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Original Article

Patient Safety Culture Around Surgical Safety Checklist Use in High-Pressure Operating Rooms

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ABSTRACT

Background: Surgical Safety Checklists are widely used to reduce preventable perioperative harm, but their effectiveness depends on the safety culture in which they are performed. In high-pressure operating rooms, urgency, hierarchy, turnover demands, interruptions, and professional assumptions may reduce checklist use to documentation rather than meaningful communication. Objective: This study aimed to explore how patient safety culture shapes meaningful use of the Surgical Safety Checklist in high-pressure operating-room contexts. Methods: A qualitative interpretivist design was used. Semi-structured interview data from 12 multidisciplinary operating-room participants representing surgical, anaesthetic, nursing, and theatre leadership perspectives were analysed using reflexive thematic analysis. The analysis focused on checklist meaning, time pressure, hierarchy, psychological safety, local adaptation, ownership, near misses, and organisational learning. Results: Five themes were developed: checklist as cultural conversation; time pressure and ritualised compliance; hierarchy, voice, and psychological safety; adaptation, ownership, and local fit; and learning culture after near misses. Checklist use became meaningful when it created shared attention, enabled multidisciplinary voice, preserved core safety checks while allowing local relevance, and linked concerns to visible improvement. It became ritualised when pressure, hierarchy, poor participation, or weak feedback reduced it to form completion. Conclusion: Surgical Safety Checklist governance should move beyond narrow compliance monitoring toward socio-cultural safety practice supported by senior role modelling, protected checklist time, psychological safety, disciplined adaptation, and non-punitive learning. Keywords: patient safety culture; surgical checklist; operating room; psychological safety; qualitative research; teamwork; high-pressure surgery.

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INTRODUCTION

Patient safety remains a central global health priority because preventable harm continues to occur across health systems despite substantial advances in clinical knowledge, technology, regulation, and quality improvement. The World Health Organization has emphasised that unsafe care is rarely the result of isolated individual failure alone; rather, it commonly emerges from weaknesses in organisational systems, communication processes, procedural reliability, staffing arrangements, leadership practices, and learning cultures (1). Surgery represents one of the most risk-intensive areas of healthcare because operative care compresses multiple hazards into a short and complex clinical episode involving anaesthesia, operative technique, sterile practice, patient positioning, equipment readiness, blood loss anticipation, implant and specimen management, postoperative planning, and interprofessional

handover. For this reason, surgical safety has become a major focus within broader patient safety strategies aimed at improving clinical system reliability and reducing avoidable harm (2).

The Surgical Safety Checklist was introduced as a structured intervention to reduce preventable perioperative errors by creating deliberate safety pauses at three critical moments: before anaesthetic induction, before skin incision, and before the patient leaves the operating room. Its purpose is not merely to confirm that a form has been completed, but to ensure that the surgical team develops a shared understanding of patient identity, operative site, planned procedure, allergies, airway risks, anticipated blood loss, equipment needs, antibiotic prophylaxis, specimen handling, instrument counts, and postoperative concerns (3). In high-pressure operating rooms, this function is particularly important because urgency, production targets, interruptions, professional assumptions, and hierarchical communication patterns may cause important information to remain unspoken. The checklist is therefore intended to interrupt unsafe clinical momentum and convert individual knowledge into shared team awareness before harm reaches the patient.

The effectiveness of the checklist, however, depends on the patient safety culture in which it is used. Safety culture includes the shared values, behavioural norms, communication expectations, leadership signals, reporting practices, and responses to error that shape whether staff feel able to identify and act on risk. Although patient safety culture can be assessed through formal surveys, checklist practice in the operating room is also determined by small but critical interactional moments: whether a nurse can pause the room, whether an anaesthetist can raise an airway or haemodynamic concern, whether a surgeon responds constructively to questions, and whether sign-out concerns lead to action. The AHRQ patient safety culture framework is relevant to this context because it highlights communication openness, teamwork, staffing, organisational learning, and non-punitive responses to error as core conditions for safer clinical practice (4).

The patient safety literature increasingly recognises preventable harm as a systems problem rather than a matter of individual vigilance alone. Two decades after To Err Is Human, Bates and Singh argued that meaningful progress in patient safety requires stronger measurement, learning, safety culture, and system redesign rather than repeated reminders to clinicians to be careful (5). This systems perspective is essential for understanding surgical checklist use because the same checklist may function as a reliable safety intervention in one operating room and as a ritualised documentation exercise in another. The checklist's impact is therefore shaped not only by its technical content but also by how it is implemented, owned, adapted, and enacted by multidisciplinary teams.

Evidence on surgical checklists suggests clinical benefit, but also demonstrates substantial variation in implementation quality. A systematic review and meta-analysis by Gillespie et al. found that safety checklist use was associated with reductions in postoperative complications, supporting the potential value of structured perioperative checks (6). Implementation studies have also shown that checklists may improve surgical team perspectives when staff engagement and ownership are actively developed (7). More recent evidence continues to support the role of WHO surgical checklists in reducing postoperative adverse outcomes, while also emphasising that the quality, reliability, and contextual fit of implementation remain central determinants of effectiveness (8,9). The key question has therefore shifted from whether a checklist exists to whether it is performed meaningfully, at the correct time, with the correct people, and with sufficient authority to change clinical action.

One of the principal mechanisms through which checklists improve safety is team communication. Surgical teams are composed of professionals who hold different but interdependent forms of knowledge. Surgeons understand the operative plan and technical risks, anaesthetists monitor physiology and airway safety, nurses coordinate sterility, instruments, implants, counts, specimens, and theatre flow, and theatre leaders manage the wider system pressures that influence practice. Effective checklist use requires these distributed forms of knowledge to be brought into a shared mental model before and during operative care. Research on surgical team communication has shown that safer practice depends on common attention,

interprofessional respect, and a culture in which team members are expected to contribute relevant safety information (10).

Implementation studies indicate that barriers to checklist use commonly arise from workflow pressure, hierarchy, leadership behaviour, scepticism, timing, and inadequate local adaptation. Russ et al. found that checklist implementation across hospitals in England was influenced by professional norms and local conditions, demonstrating that adoption cannot be understood as a purely technical process (11). Reimplementation research has similarly shown that checklist performance can improve when teams re-engage with the purpose of the tool, practise together, and receive structured feedback (12). Qualitative evidence from Indonesian hospitals suggests that staff resistance is often not directed at safety itself, but at checklist processes perceived as rushed, imposed, irrelevant, or owned by only one professional group (13). This distinction is important because it implies that checklist failure may reflect weak implementation culture rather than lack of staff commitment to patient safety.

A recurring concern in the literature is the difference between checklist completion and checklist quality. A completed form does not necessarily mean that the operating room paused, that all relevant team members participated, that concerns were invited, or that identified risks changed the plan of care. Habtie et al. argued that checklist assessment should move beyond compliance alone and examine completeness and adherence at each checklist phase (14). Audit evidence also suggests that sign-in, time-out, and sign-out may vary in quality and that closed-loop feedback is needed to improve practice rather than simply record completion rates (15). Multicentre audit data further demonstrate that documentation may conceal inconsistent team involvement, with compliance patterns differing by setting, professional role, and checklist phase (16). These findings support the need to examine the cultural conditions under which checklists become meaningful rather than merely documented.

Hierarchy and psychological safety are especially important in high-pressure operating rooms. Psychological safety refers to the shared belief that team members can raise concerns, ask questions, express uncertainty, and challenge assumptions without fear of humiliation, punishment, or professional retaliation. Edmondson's work shows that psychologically safe teams are more capable of learning and adapting under pressure because they are more willing to surface errors, uncertainty, and weak signals (17). Healthcare research similarly identifies inclusive leadership, respectful listening, clarity of purpose, and constructive responses to concern as important enablers of psychological safety (18). In checklist practice, psychological safety determines whether the invitation to speak is culturally credible. If staff anticipate annoyance, dismissal, or blame, they may complete the checklist silently even when clinically relevant concerns exist.

Checklist value can also be understood through high-reliability organising and resilience thinking. High-risk organisations require sensitivity to operations, reluctance to simplify, attention to weak signals, and deference to expertise wherever relevant knowledge exists. Vogus and Sutcliffe's work on organisational resilience reinforces the idea that reliability emerges from collective mindfulness rather than command alone (19). Safety-II extends this perspective by examining how everyday clinical work succeeds despite variability, interruptions, and resource constraints (20). Resilience research in healthcare similarly emphasises that safety depends on the capacity of teams to anticipate, monitor, respond, and learn under real clinical conditions (21). In the operating room, the checklist can support these resilience functions by creating a structured opportunity to identify risk before it becomes harm (22).

Normalisation Process Theory provides a useful implementation lens for understanding why checklists may or may not become embedded in practice. This theory asks whether staff understand the intervention, invest in it, make it workable, and evaluate its value over time. May et al. describe these processes as coherence, cognitive participation, collective action, and reflexive monitoring (23). Murray et al. similarly explain normalisation as the social work through which complex interventions become routinely incorporated into practice (24). A checklist that exists in policy but is detached from team habits is therefore not fully normalised. It becomes meaningful only when staff understand its purpose, share

ownership, enact it within real workflow, and receive feedback showing that checklist concerns lead to improvement.

Although previous studies have examined checklist compliance, implementation barriers, and surgical outcomes, less attention has been given to how operating-room staff interpret checklist use under conditions of pressure, hierarchy, and competing clinical priorities. This knowledge gap is important because high-pressure environments may be precisely the settings in which checklists are most needed and most vulnerable to ritualised completion. This study therefore aimed to explore how patient safety culture shapes the meaningful use of the Surgical Safety Checklist in high-pressure operating rooms, with particular attention to time pressure, hierarchy, psychological safety, local adaptation, ownership, and organisational learning.

MATERIALS AND METHODS

This study used a qualitative interpretivist design to explore how patient safety culture shaped the use of the Surgical Safety Checklist in high-pressure operating-room contexts. The interpretivist approach was selected because the research question concerned meaning, professional interaction, hierarchy, voice, adaptation, and learning rather than the statistical prevalence of checklist completion. The study focused on how operating-room staff understood and enacted checklist practice when clinical urgency, workflow pressure, and multidisciplinary decision-making influenced communication. This design was appropriate because checklist culture cannot be adequately explained by counting completed forms alone; it requires analysis of how staff describe pauses, silence, participation, resistance, adaptation, and perceived safety value.

The study was conducted in an operating-room context involving multidisciplinary surgical care. Participants were recruited using purposive sampling because checklist use is role-dependent and requires perspectives from staff directly involved in perioperative practice. Purposive sampling was appropriate because the study required information-rich participants with first-hand experience of Surgical Safety Checklist use in high-pressure operating-room work (29). Twelve participants were included, representing surgical, anaesthetic, nursing, and theatre leadership perspectives. Recruitment focused on staff who had direct experience of checklist use during operative care and were able to describe examples of effective use, rushed use, speaking up, local adaptation, audit, and learning after checklist-related concerns. Written informed consent was obtained from all participants before participation, and ethical approval was granted by the Surgery Department, Prima Indonesia University, Indonesia.

Data were generated through semi-structured interviews because this approach allowed common areas of inquiry to be explored across participants while preserving flexibility for role-specific examples and professional experiences. Semi-structured interviewing is suitable for healthcare research when the aim is to obtain depth, contextual understanding, and rigorous exploration of professional practice (27). The interview guide focused on participants' perceived purpose of the Surgical Safety Checklist, examples of meaningful and ineffective checklist use, the influence of time pressure, the role of hierarchy and senior clinician behaviour, willingness to speak up, multidisciplinary participation, local adaptation, audit processes, near misses, and organisational responses to checklist-identified concerns. The interview structure allowed participants to describe both routine and high-pressure situations in which checklist use either supported or failed to support patient safety.

Reflexive thematic analysis was used to analyse the interview data. This method was selected because it supports the identification of patterned meaning across qualitative data while acknowledging the active interpretive role of the researcher in theme development. Braun and Clarke describe thematic analysis as a flexible but rigorous approach for analysing qualitative data, and their later methodological work emphasises that themes are not simple topic summaries but analytic claims about meaning within the dataset (25,26). The analysis proceeded through familiarisation with the interview material, generation of initial codes, review of patterns across professional perspectives, development of candidate themes, refinement of theme boundaries, and production of final analytic themes. Coding focused on how

participants described checklist meaning, time pressure, ritualised compliance, professional hierarchy, psychological safety, adaptation, ownership, local fit, near misses, and learning culture.

The analysis was conducted inductively while remaining sensitised to relevant patient safety concepts, including psychological safety, high-reliability organising, Safety-II, resilience, and normalisation. Codes were compared across participant roles to examine whether experiences differed between surgical, anaesthetic, nursing, and theatre leadership perspectives. Theme development prioritised recurring patterns that explained how checklist practice became meaningful, superficial, resisted, adapted, or normalised in real operating-room work. The final themes were developed to represent analytic interpretations of the data rather than counts of responses. The study did not make epidemiological generalisation claims; instead, it aimed to produce transferable qualitative insights relevant to similar high-pressure operating-room settings.

Trustworthiness was addressed through attention to credibility, dependability, confirmability, and transferability. Credibility was supported by linking theme development to participant-coded interview content and by comparing emergent interpretations with relevant patient safety and qualitative research literature. Dependability was supported through a clear analytic pathway from interview material to codes, candidate themes, refined themes, and final thematic interpretation. Confirmability was addressed by avoiding statistical overclaiming and by maintaining the distinction between participant accounts, researcher interpretation, and wider theoretical explanation. Transferability was supported by describing the multidisciplinary operating-room context, participant role logic, and the cultural and workflow conditions relevant to checklist use. These procedures were informed by established guidance on qualitative trustworthiness in health research (28).

The study variables were conceptual and experiential rather than quantitative. The central phenomenon was meaningful use of the Surgical Safety Checklist in high-pressure operating rooms. Key analytic domains included perceived checklist purpose, timing and quality of checklist pauses, multidisciplinary participation, hierarchy, voice, psychological safety, adaptation to local workflow, ownership, near-miss learning, audit practice, and organisational response. Checklist use was interpreted as meaningful when participants described a genuine pause, shared attention, role participation, verbal exchange of relevant safety information, and action in response to identified concerns. Ritualised compliance was interpreted as checklist completion without shared attention, relevant participation, or clinical consequence.

Bias and interpretive limitations were addressed through purposive inclusion of multiple operating-room roles, comparison of perspectives across professional groups, and careful attention to both supportive and critical accounts of checklist use. The analysis avoided treating checklist completion as equivalent to checklist effectiveness and did not infer clinical outcome effects from qualitative accounts. Because the study aimed to explore meaning and culture rather than estimate prevalence, no statistical sample size calculation was performed. The sample size of 12 participants was consistent with the qualitative aim of obtaining detailed, role-informed accounts of checklist practice and developing transferable thematic insights from multidisciplinary operating-room experience.

Data integrity was supported by maintaining a coherent chain between the study aim, interview focus, coding process, theme development, and final interpretation. The analytic process preserved the distinction between empirical findings and broader implications for checklist governance. Ethical conduct was maintained through informed consent, protection of participant confidentiality, and presentation of findings in a manner that avoided identifying individual staff members. The methodological approach was designed to ensure that another qualitative researcher could understand the study design, sampling logic, data-generation strategy, analytic method, and trustworthiness procedures used to examine patient safety culture around Surgical Safety Checklist use.

RESULTS

The analysis generated five interrelated themes that explained how patient safety culture shaped Surgical Safety Checklist use in high-pressure operating rooms. The themes were: checklist as cultural

conversation; time pressure and ritualised compliance; hierarchy, voice, and psychological safety; adaptation, ownership, and local fit; and learning culture after near misses. Across the dataset, checklist effectiveness was not described as a function of formal checklist availability alone, but as a function of whether the checklist created a genuine multidisciplinary pause in which relevant risks were voiced, heard, and acted upon. The findings showed that the checklist became meaningful when it interrupted unsafe momentum, aligned team attention, supported speaking up, and connected identified concerns to visible improvement. Conversely, checklist use became ritualised when time pressure, hierarchy, fragmented participation, or weak feedback systems reduced the process to documentation.

Table 1. Summary of Themes, Subthemes, and Analytic Meanings

Theme	Subthemes	Analytic Meaning
Checklist as cultural conversation	Shared attention; multidisciplinary participation; conversion of assumptions into common knowledge; listening and response	The checklist functioned as a safety intervention when it created a sincere team pause rather than a verbal or written formality
Time pressure and ritualised compliance	Late-running lists; emergency urgency; turnover pressure; retrospective completion; abbreviated checks	Organisational and workflow pressure increased the likelihood that checklist completion occurred without meaningful communication
Hierarchy, voice, and psychological safety	Senior clinician behaviour; willingness to question; nurse and junior staff voice; constructive or dismissive responses	Staff participation depended on whether speaking up was culturally safe and whether senior team members actively legitimised questions
Adaptation, ownership, and local fit	Specialty-specific risks; local wording; role allocation; disciplined adaptation; risk of checklist drift	Local adaptation improved relevance when core safety functions were preserved, but uncontrolled omission weakened the checklist's protective value
Learning culture after near misses	Non-punitive review; feedback after concerns; visible process change; repeated unresolved problems; staff engagement	Checklist authority increased when concerns raised during checklist use led to learning, improvement, and system-level response

Table 1 shows that the five themes were conceptually connected rather than isolated categories. The checklist was most effective when cultural and organisational conditions supported its intended safety function. Shared attention, psychological safety, disciplined adaptation, and feedback after near misses strengthened meaningful use, whereas time pressure, hierarchical silence, and unresolved recurrent concerns weakened engagement and promoted superficial completion.

Table 2. Theme-Specific Findings and Operating-Room Safety Implications

Theme	Pattern Identified in the Data	Effect on Checklist Use	Safety Implication
Checklist as cultural conversation	Effective checklist use involved a short but sincere pause with surgeon, anaesthetist, and nursing staff present and attentive	Strengthened shared mental model and clarified operative risks before action proceeded	Checklist quality depends on active multidisciplinary attention, not only checklist completion
Time pressure and ritualised compliance	Late lists, emergency cases, urgent turnover, and production expectations encouraged abbreviation or retrospective completion	Reduced the checklist to a compliance task and weakened its communication function	Protected checklist time is necessary precisely when clinical pressure is high
Hierarchy, voice, and psychological safety	Staff were more willing to speak when senior clinicians invited questions, paused activity, and responded constructively	Increased likelihood that concerns about antibiotics, site marking, equipment, counts, airway risk, or specimens would be raised	Senior role modelling is central to checklist effectiveness
Adaptation, ownership, and local fit	Staff valued checklist adaptation for specialty-specific risks, including trauma, paediatrics, obstetrics, and complex implant work	Improved relevance when adaptation preserved essential safety checks	Checklist governance should allow local fit while preventing unsafe omission
Learning culture after near misses	Engagement increased when checklist concerns and near misses led to non-punitive discussion and process improvement	Reinforced staff belief that speaking up during checklist use had practical value	Feedback loops convert checklist participation into organisational learning

Table 2 demonstrates that checklist use was shaped by immediate clinical interactions and by wider organisational systems. The same checklist could operate as a meaningful safety pause or as ritualised compliance depending on whether the team had time, authority, psychological safety, and follow-up mechanisms. The strongest safety implications related to protecting checklist time, modelling respectful senior participation, preserving multidisciplinary voice, and ensuring that checklist-identified concerns were linked to visible corrective action.

Theme 1: Checklist as Cultural Conversation

The first theme captured the distinction between merely reciting checklist items and creating a shared clinical conversation. Meaningful checklist use was described as a brief but genuine pause in which the surgical, anaesthetic, and nursing team members were present, attentive, and prepared to reassess the operative plan together. In these situations, the checklist converted individual assumptions into common knowledge by bringing patient identity, surgical site, procedural plan, allergies, airway risk, bleeding risk, equipment needs, antibiotic prophylaxis, counts, specimen handling, and postoperative concerns into a shared field of attention.

The checklist was considered less useful when it was read aloud while other team members continued unrelated tasks, prepared equipment, or participated only passively. This pattern indicated that checklist quality depended on relational behaviours such as eye contact, listening, role inclusion, and a shared expectation that raised concerns would be addressed. The checklist therefore functioned most effectively as a cultural conversation rather than as a technical document. Its safety value emerged from the quality of team attention and response.

Theme 2: Time Pressure and Ritualised Compliance

The second theme showed that high-pressure operating-room conditions increased the risk of ritualised checklist use. Late-running operating lists, emergency cases, urgent turnover, staffing pressure, and production expectations created situations in which staff were tempted to shorten the checklist or complete it after the relevant clinical moment had passed. This did not indicate that staff viewed patient safety as unimportant. Rather, it reflected a conflict between immediate workflow demands and the time required for meaningful team communication.

Under pressure, checklist completion could become a performance of compliance rather than a safety process. When the checklist was treated as an additional task competing with workflow, rather than as part of safe workflow, it was more likely to be abbreviated, rushed, or documented without full participation. This theme showed that ritualisation was often a symptom of organisational pressure rather than simple individual resistance. The findings therefore suggest that checklist quality requires organisational protection of the pause, especially in the circumstances where teams feel least able to stop.

Theme 3: Hierarchy, Voice, and Psychological Safety

The third theme explained how professional hierarchy shaped checklist participation. The checklist provided a formal opportunity for junior staff and nurses to raise concerns, but this opportunity depended heavily on the behaviour of senior clinicians. Staff were more likely to ask questions or voice concerns when senior team members invited participation, stopped other activity during the checklist, listened without irritation, and responded constructively. Participation decreased when senior staff appeared impatient, continued other tasks, dismissed questions, or treated checklist concerns as interruptions.

This theme showed that psychological safety was constructed through repeated micro-behaviours rather than policy statements alone. A checklist could invite voice formally while still failing to produce voice culturally if staff expected embarrassment, dismissal, or blame. The findings therefore indicate that the checklist does not automatically create speaking-up behaviour; it provides a structure within which speaking up may be enabled or suppressed. Senior role modelling, respectful listening, and constructive response were central to whether the checklist became a credible safety pause.

Theme 4: Adaptation, Ownership, and Local Fit

The fourth theme described the tension between standardisation and contextual relevance. Participants valued checklist adaptation when it made the process more relevant to specialty-specific risks, including trauma, paediatrics, obstetrics, and complex implant procedures. Adaptation was useful when the core safety purpose was preserved while wording, timing, or role allocation was adjusted to match real operating-room workflow. This supported ownership because staff were more likely to engage with a checklist that reflected the risks and practical realities of their work.

However, adaptation also carried the risk of drift. Items could be removed or ignored because they were considered routine, inconvenient, or already known. This weakened the checklist's function as a defence against assumptions and omissions. The findings therefore support disciplined adaptation rather than uncontrolled local modification. Local ownership improved checklist relevance, but core safety functions needed to remain protected through governance, multidisciplinary agreement, and periodic review.

Theme 5: Learning Culture After Near Misses

The fifth theme showed that checklist engagement was strengthened when staff saw that checklist-related concerns led to learning and improvement. Near misses involving missing equipment, specimen handling, communication breakdowns, or unresolved perioperative risks increased staff commitment when they were reviewed in a non-punitive multidisciplinary manner and translated into process change. In these circumstances, the checklist gained practical authority because staff could see that speaking up had consequences beyond documentation.

Conversely, repeated concerns without visible action reduced engagement. When staff raised similar problems repeatedly and no improvement followed, the checklist became less credible as a safety tool. This theme connected checklist practice to organisational learning. The checklist was most powerful when it formed part of a feedback system in which concerns were heard, reviewed, acted upon, and communicated back to staff. A learning culture therefore gave moral and practical value to checklist participation.

Table 3. Cultural Pathway Linking Checklist Conditions to Checklist Outcomes

Cultural or Organisational Condition	Checklist Process Produced	Likely Checklist Outcome
Shared attention from all relevant team members	Genuine multidisciplinary pause	Meaningful safety conversation
Time pressure without protected checklist pause	Abbreviated or retrospective completion	Ritualised compliance
Senior clinicians invite questions and respond constructively	Increased willingness to speak up	Earlier identification of risk
Senior clinicians appear impatient or dismissive	Reduced voice from junior and nursing staff	Suppressed safety concerns
Local adaptation preserves core checks	Contextually relevant checklist use	Improved ownership and fit
Local adaptation removes inconvenient items	Checklist drift	Loss of protective function
Near misses lead to non-punitive feedback and process change	Reinforced checklist credibility	Stronger future engagement
Repeated concerns receive no response	Staff frustration and disengagement	Reduced checklist authority

Table 3 synthesises the observed pathway through which checklist culture influenced checklist outcomes. Meaningful checklist use depended on an interaction between team behaviour and organisational support. When the checklist pause was protected, senior clinicians legitimised participation, local adaptation preserved essential checks, and feedback followed near misses, the checklist operated as a live safety intervention. When these conditions were absent, checklist use tended to shift toward ritualised documentation.

Overall, the results indicate that Surgical Safety Checklist effectiveness in high-pressure operating rooms depends on the culture surrounding the checklist rather than the checklist document alone. The checklist became meaningful when it created shared attention, enabled multidisciplinary voice, supported context-sensitive but disciplined adaptation, and connected raised concerns with organisational learning. It became ritualised when workload pressure, hierarchy, fragmented participation, or weak feedback systems prevented the checklist from influencing clinical action. These findings position checklist use as a socio-cultural safety practice requiring leadership support, team participation, protected time, and visible learning mechanisms.

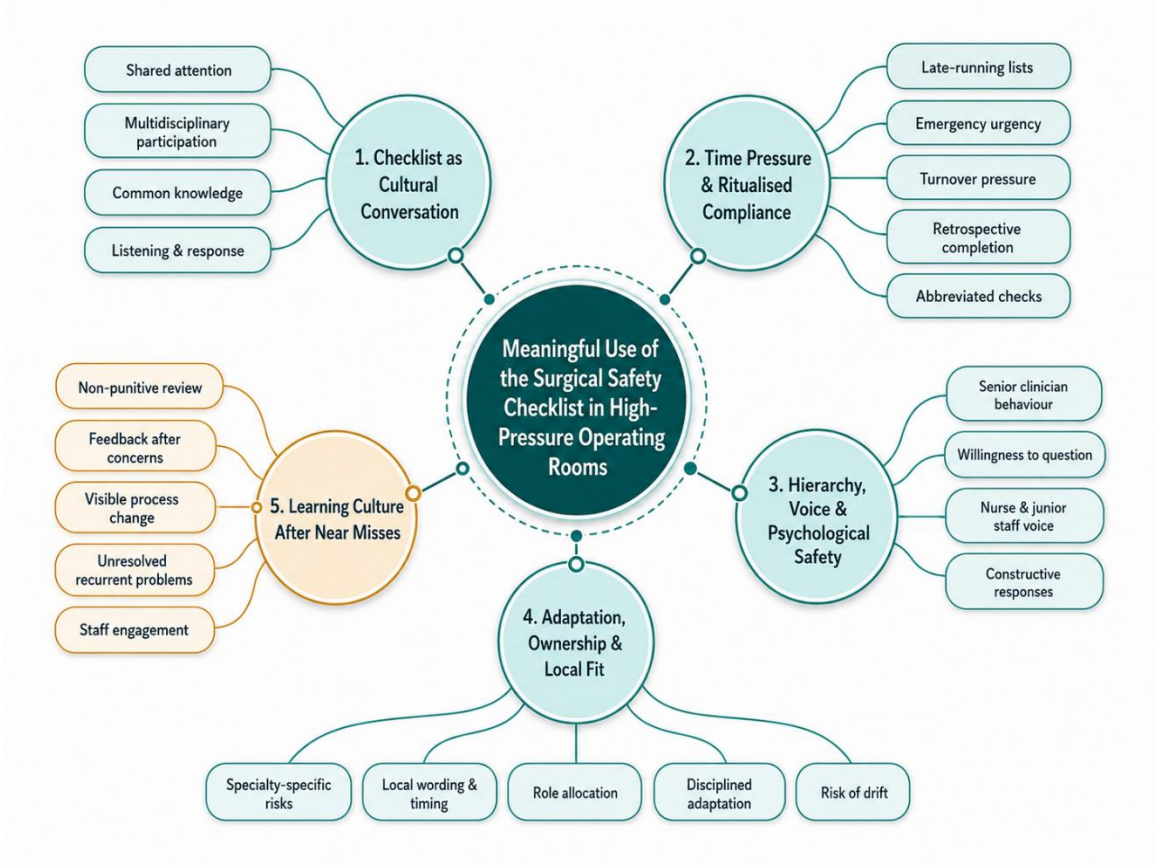

Figure 1 Thematic Network of Patient Safety Culture Around Surgical Safety Checklist Use in High-Pressure Operating Rooms. The figure illustrates the central concept of meaningful Surgical Safety Checklist use as a socio-cultural safety practice shaped by five interconnected qualitative themes: checklist as cultural conversation, time pressure and ritualised compliance, hierarchy, voice and psychological safety, adaptation, ownership and local fit, and learning culture after near misses. The subthemes show how shared attention, multidisciplinary participation, protected checklist time, senior clinician behaviour, disciplined local adaptation, and non-punitive feedback mechanisms influence whether checklist use becomes a meaningful safety pause or a superficial compliance activity.

DISCUSSION

This qualitative study explored how patient safety culture shaped the meaningful use of the Surgical Safety Checklist in high-pressure operating rooms. The findings show that checklist effectiveness was not determined by the mere presence of a checklist document, but by whether the checklist created a credible, multidisciplinary safety pause in which team members could focus, speak, listen, adapt, and act on identified risks. The five themes developed from the analysis—checklist as cultural conversation; time pressure and ritualised compliance; hierarchy, voice, and psychological safety; adaptation, ownership, and local fit; and learning culture after near misses—indicate that checklist use is best understood as a socio-cultural safety practice embedded within operating-room relationships, workflow pressures, leadership behaviours, and organisational learning systems. This interpretation is consistent with the wider patient safety literature, which frames preventable harm as a systems problem influenced by communication, teamwork, leadership, and learning culture rather than by individual vigilance alone (1,2,5).

The finding that the checklist functioned most effectively as a cultural conversation reinforces the original intent of the WHO Surgical Safety Checklist as a tool for team coordination rather than simple documentation (3). In meaningful checklist encounters, the checklist created a shared mental model by bringing together information distributed across surgical, anaesthetic, nursing, and theatre roles. This aligns with previous evidence showing that surgical safety depends on effective team communication, common attention, and interprofessional respect (10). The checklist was valuable when it transformed separate professional assumptions into collective awareness before operative action proceeded. Conversely, when it was read aloud while team members continued unrelated tasks or participated

passively, its protective function was weakened. These findings support the distinction between checklist completion and checklist quality reported in previous compliance and audit studies (14–16).

Time pressure emerged as both a reason why checklists are necessary and a condition that threatens their meaningful use. High-pressure operating rooms are characterised by late-running lists, emergency urgency, urgent turnover, staffing constraints, and production expectations. These pressures may increase cognitive load, reduce communication quality, and encourage teams to move forward on assumptions rather than shared verification. The findings suggest that checklists are most needed in exactly those circumstances where teams may feel least able to pause. This paradox helps explain why checklist implementation may fail despite formal adoption. When the checklist is treated as an additional administrative demand competing with workflow, staff may abbreviate it or complete it retrospectively. When it is protected as part of safe workflow, it can interrupt unsafe momentum and reduce preventable omission. This interpretation is consistent with implementation evidence showing that checklist success depends on workflow integration, staff engagement, leadership support, and structured reimplementation rather than policy adoption alone (11–13).

The theme of hierarchy, voice, and psychological safety highlights the central role of senior clinician behaviour in checklist quality. Hierarchy is not inherently unsafe in surgery, because complex operative care requires expertise, coordination, and decisive leadership. It becomes unsafe when it suppresses information flow or makes staff reluctant to raise concerns. The findings showed that staff were more likely to participate when senior clinicians invited questions, paused competing activity, listened respectfully, and responded constructively. This supports Edmondson's concept of psychological safety, in which teams learn and adapt more effectively when members can raise concerns without fear of embarrassment, dismissal, or punishment (17). Healthcare evidence similarly shows that inclusive leadership, respectful listening, clarity of purpose, and constructive responses to challenge enable psychological safety in clinical teams (18). In this context, the checklist does not automatically create voice; it provides a formal structure within which voice may either be enabled or suppressed by repeated micro-behaviours.

The findings also challenge narrow definitions of compliance. A bureaucratic model treats compliance as completion of a checklist form or electronic field. A safety culture model treats meaningful compliance as the correct people pausing at the correct time, sharing relevant information, identifying risks, and changing action when needed. This distinction has practical implications for checklist governance. Audit systems that measure only completion rates may reward documentation while missing poor participation, rushed timing, or lack of follow-up. Previous studies have similarly argued that checklist assessment should move beyond binary completion and examine completeness, phase-specific adherence, team participation, and closed-loop improvement (14–16). The present findings support audit approaches that assess whether the checklist is performed as an active communication process rather than a record-keeping exercise.

Adaptation, ownership, and local fit represented another important cultural mechanism. Participants valued adaptation when it made the checklist relevant to specialty-specific risks such as trauma, paediatrics, obstetrics, or complex implant procedures. This finding is consistent with implementation theory, particularly Normalisation Process Theory, which emphasises that complex interventions become embedded when staff understand them, invest in them, enact them collectively, and evaluate their value in practice (23,24). Local adaptation may increase coherence and cognitive participation by making the checklist feel clinically relevant rather than externally imposed. However, the findings also indicate that adaptation requires governance. If local modification removes items because they are inconvenient, routine, or assumed to be obvious, adaptation can become checklist drift and weaken essential safety defences. The implication is that teams should be allowed to adapt language, sequencing, and role allocation while preserving core safety functions.

The learning culture after near misses theme connects checklist practice to organisational resilience. Staff engagement increased when checklist concerns led to visible improvement, non-punitive discussion, and process change. This finding is consistent with Safety-II and resilience perspectives, which emphasise that safety is produced through anticipation, monitoring, response, and learning under real clinical conditions

(20–22). Near misses identified through checklist use can strengthen future engagement when staff see that concerns lead to action. Conversely, repeated unresolved problems reduce checklist credibility and may produce cynicism. The checklist therefore gains authority not only from its clinical content but from the organisational response that follows. This is also aligned with patient safety strategy principles that emphasise insight, involvement, improvement, and non-punitive learning rather than blame (30).

Taken together, the findings suggest that improving checklist practice requires intervention at multiple levels. At the team level, staff require shared expectations that checklist pauses are active, multidisciplinary, and clinically consequential. At the leadership level, senior clinicians must model respectful participation, invite questions, and respond constructively to uncertainty or concern. At the organisational level, theatre schedules, turnover expectations, staffing patterns, audit systems, and incident review processes must support rather than undermine protected checklist time. At the implementation level, training should focus not only on checklist items but also on facilitation, speaking up, closed-loop communication, psychological safety, local adaptation, and multidisciplinary debriefing. These changes would move checklist governance away from box-ticking compliance and toward its original function as a collective defence against preventable perioperative harm.

This study has limitations that should be considered when interpreting the findings. The qualitative design was appropriate for exploring meaning, culture, and professional interaction, but it does not estimate the prevalence of checklist behaviours or measure clinical outcome effects. The sample included 12 multidisciplinary operating-room participants, which allowed role-informed thematic exploration but limits claims of generalisability across all surgical settings. The findings reflect participant accounts of checklist practice and were not combined with direct observation of checklist performance, which may have provided additional insight into discrepancies between reported and enacted behaviour. Social desirability may also have influenced how participants described safety culture, hierarchy, and speaking up. Despite these limitations, the study offers transferable insights for high-pressure operating-room contexts where checklist implementation is formally present but variably enacted.

CONCLUSION

This study shows that meaningful use of the Surgical Safety Checklist in high-pressure operating rooms depends on patient safety culture rather than checklist availability alone. The checklist functioned as a safety intervention when it created shared attention, multidisciplinary participation, psychologically safe voice, disciplined local adaptation, and a visible link between raised concerns and organisational learning. Its value was weakened when time pressure, hierarchy, fragmented participation, retrospective completion, or unresolved recurrent problems reduced it to ritualised compliance. Strengthening checklist practice therefore requires senior role modelling, protected checklist time, team training in speaking up and closed-loop communication, audit systems that assess quality as well as completion, locally relevant adaptation that preserves core safety functions, and non-punitive feedback after near misses. These measures can help restore the checklist's intended purpose as a collective pause for shared responsibility, risk recognition, and prevention of avoidable perioperative harm.

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