthcare professionals reporting on their qualitative experiences of the WHO Surgical Safety Checklist in the perioperative environment.

Types of outcomes measured

- Qualitative reports which identified the factors associated with compliance and the implementation processes of the WHO Surgical Safety Checklist in perioperative clinical settings.

Search strategy

The CINAHL, Medline and Scopus databases were searched in August 2022 and the search was repeated in June 2023 for all includable publications and systematic reviews were scrutinized for potentially relevant studies to be included in the screening process. The search architecture was designed in collaboration with an expert systematic reviews librarian and included a combination of keywords and subject headings to capture the concepts of surgical safety checklists, perioperative settings, and factors that impact compliance and implementation. Search filters adapted from the CADTH Search filters database [https://searchfilters.cadth.ca/] were applied to retrieve qualitative and mixed-methods studies. Limiters were placed on the search results for publication date 2008 to June 2023 and for studies published in English, see **supplementary Table 1** for a detailed search strategy and search results.

Study selection

Following the database searches, all identified citations were imported from EndNote into the Covidence systematic review software where the duplicates were removed. Titles and abstracts were screened independently by the three reviewing authors (CP, VK, KH), with any conflicts resolved through discussion. The full texts articles of the retained studies were then retrieved in full text and scrutinized against the inclusion criteria by three reviewers (CP, VK, AMc). Full-text studies that did not meet the eligibility criteria were excluded with reasons provided. Relevant systematic reviews that were identified during the search were also screened for potentially relevant studies.

Quality Assessment

Methodological quality for all included full-text studies was evaluated using the JBI Critical Appraisal Checklist for Qualitative Research (Pearson and Field, 2011). This 10-item Critical Appraisal Checklist assessed for congruity between the stated philosophical position, methodology, research question,

data analysis and interpretation of results. Each question was rated individually as either 'yes', 'no', or 'unclear'. All studies were included regardless of the results of the quality appraisal to enable a comprehensive overview of the current state of the evidence, results for the quality assessment were crossed checked by three reviewers (CP, VK, AMc)

Data extraction

The data extracted from each study included the author details, year, phenomena of interest, country of origin, participant characteristics and major findings relevant to the research question. Findings were extracted from each study and organized into a data extraction table that was piloted on several studies first. Each finding compromised of a qualitative theme and was supported by a qualitative verbatim illustration of participant voices. A finding was considered as a themes or subthemes related to the context of interest of this review. Findings were given a classification as either unequivocal (findings linked to an illustration that is beyond reasonable doubt and not open to challenge), credible (findings that lack clear association with the data and are open to challenge), or unsupported (findings that are not supported by the data) (Lockwood et al., 2015). Only unequivocal or credible findings were included in the meta-aggregation in line with the JBI method. All unsupported findings were excluded from the data synthesis.

Data synthesis

Unequivocal and credible findings across the included studies were given labels and synthesized into categories based on similar meaning and themes. The identified categories had at least two findings and were developed into synthesized findings following careful and repeated assessment of the extracted data with consensus among all reviewers. Findings of both the barriers and enablers were identified separately in data extraction. The synthesis of each category produced a single comprehensive description of the barriers or enablers associated with WHO Surgical Safety Checklist.

Findings

Characteristics of the studies

Of the 1912 publications retrieved from the database searches, a total of 34 studies were included **Figure 1** (Page et al., 2021). The studies were conducted in a range of countries: Jordon 1 (Albsoul et al., 2022), Turkey 1 (Aydin Akbuga et al., 2023), Brazil 1 (de Oliveira Junior and de Magalhães, 2017), France 1 (Fourcade et al., 2012), Cyprus 1 (Georgiou et al., 2018), Thailand 1 (Kasatpibal et al., 2018), Sweden 3 (Krupic et al., 2020, Nordström and Wihlborg, 2019, Rönnberg and Nilsson, 2015), Saudi Arabia 1 (Manamela et al., 2022), Zambia 1 (Munthali et al., 2022), , Spain 1 (Peñataro‐Pintado et al., 2021), Switzerland 1 (Schwendimann et al., 2019), New Zealand 1 (Weller et al., 2018), and Madagascar 1 (White et al., 2018), USA 2 (Alidina et al., 2017, Conley et al., 2011), multiple countries 2 (Aveling et al., 2013, Elam et al., 2022), Norway 3 (Haugen et al., 2015, Høyland et al., 2014, Wæhle et al., 2012), UK 3 (O'Brien et al., 2017, Robertson-Smith, 2016, Russ et al., 2015), Australia 4 (Braaf et al., 2013, Gillespie et al., 2016a, Gillespie et al., 2016b, Rogers et al., 2020) and, Canada 6 (Dharampal et al., 2016, Gagliardi et al., 2014, Mobilio et al., 2022, Mahmood et al., 2019, Spence et al., 2011, Ziman et al., 2018). The sample sizes of ranged from 8 to 196 participants and represented a total number of included of all members of the perioperative MDT: surgeons, anaesthesiologists, operating room nurses, medical students, nurse anaesthetists, surgical trainees, theatre support workers, radiographers, nursing students, administrative staff, management, and consumers. See **Table 1**. The methodological quality assessment of the included studies is presented in **Table 2**.

A total of 251 unequivocal and credible findings were extracted from the 34 included studies (see **supplementary Table 2** for extracted findings). Significantly more findings were available in the literature on the barriers of Surgical Safety Checklists compared to the enablers to checklist implementation. Findings were grouped together based on similar meanings, see **Table 3** for the overview of the synthesized findings and categories.

Barriers

Individual barriers

Resistance, attitudes and understanding, surgeon participation, patient anxiety, and individual non-technical skills were identified as individual barriers to the implementation of the WHO Surgical Safety Checklist. Across the studies the main barrier to successful implementation was the behaviors and attitudes of senior medical staff, and in particularly the lead surgeon (Alidina et al., 2017, Aveling et al., 2013, Braaf et al., 2013, Dharampal et al., 2016, Fourcade et al., 2012, Gagliardi et al., 2014, Kasatpibal et al., 2018, Nordström and Wihlborg, 2019, Robertson-Smith, 2016, Rönnberg and Nilsson, 2015, Russ et al., 2015, White et al., 2018, Ziman et al., 2018, Albsoul et al., 2022, de Oliveira Junior and de Magalhães, 2017, Georgiou et al., 2018, Manamela et al., 2022, Mobilio et al., 2022).

"I can clearly remember two occasions where the surgeon was just very dismissive and it was like, 'oh I'm not doing this, I don't need to do this, I'm not you know…' and literally just walked away." p.5 (Aveling et al., 2013)

Resistance behaviors from individuals in the surgical MDT was reported to be a significant barrier to the checklist compliance, resulting in dismissal or refusal to participate (Aveling et al., 2013, Braaf et al., 2013, Gagliardi et al., 2014, Kasatpibal et al., 2018, O'Brien et al., 2017, Russ et al., 2015, Weller et al., 2018, White et al., 2018). Negative attitudes, perceptions, and beliefs, as well as lack of understanding, were notable barriers to checklist implementation (Aveling et al., 2013, Kasatpibal et al., 2018, Krupic et al., 2020, Robertson-Smith, 2016, Schwendimann et al., 2019). Patient anxiety created a barrier to appropriate implementation of the surgical safety checklist because it altered how the checklist process was conducted (Fourcade et al., 2012, Russ et al., 2015, Weller et al., 2018, Ziman et al., 2018)

"If they're very, very anxious and you don't want them to be in theatre or wait for too long with a whole heap of people and signing in was just one extra step that will increase their anxiety, so we'll do it [sign in] outside the theatre in pre-op." p. 234 (Weller et al., 2018)

"Some of the patients are really nervous and anxious, they just want to go in and go to sleep. So that's where we're not going to be doing a briefing with the patient … " p.579 (Ziman et al., 2018)

Poor leadership and a lack of assertiveness also negatively impacted on compliance with the checklist implementation (Aveling et al., 2013, Kasatpibal et al., 2018, O'Brien et al., 2017, Weller et al., 2018, Russ et al., 2015).

"The checklist itself is very easy. Getting the answer to some of the questions from the surgeons and the anesthetists isn't, and that's the fall down" p.5 (Russ et al., 2015)

Environment barriers

Workload, time pressures, competing tasks, emergency procedures, and distractions were key environmental factors which created barriers to the successful use of the checklist. In particular, time pressures because of extended surgical patient lists, high patient turnover rates, brief non-complex procedures were significant environmental barriers (Alidina et al., 2017, Braaf et al., 2013, Fourcade et al., 2012, Gagliardi et al., 2014, Gillespie et al., 2016a, Gillespie et al., 2016b, Peñataro‐Pintado et al., 2021, Robertson-Smith, 2016, Schwendimann et al., 2019, Albsoul et al., 2022, Aydin Akbuga et al., 2023, de Oliveira Junior and de Magalhães, 2017, Georgiou et al., 2018, Haugen et al., 2015, Munthali et al., 2022). Furthermore, the impact of increased staff workloads, disruption to the perioperative workflow created perceived delays which compounded suboptimal checklist compliance rates (Aveling et al., 2013, Fourcade et al., 2012, Gagliardi et al., 2014, Mahmood et al.,

2019, O'Brien et al., 2017, Rönnberg and Nilsson, 2015, Russ et al., 2015, Wæhle et al., 2012, Ziman et al., 2018).

Many studies identified that additional perioperative clinical tasks negatively impacted timely and accurate completion of the checklist (Alidina et al., 2017, Braaf et al., 2013, Dharampal et al., 2016, Gillespie et al., 2016a, Gillespie et al., 2016b, Krupic et al., 2020, Rogers et al., 2020, Russ et al., 2015, Weller et al., 2018, Ziman et al., 2018). Additional distractions and interruptions, such as irrelevant conversations, music, high mechanical noise, phones and other background noise, also created barriers to the completion of the checklist (Braaf et al., 2013, Krupic et al., 2020, Robertson-Smith, 2016, Rogers et al., 2020, Schwendimann et al., 2019).

"As to the contextual factors, these concerned work and environment conditions such as distractions, interruptions and time pressure. Also named were OR background noise, e.g., a high mechanical noise level or telephones ringing". p.3 (Schwendimann et al., 2019)

The pressure of emergency scenarios where time is critical further placed an environmental barrier to checklist compliance, which often lead to outright omission (Aveling et al., 2013, Braaf et al., 2013, Fourcade et al., 2012, Gagliardi et al., 2014, Kasatpibal et al., 2018, O'Brien et al., 2017, White et al., 2018).

" … the time-out procedure was omitted entirely; this usually occurred when emergency surgery was required and surgical intervention was time critical." p.651 (Braaf et al., 2013)

Organisational barriers

Organisational issues, which include staffing levels, management support and existing organisational policy, were reported to create barriers to checklist compliance (Elam et al., 2022, Mobilio et al.,

2022, Munthali et al., 2022). Staffing issues including complexities of high staff turnover, prolonged shifts, and staff shortages in combination with existing time pressures, create difficulties in completing the checklist prior to surgery commencement (Alidina et al., 2017, Aveling et al., 2013, Fourcade et al., 2012, Kasatpibal et al., 2018). Across several studies it was reported that ambiguous hospital policy resulted in a lack of ownership and confusion towards individual responsibilities of the checklist completion among key stakeholders in the theatre environment which created confusion and conflict in the team (Gagliardi et al., 2014, Gillespie et al., 2016a, Gillespie et al., 2016b, Kasatpibal et al., 2018, Krupic et al., 2020, Rönnberg and Nilsson, 2015) . A perceived 'top down' implementation approach without timely consultation among the perioperative MDT also resulted in suboptimal compliance rates (Gagliardi et al., 2014, Mahmood et al., 2019, O'Brien et al., 2017, Schwendimann et al., 2019). Furthermore, a lack of senior management and effective leadership in the organisation to support checklist execution was an issue (Conley et al., 2011, Gagliardi et al., 2014).

"Participants said that SSC use was limited by the traditional physician-dominated hierarchical culture of the operating room and lack of confidence among nurses leading SSC review, particularly when faced with resistance from staff who were most often surgeons, leading to tension and avoidance of SSC."p.4 (Gagliardi et al., 2014)

"Who enforces this stuff when the surgeon isn't behaving? ... That is where we have had problems when we have 'bad players'. It is a difficult position for nurses and even anaesthetists to be in". p.876 (Conley et al., 2011)

Cultural barriers

Specific surgical specialties were reported as barriers because of the culture inherent within individual specialties impacted compliance rates and engagement in the MDT (Peñataro‐Pintado et

al., 2021, Rogers et al., 2020, Schwendimann et al., 2019, Weller et al., 2018, Ziman et al., 2018, Elam et al., 2022, Munthali et al., 2022).

> *"… response to this problem in her hospital had been to adapt the checklist to clinical reality, which in her specific work area (ocular surgery) had meant shortening it [checklist]." p.10*
>
> (Peñataro-Pintado et al., 2021)

The culture of professional independence or disciplines working in 'professional silos' in operating theatres was a barrier to team communication and successful checklist processes (Alidina et al., 2017, Braaf et al., 2013, Fourcade et al., 2012, Gillespie et al., 2016a, Gillespie et al., 2016b). The culture of complacency was a problem because many healthcare professions viewed the WHO Surgical Safety Checklist as a 'tick box' exercise with a lack of engagement and critical thinking which was a major barrier to the effective implementation of the checklist as a patient safety tool (Alidina et al., 2017, Aveling et al., 2013, Braaf et al., 2013, Fourcade et al., 2012, Gagliardi et al., 2014, Peñataro‐Pintado et al., 2021, Russ et al., 2015, Wæhle et al., 2012, Weller et al., 2018).

> *"If you are not careful about what you are doing, the patient will get checked in and if all the boxes are ticked and nobody actually talks to the patient and confirms with the patient while they are aware that the surgeon knows what they are doing, it doesn't prevent anything" p.4 (Gillespie et al., 2016a).*

Checklist barriers

There were several barriers with the checklist itself. Issues included generalization, duplication of existing processes and repetition of items. Clinical staff reported that the checklist was too generalized which limited applicability to each clinical specialist setting (Mahmood et al., 2019, Russ et al., 2015, Wæhle et al., 2012, Haugen et al., 2015). Staff reported a lack of opportunity for local modifications for individual work settings or specialties which meant that some aspects of the

checklist were redundant, inappropriate, or irrelevant (Mahmood et al., 2019, Russ et al., 2015, Schwendimann et al., 2019).

> *"Where the answer to checks in 999 out of 1000 cases is a 'no' or 'not applicable', the team might become complacent about the checks … failing to pick-up the one case where the answer was 'yes'. This is harmful because it desensitizes staff and an error can occur". p.6 (Russ et al., 2015)*

Other issues with the checklist included the standardized implementation time of the surgical safety checklist which was often during the busiest time of the procedure where staff were preoccupied with other time critical tasks, which affected compliance and participation (Fourcade et al., 2012, Gillespie et al., 2016a, Gillespie et al., 2016b, Russ et al., 2015). The checklist wording was also viewed as unclear and ambiguous, which created confusion (Fourcade et al., 2012, Gillespie et al., 2016a, Gillespie et al., 2016b, Russ et al., 2015). Duplication of pre-existing safety checks and repetition of questions was the biggest checklist barrier identified across the studies (Aveling et al., 2013, Dharampal et al., 2016, Fourcade et al., 2012, Gillespie et al., 2016a, Gillespie et al., 2016b, Robertson-Smith, 2016, Rönnberg and Nilsson, 2015, Russ et al., 2015, Wæhle et al., 2012).

> *"I watch our ward nurses fill out one box, then another nurse fill out another box… I have no problem with that bit but I suspect we're doubling up a bit, and my concern with that is that perhaps leads to checklist fatigue". p.866 (Gillespie et al., 2016a)*

Enablers

Individual enablers

Similar to individual barriers, individual non-technical skills and surgeon participation were key enablers. The attributes of non-technical skills, such as effective leadership qualities, confidence and

assertiveness, optimized compliance and team participation with the checklist (Aveling et al., 2013, Conley et al., 2011, Gagliardi et al., 2014, Peñataro‐Pintado et al., 2021, Georgiou et al., 2018, Haugen et al., 2015). Participation of the head surgeon, in terms of leadership and promoting the checklist use in practice was important to its sussessful uptake in the clinical environement (Wæhle et al., 2012, Weller et al., 2018).

> *"But it is obvious, the surgical safety checklist performance is totally depending on the physicians participation. As soon as they become more involved, both performance and compliance increased". p.6 (Wæhle et al., 2012)*

> *"… surgeons and specialist anaesthetists as the most influential people for determining the value of the checklist…" p.5 (Weller et al., 2018)*

Organisation enablers

Management support, education and training, audits and clear policy were four main organizational considerations which facilitated the surgical safety checklist use. Support from management and perioperative leaders who provided clear policy documents, offered rewards for compliance, and encouraged a safety culture by implementing disciplinary action for non-compliance were important enablers and impacted patient safety and outcomes (Alidina et al., 2017, Gagliardi et al., 2014, Kasatpibal et al., 2018, Russ et al., 2015, Schwendimann et al., 2019, Aydin Akbuga et al., 2023, Elam et al., 2022, Manamela et al., 2022, Munthali et al., 2022). Organisations which implemented regular audits and constructive feedback to MDT teams demonstrated effective uptake and completion of the checklist (Aveling et al., 2013, Dharampal et al., 2016, Gagliardi et al., 2014, Kasatpibal et al., 2018). Provision of timely education and training to the MDT was reported as a facilitator, particularly when the training facilitator was a surgeon (Alidina et al., 2017, Conley et al., 2011, Kasatpibal et al., 2018, Robertson-Smith, 2016, Russ et al., 2015).

"The upper management giving the directive that the time out is not an option… it is a requirement helped a great deal". p. 463 (Alidina et al., 2017)

"To train surgeons, the person at the training station must himself/herself be a surgeon… a surgeon who presides at the training station would be more respected."p.903 (Kasatpibal et al., 2018)

Cultural enablers

Two key cultural considerations were identified which included leaders and maintaining a patient safety culture. Maintaining a team safety culture that encouraged collaboration, respect, communication and cooperating positively influenced checklist compliance and reduced, or completely, eliminate a hierarchy culture (Aveling et al., 2013, Gillespie et al., 2016a, Gillespie et al., 2016b, Kasatpibal et al., 2018, Nordström and Wihlborg, 2019, Schwendimann et al., 2019). Utilizing local leaders and champions, particularly through using senior surgeons, was found to facilitate correct checklist implementation (Aveling et al., 2013, Gagliardi et al., 2014, Russ et al., 2015).

"We are there to iron out any problems, or if anybody gives them grief we can go in and fire back if needed" (Aveling et al., 2013, p.6).

"…Identifying surgeon champions, needs leaders in the physician group to sell it". p.5 (Gagliardi et al., 2014)

Checklists modifications

Local modifications and integration of the surgical safety checklist into already existing safety checking procedures were two prominent findings. Modifying and adapting the checklist to specific settings promoted relevancy in the local clinical setting which improved the checklist uptake (Gagliardi et al., 2014, Gillespie et al., 2016a, Gillespie et al., 2016b, Mahmood et al., 2019, Peñataro‐Pintado et al., 2021, Russ et al., 2015, Manamela et al., 2022).

"I personally feel that compliance is going to be better if it is more tailored to what we do. You know, we always get asked about antibiotics, but we never use antibiotics in any of our surgeries." p.835 (Mahmood et al., 2019)

Studies reported that it was important that the checklist was integrated into already existing safety checking processes would facilitate compliance by reducing duplication, repetition and targeted relevance to patient safety issues and concerns (Gagliardi et al., 2014, Russ et al., 2015).

"I think the problem is that, with it being a standardized checklist, is that hospitals have their own checklists as well and you end up having two or three checklists, all checking the same sort of thing so you get some overlap." p.5 (Russ et al., 2015)

Discussion

This qualitative systematic review set out to identify the barriers and enablers that impact compliance rates and implementation of WHO Surgical Safety Checklist in clinical practice. A well-developed body of evidence has demonstrated that the checklist improves patient outcomes, reduces preventable harms, and enhances perceived team collaboration and communication within the perioperative MDT (Molina et al., 2016). However, despite these well-documented benefits, this review has provided valuable new insights into both the barriers and enablers in the real-world clinical setting of using this checklist. Resistance to the use of the Surgical Safety Checklist remains a key issue and is directly related to individual attitudes and beliefs about the perceived usefulness of the checklist as a safety tool (Aveling et al., 2013, Kasatpibal et al., 2018, Krupic et al., 2020). Senior practitioners who are 'set in their ways' are more likely to display resistive and obstructive behaviors (Gagliardi et al., 2014). Disinterested surgeons were found to be the single most important barrier to the checklist completion in this review. Furthermore, unclear organizational policy and a 'top down' implementation approach without timely and transparent consultation among key stakeholders in

the perioperative MDT further influenced attitudes and individual staff buy-in (Gagliardi et al., 2014, Mahmood et al., 2019, O'Brien et al., 2017).

A common misconception that impacted attitudes and fostered resistance was the belief that the surgical safety checklist reduced operating theatre efficiency. While this barrier has been disproved in several studies demonstrating that the application of the checklist does not cause or compound surgical delays, this review has underscored that this view remains a wide held misconception (Papaspyros et al., 2010, Gillespie et al., 2019). Therefore, affording the opportunity for evidence informed education and training sessions, as well as implementing local champions, may help to combat these inaccurate staff perceptions to better facilitate and promote effective implementation of this checklist. This review identified that training was enhanced when it was conducted by the same healthcare discipline, for example surgeon to surgeon (Alidina et al., 2017, Conley et al., 2011, Kasatpibal et al., 2018). Training may also help staff to develop the confidence to challenge resistive behaviors through courageous conversations in the face of hierarchical cultures.

Time constraints compounded with increasing workloads impacted the ability of staff to participate in the checklist because of simultaneous competing perioperative clinical tasks and tending to patient care. It has been identified that checklist completion was especially disruptive during 'time out' and 'sign out' as these are arguably the busiest points of the surgical procedure (Fourcade et al., 2012, Gillespie et al., 2019). During these times, the anesthetic team is focused on managing the patient airway and the scrub team are simultaneously setting up equipment, impeding their ability to participate.

It is widely acknowledged that the perioperative environment is fast-paced and widely embeds a surgeon-dominated culture. The embedded hierarchical culture of the perioperative setting impacted the ability to staff, particularly nursing staff, to speak up to challenge resistive behaviors or

safety concerns identified by the checklist in fear of negative responses (Gagliardi et al., 2014, Wæhle et al., 2012, Weller et al., 2018, White et al., 2018). The ability to 'speak up' can be enhanced by a lack of non-technical skills, such as confidence, assertiveness, and effective leadership attributes.

One of the most concerning findings of this review was the normalized practice of using a 'tick box' approach to surgical safety checklist completion without the use of critical thinking or team reflection. This behavior completely contradicts the use of this tool to optimize patient safety. Simply 'going through the motions' when completing the checklist can mean that pertinent patient information may not be communicated or documented amongst the perioperative MDT. The culture of professional independence with minimal verbal interaction can also lead to an over-reliance on some staff to complete their disciplinary sections of the checklist individually, and results in false sense of security for patient safety (Gillespie et al., 2019).

Non-compliance to the surgical safety checklist is a complex issue that remains problematic in surgical environments and requires multifaceted interventions to address these issues in the real-world setting. Therefore, simply targeting one facilitator may not be successful to address these interacting barriers. Future research should move away from a barrier or problem-focused approach and emphasise solution-oriented enablers to improve checklist uptake. In doing so, targeted interventions can be developed to improve compliance and overall patient safety outcomes.

Limitations

This systematic review follows the JBI guidelines for qualitative synthesis and a clear and transparent process was followed throughout. However, several limitations are present. Only studies published in English and peer reviewed studies were included, meaning relevant research may have been omitted, however this review did represent global research on the topic.

Conclusion

This qualitative systematic review identified multiple barriers and enablers that influenced the implementation of the Surgical Safety Checklist in operating theatres. The review highlighted the multifaceted nature of these factors working in tandem. Targeted future educational interventions are required to address barriers to checklist usage to promote patient safely and compliance. The findings can be used to influence policies and operating standards in the operating theatres to reduce the mishaps.

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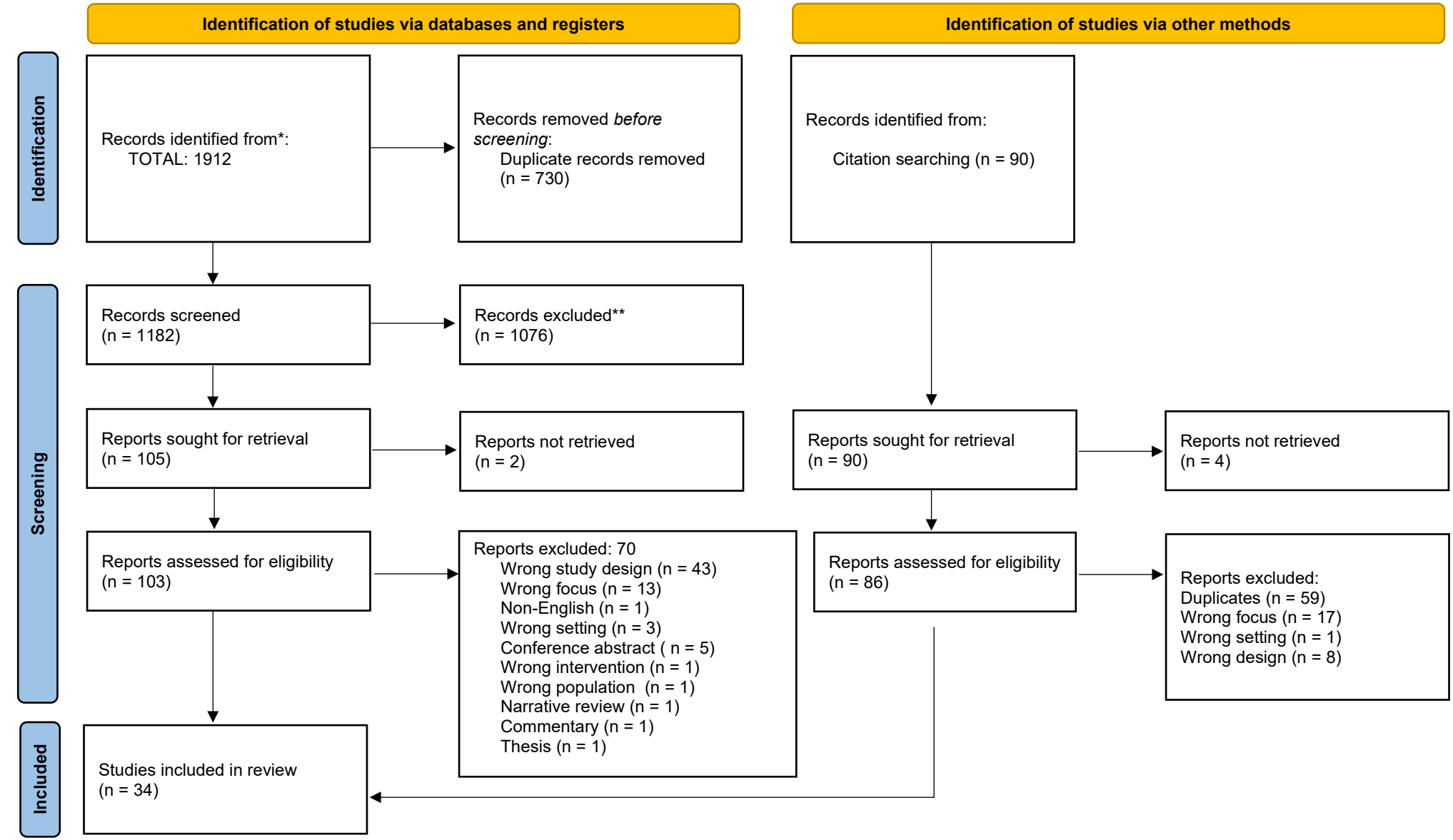

Figure 1. PRISMA Diagram

Table 1. Overview of characteristics of included studies

Lead Author/Year	Methods for data collection and analysis	Country	Phenomena of interest	Participants characteristics and sample size	Major findings
Albsoul et al., (2022)	Data collection: Semi-structured interviews Analysis: Inductive Thematic approach	Jordan	To understand the factors that distinguished effective SSC implementation	21 healthcare staff employed in the operating room (nurses, residents, surgeons, and anesthesiologists)	Three main themes emerged from data analysis namely compliance with the surgical safety checklist, the impact of surgical safety checklist, and barriers and facilitators to the use of the surgical safety checklist
Alidina et al. (2017)	Data collection: Free text analysis from pre and post implementation surveys Analysis: Fisher's exact test (quantitative), inductive coding & thematic analysis (qualitative)	USA	To gain insight into how surgical team members perceive safety in the OR, how to improve checklist implementation, and how the SSC impacts the safety of surgical practice	54 perioperative staff (pre implementation, 50 perioperative staff (post implementation)	Qualitative responses showed that concerns about checklist buy-in, team communication and coordination, patient safety climate, checklist quality and effectiveness of the checklist, perceived hierarchy, and staffing persisted after implementation
Aveling et al. (2013)	Data collection: Observation, semi-structured interviews, analysing documentation Analysis: Thematic analysis	Africa and the United Kingdom	To identify and compare influences on checklist implementation and compliance in operating theatres in hospitals in high-income and low-income countries	39 perioperative staff (anaesthetists, surgeons, theatre staff, management, administrative staff)	Consistent use, completion and fidelity of checklist deployment are not straightforward in any setting, but may be higher in the two UK hospitals compared with a hospital in a low-income country
Aydin Akbuga et al., (2023)	Data collection: Face to face semi structured interviews Analysis: Colaizzi's seven-step data analysis method	Turkey	To determine nurses' views on the use of the Turkish version of the World Health Organization's Surgical Safety Checklist	20 nurses	Three themes: the importance of using the SSC, barriers to using the checklist, and compliance with the checklist and applicability
Braaf et al. (2013)	Data collection: Participant observation, two focus groups and 20 semi-structured interviews Analysis: Coding and ethnographic analysis	Australia	To explore how the time-out procedure is implemented in clinical practice	125 perioperative staff (surgeons, anaesthetists, nurses)	Healthcare professionals adapted the content, time and number of team members involved in the time-out procedure to meet the demands of the theatre environment
Conley et al. (2011)	Data collection: Face to face semi structured interviews Analysis: Identification of distinguishing factors followed by an iterative process	USA	To understand the factors that distinguished effective SSC implementation	5 SSC implementation leaders of participating hospital (nurse, anesthesiologist, surgeon); local surgeons (unspecified)	Successful implementation of the SCC requires implementation leaders to explain why and show how this can be achieved
De Oliveira Junior et al., (2017)	Data collection: focus group technique and photographic methods Analysis: content analysis	Brazil	To explore the application of the safe surgery checklist, seeking to describe the main factors that can affect its completion and follow-up.	16 nurses	Three categories emerged from the information grouping: Checklist for patient safety – still a challenge;

					difficulty of adherence to the safe surgery checklist; and Checklist Steps.
Dharampal et al. (2016)	Data collection: Semi-structured interviews Analysis: Inductive approach	Canada	To determine the attitudes of health care providers toward that SSC that may impact its adoption and compliance in Calgary, Canada	12 surgeons, 10 anesthesiologists, 9 OR nurses	Three main themes: the SSC has bought organization to previous informal perioperative checks; the SSC is most helpful when it is simple; 3 current components of the SSC are redundant
Elam et al. (2022)	Data collection: Semi-structured interviews Analysis: Inductive approach	Multi-Country	To explore the extent to which SSC implementation practices could be assessed through the i-PARIHS framework and examined how it could support development of targeted recommendations to improve SSC implementation	51 multi-disciplinary clinicians and health administrators	Themes that impacted SSC implementation in each of the four i-PARIHS constructs and several that spanned multiple constructs
Fourcade et al. (2012)	Data collection: Collective and individual interviews, questionnaire, direct observation Analysis: Axial and vertical coding	France	To assess the use and compliance and completeness rates of surgical checklists in cancer centers, to identify and compare barriers to effective use, to develop a strategy for effective use	4 surgeons, 3 anaesthetists, 8 nurses, 1 quality manager (collective interviews), 2 surgeons, 3 anaesthetists, 2 nurses (individual interviews), 18 clinical staff (questionnaire)	Eleven barriers to effective checklist implementation were identified
Gagliardi et al. (2014)	Data collection: Phone interviews Analysis: Implementation fidelity conceptual framework	Canada	To understand and compare the processes and factors influencing SSC adherence	13 surgeons, 29 perioperative nurses and 9 anaesthetists	Multiple process and factors influence SSC adherence: differentiation, responsiveness, quality, facilitation, complexity and interpretation
Georgiou et al. (2018)	Data collection: focus group technique and photographic methods Analysis: Thematic analysis	Cyprus	To explore the factors that serve as barriers and facilitators for the list's implementation	23 general nurses	Positive and negative factors which impacted update of SSC
Gillespie et al. (2016)	Data collection: Field observations, focus groups and individual semi-structured interviews Analysis: Comparative analysis	Australia	To identify and describe factors that act as barriers or enablers to team participation in SCC checks	80 perioperative staff (observations), 70 perioperative staff (focus groups) and 23 nurses, physicians and consumers (interviews)	Team participation in safety checks depends on a convergence of intertwined factors, including team attributes, communication strategies and checking processes
Gillespie et al. (2016)	Data collection: Observation, focus groups and individual interviews Analysis: Inductive and deductive approaches according to Strauss and Corbin	Australia	To identify issues around workflow that impacted on surgical teams' ability to use the SSC across the three phases of the checklist process (i.e. sign in, timeout and sign out)	80 perioperative staff (observations), 70 perioperative staff (focus groups) and 23 nurses, physicians and consumers interviews)	Perioperative workflow has a substantial impact on the execution of the SSC
Haugen et al. (2015)	Data collection: Focus groups Analysis: Content analysis	Norway	To explore surgical personnel experiences with the World Health	3 operating room nurses and 3 nurse anesthetists (group 1), 4	The condensed themes 'the checklist is optimizing safety' and 'safety and

			Organization's Surgical Safety Checklist, 2 years after implementation	anesthetists (group 2) and 4 surgeons (group 3)	effectiveness are balancing in the OR' supported by several categories and meaning units, emerged as the main findings of the study
Høyland et al. (2014)	Data collection: Focus groups Analysis: Content analysis	Norway	To describe health care professionals' experience using the WHO SSC	14 surgeons, nurses, and anesthetists	Three themes: balancing safety and efficiency, time spent on SSC, and planning and rationale.
Kasatpibal et al. (2018)	Data collection: Focus groups and semi-structured in-depth interviews Analysis: Content analysis	Thailand	To explore the surgical team's perceptions of barriers and strategies to improve SSC implementation in Thailand	39 OR nurses (focus groups), 50 perioperative staff members (interviews)	Four themes relating to barriers to the SSC: structure; surgical team, checklist; patient barriers
Krupic et al. (2020)	Data collection: Mixed-methods survey Analysis: Descriptive statistics and qualitative analysis according to Malterud	Sweden	To describe health care professionals' experience using the WHO SSC	196 health care professionals (assistant nurses, nurse anaesthetists, operating nurses, anaesthesiologists, surgeons)	Although many health care professionals report the positive use of the WHO SSC, there remains difficulties in the appropriate implementation of the SSC
Mahmood et al. (2019)	Data collection: Observation and semi-structured interviews Analysis: Statistical analysis (quantitative) and thematic analysis (qualitative)	Canada	To explore the compliance and quality of the SSC completed and investigate potential discrepancies between compliance and quality to determine whether the quality of SSC completion varied between procedure type or surgical specialties to understand why such discrepancies occur	6 surgeons, 6 OR nurses, 6 anaesthetists	Hospital-recorded SSC compliance was higher than the proportion of checklist items completed in matched cases. Four factors impacted the quality of the SSC included the mandated nature of implementation, the imperative of efficiency in the OR, the frequent redundancy and irrelevancy of the SSC and team hierarchies
Manamela et al. (2022)	Data collection: Semi-structured Analysis: Content analysis	Saudi Arabia	To explore and describe the factors that contribute to non-adherence of peri-operative surgical team to WHO surgical safety checklist	12 peri-operative surgical team members	The challenges affect their adherence, which depends on a convergence of intertwined factors, such as the use of WHO SSC related to issues in the checklist steps and uncertainties regarding the safe use of WHO SSC, team factors, checklist items factors and procedural factors.
Munthali et al. (2022)	Data collection: Semi-structured interviews Analysis: Inductive thematic approach	Zambia	To explored barriers and enablers to the utilization of the Checklist	16 surgical team members	Variability in implementation of the SSC by surgical teams, which stemmed from lack of senior surgeon ownership of the initiative. Low utilization was also linked to factors

Mobilio et al. (2022)	Data collection: focus group technique and observation Analysis: Thematic analysis	Canada	To explore checklist compliance to highlight where assumptions about the Surgical Safety Checklist	12 nurses	Gaps between policy and practice were identified at four different levels: compliance with the stages and items; responsibility for the checklist; documentation of adherence; and interprofessional teamwork
Nordstrom et al. (2019)	Data collection: Semi-structured interviews Analysis: Phenomenographic procedure approach according to Dahlgren and Fallsberg	Sweden	To describe the work experiences of nurse anaesthetists and OR nurses in the OR	12 nurse anaesthetists and 6 OR nurses	Four categories identified: team member approach; professional awareness; lifelong learning approach; safety and the patient's interest
O'Brien et al. (2017)	Data collection: Semi-structure interviews Analysis: Descriptive analysis of emergent themes according to Coliazzi	UK	To explore nurses' use of the WHO SSC in the perioperative setting	10 perioperative nurses	Three themes: challenges with the checklist; complying with the checklist; concordance with best practice
Penataro-Pintado et al. (2020)	Data collection: Five focus groups Analysis: Content analysis	Spain	To explore the views and experiences of perioperative nurses regarding factors that impact surgical patient safety	50 perioperative nurses,	Four main themes: personal qualities; the surgical environment; safety culture; perioperative nursing care plans
Robertson-Smith (2016)	Data collection: Mixed methods questionnaire Analysis: Non-parametric data analysis (quantitative) and thematic analysis (qualitative)	UK	To explore factors that influence the successful implementation of the WHO surgical safety checklist	98 participants (consultant surgeons, surgical care practitioners, consultant anaesthetists, scrub nurses, surgical trainees, operating department practitioners, anaesthetic trainees, theatre support workers	The biggest obstacle in successful implementation of the SSC was found to be disengagement of the surgical team. Differing staff perceptions were found to create barriers to successful implementation of the SSC
Rogers et al. (2020)	Data collection: Observation and semi-structured interviews Analysis: Thematic analysis according to Braun and Clarke	Australia	To gain insight into how operating room nurses engage with the multidisciplinary team during the SSC	8 operating room nurses	Three main themes: varied nurse participation in the SSC; the influence of team culture; leadership; expectations and the nurses' perception of their role in the SSC
Ronnberg et al. (2015)	Data collection: Mixed methods questionnaire Analysis: Chi-square test, Mann-Whitney U test, ANOVA (quantitative) and qualitative content analysis	Sweden	To describe registered nurse anaesthetists experiences with the WHO SSC	47 registered nurse anaesthetists	The WHO SSC helped facilitate teamwork and patient care. Difficulties in implementing the checklist include ambiguity over who is responsible, non-

	according to Graneheim and Lundman (qualitative)				compliance with sign-in and time pressures
Russ et al. (2014)	Data collection: Semi-structured phone interviews Analysis: Thematic analysis	UK	To evaluate the implementation of the WHO SSC, to identify barriers and facilitators toward implementation and to establish lessons for improvement	119 operating theatre personnel (surgeons, nurses, anaesthesiologists, radiographers, operating department practitioners)	Eleven themes were extracted that represented the barriers and facilitators to SSC implementation, including organisational, systems, team and checklist-specific themes
Schwendimann et al. (2019)	Data collection: Structure interviews and observation Analysis: Descriptive statistics (quantitative) and structured interviews (qualitative)	Switzerland	To explore which factors foster or hinder the consistent application of the SSC and assess if the SSC is consistently and correctly applied during surgical procedures	11 perioperative staff (6 surgeons and anaesthetists, 5 OR nurses)	Individual, procedural and contextual variables influence the application of the SSC
Spence et al. (2011)	Data collection: Student observations and two focus groups Analysis: Thematic analysis	Canada	To compare current surgical safety practices with the WHO SSC guidelines	65 medical and nursing student observers, 15 medical and nursing student focus groups	Surgical safety practices are consistent with the guidelines established, but are not monitored or enforced
Waehle et al. (2020)	Data collection: Observation and in-depth interviews Analysis: Inductive content analysis approach according to Graneheim et al.	Norway	To explore how members for the multidisciplinary perioperative team integrate the SSC within their risk management strategies	17 perioperative staff members	Three major themes: perceived usefulness; modification of implementation; communication outside the checklist
Weller et al. (2018)	Data collection: Mixed methods study including participant observations using WHOBARS ratings and semi-structured interviews Analysis: Multiple linear regression (quantitative) and thematic analysis according to Lincoln and Guba, Morse and Field, as well as coding analysis according to Saldana (qualitative)	New Zealand	To compare perceptions of the quality of SSC administration and to explore OR staff attitudes towards and experiences with the SSC	Observations of 60 surgical procedures and 33 OR staff interviews (9 anaesthetists, 10 surgeons, 9 nurses and 5 anaesthetic assistants)	Four key themes: team culture and embedding of the checklists; obstacles to information transfer; raining concern; a ‘tick-box’ exercise
White et al. (2018)	Data collection: Questionnaires, WHOBARS assessments, focus groups Analysis: Descriptive statistics (quantitative) and thematic analysis (qualitative)	Madagascar	To evaluate the extent of sustained checklist use in Madagascar and assess the quality of checklist administration in terms of team behaviour, the impact of checklist use on OR staff, practice and culture and to identify predictors and barriers to implementation	158 operating room staff	Three keys themes emerged from the focus group responses: teamwork and communication; preparation and organisation; trust and confidence in each other

Ziman et al. (2018)	Data collection: Observation and semi-structured interviews Analysis: Inductive thematic analysis	Canada	To address what the perceived importance of different checklist items is among different professional members of the orthopaedic operating room team	10 orthopaedic perioperative staff	SSC compliance was influenced by the perceived (un)importance of individual checklist items within the orthopaedic setting

SSC = Surgical Safety Checklist
WHO = World Health Organisation
OR = Operating Room

Table 2. Methodological Quality Assessment Results.

Study	1	2	3	4	5	6	7	8	9	10
Albsoul et al., (2022)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Alidina et al. (2017)	U	N	Y	Y	Y	N	N	Y	N	Y
Aveling et al. (2013)	Y	U	Y	Y	U	N	Y	Y	Y	Y
Aydin Akbuga et al. (2023)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Braaf et al. (2013)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Conley et al. (2011)	Y	Y	Y	Y	Y	N	N	Y	U	Y
De Oliveira Junior et al. (2017)	Y	Y	Y	Y	Y	N	N	Y	N	Y
Dharampal et al. (2016)	Y	U	Y	Y	Y	U	Y	Y	Y	Y
Elam et al. (2022)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Fourcade et al. (2012)	Y	Y	Y	Y	Y	Y	Y	U	U	Y
Gagliardi et al. (2014)	U	Y	Y	Y	Y	N	Y	Y	Y	Y
Georgiou et al. (2018)	Y	Y	Y	Y	Y	N	N	Y	Y	Y
Gillespie et al. (2016a)	Y	U	Y	Y	Y	Y	U	Y	Y	Y
Gillespie et al. (2016b)	U	U	Y	Y	Y	N	N	Y	Y	Y
Haugen et al. (2015)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Høyland et al. (2014)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Kasatpibal et al. (2018)	Y	Y	Y	Y	Y	N	N	Y	Y	Y
Krupic et al. (2020)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mahmood et al. (2019)	Y	Y	Y	Y	Y	Y	N	Y	N	Y
Manamela et al. (2022)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Munthali et al. (2022)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Mobilio et al. (2022)	Y	Y	Y	Y	Y	N	N	Y	Y	Y
Nordstrom et al. (2019)	Y	Y	Y	Y	Y	N	N	Y	Y	Y
O'Brien et al. (2017)	Y	Y	Y	Y	Y	N	N	Y	Y	Y
Penataro-Pintado et al. (2020)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Robertson-Smith (2016)	Y	Y	Y	U	U	Y	Y	N	Y	Y
Rogers et al. (2020)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ronnberg et al. (2015)	Y	Y	Y	Y	Y	N	Y	Y	Y	N
Russ et al. (2014)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Schwendimann et al. (2019)	Y	Y	Y	Y	Y	U	Y	U	U	Y
Spence et al. (2011)	Y	N	Y	U	Y	N	Y	Y	Y	U
Waehle et al. (2020)	Y	Y	Y	Y	Y	Y	U	Y	Y	Y
Weller et al. (2018)	Y	Y	Y	Y	Y	N	U	Y	Y	Y

White et al. (2018)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ziman et al. (2018)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Item number check list key*: 1 Is there congruity between the stated philosophical perspective and the research methodology?; **2** Is there congruity between the research methodology and the research question or objectives?; **3** Is there congruity between the research methodology and the methods used to collect data?; **4** Is there congruity between the research methodology and the representation and analysis of data?; **5** Is there congruity between the research methodology and the interpretation of results?; **6** Is there a statement locating the researcher culturally or theoretically?; **7** Is the influence of the researcher on the research, and vice-versa, addressed?; **8** Are participants, and their voices, adequately represented?; **9** Is the research ethical according to current criteria for recent studies, and is there evidence of ethical approval by an appropriate body?; **10** Do the conclusions drawn in the research report flow from the analysis, or interpretation, of the data?

Quality assessment Key	
1	Yes
2	No
3	Unclear

Table 3. Synthesized findings.

Barriers to the implementation and compliance with the Surgical Safety Checklist		
Findings	**Category**	**Synthesized Finding**
F1, F2, F4, F16, F21, F23, F40, F49, F51, F52, F71, F74, F75, F76, F94, F95, F114, F116, F117 F126, F128, F142, F145, F156, F158, F165, F166, F169, F171, F181, F184, F193, F195, F211, F216, F231, F233, F235, F240, F241, F244, F247	Individual barriers - Resistance - Negative attitudes/perceptions - Surgeon participation - Patient anxiety - Non-technical skills	Individual actions, behaviors, beliefs, knowledge, and attitudes are barriers to the successful implementation of surgical safety checklists as intended. Resistance to the checklist itself resulted in dismissal or refusal to participate based on negative attitudes and personal perceptions. Other individual barriers include non-technical skills such as leadership skills, as well as patient anxiety and level of understanding of the use and benefits of the surgical safety checklist. Level of understanding, attitudes and perceptions ultimately influenced individual checklist buy-in.
F3, F5, F15, F18, F19, F33, F34 F37, F38, F39, F49, F53, F66, F81, F89, F90, F93, F106, F108, F109, F110, F111, F113, F122, F129, F143, F147, F149, F160, F168, F170, F174, F179, F182, F186, F190, F192, F197, F202, F217, F219, F228, F234, F239, F245, F246	Environmental barriers - Workload - Time pressures - Competing tasks - Emergency procedures - Distractions/interruptions	The nature of the perioperative environment itself can create barriers to compliance and implementation of the surgical safety checklist. High workloads and time pressures were observed to be characteristics of this clinical environment. The checklist created perceived delays which negatively impact workflow. Perioperative staff articulated competing tasks were distractors during the completion of the checklist which directly impacted compliance and participation. The urgency surrounding emergency procedures meant that the checklist was often partially completed or omitted completely in this scenario. Distractions and interruptions in the form of music, phones, staff coming in and out of the room, irrelevant conversations, and noise from machines all negatively impacted checklist compliance.
F9, F17, F25, F48, F57, F61, F62, F63, F68, F80, F84, F86, F87, F92, F97, F115, F123, F124, F127, F144, F148, F159, F167, F194	Organisational barriers - Staffing issues - Implementation factors - Management support - Organisational policy	Management issues such as high staff turnover, staff shortages and prolonged shifts all impacted checklist compliance. The implementation of the checklist using a 'top down' approach from management and organisational policy created issues with checklist implementation. A lack of training and education was noted to negatively influence adherence and successful implementation and influenced individual checklist buy-in.
F7, F8, F10, F11, F13, F20, F26, F28, F32, F41, F43, F44, F60, F65, F67, F70, F73, F77, F78, F82, F83, F96, F99, F100, F101, F125, F130, F132, F150, F153, F154, F161, F173, F175, F176, F178, F185, F187, F188, F189, F196, F203, F220, F221, F222, F226, F227, F229, F232, F236, F237, F238, F242, F248, F249	Cultural barriers - Surgical specialties - Professional independence - 'Tick box' exercise	The observed differing cultures across surgical specialties resulted in differing checklist participation and compliance rates. The MDT reported to work independently of each other which impacts team communication during the surgical safety checklist. The culture of complacency during surgical safety checklist implementation as normal and accepted practice lead to the checklist being used as a 'tick box' exercise and negatively impacts observed compliance rates.
F22, F27, F54, F55, F64, F69, F72, F107, F112, F119, F131, F133, F134, F146, F151, F183, F191, F198, F199, F200, F201, F218, F223, F250, F251	Surgical Safety Checklist barriers - Repetition & duplication - Generalization	Barriers associated with the surgical safety checklist itself created obstacles to its successful implementation. The duplication and repetition with other safety checklist during the preoperative process impacted checklist efficacy. Lack of local modifications for hospitals or specialties meant that some aspects of the checklist were redundant, inappropriate, or irrelevant. The 'sign out' portion of the checklist was viewed as irrelevant for surgeries with no complications.
Facilitators to the implementation of the Surgical Safety Checklist		
F24, F29, F45, F93, F98, F104, F118, F172, F208, F121, F212, F222, F230	Individual facilitators - Non-technical skills - Surgeon participation	The non-technical skills of individual perioperative staff members helped to facilitate the use of the surgical safety checklist. Attributes such as leadership, confidence and assertiveness facilitate checklist use. When

		the staff surgeon participates, leads, and encourages checklist usage, this facilitated successful implementation and compliance rates.
F6, F12, F30, F35, F46, F47, F58, F59, F88, F91, F135, F136, F137, F139, F141, F155, F162, F163, F180, F204, F205, F213, F214	Organisational facilitators - Leadership support - Education and training - Audits - Policy	Organisational support from leadership and management were also reported to be facilitators to the successful implementation of the checklists. This included support for perioperative staff, enforcement of policy, disciplinary action for non-compliance, rewarding compliance and providing feedback. Providing education and training to staff enhanced understanding and compliance. Clear mandated protocols and policy, as well as regular audits, also helped compliance.
F14, F31, F85, F103, F138, F164, F207, F215, F224	Cultural facilitators - Local leaders and champions - Safety culture	Studies reported that local leaders as champions of the checklist, particularly when it involved lead surgeons, facilitated compliance rates and successful implementation of the surgical safety checklist. Instilling a safety culture in the perioperative setting that encouraged multidisciplinary cooperating and verbalization helped to reduce the hierarchy that existed and facilitated checklist implementation.
F56, F79, F102, F139, F152, F157, F177, F206, F209, F210, F243	Surgical Safety Checklist facilitators - Local modifications - Integration with existing practice	Modifying and adapting the checklist to specific settings ensured relevancy and improved checklist uptake. Integrating the checklist into already existing safety checking processes also facilitates compliance through reduced duplication, repetition and increasing the checklists relevance to patient safety.

Supplementary Table 1. Database Searches.

The CINAHL (EBSCOhost platform), Medline (EBSCOhost platform), and Scopus databases were searched on 30 June 2023 to identify relevant studies. Searches included a combination of keywords and subject headings to capture the concepts of surgical safety checklists, perioperative settings, and factors that impact compliance and implementation. Search filters adapted from the CADTH Search filters database [https://searchfilters.cadth.ca/] were applied to retrieve qualitative and mixed-methods studies. Limiters were placed on the search results for publication date 2008 to present and for studies published in English. Full record of database searches:

CINAHL

Search #	Concept	Search Terms/Strategy	# of Results
#1	Surgical safety checklists	(MH "Checklists") OR “safety checklist*” OR “surgical checklist*” OR “WHO checklist*”	37,367
#2	Perioperative settings	(MH "Operating Room Nurses") OR (MH "Operating Room Nursing") OR (MH "Operating Room Personnel+") OR (MH "Perioperative Nursing") OR ana#sthe* OR operat* OR periop* OR surg* OR theater OR theatre	956,736
#3	Factors impacting compliance and implementation	adhere* OR application OR attitude* OR awareness OR barrier* OR challenge* OR comply OR compliance OR engage*OR facilitat* OR implement* OR motivat* OR participat* OR perception* OR use*	3,145,103
#4	Search filter: qualitative or mixed methods studies	(MH "Qualitative Studies+") OR (MH "Grounded Theory") OR (MH "Narratives+") OR (MH "Interviews+") OR (MH "Audiorecording") OR (MH "Focus Groups") OR (MH "Research, Nursing") OR (MH "Discourse Analysis") OR (MH "Content Analysis") OR (MH “Ethnographic Research”) OR (MH “Ethnonursing Research”) OR (MH “Constant Comparative Method”) OR (MH Qualitative Validity+”) OR (MH “Purposive Sample”) OR (MH “Observational Methods+”) OR (MH “Field Studies”) OR (MH “Theoretical Sample”) OR (MH “Phenomenology”) OR (MH “Phenomenological Research”) OR (MH “Life Experiences+”) OR (MH “Cluster Sample+”) OR qualitative OR interview* OR theme* OR thematic OR "ethnological research" OR ethnonursing OR ethnograph* OR phenomenol* OR "focus group*" OR (grounded N1 (theor* OR analys?s OR research OR studies OR study)) OR "life stor*" OR emic OR etic OR hermeneutic* OR heuristic* OR semiotic OR (data N1 saturat*) OR "participant observ*" OR "social construct*" OR postmodern* OR "post-structural*" OR poststructural* OR "post-modern*" OR feminis* OR "action research" OR "cooperative inquir*" OR "co-operative inquir*" OR humanistic	401,329

		OR existential OR experiential OR paradigm* OR (field N1 (research OR study OR studies)) OR "human science" OR "biographical method" OR "theoretical sampl*" OR ("purpos* N4 sampl*") OR "open-ended" OR narrative* OR textual OR texts OR "semi-structured" OR "life world" OR "life-world" OR "conversation analys?s" OR "personal experience*" OR "theoretical saturation" OR ((life OR lived) N1 experience*) OR "cluster sampl*" OR "observational method*" OR "content analysis" OR ((discurs* OR discourse*) N3 analys?s) OR (constant N1 (comparison OR comparative)) OR "narrative analys?s" OR heidegger* OR colaizzi* OR spiegelberg* OR merleau* OR husserl* OR foucault* OR ricoeur OR glaser* OR (van N1 manen*) OR (van N1 kaam*) OR (Corbin* N2 strauss*) OR "mixed method*" OR "mixed model*" OR "mixed design*" OR "multiple method*" OR multimethod* or triangulat*	
#5	Qualitative or mixed methods studies examining factors impacting compliance and implementation of surgical safety checklists.	#1 AND #2 AND #3 AND #4	347
	Limiters applied: Date 2008- English language		289

MEDLINE

Search #	**Concept**	**Search Terms/Strategy**	**# of Results**
#1	Surgical safety checklists	(MH "Checklist") OR “safety checklist*” OR “surgical checklist*” OR “WHO checklist*”	9,075
#2	Perioperative settings	(MH "Operating Room Nursing") OR (MH "Operating Room Technicians") OR (MH "Perioperative Care+") OR (MH "Perioperative Medicine") OR (MH "Perioperative Nursing+") OR (MH "Surgical Procedures, Operative+") OR OR ana#sthe* OR operat* OR periop* OR surg* OR theater OR theatre	5,725,931
#3	Factors impacting compliance and implementation	adhere* OR application OR attitude* OR awareness OR barrier* OR challenge* OR comply OR compliance OR engage*OR facilitat* OR implement* OR motivat* OR participat* OR perception* OR use*	13,420,498

#4	Search filter: qualitative or mixed methods studies	(MH "Attitude+") OR (MH "Empirical Research+") OR (MH "Focus Groups") OR (MH "Interviews as Topic") OR (MH "Personal Narratives as Topic") OR (MH "Narration+") OR (MH "Nursing Methodology Research") OR (MH "Narrative Medicine") OR (MH "Tape Recording+") OR (MH "Videotape Recording") OR (MH "Grounded Theory") OR (MH "Qualitative Research+") OR qualitative OR interview* OR theme* OR thematic OR "ethnological research" OR ethnonursing OR ethnograph* OR phenomenol* OR "focus group*" OR (grounded N1 (theor* OR analys?s OR research OR studies OR study)) OR "life stor*" OR emic OR etic OR hermeneutic* OR heuristic* OR semiotic OR (data N1 saturat*) OR "participant observ*" OR "social construct*" OR postmodern* OR "post-structural*" OR poststructural* OR "post-modern*" OR feminis* OR "action research" OR "cooperative inquir*" OR "co-operative inquir*" OR humanistic OR existential OR experiential OR paradigm* OR (field N1 (research OR study OR studies)) OR "human science" OR "biographical method" OR "theoretical sampl*" OR ("purpos* N4 sampl*") OR "open-ended" OR narrative* OR textual OR texts OR "semi-structured" OR "life world" OR "life-world" OR "conversation analys?s" OR "personal experience*" OR "theoretical saturation" OR ((life OR lived) N1 experience*) OR "cluster sampl*" OR "observational method*" OR "content analysis" OR ((discurs* OR discourse*) N3 analys?s) OR (constant N1 (comparison OR comparative)) OR "narrative analys?s" OR heidegger* OR colaizzi* OR spiegelberg* OR merleau* OR husserl* OR foucault* OR ricoeur OR glaser* OR (van N1 manen*) OR (van N1 kaam*) OR (Corbin* N2 strauss*) OR "mixed method*" OR "mixed model*" OR "mixed design*" OR "multiple method*" OR multimethod* or triangulat*	1,862,001
#5	Outcome to barriers and facilitators to the implementation and compliance with surgical safety checklists	#1 AND #2 AND #3 AND #4	533
	Limiters applied: Date 2008- English language		510

Scopus

Search #	Concept	Search Terms/Strategy	# of Results
#1	Surgical safety checklists	“safety checklist*” OR “surgical checklist*” OR “WHO checklist*”	1,380
#2	Perioperative settings	an*sthe* OR operat* OR periop* OR surg* OR theater OR theatre	9,563,723
#3	Factors impacting compliance and implementation	adhere* OR application OR attitude* OR awareness OR barrier* OR challenge* OR comply OR compliance OR engage* OR facilitat* OR implement* OR motivat* OR participat* OR perception* OR use*	35,674,230
#4	Search filter: qualitative or mixed methods studies	("Empirical Research" OR interview OR "Interviews as Topic" OR "Personal Narratives" OR "Focus Groups" OR narration OR "Nursing Methodology Research" OR "Narrative Medicine" OR interview* OR qualitative OR theme* OR thematic OR "ethnological research" OR ethnograph* OR ethnomedicine OR ethnonursing OR phenomenol* OR "grounded theor*" OR "grounded study" OR "grounded studies" OR "grounded research" OR "grounded analysis" OR "grounded analyses" OR "life stor*" OR emic OR etic OR hermeneutic* OR heuristic* OR semiotic* OR "data saturat*" OR "participant observ*" OR "social construct*" OR postmodern* OR post-structural* OR "post structural*" OR poststructural* OR "post modern*" OR post-modern* OR feminis* OR "action research" OR "cooperative inquir*" OR "co operative inquir*" OR co-operative AND inquir* OR humanistic OR existential OR experiential OR paradigm* OR "field study" OR "field studies" OR "field research" OR "field work" OR "human science" OR "social science" OR "biographical method" OR "theoretical sampl*" OR (purpos* W/3 sampl*) OR (focus W/3 group*) OR open-ended OR narrative* OR textual OR texts OR "semi-structured" OR "life world*" OR "life-world*" OR "conversation analysis" OR "personal experience*" OR "theoretical saturation" OR "conversation analyses" OR "lived experience" OR	693,107

		"life experience*" OR "cluster sampl*" OR "observational method*" OR "content analysis" OR "constant comparative" OR "constant comparison" OR (discourse* W/3 analysis) OR (discourse* W/3 analyses) OR (discurs* W/3 analysis) OR (discurs* W/3 analyses) OR heidegger* OR colaizzi* OR spiegelberg* OR merleau* OR husserl* OR foucault* OR ricoeur OR glaser* OR "van manen*" OR "van kaam*" OR (corbin* W/2 strauss*) OR “mixed method*” OR “mixed model*” OR “mixed design*” OR “multiple method*” OR multimethod* or triangulat*)	
#5	Qualitative or mixed methods studies examining factors impacting compliance and implementation of surgical safety checklists.	#1 AND #2 AND #3 AND #4	68
	Limiters applied: Date 2008- English language		68

Supplementary Table 2. Qualitative Data Extraction

Study		Unequivocal	Credible	Not Supported	Finding Number
Albsoul et al. (2022)					
Finding	**Compliance with surgical safety checklist.**				
Illustration	"Unfortunately, it's used infrequently and incompletely"p.7 "We use WHO SSC before any procedure even if it was with or without local anesthesia in the holding department" p.7 " what actually happens is that it is skipped at times, some surgeons skip the" Time Out, "but this is not a big deal because surgeons know their patients when they are admitted to the floor preoperatively, but this can be a concern to other members in the operating room like anesthesiologists who don't previously know anything about the patient, including the estimated surgery time" p.7	X			**F1**
Finding	**Impact of the surgical safety checklist**				
Illustration	"It makes me more organized in the operation room" p.7 "Because we use it in a routine manner, it collects the important pointes of the patient before going to surgery, like the surgery site, patient's allergy. Etc." p.7 "As I mentioned previously checking the patient at each step decreases the complications. The rate of infection, and it also influences the outcome of each surgery" p.7 "Especially in orthopaedics, we have the right and left side, upper and lower limbs, 10 fingers and 10 toes, the SSC is an important part of our daily practice, it helps us to avoid working on the wrong site which is a disaster if it happened" p. 7	X			**F2**
Finding	**Facilitators and barriers for execution of surgical safety checklist**				
Illustration	"it will be easier to implement it if we already know the patient, and if there was enough time between patients, and if the surgeon knows the importance of such a tool and takes care of implementing it" p.8 "we barely have breaks between surgeries, 8 h in a row from 8 am to 4 pm. I think if we have more time and less pressure everyone can do everything optimally as it should be" p. 8 "The time and the load prevent us from using it effectively" p. 8 "The crowded operation rooms and a large number of patients made it difficult to apply the WHO SCC" p.8 "The components of SCC is not clear to all of us, there should be more educational interventions to train and educate all of us 'nurses, surgeons, anesthesiologists' about the whole components of SCC, it should become part of the routine doing it by heart" p.8.	X			**F3**
Alidina et al. (2017)					
Finding	**Resistance to checklist use as a barrier**				
Illustration	"Surgeons are flippant about the surgical checklist." p.463 "The OR staff and surgeons have been very resistant to implementing a SSC. Surgeons leaving the room to scrub say, 'make sure the checklist is done when I get back'." p.464	X			F4

Finding	**Rapid turnover and time considerations as a barrier**				
Illustration	"Rushing to turn over room at times gets in the way of safety." p.463	X			F5
Finding	**Leadership/management support as a facilitator**				
Illustration	"The upper management giving the directive that the time out is not an option… it is a requirement helped a great deal." p.463	X			F6
Finding	**Perceived hierarchy as a barrier**				
Illustration	"… surgeon's still believing they are captains of the ship." p.463 After implementation, all related comments were again negative, without ongoing comments about the lack of respect for nursing input, particularly with respect to SSC implementation. p.466	X			F7
Finding	**Perceived lack of freedom to speak up as a barrier due to hierarchy**				
Illustration	"Some errors are not reported due to fear of retaliation	X			F8
Finding	**Staffing turnover as a barrier**				
Illustration	"… I have never seen such a turnover of OR staff as in the OR I work in. It is awful…" p.463	X			F9
Finding	**Perceived poor safety climate as a barrier, hierarchy as a contributor**				
Illustration	"… it is very difficult, if not impossible, for the checklist to result in positive changes in an OR when the culture is so poor." p.463 After implementation, respondents still discussed negative climates, making statements about the low prioritization to SSC implementation and the focus on pleasing providers rather than patients. p.464	X			F10
Finding	**Perceived lack of team communication and coordination due to professional independence as a barrier, training as a facilitator**				
Illustration	"Physicians need to be trained to understand the importance of Time Out and they need to learn how to discuss what they plan on doing with all team members and not just another MD." p.463 The most common negative comment was that teams were siloed, which affective communication and coordination. Teamwork training was frequently suggested. p.464	X			F11 F12
Finding	**Complacency and loss of checklist effectiveness as a barrier**				
Illustration	"I think the checklist is becoming such a habit that it is losing its impact." p.463	X			F13
Aveling et al. (2013)					
Finding	**Reducing hierarchical culture as a facilitator of the SSC to improve safety culture**				
Illustration	"It's not something fluffy and friendly, it is actually functional and it is about all respecting one another." p.4 … also suggested that checklist use could improve communication and teamwork with "no hierarchy" (Amfield, anaesthetist). p.4		X		F14
Finding	**Competing tasks as a barrier to the SSC**				
Illustration	"The scrub nurses and the student Operating Department Practitioner (ODP) are sort of removed, standing over by their metal trolley preparing some of the equipment and talking; they're not really listening to the rest of the group [surgeon, anaesthetist, ODP] who are crowded around the patient (who's already anaesthetised), but they answer the questions when they're called to, and they do all the checks." p.4	X			F15
Finding	**Surgeon participation as a barrier to the SSC**				

Illustration	"At the end of the operating, just as the patient is being moved from the operating table onto a trolley, and they're waiting for him to wake up… the anaesthetist says 'oh, we haven't done the sign out, oh, we should do the sign out.' By this point the surgeon's already left the theatre." p.4	X			F16
Finding	**Staff shortages and workload as a barrier to the SSC**				
Illustration	When staff were under pressure due to staff shortages, emergencies or lengths of shifts (up to 36h) not seen in the UK, the checklist was apt to be abandoned all together. p.4 "Sometimes it's difficult to use this [checklist], due to staff overload…" p.4	X			F17 F18
Finding	**Emergency procedures as a barrier to the SSC**				
Illustration	"Sometimes it's difficult to use this [checklist], due to staff overload, so something if there is an emergency case, they may not fill it in. Rather than fill it in, they might just get the instruments for those guys because of the urgency of the case." p.4	X			F19
Finding	**The checklist being used as a tick-box exercise as a barrier**				
Illustration	Checkboxes were often ticked without the requisite information having been obtained or the tasks to which they referred undertaken, and the timing of the checks was haphazard. Sometimes the nurse ticked the Sign In and Time Out checkboxes when the procedure was already underway, rendering them useless. Team introductions were never performed, yet the boxes were ticked before the procedure was completed." p.4-5 "[During the procedure] I check the checklist: the nurse had (at some point before the end of the operating) filled the entire thing in, including 'specimen is correctly labelled' – even though the specimen-to-be was still inside the patient." p.5	X			F20
Finding	**Perceptions of futility and uselessness as a barrier, duplication as a barrier that influences individual attitudes**				
Illustration	"The anaesthetist refuses to say his name. He says "I think we all know each other by now…it's ridiculous'." p.5 "No, no, no [we don't do introductions]. We know each other! I know the anaesthetist, I know the nurse." p.5 "I can clearly remember two occasions where the surgeon was just very dismissive and it was like, 'oh I'm not doing this, I don't need to do this, I'm not you know…' and literally just walked away." p.5 "Even though training on the checklist was given for surgeons, they don't use it, they don't believe in this bit of paper, because mostly they said 'we don't mistake the identity of the patient, it doesn't happen that we get the wrong patient'." p.5 Perceptions of 'duplicative' or 'useless' checks contributed to the view of some in all settings that the checklist was an illegitimate bureaucratic intrusion, and resentment towards it intensified during busy periods, emergencies or staff shortages. p.6	X			F21 F22
Finding	**Surgeon behaviour and attitude as a barrier, confidence of the nursing staff as a facilitator**				
Illustration	"I can clearly remember two occasions where the surgeon was just very dismissive and it was like, 'oh I'm not doing this, I don't need to do this, I'm not you know…' and literally just walked away." p.5	X			F23 F24

	"Even though training on the checklist was given for surgeons, they don't use it, they don't believe in this bit of paper, because mostly they said 'we don't mistake the identity of the patient, it doesn't happen that we get the wrong patient'." p.5 "The surgeon may not volunteer to cooperate to fill in the checklist… The nurse may stop her work, or may do it without filling the checklist. It may depend on the confidence of the nurse." p.6				
Finding	**Resource shortages in low-income countries as a barrier, ticking items not completed on the checklist as a barrier**				
Illustration	Such resource shortages meant that it was not always possible to comply with the technical items on the checklist, yet nurses often tick the boxes nonetheless. p.5	X			F25 F26
Finding	**Duplication of other checks as a barrier**				
Illustration	… a recurring objection was that the checklist duplicated pre-existing systems and checks, including, for example, long-standing equipment counting procedures. p.6		X		F27
Finding	**Hierarchy culture as a barrier influencing ability to speak up**				
Illustration	"I think it's difficult because there is a hierarchy within the theatre complex, or within the medical profession full stop, and the theatre staff might feel intimidated by some of the environments they are in. Some of them are forceful enough and have a voice, but others are quite timid and probably quite reluctant to actually speak up." p.6	X			F28
Finding	**Non-technical skills (confidence, assertiveness) as a facilitator against hierarchy**				
Illustration	"I think it's difficult because there is a hierarchy within the theatre complex, or within the medical profession full stop, and the theatre staff might feel intimidated by some of the environments they are in. Some of them are forceful enough and have a voice, but others are quite timid and probably quite reluctant to actually speak up." p.6 "The surgeon may not volunteer to cooperate to fill in the checklist… The nurse may stop her work, or may do it without filling the checklist. It may depend on the confidence of the nurse." p.6	X			F29
Finding	**Institutional policies, audits, feedback and disciplinary action as a facilitator**				
Illustration	"You know, I do not mind being part of any audit at all because I think it's great, we won't find anything or improve anything unless we do." p.6 "We have to be careful because you know, it's our registration as well to follow this protocol isn't it, so [even] if the surgeon is not keen to do it, we have to tell them, you have to stop and do it." p.6	X			F30
Finding	**Using local leaders as champions of the SSC as a facilitator**				
Illustration	"We are there to iron out any problems, or if anybody givens them grief we can go in and fire it back if needed." p.6 Beyond formal arrangements, some local leaders acted as champions for the checklist. Surgeons, anaesthetists, and senior nurses in both UK hospitals took on the role, and were important in leading by example and supporting junior or non-surgical staff when there was 'push back'. p.6	X			F31
Finding	**Team training as a facilitator of the SSC**				
Illustration	Our study suggests that explicit interventional focus on improving team dynamics and communication may be even more critical in African healthcare settings than in high-income			X	

	countries. Professional groups – in what ever setting – should be trained together on the checklist, not separately as occurred in Mbile. p.8				
Finding	**Fear of repercussions for speaking up against a hierarchical culture as a barrier**				
Illustration	Challenging those in authority could therefore feel very risky and have unpredictable results, perhaps damaging career prospects or even worse. p.7	X			F32
Aydin Akbuga et al. (2023)					
Finding	**The Importance of Using the SSC**				
Illustration	SSC is a bulletproof vest for the surgical team. When you apply every item on the list and sign it, you will be safe. It provides written, signed evidence for a lawsuit filed after an ethical violation or misconduct. p.4 Working with a checklist or a protocol is a guarantee for you. I think it prevents negligence and provides evidence. P.4 The SSC starts in the ward [nursing unit] and continues until the patient returns to the ward after surgery. In fact, it is a bridge that connects the members of the surgical team. It provides communication and maintains cooperation. p.4	X			F33
Finding	**Barriers to the Use of the SSC**				
Illustration	Actually, the operating room is a bit tense, and it is a place where the team mentality is dominant. SSC is the responsibility of all surgical team members. There is a signature place on the list for everyone in the team. Nevertheless, only the nurses are held responsible for such practices. Why should the nurse take responsibility for the entire team? I am uncomfortable with this situation, and I avoid practices outside of my responsibility. p.4	X			F34
Finding	**Compliance With SSC and Applicability**				
Illustration	Surgical patient safety is closely related to the awareness of the surgical team. Awareness and consciousness are realized through education. I think if this as teamwork, everyone should be educated and have awareness. p.4 The SSC is a checklist with too many practices[tasks]. I think a person from the team should really guide the others, having a leader removes uncertainty and prevents chaos. Thus, the list is applied more carefully. p.4 I think the patient should not be discharged before this list is completed, or the [postoperative] order should not be entered into the system before each section is signed. So, there must be a sanction. There should be some form of system control, and obstacles should be placed. p.4	X			F35
Braaf et al. (2013)					
Finding	**Professional independence as a barrier to the SSC**				
Illustration	Surgeons, anaesthetists and nurses worked asynchronously as each discipline went about performing its specific duties before surgery commenced… [which] impacted on a healthcare professional's ability to halt their work and collaboratively meet to communicate at a time-out procedure. p.651 Other surgical team members present in the theatre were busily engaged in discipline-specific preparations for the impending surgery. p.651		X		F36
Finding	**Time pressures and competing tasks as barriers to the SSC**				

Illustration	"The surgeon had cut the patient's skin and a nurse asks, 'did we do a time out?' The anaesthetist says' 'no, but we should keep it legal'. The time out is performed, but as the surgeon has started operating he was not involved." p.651 "Sometime things are rushed before surgery, but theatre time out is always conducted, even if [the surgeon] can't be involved". p.651 "It [time out] takes a long time if everyone is involved… Everyone's busy doing their own jobs. We just need to get on with treating patients; there are enough people on the waiting lists for surgery as it is." p.651 As nurses customarily instigated the time-out procedure, any distraction or interruptions to nurses' routines had the potential to lead to delays or omissions in the time-out procedure. p.652	X			F37
Finding	**Competing tasks as a barrier to the SSC and to communication amongst the MDT**				
Observation	Often anaesthetists did not participate in time-out communication, as usually no invitation was extended by other staff to involve the anaesthetist, and no announcement was made that the time-out procedure was being conducted. p.651 Nurses, busy fulfilling last minute requests made by surgeons, were distracted from seeing a surgeon beginning operating. p.652 "Time out was about to commenced and the nurse initiating it asked the anaesthetist 'are you joining us?' The anaesthetist replies, 'no, we have things to do'." p.651	X			F38
Finding	**Emergency scenarios as a barrier to the SSC**				
Observation	On other rare occasions, the time-out procedure was omitted entirely; this usually occurred when emergency surgery was required and surgical intervention was time critical. p.651		X		F39
Finding	**Individual behaviour and participation in the SSC as a barrier**				
	"I will call or contact the surgeon prior to the procedure if [the anaesthetist] have any concerns." p.651	X			F40
Finding	**Perceived inability to speak up and hierarchical culture as a barrier, lack of non-technical skills influencing ability to speak up**				
Illustration	"It's [time out] just to check right patient, right procedure. If I need to know something, I'll ask one of the other nurses. We [nurses] are very subservient to the surgeons; we pretty much do as we are told. I don't like to question." p.652 Nurses either felt intimidates to ask for information, or their experiences of asking proved to be of little benefit. p.652 "Prior to the commencement of surgery the theatre nurse asked the surgical consultant to review the equipment for surgery. The surgeon declined." p.652 Nurses choose to rarely verbally protest or directly challenge a surgeon's authority. p.652	X			F41 F42
Finding	**Complacency as a barrier to the SSC**				
Observation	The procedure was simplified and shortened by reducing the number of staff involved and limiting the details to be authenticated by not physically checking the site of surgery. p.652 Nurses accepted partial completion of the time-out procedure as custom. p.652		X		F43

	"At time out the surgeon and nurses read out the patients [name], procedure and site of surgery, but the site of surgery was never physically checked. The patient's legs remained under the blanket." p.652				
Conley et al. (2011)					
Finding	**Hierarchy as a barrier to speaking up during the SSC**				
Illustration	I was trying to involve the entire OR crew and empower them with the safety of the patient. I was going for a flattening of the hierarchy, to allow everybody to speak up when something was going on in the OR". p.876	X			F44
Finding	**Using leadership skills to prompt the conduction of the SSC as a facilitator**				
Illustration	Previously "we felt that only the surgeon could initiate it or else it wasn't a success. [But at that point] the surgeon is really focused on the case in front of him or her. If the nurse prompted the surgeon to start the checklist, it would get done every time". p.876	X			F45
Finding	**Education and training as a facilitator of SCC use**				
Illustration	The team "had a lot of conversations around why" to build enthusiasm and achieve buy-in. p.875 The process would have benefited from "a little more formal education of surgeons". p.876	X			F46
Finding	**Education and training facilitator role – requires similar vocation to staff**				
Illustration	Surgeons "wouldn't have listened if we bough in a 'quality person'. The responded because it was people (other surgeons) that they knew and trusted". p.875	X			F47
Finding	**Lack of management/leadership enforcement as a barrier**				
Illustration	"Who enforces this stuff when the surgeon isn't behaving?... That is where we have had problems when we have 'bad players'. It is a difficult position for nurses and even anaesthetists to be in". p.876 Nurses worried that they would be responsible for "forcing surgeons" to use the checklist. p.676	X			F48
Finding	**Overall facilitators of the SCC**				
Conclusion	Active participation, deliberate enrollment, extensive discussion and training, piloting, multidisciplinary communication, real time coaching and ongoing feedback… did distinguish highly effective checklist implementation processes. p.877				
De Oliveira Junior et al. (2017)					
Finding	**Patient safety checklist: still a challenge**				
Illustration	At the moment that we receive the patient, whoever is in the screening has to confirm with the patient the full name, before the patient enters or at the moment that he is changing; we confirm this for the safety of the patient. Page 452 I had an experience in which I called the patient, and he was not the patient I was calling. I find it wonderful to have a bracelet to identify the patient. Everything is not enough. P.452	X			F49
Findings	**Difficulty adhering to the safe surgery checklist**				
Illustration	We have a barrier with the checklist inside the room, depending on our doctors. [...] Because there are some doctors who don't accept it. [...] p.543 In a room, it's very complicated to do it. What do we do? We identify ourselves, check the list at the screening, confirm patients' name, bracelet, surgery, surgeon, allergies; we talk about	X			F50

	everything we are supposed to, because when we arrive in the room they the patient is already on the table being punctured; they don't let us talk. p. 543				
Finding	**Checklist steps**				
Illustration	In my opinion, this checklist must be done before, because in a surgery everything goes very fast and we have to get the patient, and this paper goes along. So, if you don't fill it out at that moment, and you have to fill it out fast, you can't fill it out afterwards and you end up going to the recovery room without it. p.454 They do not understand it. They don't want to waste time in the room; they think this is silly, foolishness. And when we tried to apply the checklist in the room before, we had several barriers, several arguments. [...] Actually, here, we can't do what we are supposed to; the surgeon plays his role, and the anesthetist does his part. [...] because the anesthesiologist thinks it's silly, and the surgeon thinks it's silly. p.454	X			F51
Dharampal et al. (2016)					
Finding	**Participation of the surgeon as a barrier to the SSC**				
Illustration	Nurses expressed their frustrations as "sometimes it feels like we nurses spend a lot of time lassoing people to get them to participate." p.271 … it was more difficult to ask surgeons to further divide their time by using the SSC, and their cooperating "was the biggest challenge in the process." p.272	X			F52
Finding	**Competing tasks and priorities as a barrier to the SSC**				
Illustration	The main complexity perceived by the surgeons was the additional burden of completing the SSC while managing their busy days in the operating room. p.271 Nurses found that attending surgeons had "often left the room by the time [nurses] can do the debriefing because [surgeons] have an important responsibility to speak with the family of the patient postoperatively. " p.271 Anaesthesiologists found they were occupied with waking a patient at the end of a case when debriefing [sign out] is meant to be completed. p.272	X			F53
Finding	**Lack of modification and generalization as a barrier to the SSC**				
Illustration	Completing all 3 portions of the SSC was found to be cumbersome, particularly for numerous, similar, repetitive procedures, such as tonsillectomies and lumpectomies. p.271 One surgeon notes that the SSC is "harder during those quick little cases that [health care providers] do, and it would be nice if we could do an abbreviated version in those situations." p.271	X			F54
Finding	**Perceived redundancy of the 'sign out' as a barrier**				
Illustration	From the surgeons' perspective, briefing is less of an issue if the case has gone as planned, and when other health care providers "don't have any concerns you are sometimes just move on; sometimes it's because the nurses are busy at the end of the case getting ready for the next case." p.272 Most interviewees commented the debriefing was more likely to be completed for procedures that had an unexpected course… p.272	X			F55
Finding	**Perceived positive impact on efficiency as a facilitator to the SSC**				

Illustration	"The SSC reduces the number of questions from the team because [the surgeons] state it up front and there is lots of clarity about equipment and how things will be done." p.272	X			F56
Finding	**Perceived lack of benefits of the SSC, lack of feedback from management as a barrier**				
Illustration	… however, most health care providers subjectively did not notice a change in morbidity or mortality. p.272 "I know it's supposed to save lives and reduce morbidity, I'm not sure it does that. I think that it improves the efficiency of my OR." p.272	X			F57
Finding	**Disruption to workflow as a barrier to the SSC**				
Illustration	The SSC was viewed as being disruptive to previous perioperative workflow, which was considered a barrier to adoption from a complexity and trialability perspective. p.273 Each provider group felt the SSC had the potential to distract from their own clinical duties. p.274			X	
Finding	**Policy and checklist enforcement as a facilitator**				
Illustration	The nurses interviewed emphasized the SSC was a mandated protocol and, thus, needed to be completed. p.274		X		F58
Elam et al. (2022)					
Finding	**Innovation**				
Illustration	"…it could have been helpful to have…a little bit more formal training on it [the checklist]…more of the history, the background where it comes – and why it was introduced, why it's thought to be important."p.5 It's quite powerful to know that if you give the antibiotics at the right time that it has a massive impact on perioperative infection. But if people don't understand that then they're not going to be engaged with that question. P.5 "…I can only remember one case where anything was significantly picked up during the checklist. I remember one day we had a patient ready for a knee scope …and we said, "Okay is this Mr. Smith for a left knee scope" and we looked down and we had the right knee ready. So that was picked up on the checklist… p.6	X			F59
Finding	**Recipients**				
Illustration	When the checklist first came out, there was a lot of umming and ahing in the UK because most of us saw that we didn't have the dreadful number of problems…that were reported in the original paper p.10 We had a number of adverse events with senior surgeons in a certain subspecialty and that changed immediately the practice in that unit…there's someone who's had effectively the wrong-site surgery with a senior surgeon involved and then… overnight almost the checklist was adopted in that unit p.10 "…I find the younger ones are very focused on it and they're grabbing the checklist and they want to do it correctly, while some of the older surgeons, not so much. P.10 "… we made it very clear that the anesthesiologist should lead the sign in, the surgeon should lead the time out, and the nurse should lead the sign out. And that's improved ownership and it's improved sort of engagement from the team." P.11	X			F60
Finding	**Local level**				

	…surgeons…how they come across because of their position of leadership, their attitude to the safe list is very pervasive on the team and if they are dismissive then why should everybody else buy into it?" p.11 "My impression also is that… happiness with the process is rather low, … because there's been recurrent changes…there's a bit of change fatigue in terms of the surgical checklist. P.11	X			F61
Finding	**Organizational level**				
Illustration	"There's always a theatre efficiency time pressure to get the job done and I feel that the time pressure often goes against the Surgical Safety Checklist and people instead of paying attention to the items, it turns into, 'Ah we just need to tick all the boxes and then we can proceed p.11 "I don't think you can look at the checklist in isolation without also addressing the safety culture. It's a tool to help change safety culture, but if it's used on its own it won't change anything; you have to look at the whole safety culture of the department and hospital in order to affect real change p.11	X			F62
Finding	**Health system level**				
Illustration	"…the only way we get patients into our hospital is by the patient being referred from their general practitioner to a surgeon and the surgeon has got operating rights at this hospital… they have operating rights at several hospitals. It won't just be this one… So, the emphasis is on protecting the surgeon and that's how it is in private hospital p.12 I have a very, very powerful, strong, effective, sensible CEO at my hospital. And he takes no prisoners. And he recently threw out the biggest financial earner in the hospital because of a problem… It [SSC] needs proper management who will stand up to maintaining standards, as opposed to, well we need the money p.12 …you need to get buy-in from people in every area. So, if you have anaesthetists and surgeons and nurses and non-medical…you want all of them on board, you have to get a couple of champions from my point of view for all of those areas to push it through their colleagues…" p.12	X			F63
Fourcade et al. (2012)					
Finding	**Duplication of existing processes as a barrier**				
Illustration	The most common barrier (16 centres) was duplication with existing processes that already covered several of the items in the surgical checklist p.193 For adverse event reporting, an electronic system was also used in most of the centres. Therefore there was duplication in documents for reporting events. p.193		X		F64
Finding	**Professional independence causing lack of MDT communication during the SSC as a barrier**				
Illustration	The next most common barrier (10 centres) was lack of communication between the surgeon and anaesthetist at the end of the surgical procedure. The surgeon might leave before 'sign out' and the anaesthetist might return during recovery after skin closure. This jeopardized the sharing of information on patient management. p.193		X		F65
Finding	**Time constraints and heavy workloads as a barrier**				

Illustration	Staff in nine centres found that the checklist took too long to complete as they already had a heavy workload and did not perceive the added benefit. p.194 Five centres reporting that items could be ticked off even when items were not checked because of time constraints. p.194 Checklist too long to complete, especially when very busy (eg, emergency surgery, end of day). p.196		X		F66
Finding	**Time constraints leading to complacency as a barrier**				
Illustration	Five centres reporting that items could be ticked off even when items were not checked because of time constraints. p.194	X			F67
Finding	**High staff turnover as a barrier to the SSC despite education**				
Illustration	High staff turnover, especially of nurses, in nine centres was also considered an obstacle to checklist implementation despite provision of training. p.194		X		F68
Finding	**Inappropriate or difficult wording of the SSC as a barrier**				
Illustration	In nine centres, some items did not make sense because they did not fit in with customary operating room practices… or because their timing was inappropriate. p.194 The binary yes/no response system was ambiguous and confusing according to eight centres, that is, could a non-'yes' answer prevent moving on to the next question and postpone surgery? p.194 Difficult to check sampling labeling at the end of the procedure if the samples were sent to pathology laboratory during surgery. p.196 Did a 'yes' response for 'allergies' mean that the patient had an allergy or that the risk of allergy has been checked? p.196		X		F69
Finding	**Lack of engagement of the multidisciplinary team as a barrier due to professional independence**				
Illustration	According to the nursing staff completing the checklist, the surgeons and anaesthetists who were ultimately responsible for the surgical procedure did not always listen to the items when they were read out. Nurses were therefore concerned about the legal implications of signing the checklist as they may be held accountable for errors. p.194		X		F70
Finding	**Patient anxiety as a barrier to the SSC, repetition causing increasing patient anxiety**				
Illustration	In five centres, staff though that repeating questions that had already been answered several times might generate anxiety in patients. p.194 Asking the patient his or her name three times over a very short time may cause alarm. p.196		X		F71 F72
Finding	**Inappropriate 'tick-box' use of the checklist to meet organisational demands as a barrier**				
Illustration	Five centres reported that items could be ticked off even when items were not checked because of time constraints. Items were ticked only to comply with the management audit; therefore in this situation, checklists failed to improve patient safety. p.194 Ticking off unchecked items at the end of the day [to meet organisation requirements]. p.196		X		F73
Finding	**Attitude, perceptions and resistance from surgeons as a barrier to the SSC**				
Illustration	The head surgeon in this centre had attended the training session but considered 'administrative tools' unsuited to assessing his field of work. He was therefore against using the checklist. His staff though that the measurements that the anaesthetist, who was working on the centre's information		X		F74

	systems, had made using the checklist were 'boring' and irrelevant to just in time management. p.195				
Finding	**Organisational changes as a facilitator to the SSC**				
Illustration	Organisation changes are needed while implementing a surgical checklist in operating rooms, for example, harmonization with existing adverse-event reporting systems and allocating the time needed to complete the checklist, communicate it, and check that it is complete. p.196			X	
Finding	**Hierarchical culture as a barrier to team communication and the SSC**				
Illustration	Verbal communication between health professionals (surgeons, anaesthetists and nurses) has to be egalitarian for checklist use to be effective but the findings suggest that operating room staff practices are rooted in a time-honoured hierarchy, at least in France. p.196			X	
Gagliardi et al. (2014)					
Finding	**Varying surgeon participation and resistance as a barrier**				
Illustration	"Getting the surgeon to be in the room for the briefing." p.5 "Surgeons were refusing to do it." p.5 Physician resistance to change was attributed to individual beliefs… perceived redundancy with other checklists or processes, and concerns about surgical delays as a result of taking time to review the SSC. p.4	X			F75
Finding	**Resistance and reluctance to change as a barrier**				
	Getting acceptance form surgeons and anaesthesiologists." p.5 "Older practitioners are very set in their ways and it's hard to change them." p.5	X			F76
Finding	**Hierarchical culture as a barrier to team interaction during the SSC**				
Illustration	"Nurses were intimidated so there was friction between team members." p.6 Participants said that SSC use was limited by the traditional physician-dominated hierarchical culture of the operating room and lack of confidence among nurses leading SSC review, particularly when faced with resistance from staff who were most often surgeons, leading to tension and avoidance of SSC review. p.4	X			F77
Finding	**Inconsistent completion of the checklist as accepted and normalized practice**				
Illustration	"No one goes through the whole list of every single item." p.5 "Consistent application of the checklist in every case." p.5	X			F78
Finding	**Local modifications as a facilitator**				
Illustration	"As issues came up there would be discussions about what should or should not be on the checklist." p.5 "We came up with our own." p.5 "It needs to be easily modifiable." p.5 The SSC was often modified to make it easier to use and accommodate existing local practices and processes… therefore multidisciplinary interaction at key time points may not have occurred. p.3 … extensive modification of the SSC to accommodate existing, preferred practice patterns eliminated essential interaction to discuss patient management issues at key time points. p.4	X			F79
Finding	**Implementation issues with the checklist as a perceived barrier**				
Illustration	"It's been forced on us. It's hurt morale and caused tension in the OR." p.5	X			F80

	For example, many participants said that staff should have been involved in adapting and implementing the SSC as a means of fostering ownership. p.3				
Finding	**Perceived impact on efficiency as a barrier with time constraints**				
Illustration	"It does delay getting the case started." p.5 "Cause of inefficiency in out operating room." p.5	X			F81
Finding	**Varying multidisciplinary team engagement and professional independence as a barrier**				
Illustration	"Some days it doesn't seem like a team effort." p.5 "Everybody being in the room at the same time was one of the biggest challenges." p.5 The intended multidisciplinary interaction among staff was frequently not achieved. p.3	X			F82
Finding	**Using the checklist as a tick box exercise as a barrier**				
Illustration	"There are a lot of people that are just going through the motions." p.5 Even when the SSC items were being reviewed, staff were talking or not paying attention, and this was described as 'going through the motions', which diminished the impact of the SSC to 'just another tick box'. Therefore the quality of interprofessional communication was limited, and items pertinent to patient safety may not have been reviewed in a mindful manner. p.3	X			F83
Finding	**Lack of training and education as a barrier to the SSC**				
Illustration	"We don't know how to do it, we're not trained." p.5 "They could have done a better job at educating people." p.5 "People were not fully understanding what the components of the checklist were." p.5	X			F84
Finding	**Surgeons as leaders or champions of the SSC as a facilitator**				
Illustration	"Identifying surgeon champions." p.5 "Needs leaders in the physician group to sell it." p.5 To address resistance participants recommended that physicians assume the responsibility for leading SSC review. p.6	X			F85
Finding	**Lack of organisational support from management as a barrier to the SSC**				
Illustration	"I just didn't get the support that I would have needed to be able to implement that fully." p.5 Hospital leadership was not seen as involved in either promoting or actively implementing the SSC. p.4 Organizations provided few resources and supports for thorough implementation, training, monitoring and feedback. p.4	X			F86
Finding	**No consequences to non-compliance from management as a barrier**				
Illustration	"There are no consequences." p.5 "There's no punishment." p.5 "If it was mandatory people might be more diligent." p.5 Rarely was non-adherence reported to those in leadership roles. p.4	X			F87
Finding	**Feedback from audits and management as a facilitator**				

Illustration	“People like to know this is evidence-based.” p.5	X			F88
Finding	**Nurse workload as a barrier to the SSC**				
Illustration	“It’s one more job for the nurse to do.” p.6 “Documentation has dramatically increased, and it has taken away from patient care.” p.6 “Layering on a further administrative burden.” p.6	X			F89
Finding	**Time and workload pressures as a barrier to the SSC**				
Illustration	Rapid turnovers, call backs and emergency cases also challenged SSC adherence. p.3		X		F90
Finding	**Audits and consequences for non-compliance as a facilitator to compliance with the SSC**				
Illustration	Several participants recommended regular local audits of SSC use, or random audits conducted by groups independent of the operating room team or external to the organisation, and consequences associated with non-compliance. p.4		X		F91
Finding	**Lack of clarity in policy/protocols over who was responsible for the SSC as a barrier**				
Illustration	Many participants said staff were uncertain about … who was responsible for leading it. p.4		X		F92
Georgiou et al. (2018)					
Finding	**Positive factors: surgical team**				
Illustration	'there was a surgeon from abroad that day, and suddenly I saw him waiting for something...., he didn't start the operation... so I realize that he was waiting for me to start the List! Then the rest of the team complied without any hesitation p.342 '...younger doctors are more willing to adopt the list, are more open-minded p342	X			F93
Finding	**Negative factors Surgical team: Working environment**				
	'If I ask the surgeon to tell me his name during the Time Out phase, he will probably answer ironically p.342 surgeons, they are always in a hurry, so they just do not reply to my questions p.342 'I saw younger staff that wasn't sure how to complete some parts of the list and was saying that they did not know who to do it. It happens... I think that more training on the list is needed... p.342 'doctors think that the list has to do with nurses' duties only, therefore they do not need to participate in the completion' p.342 you have a thousand things to do, I cannot waste time to complete the list p.342 'in my opinion the problem is the structure of the list itself. Maybe the way that the points are written [...] is a kind of dissuasive. I mean much more concentration is needed ...it must be simple and much easier for someone, to feel more comfortable to implement it, to know that won't take you so long to fill it p.342	X			F94
Finding	Resistance to change				
	'there is a female colleague, older in age that never does the list, not because she does not have the time, because she says she does not want to...she does not want to write her name or sign the list p.343 most items of the list come on the tip of our tongue, as soon as the patient enters the room. We do not need the list p.343	X			F95

	in all other countries the list is implemented properly, because of the status of the nurse. In Cyprus things are different... nurses are not treated as equal members of the surgical team, that's why.... It's a matter of culture p.343				
Gillespie et al. (2016)					
Finding	**Using the SSC as a 'tick-box' exercise as a barrier to the SSC**				
Illustration	"I guess effectively it's almost a tick and flick but occasionally something pops up in the process of ticking and flicking there to remind you about something." p.4 "The last bit is not done very well, the sign out. That's a tick tick tick thing." p.4 "If you are not careful about what you are doing, the patient will get checked in and if all the boxes are ticked and nobody actually talks to the patient and confirms with the patient while they are aware that the surgeons knows what they are doing, it doesn't prevent anything." p.4 "But those who are just used to doing the tick and flick are not asking the deep meaningful questions, struggle when the meaningful questions are first asked." p.5 Some participants however warned that using the surgical safety checklist as a 'tick and flick' exercise may have the unintended effect of leading to complacency because team members were merely 'going through the motions' without listening to, or thinking about the information being collected. p.5 When the checklist was carried out as a 'tick box' process, team members' ability to 'ask meaningful questions' and elicit relevant information from patients and other team members was reduced. p.6	X		F79	F96
Finding	**Lack of clarity over who is responsible for the SSC as a barrier**				
Illustration	The majority of clinical participants believed that the physician should 'take ownership' and 'lead the process' of checking, particularly during the time out phase. p.5	X			F97
Finding	**Including patients in the SSC as a facilitator**				
Illustration	"If the patient is awake and is having blocks of local anaesthetic and they say 'time-out', I say to the patient 'just listen. If any information about you or what they are saying in the next two minutes is wrong, say something'." p.4	X			F98
Finding	**Working as independent disciplines as a barrier to the SSC**				
Illustration	"We don't work very well as a team. We have our two separate teams but we're not a whole team. We've got two pods. An anaesthetic pod and a surgical pod." p.4 "It's 'I have my job. You have your job' and I'm so like, why cant we just help each other out?" p.4 "Fasting status is more of an anaesthetic nurse concern, but as a scrub or a scout I don't… I'm concerned about that if I'm in a different role, but when I'm just a scrub scout in theatre, I probably don't." p.4 "The anaesthetic nurse does the sign in bit by themselves. We usually go in and do our own little bit but it's not the way it's meant to be done but it's getting done and the sign out is just pointless all together." p.4 The influence of 'being task focussed', 'working in isolation' and 'working in silos' was obvious in the way team members emphasised discipline-specific information and the limited coordination in checks conducted as a collective. p.5	X			F99

	The notion of role demarcation was again reinforced in 'being discipline-centric' as team members checked off particular checklist items based on their different discipline orientations. p.6 Study participants' expectations that team members would naturally perform their sections of the checklist, with little, if any communication about how this would or should be done…" p.6				
Finding	**Lack of communication between disciplines as a barrier**				
Illustration	"But it's the communication between the surgical team and the anaesthetic team is probably something that needs to be improved on. I guess it's because we're focused on two completely different aspects of this patient. One is focused solely on the airway and that they stay alive, and the surgical team are just… purely there to get them in and out." p.4 "I don't think that they really pay attention to it [anaesthetic checklist items]. They [scrub nurses] pay attention to their own check, despite it being very important and a lot of it in their check as well." p.4 Study participants' expectations that team members would naturally perform their sections of the checklist, with little, if any communication about how this would or should be done…" p.6 The sign in and sign out checks were not confirmed and validated by the entire surgical team… p.7-8	X			F100
Finding	**Lack of verbal communication during the SSC conduction as a barrier**				
Illustration	"We should just verbalize it more, really. We've probably always done it. You know, you always check if your specimens are labeled… I think we just don't verbalize that we've done it because it's unsaid." p.5 Without explicit communication about performing the checks, vital information may be missed and/or not passed on. p.6	X			F101
Finding	**Modifying the SSC to the local context as a facilitator and barrier**				
Illustration	Surgical team members believed that 'modifying and adapting' the checklist enabled them to tailor their care to the particular needs of the patient as well as reflect the nuances of different surgical specialties. However some participants believed that the ability to modify the checklist or checking process had to be carefully balanced with the need to standardize the items covered in the checks to ensure that important information was communicated and was not lost or omitted during handover exchanges. p.5		X		F102
Finding	**Verbal team communication as a facilitator to the SSC and establishment of team safety culture**				
Illustration	Strategies such as 'making sure, double checking', and 'verbalising information' enabled team members to develop a shared mental mode ensuing that everyone was on the same page. p.6 Likewise, the deliberate act of verbalizing information offered participants the opportunity to engage in dialogue, especially during time out. p.6		X		F103
Finding	**Strong leadership as a facilitator**				
Illustration	Participants in our study described the importance of having a designated leader for each phase of the checklist…" p.7		X		F104
Finding	**Team attributes as a facilitator**				
Observation	Team attributes is the biggest factor in checklist participation and drives the communication strategies used when performing the phases of the checks. p.7			X	F105

Finding	**Disruption of workflows as a barrier**				
Illustration	Competing workflows consequently led to potential discrepancies or incomplete checks. p.7		X		F106
Finding	**Unclear wording and timing of the SSC**				
Illustration	Participants perceived sign out items as nebulous and unclear, and held disparate perceptions of when to initiate the sign out phase, likely because of conflicting individual work flows. p.7		X		F107
Gillespie et al. (2016)					
Finding	**Competing task priorities as a barrier to the SSC**				
Illustration	"Occasionally the patient might be a bit hypertensive and if that was happening I would just say 'I'm listening but I'm dealing with this'." p.866 "Sometimes for 'sign in' it's having the doctors there who want to listen and want to be involved. Because sometimes they might be scrubbing or talking about the next cases so getting their attention is hard." p.866 During 'sign in', anaesthetists were frequently unable to be present as they were in theatre providing patient anaesthesia. p.865 It was not always possible for some staff to fully participate [in time out] as they were engaged in work-related tasks, that is, multitasking. p.865	X			F108
Finding	**Heavy workload as a barrier to the SSC**				
Illustration	"… And sign out there's so much going on, anaesthetic wise, we're looking after the patient, getting them ready to be extubated and then the scrub team are counting and cleaning up. So there're lots of different things going on at the same time so it's difficult to get everyone." p.866	X			F109
Finding	**Time pressures and constraints as a barrier to the SSC**				
Illustration	"The scrub nurses have to finish that procedure, then have to get rid of all their operating things and then the theatre has to be cleaned, and then they have to start another procedure…. so that's the bit that gets left out. Because they just run out of time." p.866 Participants had to juggle multiple clinical activities simultaneously in response to the need to manage time constraints; curtailing their participation in various checks, or preventing them from performing checks at the specified times. p.865	X			F110
Finding	**Disruptions to workflow as a barrier to the SSC**				
Illustration	"It's work flow… what happens is that the team I taken to recovery, before that though, the next patient has already been bought into the room, usually the anaesthetic nurse has gone through the check… we don't all just stand around, all go to recovery and then go see this patient, efficiency would drop incredibly." p.866 In managing workflow pressures, participants modified practices, that is, work-arounds in communicating information to others during heightened periods of work activity. p.865	X			F111
Finding	**Repetition as a barrier to the SSC**				
Illustration	"I watch our ward nurse fill out one box, then another nurse fill out another box and then my understudy assistant often does a third one. I have no problem with that bit I suspect we're probably doubling up a bit and, my concern with that is that perhaps leads to checklist fatigue." p.866	X			F112

	Having various types of checklists and checking processes where similar information was checked several times over at different junctures of care often led to a 'tick and flick' approach to checks. p.865				
Finding	**Perceived impact on efficiency as a barrier to the SSC**				
Illustration	"It's work flow… what happens is that the team I taken to recovery, before that though, the next patient has already been bought into the room, usually the anaesthetic nurse has gone through the check… we don't all just stand around, all go to recovery and then go see this patient, efficiency would drop incredibly." p.866	X			F113
Mobilio et al. (2022)					
Finding	**Compliance with the SSC**				
Illustration	We really do it here. We don't take the checklist from the clip on the door and verify that it's been done properly, but everybody has a version of it that they do and they give the points they care about. Each team adjusts it: some will have written notes, some only a few thoughts, but there is always some version of it that is being run p.233 "What's the difference between Briefing and Time-Out …. Are they not the same thing? P.233	X			F114
Finding	**Responsibility for the SSC**				
Illustration	Yes, [the Briefing] is conducted regularly. However, it is most often led by the surgical fellow, who often isn't knowledgeable about the details of the case (required equipment, sequence of events etc). It would be valuable to have the [attending] surgeon for the Briefing, especially in complex cases that are not considered routine p.234 In many cases, the surgical checklist is led by a surgical trainee who knows little to nothing about the patient - they often review the chart for the first time in the room before the case. This does not reflect the true intent of the checklist p.234 Well, sometimes it's because of, just the nature of our hospital. It's a teaching environment. So if [the surgeon is] there all the time, the delegates don't learn as much. And sometimes, you know, we ask too much of the staff surgeon. They're in meetings so they can't necessarily be there at the beginning [of the case] but they'll come in shortly after that, right? P.234	X			F115
Finding	**Documenting adherence to the SSC**				
Illustration	… the higher level of authority saying you gotta [follow a procedure] produces some element of importance to it, right?.. I think if you were to stop documenting [compliance], or stop recording it in the hospitals, have it on some sort of bound score card, I think it, you know the compliance would go down. It definitely would go down p.233 It gets harder to go through the checklist if the surgeon doesn't want to do it. You're not going to challenge your surgeon if they don't want to do the checklist. It's not going to happen. So you'll fill it [the documentation record] regardless, so as not to get a [charting] error p.233	X			F116
Finding	**Team collaboration**				
Illustration	[The OR is a] historically, male-dominated surgeon-centric environment, right? And I would say the success of the checklist might be more in helping move that culture to a more democratic environment, where people have the right to speak up. Be it nursing students, or anesthetist. Not	X			F117

	in a challenging, that they're challenging the authority of the surgeon, but that there's been a change to have a distributed authority …. So to my mind … the checklist was just a vehicle I think to change culture p.234 It doesn't matter if there is a Briefing in our rooms, because the nursing staff frequently change before and during the case. Also, the anesthesiologist is frequently not present for the Briefing, just the resident or fellow. If the only person that is present for the brief and DeBriefing, and the whole case, is the surgeon, then what is the point? P.234				
Haugen et al. (2015)					
Finding	**Optimizing safety**				
Illustration	I believe the Time-out has influenced the team, in terms of better contact within the team. We all start a conversation before surgery; it provides the opportunity to ask questions about equipment and the procedure. I think it is an improvement (operating room nurse) p.58 It feels unsafe not using the checklist once you are familiar with it p.58 It is very useful to check patient identity, correct site, x-rays, since the fear is one day to perform an unforgivable error. In this regard, the Time-out makes you remember or trigger thoughts on safety issues p.58	X			F118
Finding	**Balancing safety and effectiveness**				
Illustration	In routine surgery, the Time-out can be a litany; we do not pay enough attention p.59 In my opinion the checklist supports safety, but we need to become more attentive in performing it, and ask 'which side is it?' instead of 'is this the correct foot p.58 Even if we do not hand over the knife or blade until after the Time-out, the surgeon starts drawing and are very focused on the next steps of the surgical procedure p.58	X			F119
Høyland et al. (2014)					
Finding	**The operating team constantly balances the safety (time spent) and efficiency (time saved) scales**				
Illustration	''Personally, I wish the absolute best for every patient I treat, but the pressure from ''above'' makes this a challenge ... because they want to push the patients through, they want to earn money right, they earn money on patients, the more we can handle the better. This places even more pressure on us to work faster. We're already working as efficiently as we can ... At times, this compromises safety, since things are moving too fast.' p.73 ''When there's pressure on production [and many tasks that need to be performed] ... I feel that the list, in a way, becomes just another task rather than a task you actually perform in an alert and focused way ... You can easily move through the checklist without checking anything. I've experienced this myself p.73 'Clearly, lack of time and the use of a checklist ... to move through the checklist takes time. There's a conflict there somewhere p.73	X			F120
Finding	**Time spent on the Surgical Safety Checklist can reduce total operating room time, depending on the operating team's familiarization levels**				
Illustration	'Overall, I don't think you lose any time [on the checklist] ... While it [the list] can feel ineffective at first, the reward is that you get things into a system, in a sensible way. p.74	x			F121

	[The checklist] strengthens culture and the team's awareness of things in a systematic way. As a concrete example, I'm absolutely sure that the communication and performance of antibiotic administration is better than before [the list] p.74 The checklist doesn't take time, in my opinion. In relation to operations that take three hours, two minutes are nothing. So I believe the time concern is negligible' p.74				
Finding	**Planning and rational use of time are important aspects of operating room time**				
Illustration	The use of time has much to do with planning, I believe. A major surgical procedure is to be undertaken and there are a lot of things that need to be prepared in advance. A lot of equipment for the operating and anesthesia personnel must be in place ... It has to do with rational use of time, during the anesthesia, during the operation itself, that we're rational in our use of time ... to avoid unforeseen events. P.75 The surgeon who plans [the operation] can override [the average time the planning system produce] if he knows it is a complicated patient that will take longer time than the average... The most experienced surgeons should be aware of these things ... However, it's my experience that they [the surgeons] leave many of the planning tasks to [be entered into the electronic planning system] to a secretary ... and this has to do with [the surgeons' willingness] to learn how to use the [planning system], to spend time on this p.75	X			F122
Kasatpibal et al. (2018)					
Finding	**Unclear local policies as a barrier to the SSC**				
Illustration	"Our obstacle is unclear policies. It's because we do it individually, don't we? It's like there is not a law and constitution. Anything could go in different directions." p.902 Some hospitals had an unclear policy mandating SSC adoption; therefore, they could not put it into real practice. p.900	X			F123
Finding	**Staffing issues as a barrier to the SSC**				
Illustration	"It's because we don't have enough staff. Our personnel can't get the job done in time." p.902 "SSC documentation is 'not real time' for both paper and electronic SSC as there are not enough personnel or computers." p.902 Surgical team barriers included unprepared surgical teams… p.900	X			F124
Finding	**Hierarchical culture in the OR as a barrier to the SSC and speaking up**				
Illustration	"Thai culture is another barrier: some surgeons do or do not do whatever they like even though it is part of hospital policy, such as SSC implementation, because they are senior. I cannot say anything…" p.902 Thais highly respect and abide by seniority. People who have higher job positions or are generally older are given deference by younger staff members. Going against the opinions of these people is culturally and socially unacceptable. p.904	X			F125
Finding	**Lack of non-technical skills as a barrier to the SSC**				
Illustration	"Some personnel are shy to introduce themselves and their roles." p.902	X			F126
Finding	**Unclear policy over SSC responsibility as a barrier**				

Illustration	"I am not sure who must be the person who would verbally check… I am not sure if it is necessary that we must sign names at every procedure." p.902	X			F127
Finding	**Resistance to change from surgeons as a barrier to the SSC**				
Illustration	"In the beginning, some personnel refused to do. This refusal is mostly found among senior surgeons who still adhere to the traditional way of practice..." p.902 "Some of them were against signing and refused to use the checklist." p.902	X			F128
Finding	**Emergency scenarios as a barrier to the SSC**				
Illustration	"In the beginning, some personnel refused to do. This refusal is mostly found in those… who had to perform an emergency surgery." p.902	X			F129
Finding	**Lack of engagement of the multidisciplinary team as a barrier to the SSC**				
Illustration	"The problems at my hospital are lack of cooperation and inattention. It feel like crazy to speak out alone to complete the checklist." p.902				F130
Finding	**Timing of SSC completion as a barrier**				
Illustration	"The SSC was completed before the surgery or after the surgery which was not real time." p.902 "The implementation of the SSC was not done in full steps, the process was cut short… they 'just' did to get it done quickly" p.902	X			F131
Finding	**Language barriers as a barrier to the SSC**				
Illustration	"The SSC in Thailand must be written in Thai as some surgical team members lack English language skills." p.902 "My hospital had to hire an interpreter for effective communication and assurance that a foreign patient would understand the questions and information provided by the surgical team." p.902	X			F132
Finding	**Some local modifications as a barrier to the SSC**				
Illustration	"We adapted the SSC by adding a quality indicator to the checklist. The modifications made its use complicated, and this resulted in increased resistance and reduced compliance." p.902	X			F133
Finding	**Repetition to patients as a barrier to the SSC**				
Illustration	"My patients reflected they felt tired of being asked and investigated many times according to the SSC procedures. Patients were asked at the ward, during the transfer process, in the waiting area in OR and in the OR. Many personnel such as the surgeon, the surgical resident, the anaesthetist, the anaesthesia resident, the surgical ward nurse, the anaesthetic nurse, and the OR nurse asked them and investigated several times." p.902	X			F134
Finding	**Effective policy as a facilitator of the SSC**				
Illustration	"I think we should have a policy from the ministry… if there aren't any policies, it's difficult to be successful." p.903 "The hospital executives must have a formal order that we need to do. It must be formal, decisive, and compulsory." p.903	X			F135
Finding	**Rewarding compliance as a facilitator of the SSC**				
Illustration	"Another way to promote the SSC is to give rewards such as given more compensation to those who do not do the checklist correctly and completely." p.903	X			F136
Finding	**Regular monitoring, audits and feedback of SSC use as a facilitator**				

Illustration	"The checklist must be completed systematically with feedback for improvement… a committee should be set up to check practice… supervision of a team… monitoring and periodic random checks… internal audits." p.903	X			F137
Finding	**Cooperation of the multidisciplinary team as a facilitator**				
Illustration	"When implementing the SSC, what we have to do is verbally confirm together. It should be done based on cooperating, rather than command… an order can't be used anymore." p.903	X			F138
Finding	**Characteristics of the facilitator of training and education surrounding the SSC**				
Illustration	"If possible, the facilitator should have the same vocation as the training attendees, for example, a surgeon must be a facilitator for training surgeons… if other training is used, the facilitator should have expertise that is widely recognised." p.903 "To train surgeons, the person at the training station must himself/herself be a surgeon… a surgeon who presides at the training station would be more respected." p.903	X			F139
Finding	**Adaptation of the SSC to the local context as a facilitator**				
Illustration	"I think the way of implementation of the SSC should be suitable in the hospital's context." p.903 "I think the contents of the SSC and the methods of self-introduction in different hospitals could be different, depending on the hospital's context." p.903	X			F140
Finding	**Providing feedback from monitoring the SSC as a facilitator**				
Illustration	"Providing information about the benefits of the SSC implementation and the incidents of surgical adversity helps us build self-awareness as regard the team." p.903	X			F141
Finding	**Individual understanding and attitudes surrounding the SSC as a barrier**				
Illustration	Some surgical personnel lacked true understanding regarding SSC content, leading to uncertainty and ineffective implementation. They did not know how to use the checklist. p.900 In addition, some though the SSC was not important and considered it a waste of time. p.904		X		F142
Finding	**SSC formatting as a facilitator and barrier**				
Observation	Hanging a large SSC chart on the wall in the OR for all members of the surgical team to see might be an effective way of motivating them to take action. p.901 This study found than an electronic SSC was used in some hospitals. However, providers were not prompted to implement it because of an inadequate number of computers… the electronic version resulted in both reducing SSC compliance and increasing incomplete SSC documentation. p.904			X	
Finding	**Increasing patient involvement with the SSC as a facilitator**				
Conclusion	When the patient was fully conscious, his/her participation was recommended. This helps reduce patient complaints, increases patient satisfaction, and improves SSC implementation. p.902			X	
Finding	**Education and training as a facilitator**				
Conclusion	Comprehensive training using role-play may be another important strategy to improve SSC implementation in Thailand. p.904			X	
Krupic et al. (2020)					
Finding	**Distractions as a barrier to SSC use**				

Illustration	**"**When I want to say something important if the patient usually fails to pay attention… everyone wants to start their activities in the operating room." p. 291 "None of the employees listen any more, because they are all busy with their own work and duties in the operating room" p.291 "The list sometimes ends up as a shorter version and, for me, as I am taking care of the patient, it is sometimes difficult to keep up." p.291 Discussions are sometimes very lively, and using the WHO checklist is sometimes impossible. p.291	X			F143
Finding	**Unclear who is responsible for the SSC – policy – as a barrier**				
Illustration	"It would be good to know who is responsible for the WHO checklist being reviewed." p.291 With regard to the responsibility for using the WHO checklist before surgery, most respondents answered that they did not know who was responsible. p.290	X			F144
Finding	**Personal beliefs, behaviour and attitudes as barriers**				
Illustration	Some health care professionals mentioned that the WHO checklist causes annoyance in the room… because they would like to start operating as soon as possible… p.291 They said surgeons usually hijack the end of the operating to speed up the process and end the operating as quickly as possible. p.291		X		F145
Finding	**Perceived repetition as a barrier to the SSC**				
Illustration	Some of the health care professionals also mentioned that it was… unnecessary to repeat the questions several times, that not everyone focuses on the list… p.291		X		F146
Finding	**Emergency scenarios as a barrier to SSC use**				
Illustration	Some of the health care professionals mentioned that … with emergency patients, the list is often skipped completely. p.291		X		F147
Mahmood et al. (2019)					
Finding	**Perceived mandated nature of SSC implementation leading to 'box ticking'**				
Illustration	"Probably most of them don't want to do it, I don't think everyone is sold on how useful it is. It was brought on more as a provincial mandate because of the book that was put out there. I don't think it is done in an evidence-based manner or in an efficient way." p.834 "Some are on board 100% - actively participate. Some are doing it because it is required and it is mandated and you gotta do it – so they pretend." p.834 "Actually, the compliance data have very little value because what compliance is and what we do are very different." p.835	X			F148
Finding	**Perceived impact on efficiency with time constraints as a barrier to the SSC, leading to complacency**				
Illustration	"We are such a time sensitive area… not to say that it would be a waste of time, but you would be going through all of these questions and people would be like, 'okay let's go – I just wanna go and do it'." p.834 "The OR is not very efficient anyway. So it [the checklist] may add to the inefficiencies of things, if this… adds to the efficiency in some way, then that would be easier to adapt." p.834 Given that the SSC was not believed to improve the efficiency of team communication, but was required to ensure appropriate 'compliance', teams would often complete the SSC in a haphazard fashion without spending too much time. p.834	X			F149 F150

Finding	**Perceived redundancy, generalization and irrelevancy to specific settings as barriers**				
Illustration	"In cardiac we have our own checklist, so that one that is hanging on the wall [WHO checklist] is really just a dust collector. We fill outs out… I go by the one that we use." p.835 "Maybe some specialties see less relevance of some of the items to their specialty that to others. Less of them immediately apply. For example, ophthalmology doesn't need blood ever really. Having to go through that – it gets skipped all the time." p.835 "If you have extra things that are completely useless, then people wont do them and it downs out the effectiveness of what is really important for the patient." p.835 … who believed that standarisation cannot ensure excellence because it distilles many situations to one generalised instance. p.836	X			F151
Finding	**Modifications to local settings as a facilitator**				
Illustration	"I personally feel that compliance is going to be better if it is more tailored to what we do. You know, we always get asked about antibiotics, but we never use antibiotics in any of our surgeries." p.835 Eliciting feedback from surgical staff on how to tailor the content and process the safety check to maximize the relevance for each surgical team. p.836	X			F152
Finding	**Team hierarchy and lack of engagement as barriers**				
Illustration	"I mean, I see people trying to do a time out, and, as soon as somebody says, 'we will do a time out now', I see 3 people in the corner turn around and start having a conversation and those 3 people will be the entire 'surgical' team. While the nurse, who is probably the youngest, newest edition to the room, who is maybe 22 years old and has a very soft voice and is very embarrassed about speaking is being listened to by one of her colleagues." p.835	X			F153
Finding	**Hierarchy as a barrier against nursing staff speaking up**				
Illustration	This lack of engagement by team members, particularly surgeons and anaesthesiologists, was perceived to devalue the SSC… participants indicated that a single team member would find it difficult to advocate for completion of the SSC when the rest of the group demonstrated disregard for the process, especially if that team member were a nurse, because traditional hierarchies relegate nurses to a supporting role, limited their power to engage team members in the SSC. p.835 The SSC falls mainly to the nursing staff, often these individuals are in positions with the least authority in the OR and, as a result, may experience significant challenges in engaging other team members. p.836	X			F154
Manamela et al. (2022)					
Finding	**Use of WHO SSC factors**				
Illustration	I believe that all members of the perioperative surgical team should attend an education program or awareness campaign about the significance of the WHO SSC, which includes a step-by-step implementation approach and clear roles and responsibilities p.1	X			F155

	Surgeons confirm patients in the holding or reception area, but sign- in items are not confirmed during that same time". "I do not think anesthetists are aware of the items that are specific to them, for sign out items, blood loss and specimen are the once we ask surgeons p.1 Most of anesthesiologists and surgeons consider WHO SSC to be a nursing practice. They don't realize that it applies to all members of the peri-operative surgical team. Some registered nurses are just documenting this WHO SSC in the system, they are unaware of its significance" p.1				
Finding	**Team factors**				
Illustration	lack of commitment or interest in involved tasks from the surgical team members p.2 poor or inadequate communication among the surgical team members p.2 Inside the operating theatres, peri-operative surgical team does not engage verbally with the surgeon, anesthesiologist, nurses, or technologist; they need to communicate to each other, creating a closed loop communication system. It seems registered nurses prefer writing to verbalizing; they prefer to document elements of WHO SSC checklist on the system. Communication is also influenced by language barrier p.2	X			F156
Finding	**Checklist items factors**				
Illustration	"Items that are repeated we omit, we don't ask about blood loss at sign-in because this is something, we usually ask about during time out" p.3 Time out elements are repeated and have previously been called out at sign in. Due to repetition, we already know responses to some of the questions. The number of time-out items should be decreased due to repetition p.3	X			F157
Finding	**Procedural factors**				
Illustration	Some of the surgeons are unfamiliar with the checklist, while others regard it as a waste of time" p,4 We are occasionally yelling at them for taking too long to call all of the checklist items" p.4 length of the WHO SSC completion being too long due to time taken to review the SSC p.3 In an emergency, everyone is focused on saving the patient's life, there is no time to call out and complete the checklist p.4	X			F158
Munthali et al. (2022)					
Finding	**Surgical team - inconsistent training**				
Illustration	Yes, very senior staff, especially some medical doctors who have been operating for years with- out any recorded AEs/complications, may think that the tool is being imposed on them by the westerners, and feel it is not important and won't utilize the tool. If they are trained and shown actual data from other countries they may change and they would do well to be part of the adverse events audit p.4 Where I work from I rarely see among other leaders, consultants to check on how the junior medical doctors are working. In short, there is no leader figure ensuring that the SSC is utilized	X			F159

	consistently at UTH, despite the fact that there are a lot of new staf who haven't yet been trained on the application of the SSC, and who find it difficult to ft in p.4				
Finding	**Non-availability of resources**				
Illustration	"You would want to be out of theatre as soon as possible...and therefore, you end up not utilizing the SSC. This is because the challenges with the availability of material resources are huge and come in the form of less numbers or nothing at all to use for most times, such as equipment, instruments, consumables and there are no comfortable well-ventilated theatres p.4 ...staffing is also a huge barrier … . [there are] very few nurses [available] against all the operating rooms that are open, the recovery room and theatre sterile supply unit to prepare surgical sets continuously. You end up having the medical doctors con- ducting certain operations alone, while the nurses are scrubbed up in the other operating rooms and you find that the SSC will not be used p.4	X			F160
Finding	**Team barriers**				
Illustration	Sometimes you find that you need to remind the medical doctors as junior staff to utilize the SSC, like 'let's do this … let's do this'. However, they would not want to apply the SSC and you then just start conducting the surgery. Eventually, as a junior staff, you mostly follow what senior staff take on board (...) with regard to keenness towards utilization of the SSC. P.5 It is an issue of specific team members not wanting to attend training that brings and mixes the entire surgical team in one room p.5	X			F161
Finding	**Organisational enablers**				
Illustration	It is better to keep training all new staff on SSC utilization and I think there is a need to plan on our calendars that we need to regularly hold workshops to update our knowledge. The preoperative phase is equally very important and there is a need to also empower surgical ward nurses with skills on pre-operative preparation of patients and include them in lessons about safe surgery p.6 Another way to enhance SSC utilization would be for management to bring on board funded initiatives to strengthen monitoring of the SSC utilization, because it will then make the staff know that they have to be answerable to someone. P.6	X			F162
Finding	**System enablers**				
Illustration	What we need first and foremost is agreeing on the start time for procedures. Basically, the whole team should start together instead of what is happening currently, where at times some team members just come into theatre along the way, meaning their input won't be known and they miss the briefing and 'sign in' of the SSC process p.6 Senior staf also need to delegate leadership roles to juniors for them to learn the skills (…), instead of what happens where sometimes the sen- iors usually take up a lot and fail to do important practices like SSC utilisation. Now one person does everything alone then safety is compromised p.6	X			F163

Nordstrom et al. (2019)					
Finding	**Effective team collaboration and communication as facilitators of the SSC and safety culture**				
Illustration	The time out helped to set high standards to teamwork and communication at the onset of the procedure. p.220 "It is an exchange of knowledge to hear about [listen to] the joint process [time out]… the checklist is a working tool that supports and improves our team feeling." p.220	X			F164
Finding	**Surgeon attitudes toward the SSC as a barrier**				
Illustration	The nurses also experienced that the quality of the time out and the subsequent effect it had on teamwork and communication differed according to whether the surgeon was in favour of using it or not. p.220 However, using the checklist differs from surgeon to surgeon. p.222 However, they also expressed that whether or not the checklist was used and how it was used differed according to the surgeons' attitude. p.223		X		F165
Finding	**Modification of the SSC to the local context as a facilitator to the SSC**				
Illustration	Modifying the SSC and dividing the responsibilities for completing it are measure that could increase use of the checklist in the OR. p.223				
O'Brien et al. (2017)					
Finding	**Resistance to change as a barrier to the SSC**				
Illustration	"… the multidisciplinary team members were happy the way things were and wanted to remain with the status quo that they have been used to." p.470	X			F166
Finding	**Lack of input from the MDT during implementation as a barrier**				
Illustration	"If the multidisciplinary team had been involved from the beginning they may have wanted to engage with the checklist." p.470	X			F167
Finding	**Increasing workload as a barrier to the SSC**				
Illustration	"…oh no not more paperwork, not another checklist, not something else for the nurse to do." p.471 "… the checklist is time, the checklist is an extra job, extra pressure especially on a busy list, the checklist is something else that nurses have got to think of." p.471 "… it just seems like another demand on my time when I was already very busy." p.471	X			F168
Finding	**Lack of individual participation as a barrier**				
Illustration	"… it can be really frustrating when you are trying to go about your job and using the new checklist tool to the best of your ability and you are meeting a brick wall from other members of the multidisciplinary team." p.471 "When we began to ask the checklist questions, we were met with stony silence, nobody answered from the surgical team." p.471 "… I just wish some of the team members would just answer questions asked the first time." p.471 "… I feel that implementing the checklist was not a joint effort. The checklist was very much nurse led." p.473	X			F169
Finding	**Emergency procedures as a barrier to the SSC**				

Illustration	"… carrying out the checklist is not smooth when doing an emergency procedure where speed is of the essence and there are many unknowns about the patient history." p.472	X			F170
Finding	**Lack of leadership skills as a barrier**				
Illustration	"… it was difficult to feel assertive and confident enough to stop the surgical procedure to ask questions…" p.473	X			F171
Penataro-Pintado et al. (2020)					
Finding	**Effective leadership as a facilitator of the SSC**				
Illustration	"Leadership means that the patient isn't bought into the operating room until the extremity to be operated on has been marked and all the necessary checks have been carried out, even if another member of the time gives the OK… Nurses should show leadership, as it demonstrates control of the situation and professionalism." p.5 "The team as a whole shares responsibility for applying and completing the checklist, and it needs to be done properly, like the WHO recommends, not just anyhow. But although each team member has a part of the responsibility, there also needs to be someone who takes the lead with this procedure." p.8	X			F172
Finding	**Differing completion rates across surgical specialties as a barrier**				
Illustration	"I'm in the ophthalmology operating room, and there are 11 procedures in the morning, and it's impossible to fill out the checklist for each patient at the time you're supposed to. Sometimes I fill them all out first thing." p.8 The majority of nurses also stated that completing the checklist was less of a problem in major surgery, because the longer duration meant that only one or two surgical interventions would be scheduled during a given shift, thus allowing more time for completion of the checklist in accordance with recommendations. In these cases, they also felt more listened to by the rest of the surgical team and found it easier to lead the process in each of the phases defined by the WHO. p.10	X			F173
Finding	**Time pressures as a barrier to the SSC**				
Illustration	"The checklist doesn't get completed because of time pressures." p.8 "There have been times when I'm talking to the patient in the preoperative area and they wheel him off into the operating room before I've finished." p.7	X			F174
Finding	**Disengagement of the multidisciplinary team as a barrier to the SSC**				
Illustration	"Sometimes you go through it [the checklist], you read it aloud, but the rest of the team, either they're not listening or they hear you but don't answer." p.8	X			F175
Finding	**Using the SSC as a tick-box exercise creating a false sense of security as a barrier**				
Illustration	Simply ticking off the items regardless of whether the other team members were listening was, they argued, of no use and merely serves to create a false sense of security. p.8		X		F176
Finding	**Adapting the checklist to local settings as a facilitator to the SSC**				
Illustration	One of the nurses said that the response to this problem in her hospital had been to adapt the checklist to clinical reality, which in her specific work area (ocular surgery) had meant shortening it. p.10		X		F177
Robertson-Smith (2016)					

Finding	**Lack of engagement of the multidisciplinary team as a barrier to the SSC**				
Illustration	Consultant anaesthetists reported that time out is a critical time for the anaesthetic safety of the patient and stated that theatre personnel did not give their full attention whilst this took place. p.245 A minority of surgeons reported that, if there were obstacles, a lack of attention from theatre staff… would be factors. p.246 Consultant anaesthetists reported a lack of teamwork… as a minor obstacle. p.246		X		F178
Finding	**Distractions and high workload as barriers to the SSC**				
Illustration	Participants reported that cleaning of the theatre, gathering of equipment for the next day and over running theatre lists prevented a team debrief [sign-out]. p.246 Theatre staff also blamed a lack of compliance with the WHO checklist… due to the distractions such as music and theatre staff talking whilst the checklist was being carried out. p.246 The sign out was felt to be the most poorly carried out component, being performed at a time in the surgical procedure where this a high workload demand. p.247		X		F179
Finding	**Training and education as a facilitator of the SSC**				
Illustration	Theatre staff reported that when training involved the surgeons, including practical training sessions, this would enhance compliance and communication. Importantly, theatre staff reported that the training they received gave them confidence to challenge non-compliance of the surgical team. p.246		X		F180
Finding	**Attitudes of surgeons and resistance as a barrier to the SSC**				
Illustration	… whilst theatre staff reported that the biggest obstacle was the surgeon. p.246 Over 50% complained that the mind-set of the surgical team needed to be changed and that there were “surgical dinosaurs” (quote from consultant anaesthetist), within the surgical team. p.246 Theatre staff reported that disengagement of the consultant surgeon was the biggest obstacle in successful implementation of the WHO checklist. p.248 Some surgeons and anaesthetists were regarded as disinterested [in sign-out] by theatre staff, leaving the theatre complex to perform postoperative ward rounds. p.246		X		F181
Finding	**Time pressures as a barrier to the SSC**				
Illustration	A minority of surgeons reported that, if there were obstacles… time pressures to finish the list would be factors. p.246		X		F182
Finding	**Perceived repetition of WHO SSC components**				
Illustration	A minority of surgeons reported that, if there were obstacles… repetition of components of the WHO checklist… would be factors. p.246 Consultant surgeons reported that the sign in and time out could be amalgamated into one step. p.246		X		F183
Finding	**Lack of individual understanding of the purpose of the SSC**				
Illustration	Consultant anaesthetists reported a lack of… understanding of why the WHO checklist was being carried out as a minor obstacle. p.246		X		F184
Rogers et al. (2020)					
Finding	**Varied nurse participation and complacency as a barrier**				

Illustration	Nurses tended to nominate themselves or another nurse to represent the nursing team to 'do the time out' in an ad hoc fashion. p.e-21 "I think only one nurse needs to be involved, it's probably not necessary for all of us to be there." p.e-21	X			F185
Finding	**Competing tasks as a barrier to the SSC**				
Illustration	The primary researcher observed instances where while on nurse participated, others would be performing other tasks such as documentation, locating and setting up equipment and conversing with other staff members. p.e-21	X			F186
Finding	**Varied team communication during the SSC as a barrier**				
Illustration	Information was infrequently offered by nurses to surgeons regarding any concerns or equipment. p.e-22 In many observations the surgeons did not ask the nurses whether they had any concerns which indicates that this area of the checklist was frequently overlooked. p.e22 During some observations the person who led the checklist (often the surgeon) had to prompt people several times that the time out needed to be done and, even then, not all staff in the room would participate. p.e-22		X		F187
Finding	**Team culture as a barrier**				
Illustration	"I think it depends on where you are and what area you're working with and what they [senior medical and nursing staff in the theatre] expect you to do." "It's surgeon and team dependent, sometimes they don't know that you're missing until you push your way into the checklist." p.e-22	X			F188
Finding	**Hierarchy and attitudes toward nursing staff as a barrier**				
Illustration	"I don't' think we're valued as much as we should [be]. It's basically the doctors doing and speaking to each other, I find. We're just kind of there." p.e-22 The findings of the study suggest that attitudes of the multidisciplinary team toward the role of nurses in conducting the SSC have the potential to empower or hinder nurses actively engaging in this process. p.e-24	X			F189
Finding	**Distractions and competing tasks as barriers**				
Illustration	Staff who declined to take place seemed disinterested in the process and performed other work-related tasks including talking to others, moving equipment, walking and out of the room and accessing computers. p.e-22 This appeared to be accepted by and normalized by those present, as no one was reminded to pause and participate, which seems to indicate noise and distractions while conducting the SSC were acceptable. p.e-22		X		F190
Finding	**'Below ten thousand concept' as a potential facilitator**				
Strategy	Another strategy worthy of consideration to address the issue of noise and distractions during the SSC is to adopt the 'sterile cockpit' or 'below ten thousand' concept. p.e-23			X	
Finding	**Requirement for education and training of OR nursing staff as a facilitator**				

Illustration	Further education and training in the requirements of full team participation in conducting the SSC may be required for operating room nurses to overcome any knowledge deficits and improve nurse participation in conducting the SSC			X	
Ronnberg et al. (2015)					
Finding	**Repetition as a barrier to the SSC**				
Illustration	Some noted that there was no need to confirm all the items in sign-in as this information has already been checked before the patient entered the operating room. p.470		X		F191
Finding	**Impact on workload and workflow as a barrier**				
Illustration	"Some think it is something that is unnecessary and inconvenient, especially surgeons." p.470 "Extra workload that doesn't add anything to patients' safety". p.471 It also emerged that some felt that the presentation of all team members sometimes wasted time. p.471	X			F192
Finding	**Negative surgeon attitudes as a barrier to the SSC**				
	The nurse anaesthetists noted that the surgeon was not always interested in what the other team members had to say. p.470 "Some think it is something that is unnecessary and inconvenient, especially surgeons." p.470 "It often happens that the surgeon has their own version of the checklist or are not following the order of the item, as well as they think that the checklist is over and done when they have finished their part of it." p.470	X			F193
Finding	**Lack of clarity over who was responsible for the SSC, unclear checklist protocols**				
Illustration	A negative aspect of the checklist was the lack of clarity around which team members were responsible for it. This could lead to irritation and tension between members. p.471		X		F194
Finding	**Education and training as a facilitator to the SSC**				
Observation	It is very important that all OR staff receive an appropriate checklist education including its history and use. An annual 'refresher course' should be implemented. p.472			X	
Russ et al. (2014)					
Finding	**Resistance as a barrier, resulting in disruptive behaviours from a hierarchical culture as a barrier**				
Illustration	"A lot of people don't like change and they don't like new things, and if they've been doing it this way for the last 20 years and it's not broken, why fix it?" p.5 "Just personal interest and refusal to change, unable to adapt. Some doctors feel uncomfortable when you're trying to change." p.5 "The checklist itself is very easy. Getting the answer to some of the questions from the surgeons and the anaesthetists isn't, and that's the fall down." p.5 "When the surgeons weren't on board you were told to 'oh shut up and let's get on with it.' During introductions we had surgeons look up and say… if you don't know me by now get out of my operating room." p.5	X			F195 F196

	"In some cases, because of the conflict it creates, it's actually been counterproductive". p. 6 If you see the guy at the top mocking it, nobody else is going to stand up for it – no matter how much we try to kill the hierarchy, I think a bit of it may still remain." p.7				
Finding	**Perceived time delay as a barrier to the SCC**				
Illustration	"Yet more delay! Oh gosh, we're going to get less work done for the patients." p.5 "The first and second part of the checklist will delay things because you're delaying starting the anaesthetic room and you're delaying starting on the operating table." p.5	X			F197
Finding	**Perceived repetition and duplication as a barrier to the SSC**				
Illustration	"I think the problem is that, with it being a standardized checklist, is that hospitals have their own checklists as well and you end up having two or three checklists, all checking the same sort of thing so you get some overlap." p.5	X			F198
Finding	**Inapplicability to certain specialties and generalization as a barrier to the SSC**				
Illustration	"Where people have had problems with it has been in specialties like ophthalmology. I know people have said it has been overkill for them". p.6 "It's a little too ridged for different kinds of environments. For instance day surgery. It was a little over the top in that we ought to have combined some of the checks, so they've walked 50 yards and then they ask the same questions again." p.6	X			F199
Finding	**Irrelevant questions or illogical content as a barrier to the SSC**				
Illustration	"It asks questions on there but without any definite answers. I'll ask about the patient's ASA grade, so you just tick it and say yes. It doesn't mention what the code is or what relevance that has to anything… it's a bit bizarre and there's a sense of, I'm not actually progressing the patient care with this question." p. 6 "Some of the questions are like a red-rag to a bull, like 'are you expecting the unexpected?'" p.6	X			F200
Finding	**Unsuitable timing of the SSC**				
Illustration	"And it's done too late. Once that patient's on the table, anaesthetized, and they you find that they haven't got the prosthesis, or the bloods, or the right equipment, it's too late isn't it?" p.6	X			F201
Finding	**Busy workload as a barrier to the SSC**				
Illustration	"We find the most difficult part to complete is the final part of it. The transfer from ORs to recovery, like the sign-out part, because that's a very very busy time." p.6	X			F202
Finding	**Complacency as a barrier to the SSC**				
Illustration	"Where the answer to checks is in 999 out of 1000 cases a "no" or "not applicable", the team might become complacent about the checks and use the tool as a tick-box exercise, failing to pick-up the one case where the answer was a "yes." This is harmful because it de-sensitizes staff and an error can occur." p.6 If used as a tick-box exercise with limited buy-in from staff, the checklist could create a false sense of security and, over time, result in complacency – inadvertently caused diminished levels of team vigilance in the OR. p.8	X			F203
Finding	**Education and training as a facilitator to the SSC to overcome resistance**				

Illustration	"Education's probably the most important thong. Education programs to everybody, not just medical staff, but operating room staff as well. It needs to be incorporated into clinical governance days or something, about why you're doing the checklist, and what improvements it's made." p.7 "We should have all had training In it, explaining what they want, why it was important, why they wanted us to do it, and how to deal with resistant team members." p.7	X			F204
Finding	**Support from hospital management for accountability to the SSC as a facilitator**				
Illustration	"Another thing that could be done is the higher management could start to have teeth, if you like, start to take people aside and say, you do this, or else, but you find in medical professionals that doesn't help much." p.7 "The organisation now have put out that if the WHO checklist isn't done and there's people resisting, the surgeons and the staff can get reported to their registered bodies. It's a threat, but it works." p.7 "Management have to play a little, management means the managers, not the doctors, they have to show clinicians all over the hospital that this is not just their job, but our job together." p.7	X			F205
Finding	**Integrating existing processes as a facilitator to the SSC**				
Illustration	"It could be improved by fully integrating it into some sort of perioperative pathway, which would reduce the duplication that exists." p.7	X			F206
Finding	**Senior leaders in the SSC implementation**				
Illustration	"I think the driving force has to be from the senior staff, senior surgeons, senior anaesthesiologists, attendings. If they take it seriously everybody does." p.7 "That's because I particularly did work with one attending surgeon who is in favour of the WHO checklist and he has been able to improve upon everybody about the importance of the form. Once we get the surgical team on board it's history and it flows for everyone." p.7	X			F207
Finding	**Leadership skills as a facilitator to the SSC**				
Illustration	"It's about assertiveness as the end of the day, you don't have to be aggressive, but you have to be assertive but firm, and give them reasons why you're saying what you're saying." p.7 "Some people are much better at it than others. Some people have got a clear voice, they're committed to doing it and they do it formally. Other people not really into it, they answer their own questions, which completely takes away the safety aspect of it." p.7	X			F208
Finding	**Modifications to the local context to improve uptake of the SSC**				
Illustration	"So we use different versions of the checklist depending on the surgical specialty and role. And that's made a huge difference to acceptance because what people really didn't like about it at the beginning was the one size fits all approach." p.8 "There is obviously a very surgically designed form, they need more input from anaesthesiologists and much more input from nursing staff." p.8	X			F209
Finding	**Non-paper formats of the SSC as a facilitator**				
Illustration	"Well we're evolving it now to a whiteboard, is that we will mark it on a white board rather than physically standing there with a sheet in our hand, because I think that's what sends surgeons and	X			F210

	anaesthesiologists cold really, reading from a set. So it's like an aide memoire in OR now as opposed to a list. It makes people think a bit more." p.8				
Finding	**Patient anxieties as a barrier to the SSC**				
Illustration	"One of the things that the patients don't like, and we've had this from the patient surveys we've done, is being bombarded with question after question, and then have the same ones asked again." p.6 "The two main areas that have always caused raised eyebrows are discussion of blood loss, especially where the patient didn't expect to bleed. All of a sudden their simple eye operation was turning into a potential blood bath and a threat to their life, and discussion of difficult airway." p.6	X			F211
Schwendimann et al. (2019)					
Finding	**Personal attitude and approach as individual factors facilitating the SSC**				
Illustration	This was expressed in terms for "being well informed and committed" and "standing behind" the checklist concept, as well as in relation to application of the checklist application, e.g., "considering it important" and "believing in it's philosophy". p.2	X			F212
Finding	**Procedural factors that facilitate the SSC**				
Illustration	The procedural factors influencing the checklist's application were highly focused on "regularity of … [checklist] application" and "procedure safety", the "moment of pause before the procedure" when "everyone is focused", "the checklist points are read up on explicitly" the essential elements, e.g., "diagnosis, problems, risks and procedures" are in sharp focus and "no-one is busy with other tasks". p.2	X			F213
Finding	**Implementation practices as a facilitator, safety climate as a facilitator**				
Illustration	"Quiet in the OR" and "an atmosphere which allows everybody to participate during the TTO during these two to three minutes" were considered as particularly important factors. p.2 Factors that encouraged adherence to the checklist was the feeling of being part of a team, a shared goal of patient safety and full staff participation. p.4	X			F214 F215
Finding	**Negative attitudes, insecurity and resistance to the SSC as individual barriers**				
Illustration	For example, "inertia of people regarding change from their establish routine (from the pre-checklist period)", "hubris". "lack of self-discipline", "not listening carefully", as well as "lack of insight and acceptance as to the meaning and purpose" of the checklist were mentioned. p.3 Factors that reduced adherence were feelings of insecurity, certain team members' resistance to checklist implementation and key team members not being full involved. p.4	X			F216
Finding	**Disruptions, time constraints and lack of teamwork engagement as barriers to the SSC**				
Illustration	"Being unclear regarding to whom the questions are posed", "the checklist being crammed in", "persons arriving too late" or that "people conversed during the TTO". p.3	X			F217
Finding	**Checklist format and irrelevancy as a procedural barrier**				
Illustration	In addition, "it's length" with "unnecessary and irrelevant topics, if in a hurry". p.3	X			F218
Finding	**Work environment conditions as a barrier**				
Illustration	As to the contextual factors, these concerned work and environment conditions such as distractions, interruptions and time pressure. Also named were OR background noise, e.g., "a high mechanical noise level" or "telephones ringing". p.3	X			F219

Spence et al. (2011)					
Finding	**Hierarchy culture and disruptive behaviour as a barrier to the SSC**				
Illustration	"The surgeon in my OR was very demanding and the nurses didn't question him a lot. I think if the checklist was standard across all of the OR's it would allow people that wouldn't normally speak up to say 'hey, did he get antibiotics?'." p.5	X			F220
Finding	**Informal conduction and accepted culture of complacency of the SSC as a barrier**				
Illustration	"I found that the OR was a lot less formal than what I had imagined it would be and that a lot of things on the checklist were happening but nobody knew about it." p.5 "I think that for the most what I observed is [OR staff] are doing everything on the checklist, they're just not formally discussing it." p.5 "The time out basically consisted of one nurse sitting off to the side and filling out something and then they started the operation. After the procedure one of the surgeons asked if the patient had any allergies. That seems like something important for the surgeon to know before the procedure." p.5	X			F221
Finding	**Lack of engagement and professional independence as a barrier**				
Illustration	"The time out basically consisted of one nurse sitting off to the side and filling out something and then they started the operation. After the procedure one of the surgeons asked if the patient had any allergies. That seems like something important for the surgeon to know before the procedure." p.5 "The nurses went through the time-out on their own. Neither the surgeon or anaesthetist were really involved. Then, after the operation, the surgeon asked if the patient had received antibiotics. He hadn't, even though there was an order written. That seems like a simple mistake that would have been easily prevented if everyone has participated in the time-out." p.5	X			F222
Waehle et al. (2020)					
Finding	**Duplication of existing checks as a barrier**				
Illustration	"Before I anaesthetise the patient, I know all the parameters… I feel I have complete control of the patient, so … It is hard to think that the checklist will provide extra safety for me." p.5 "We have always performed these items; it is part of the standardised per-operative anaesthesia assessment and preparations." p.5 "Well, the SSC has a function, in a very simplistic way, but it does not have a proper control function, the way it is supposed to, because we have so many checks and control mechanisms incorporated." p.5 The interactive patterns of micro-team communications and information exchanged clearly dominated and superseded any SSC checks. p.7	X			F223
Finding	**Perceived benefits to team communication as a facilitator**				
Illustration	"I value how the SSC may contribute in aligning the surgical and anaesthesia plan for the entire team." p.5	X			F224
Finding	**Surgeon participation as a facilitator**				
Illustration	"But it is obvious, the SSC performance is totally depending on the physicians participation. As soon as they became more involved, both performance and compliance increased." p.5	X			F225

	The presence of different team members in the OT also influence how – and by whom the SSC items were checked. p.6				
Finding	**Ability to speak up against hierarchy as a barrier**				
	"Some surgeons are more reluctant that others, they just start to mumble through the SSC as soon as they enter the OT, and then proclaim to have performed time-out. Then, it is required from an OT nurse to be determined and speak up… the speak up requires some years of work experience." p.5	X			F226
Finding	**Potential perceived conflict as a barrier leading to a 'tick box' exercise**				
Illustration	"Well, you don't want a conflict within the OT, you're in a way a bit tired of that, so you try once more to performed the SSC, and if you do not receive any attention, you just let it go and tick off the box, even though it has not been performed." p.5 Resistance within the team and verbal disturbances also influenced performance. As a result, SSC registration was often described as a 'tick box exercise'. p.6	X			F227
Finding	**Perceived disruptions to workflow as a barrier**				
Illustration	"It is so important to keep the SSC short, because it does in a way disturb our workflow… you are about to state induction of anaesthesia and then 'no, no, we have to stop and perform the SSC', our workflow is interrupted, and it is very disturbing and frustrating." p.5 When the SSC checks interfered with existing workflow, the SSC was often partly or poorly performed, delayed, or left out as a result. p.6	X			F228
Finding	**Hierarchy culture as a barrier**				
Illustration	"The anaesthesia team is responsible for the anaesthesia, medication… it is their responsibility. Questioning them about this is like questioning them whether they have done their job or not." p.5	X			F229
Finding	**Management approach to SSC implementation as a barrier**				
Illustration	If hospital managers fail to regard the SSC as a complex, social intervention and instead exert demands for high compliance rates of SSC performance as a top down approach, this can lead to workarounds and outright resistance, and cause for the checklist to be used as a tick-box exercise to meet management requirements. p.8			X	
Weller et al. (2018)					
Finding	**Senior medical leaders participation as a facilitator**				
Illustration	"And if the anaesthetic team and the surgical team are really involved and supportive of it, and kind of include people with what their plan is, then you do feel like you can better prepare, you are between prepared for it and you are more involved in that situation…" Sup. Table 1 Participants viewed specialist surgeons and specialist anaesthetists as the most influential people for determining the value of the checklist… When specialists did not participate in the checklist effectively, this affected the way other staff engaged with the checklist and with one another. p.5	X			F230
Finding	**Resistance as a barrier, and disruptive behaviour as a barrier to speaking up**				
Illustration	"You just feel like you are constantly battling with some people trying to get them to actually engage and actually take it seriously. Some people kind of mock it a wee bit. They are like okay or sometimes they are all sarcastic about it too, so that it doesn't really create an environment of openness." Sup. Table 1	X			F231 F232

	"Some of them will go 'blah-blah-blah Sign In, Sign In and that's it over. So you may feel like an idiot if you're trying to do it properly. Come on move along they'll shout at you." Sup. Table 1 "If it was a different surgeon I would have been comfortable to gently raise the question but with this guy everyone knows you just don't question him, he's a horrible man." Sup. Table 1 "The more overbearing they are the less people want to speak up." Sup. Table 1 When a senior staff member was grumpy or appeared not to value the checklist, it discouraged participants from raising concerns even if they had some. p.6				
Finding	**Patient anxieties as a barrier to the SSC**				
Illustration	"If they're very, very anxious and you don't want them to be in theatre or wait for too long with a whole heap of people and singing in was just one extra step that will increase their anxiety, so we'll do it [sign in] outside the theatre in pre-op." Sup. Table 1	X			F233
Finding	**Workload and distractions as barriers to the SSC, lack of non-technical skills as a barrier**				
Illustration	"I think it's sometimes hard to get everyone's attention and quite often scrub nurses may still be sorting out their equipment. Generally I don't think everyone really stops and pays attention all the time. The impact is that not everyone's present in that time, it's quite, it's a pretty important time, so if not everyone's paying attention I would say things could be missed." Sup. Table 1 Several nurse participants reported issues around effective communication when the personal delivering the checklist spoke too quietly or other staff did not stop, but carried on their own conversations or continued to work with noisy equipment. p.5	X			F234 F235
Finding	**Perceived inability to speak up against hierarchy as a barrier**				
Illustration	"… it takes a lot of guts to speak out if you don't have that window… whereas if you are being asked, 'if anyone has any concerns?', then yeah, that kind of says, 'I value your opinion'." Sup. Table 1 "I would speak up if I had any concerns, but in terms of everything else its better like its better to just keep your mouth shut just for the peace of the theatre… You look at the allocations first thing in the morning and you're just like 'oh God'." Sup. Table 1 "I do find the registrars are good with that [inviting concerns] but sometimes the older ones that have been there for a while, I find that when you speak up they shut you down. So I do feel like there is kind of a hierarchy in the theatre sometimes if it's an older consultant that has been there fore ages." Sup. Table 1 "If it was a different surgeon I would have been comfortable to gently raise the question but with this guy everyone knows you just don't question him, he's a horrible man." Sup. Table 1 "The more overbearing they are the less people want to speak up." Sup. Table 1 When a senior staff member was grumpy or appeared not to value the checklist, it discouraged participants from raising concerns even if they had some. p.6	X			F236
Finding	**Hierarchical culture as a barrier to the SSC**				
Illustration	"I do find the registrars are good with that [inviting concerns] but sometimes the older ones that have been there for a while, I find that when you speak up they shut you down. So I do feel like	X			F237

	there is kind of a hierarchy in the theatre sometimes if it's an older consultant that has been there fore ages." Sup. Table 1				
Finding	**Complacency and using the SSC as a 'tick-box' exercise**				
Illustration	"Some people… seem to take a genuine interest in the answers. Some people seem to be content to just tick the boxes and proceed through it as quickly as possible which negates the value of performing it in the first place." Sup. Table 1 "I've seen it in gynae when sometimes the surgeon forgets to do it, it's forgotten so it's not done at all but the forms are always ticked, the stamp is always ticked which irritates… me at the beginning, certain users just tick everything that it's all been done when it hasn't…" Sup. Table 1 ... on one hand embedding a culture of safety, but potentially creating a monotonous habit, resulting in lack of focus or meaningful engagement. Some staff reportedly saw it as a 'tick-box' exercise and did not genuinely engagement with the checklist or the team. p.6	X			F238
White et al. (2018)					
Finding	**Time constraints during emergency scenarios as a barrier**				
Illustration	The most frequently reported barrier to checklist use was lack of time to perform the checklist in an emergency. p.6 …lack of staff during emergency surgery. p.7		X		F239
Finding	**Resistance to checklist use as a barrier**				
Illustration	"There is conflict between the team and the hospital director… some people are very opposed to the checklist and others want to implement it." p.7 However, the most influential barrier to implementation was the presence of negatively dominant or obstructive people. Both hospital B and C… had senior doctors who were actively opposed to checklist use. p.6	X			F240
Finding	**Negative attitudes as a barrier, hierarchical culture as a barrier**				
Illustration	"Running the checklist out loud would interrupt surgeons' concentration… the checklist doesn't apply to Malagasy culture, where it's not appropriate to check that a more senior person has done their job… it would be questioning [their] competence." p.7 However, they described a dominant surgeon who adamantly opposed the checklist leading to nurses being fearful of interrupting the surgeon. p.6	X			F241 F242
Ziman et al. (2018)					
Finding	**Perceived importance of the checklist as a facilitator**				
Illustration	"For me, every now and then, even with the checklist, I get this like pang of terror that goes through me in the middle of an operating, like, oh shit, are we doing the right side? And having had the checklist done has definitely reduced that pang of terror." p.578	X			F243
Finding	**Absence of the staff surgeon as a barrier**				
Illustration	Our observations revealed the staff surgeon was often not in the OR during the briefing and the process was delegated to a medical trainee, most commonly a surgical fellow. p.578 "To do it when the surgeon is out of the room is ridiculous…" p.578	X			F244
Finding	**Differences in workflow due to competing responsibilities as a barrier**				

Illustration	"While the surgical fellow is doing the briefing the surgical team is at the x-ray talking and not paying attention. The scrub nurse has her back to the surgical fellow, setting up her table, and the new circulating nurse is opening packages…" p.578 "… And make sure it's okay with the nurses, sometimes they're counting and it's not a good time." p.578 These differences were perceived to be dictating workflow patterns, which sometimes conflicted with those of other healthcare professionals and acted as a barrier. p.580 We observed that the checklist appeared to create tension between the different professional groups when it was led at a time when part of the OR team could not participate due to competing responsibilities. p.581	X			F245
Finding	**Differences in remuneration between surgeons and nurses on perception of time as a barrier**				
Illustration	The surgeons who are paid on a case-by-case basis, were described by themselves and other as being incentivized to get through more cases and not run behind. p.578 … the extra time that it takes to debrief could be seen as a deterrent to surgeons who are paid per case. p.579	X			F246
Finding	**Patient anxiety as a barrier**				
Illustration	"Some of the patients are really nervous and anxious, they just want to go in and go to sleep. So that's where we're not going to be doing a briefing with the patient… and then there's ones that are very good with being involved and they're not showing much anxiety. Those ones, we'll include them." p.579	X			F247
Finding	**Lack of engagement of the MDT and professional independence as a barrier**				
Illustration	"The attending yells, 'time out' but no one pauses what they are doing. Everyone continues without going through any checklist items." p.579	X			F248
Finding	**Differences between surgical specialty cultures in SSC participation**				
Illustration	"The ortho team, they usually do the time out before skin incision I think because they are really concerned about whether we give the antibiotics or not. They are very concerned about infection." p.579	X			F249
Finding	**Perceived unimportance of the debrief as a barrier**				
Illustration	"I think, by and large, if the surgery has gone well, and most people know the surgery has gone well, so there are rarely things that need to be announced at the end, unless it's something specific." p.579 The majority of participants expressed debrief was dong poorly or was often skipped, usually because of a perceived lack of importance, anaesthesia being busy while the team was debriefing, or people simply forgetting. p.579	X			F250
Finding	**Debriefing poorly times for anaesthesia as a barrier to their participation in the SSC**				
Illustration	"I usually don't debrief with the surgeon… I'm waking up the patient so I cannot divert my attention to the debriefing at that time." p.580 … from their perspective, closing the patient does not mark the end of the procedure. p.580	X			F251
Finding	**Involving staff in local modifications of the checklist to increase uptake**				

Illustration	It may be beneficial to involve OR staff in adapting and re-implementing the SSC so it is meaningful in their local practice setting. p.580			X	

SSC = Surgical Safety Checklist
WHO = World Health Organisation
OR = Operating Room