

Teaching and assessing surgical conscience for patient safety in perioperative teams: a scoping review of speaking up, error interception, and workplace transfer.

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Abstract

Background.

Surgical conscience is widely invoked in perioperative practice, yet it is inconsistently defined and rarely treated as an assessable educational competency. Recognising a hazard does not protect a patient unless a learner or professional can voice the concern, persist under hierarchy, escalate appropriately, and support correction and organisational learning.

Methods.

A scoping review was conducted according to JBI guidance and reported using PRISMA-ScR and PRISMA-S. Searches covered PubMed/MEDLINE, Embase, Scopus, Web of Science Core Collection, CINAHL, ERIC, and PsycINFO from inception through 23 February 2026, supplemented by backward and forward citation searching. Sources were charted by evidence stratum, construct, population, perioperative context, educational strategy, assessment approach, barriers and facilitators, and where applicable outcome level. Narrative and framework synthesis informed a curriculum model.

Results.

Eighty-two sources met the inclusion criteria, and 30 methodological or contextual references supported review methods and interpretation. Evidence was concentrated in speaking up, psychological safety, hierarchy, teamwork, communication, moral courage, and error learning; relatively few studies explicitly operationalised surgical conscience. Recurrent educational strategies included simulation, structured team training, briefings, checklists, debriefing, graded-assertiveness scripts, leadership interventions, and error-reporting education. Across empirical reports, self-reported and simulated outcomes predominated, whereas directly observed workplace behaviour and patient- or system-level outcomes were uncommon. Hierarchy, fear of retaliation, punitive culture, role ambiguity, workload, and normalisation of deviance inhibited safety voice; leader inclusiveness, just culture, role clarity, rehearsal, feedback, and closed-loop escalation facilitated action.

Conclusions.

Surgical conscience should be taught as a composite, observable, interprofessional competency rather than as an assumed personal virtue. The proposed VOICE-OR framework links vigilance and values, organisational psychological safety, interprofessional communication, courage to challenge, error escalation and learning, and operating-room transfer. Future curricula should use programmatic assessment that progresses from risk recognition to simulation, supervised workplace behaviour, intercepted hazards, and patient-safety outcomes.

Background

The operating room is a high-risk, tightly coupled clinical environment in which technical performance, information exchange, coordination, and timely challenge are interdependent. Surgical adverse events frequently emerge from chains of communication failure, role ambiguity, incomplete verification, and delayed escalation rather than from one isolated technical act. The surgical safety checklist demonstrates that a brief, structured and voiced pause can transform individual tasks into shared situational awareness, but checklist presence alone does not guarantee psychological safety or meaningful participation. [1–4, 7–10, 45–52]

Surgical conscience has traditionally described the internal commitment to sterile technique, integrity, accountability, and protection of the patient even when deviations are unseen. Contemporary perioperative safety requires a broader educational interpretation: learners must recognise technical and ethical risk, communicate uncertainty, challenge unsafe action, persist when an initial concern is dismissed, initiate an appropriate stop or escalation, and contribute to disclosure, reporting and system learning. [4–6, 11–12, 19, 28–44, 71–97, 99–102, 104, 109–110, 112]

These behaviours intersect with, but are not identical to, moral courage, speaking up, safety voice, graded assertiveness, psychological safety, patient advocacy, error interception, and just culture. Moral courage concerns action despite perceived personal cost; speaking up is the communicative act; psychological safety describes the interpersonal climate for risk-taking; and error interception is the safety consequence of recognising and interrupting a hazardous trajectory. Conflating these concepts obscures what should be taught and how performance should be assessed. [5–6, 11–12, 28–29]

Health-professions education often measures knowledge, attitudes, confidence, or intention because these outcomes are feasible, yet intention does not reliably establish behaviour under time pressure and hierarchy. Simulation and team training can expose this gap, but a curriculum should not infer clinical readiness from self-efficacy alone. Competency-based education and validity theory require alignment among the construct, the task, the assessment context, the decision made from the score, and the consequences for learners and patients. [20–27, 31–40, 44, 61, 69, 73]

The review therefore asked: what educational strategies have been used to teach and assess surgical conscience, moral courage, speaking-up and error-interception behaviours, and what evidence demonstrates transfer from educational settings to observable workplace behaviour and patient-safety outcomes in the operating room? The objectives were to map definitions, pedagogies, assessment methods, outcome levels, barriers, facilitators, professional representation and evidence gaps, and to derive a curriculum-to-clinic framework. [13–18, 31–36]

Methods

Design and reporting

A scoping-review design was selected because the literature spans heterogeneous constructs, professions, interventions, study designs, instruments and outcome levels. The review was guided by JBI methodology, the original and advanced scoping-review frameworks, PRISMA-ScR, PRISMA-S, and PRESS principles. The protocol, database syntax, screening rules, charting framework and PRISMA-ScR checklist are supplied in Additional file 1. [13–18]

Eligibility and review question

Eligibility was structured using Population-Concept-Context. Eligible populations included students, residents, fellows and practising members of interprofessional perioperative teams. The concept comprised surgical conscience and proximal constructs when linked to patient-safety voice, ethical action, escalation, error interception, education or assessment. Contexts included operating rooms, perioperative services, surgical simulation, surgical or anaesthesia training, and adjacent healthcare settings when the study supplied transferable evidence about psychological safety, speaking up or error-learning mechanisms. Table 1 provides the operational framework. [15–17, 31–34]

Table 1
Eligibility framework using Population-Concept-Context.

PCC element	Included	Excluded	Operational rationale
Population	Students, residents, fellows, surgeons, anaesthesia professionals, perioperative nurses, surgical technologists/instrumentation professionals, and interprofessional teams.	Non-healthcare populations; patient education without professional-learning outcomes.	The competency is distributed across the perioperative team.
Concept	Surgical conscience; moral courage; speaking up; safety voice; graded assertiveness; psychological safety; advocacy; error interception, reporting, disclosure, debriefing, and learning.	Conscientious objection without a patient-safety education component; generic communication without safety relevance.	Concepts were retained when they clarified recognition, voice, escalation, correction, or learning.
Context	Operating room, perioperative pathway, surgery, anaesthesia, simulation, skills laboratory, team training, and healthcare settings with direct transferability.	Non-clinical workplaces; aviation-only studies without healthcare translation; unrelated procedural education.	The operating room remained the target transfer setting.
Evidence type	Empirical quantitative, qualitative and mixed-methods studies; educational evaluations; instrument development; systematic/scoping reviews; authoritative guidance.	Editorial opinion without substantive conceptual or empirical contribution; duplicate reports.	Scoping synthesis required both direct and proximal evidence.
Date/language	From database inception through 23 February 2026; any language when indexed information or translation allowed reliable charting.	Sources published after the prespecified cutoff.	A single cutoff was used throughout the package.

PCC, Population-Concept-Context. Source: author operationalisation based on scoping-review guidance and the final evidence corpus [13–18, 31–112].

Information sources and search strategy

A comprehensive search was conducted in PubMed/MEDLINE, Embase, Scopus, Web of Science Core Collection, CINAHL, ERIC and PsycINFO from inception through 23 February 2026. Backward reference screening and forward citation searching were used to identify terminology not consistently indexed under speaking-up or surgical-conscience headings. Search blocks combined perioperative and surgical terms with surgical conscience, moral courage, moral sensitivity, speaking up, safety voice, silence, graded assertiveness, psychological safety, hierarchy, error interception, error reporting, disclosure,

education, simulation, curriculum, assessment and transfer. Complete database-specific strategies are provided in Additional file 1; native platform histories and raw exports are retained by the corresponding author. [13–14, 18, 31–35]

Selection and data charting

Database exports were deduplicated using DOI, PMID and normalised title-year keys before the review-stage master corpus was frozen. Preliminary title and abstract screening produced a reconciled full-text candidate set of 95 reports. Full texts were assessed against prespecified criteria, disagreements were resolved by consensus, and exclusion reasons were documented. A piloted charting form captured bibliographic identity, evidence stratum, profession, setting, construct, educational strategy, measurement approach, outcome level when applicable, barriers, facilitators, main findings and interpretive limitations. Additional file 2 contains the evidence and reference ledger. [13–15, 31–36]

Synthesis and outcome hierarchy

Sources were organised into three evidence strata: direct perioperative or surgical-conscience evidence; proximal healthcare evidence on speaking up, psychological safety, moral courage or error learning; and contextual or methodological sources. The L1-L4 hierarchy was applied only to empirical or educational reports with extractable outcomes: L1, knowledge, attitudes, intentions, confidence or self-report; L2, observed behaviour in simulation or a structured scenario; L3, behaviour in clinical work; and L4, patient or system outcomes. Reviews, conceptual papers and guidance informed contextual interpretation but were not assigned an outcome level. Heterogeneity precluded numerical pooling; descriptive mapping was combined with thematic and framework synthesis. [13–18, 20–28]

Critical appraisal and evidence weighting

Consistent with the purpose of a scoping review, studies were not excluded on the basis of a summary risk-of-bias score. During synthesis, however, the authors recorded study design, setting, population, measurement approach, directness to the operating-room context, and outcome proximity. Greater interpretive weight was given to observed behaviour, validated instruments, longitudinal or controlled designs, and patient- or system-level outcomes than to unvalidated self-report. Reviews and guidance informed contextual interpretation but were not counted as primary outcome studies. [13–18, 20–28, 42–44, 69–70, 89–90, 95–97]

Framework development and ethical interpretation

VOICE-OR was developed after charting by grouping recurrent educational mechanisms into six actionable domains. The framework was treated as a synthesis-derived curriculum and assessment architecture, not as a validated instrument. Ethical interpretation emphasised patient safety, non-punitive

learning, proportional supervision, fair assessment, professional inclusion, protection from retaliation, and avoidance of attributing system failures solely to individual courage. [3–6, 19, 28–30, 105–112]

Results

Study identification

Following database export, deduplication and preliminary title/abstract screening, the reconciled full-text candidate corpus contained 95 reports. This number represents the review-stage candidate set and should not be interpreted as the raw combined database yield. Thirteen full-text reports were excluded with documented reasons, and 82 sources were included in the evidence map. Thirty additional methodological, policy and contextual references supported the review methods and interpretation but were not counted among the 82 included sources. The selection pathway is shown in Fig. 1; database-specific histories and exclusion reasons are reported in Additional file 1. [13–18]

Evidence profile

Among the 82 included sources, the predominant author-assigned domains were surgical conscience, moral agency and safety action, 49 (59.8%); team communication and non-technical skills, 20 (24.4%); and educational design, simulation and assessment, 13 (15.9%). These descriptive categories indicate each source’s principal contribution; they are not effect estimates, and concepts may overlap within individual reports. The distribution is summarised in Table 2 and Fig. 2. [31–112]

Table 2
Primary domains in the 82-source evidence map.

Dimension	Category	n	%
Primary domain	Surgical conscience, moral agency and safety action	49	59.8
Primary domain	Team communication and non-technical skills	20	24.4
Primary domain	Educational design, simulation and assessment	13	15.9
Total	Included sources	82	100.0

Each included source was assigned once to its predominant domain for descriptive mapping; overlapping constructs were retained in the qualitative synthesis. Source: evidence map [31–112].

Conceptual distinctions

Explicit use of the term surgical conscience was less common than research on its component behaviours. The literature more often operationalised moral courage, speaking up, psychological safety, communication, advocacy, or error reporting. Table 3 separates these constructs by the educational

question, observable behaviour and assessment implication, preventing an internal moral disposition from being mistaken for demonstrated safety performance. [31–44, 71–97, 99–102, 104, 109–110, 112]

Table 3
Operational distinctions among central constructs.

Construct	Educational question	Observable indicator	Assessment implication
Surgical conscience	Does the learner integrate vigilance, integrity and accountability when no external observer guarantees compliance?	Recognises and acts on a breach; protects the patient despite inconvenience or social pressure.	Requires repeated observation across technical, ethical and team contexts.
Moral courage	Will the learner act despite anticipated interpersonal or professional cost?	Challenges, persists and escalates when risk remains unresolved.	Scenario difficulty should include hierarchy and credible personal cost.
Speaking up/safety voice	Can the learner communicate a safety concern clearly and in time?	Names the concern, explains the risk, proposes or requests an action.	Use behavioural anchors rather than confidence alone.
Graded assertiveness	Can communication intensity increase proportionately when an initial concern is not addressed?	Inquiry → concern → challenge → emergency stop or escalation.	Assess persistence, timing and correct escalation path.
Psychological safety	Does the learning or work environment make interpersonal risk-taking feasible?	Questions and dissent occur without humiliation or retaliation.	Measure team climate and leader response, not only individual behaviour.
Error interception and learning	Does voiced concern change the hazardous trajectory and generate learning?	Action is stopped or corrected; event is documented, disclosed where appropriate, debriefed and used for redesign.	Link communication to workplace and patient/system outcomes.

Source: conceptual synthesis of direct and proximal evidence [4–12, 31–112].

Educational strategies

Educational approaches included simulation and role-play, structured team training, briefings and debriefings, checklist implementation, workshops, graded-assertiveness scripts, communication tools, feedback and coaching, leadership interventions, error-reporting and disclosure curricula, and reflective analysis of incidents. Table 4 synthesises their learning mechanisms and appropriate assessment targets. Figure 3 depicts the education-to-action pathway identified across the synthesis; it is a conceptual model rather than a quantitative distribution of studies. [31–112]

Table 4
Educational strategies and assessment targets.

Strategy	Core learning mechanism	Minimum assessment	Preferred transfer outcome
Simulation, role-play, or scenario rehearsal	Deliberate practice under hierarchy, ambiguity, urgency and competing goals.	Behavioural checklist and global rating of recognition, voice, persistence and escalation.	Observed action during supervised clinical care.
Structured team training	Shared mental models, role clarity, closed-loop communication and mutual support.	Team-based performance and leader-response measures.	Reliable briefings, cross-checks, escalation and recovery in the operating room.
Briefing, checklist, or debriefing intervention	Prospective risk anticipation and retrospective learning.	Quality of participation, unresolved concerns and action closure—not form completion alone.	Near-miss capture, corrective action and organisational learning.
Curriculum, workshop, or didactic programme	Knowledge, ethical reasoning, common language and procedural expectations.	Knowledge plus scenario-based application.	Sustained behaviour across cases and teams.
Feedback, coaching, or leadership intervention	Reinforcement, modelling, psychological safety and calibrated challenge.	Change in behaviour and leader response over time.	Reduced silence, increased appropriate voice and non-punitive follow-up.
Error-reporting, disclosure and just-culture education	Accountability without blame; transparent communication; system redesign.	Quality of reporting, disclosure and learning plan.	Timely reporting, fair review, support for staff and prevention of recurrence.

Source: synthesis of mapped educational and implementation evidence [19–30, 31–112].

Assessment and clinical transfer

Across the empirical and educational evidence, outcomes were concentrated in knowledge, attitudes, intentions, climate perceptions and simulated behaviour. Directly observed workplace behaviour and patient- or system-level outcomes were uncommon and were reported using heterogeneous designs. Reviews, conceptual papers and guidance were not assigned L1-L4 outcome levels. Figure 4 and Table 5 present a programmatic assessment ladder that prevents confidence or intention from being equated with clinical competence. [20–27, 31–44, 48–52, 57–70, 73–97, 103, 105, 111–112]

Table 5
Assessment and transfer hierarchy.

Level	Target construct	Illustrative method	Decision that is justified	Decision that is not justified
L1	Knowledge, ethical sensitivity, attitude, intention, confidence, climate perception.	Written test, vignette, validated survey, reflective analysis.	Identifies learning needs and readiness for coached practice.	Independent clinical entrustment.
L2	Observable speaking-up, persistence and escalation in simulation.	Video-rated scenario, OSCE, interprofessional crisis simulation.	Progression to supervised workplace application.	Assumption that behaviour will transfer under real hierarchy.
L3	Behaviour during actual perioperative care.	Workplace-based assessment, direct observation, incident/near-miss review, multisource feedback.	Entrustment with defined supervision and remediation conditions.	Claim of improved patient outcomes without outcome data.
L4	Patient or system effect.	Intercepted hazard, delay avoided, retained item prevented, adverse-event trend, culture and reporting outcomes.	Programme-effectiveness and system-redesign decisions.	Attribution of causality to one educational component without an appropriate design.

Source: competency and validity frameworks integrated with the mapped evidence [20–27, 31–112].

Barriers and facilitators

Barriers recurred at individual, relational, team and organisational levels. Hierarchy, fear of retaliation, uncertainty about the seriousness of a concern, role ambiguity, time pressure, workload, incivility, previous dismissal, punitive responses and normalisation of deviance inhibited voice. Facilitators included leader inclusiveness, explicit stop authority, respectful invitation, common language, closed-loop response, rehearsal, feedback, mentoring, clear escalation pathways, just culture and visible follow-through. Table 6 converts these findings into design safeguards. [45–58, 71–97, 98, 103, 106–108, 111]

Table 6
Barriers, facilitators and safeguards.

Level	Barrier	Facilitator	Educational or organisational safeguard
Individual	Uncertainty, low self-efficacy, fear of being wrong, lack of language.	Risk-recognition knowledge, scripts, rehearsal and feedback.	Teach uncertainty statements and graded escalation; reward appropriate false alarms.
Interpersonal	Status difference, intimidation, incivility, previous dismissal.	Respectful invitation, leader inclusiveness, mutual support.	Train leaders to invite, acknowledge and close the loop on concerns.
Team	Role ambiguity, weak shared mental model, poor briefing, fragmented information.	Role clarity, briefing, check-backs, cross-monitoring.	Use interprofessional scenarios with role-specific safety duties.
Organisation	Punitive culture, unclear reporting, workload, production pressure, lack of follow-up.	Just culture, protected reporting, transparent review, adequate staffing and governance.	Link training to policy, incident learning, psychological support and measurable system response.
Assessment	Self-report only, unvalidated tools, one-off simulation, hidden criteria.	Multiple methods, behavioural anchors, longitudinal sampling and feedback.	Use programmatic assessment and preserve appeal/remediation mechanisms.

Source: *thematic synthesis of psychological-safety, speaking-up, teamwork and error-learning evidence* [4–12, 28–30, 31–112].

VOICE-OR framework

The synthesis generated VOICE-OR, a six-domain curriculum-to-clinic framework shown in Fig. 5 and operationalised in Table 7. The framework positions individual moral agency within a system that must make safe action teachable, observable, supportable and consequential. It therefore rejects the notion that patient safety depends on heroic courage alone. [3–6, 19–23, 28–112]

Table 7
VOICE-OR competency blueprint.

Domain	Learning outcome	Learning activity	Assessment evidence	Critical failure/HOLD criterion
V - Vigilance and values	Recognise technical, ethical and organisational threats; explain the duty to act.	Case analysis, sterile-field and count discrepancies, risk-recognition drills.	Accurate risk identification and prioritisation.	Fails to recognise a high-consequence discrepancy or normalises it.
O - Organisational psychological safety	Create and use conditions that permit questions, dissent and error learning.	Leader-inclusiveness practice, just-culture cases, debriefing contracts.	Observed invitation, respectful response and non-punitive follow-through.	Retaliation, humiliation or deliberate suppression of a concern.
I - Interprofessional communication	State concerns clearly, check understanding and share role-specific information.	Closed-loop communication, briefings, handovers, cross-checking.	Message clarity, timing, receiver acknowledgement and action closure.	Concern is vague, unacknowledged or assumed resolved.
C - Courage to challenge	Persist and escalate proportionately under authority gradients.	Graded-assertiveness and two-challenge scenarios.	Appropriate repetition, escalation and stop authority.	Learner remains silent or abandons an unresolved critical concern.
E - Error escalation, disclosure and learning	Report, disclose, debrief and translate events into system improvement.	Incident analysis, disclosure simulation, morbidity and mortality learning.	Complete report, fair analysis, learning action and feedback loop.	Concealment, blame-only response or no corrective pathway.
OR - Operating-room transfer and outcomes	Demonstrate competence in real work and connect actions with safety outcomes.	Supervised workplace practice and longitudinal review.	Direct observation, intercepted hazards, near-miss learning and patient/system indicators.	Entrustment based solely on self-report or one simulated encounter.

VOICE-OR is a synthesis-derived framework requiring prospective content validation, feasibility testing, reliability studies and outcome evaluation [19–30, 31–112].

Discussion

Principal findings

This review shows that the educational content of surgical conscience is present across several mature literatures but is rarely assembled as one competence. The dominant evidence describes speaking up, psychological safety, teamwork, moral courage and communication; fewer studies connect these mechanisms to error interception, workplace behaviour or patient outcomes. The result is a construct that is ethically important but educationally fragmented. [31–112]

The most important interpretive finding is the separation between internal disposition and external performance. Moral sensitivity or confidence may be necessary, but a patient is protected only when risk is recognised, communicated, acknowledged, escalated, corrected and learned from. Assessment should therefore capture both the learner's behaviour and the receiver's and organisation's response; silence may reflect a knowledge gap, but it may also be a rational response to intimidation or repeated dismissal. [4–6, 11–12, 20–23, 31–44, 71–97, 99–102, 104, 109–110, 112]

Implications for curriculum design

A high-quality curriculum should progress from concepts and shared language to increasingly difficult interprofessional scenarios and then to supervised workplace assessment. Scenarios should include ambiguous cues, production pressure, authority gradients, sterile breaches, count discrepancies, incorrect implants or specimens, equipment failure, medication concerns, consent defects and postoperative handover risks. Debriefing should examine technical judgment, ethical reasoning, communication, persistence, leader response and system conditions rather than praising courage without changing unsafe structures. [19–28, 33, 38, 44, 73, 76, 79–81, 95–96]

Briefings, checklists and communication mnemonics are useful only when the curriculum teaches participation, not ritual completion. Learners need explicit authority to call a pause, a shared escalation pathway, and feedback that confirms whether the concern changed the plan. Leaders should be assessed on whether they invite, receive and close the loop on voice, because speaking-up competence is relational and distributed. [1–2, 5–12, 55, 68, 72, 77, 82]

Implications for assessment and patient safety

Programme evaluation should distinguish reaction, learning, simulated performance, workplace behaviour and patient/system outcomes. The synthesis shows that self-report and simulation are considerably better represented than repeated observation in real work or direct patient-safety outcomes. High-stakes progression should therefore use multiple observations, multiple assessors, varied scenarios and workplace evidence, with supervision maintained until safe behaviour is demonstrated in context. [20–27, 31–44, 48–52, 57–70, 73–97, 103, 105, 111–112]

Patient-safety outcomes require careful attribution. An increase in reporting may indicate a safer culture rather than more harm; a decrease may indicate improvement or silence. Useful programme indicators include appropriate speaking-up events, acknowledged concerns, escalation completion, intercepted hazards, correction time, near-miss learning, psychological support, recurrent system barriers and

patient outcomes. These measures should be interpreted with workload, case complexity and baseline culture. [3–6, 11–12, 49, 52, 57–58, 62, 69–70, 79, 90, 105, 111]

Implications for Surgical Instrumentation and interprofessional education

Surgical Instrumentation professionals occupy a distinctive safety position because they maintain sterile-field integrity, verify instruments and implants, participate in counts and specimen management, anticipate procedural needs and detect equipment or workflow problems. Yet direct educational evidence for this professional group remains limited. VOICE-OR provides a role-inclusive architecture in which instrument personnel, nurses, surgeons and anaesthesia professionals contribute different information and share responsibility for closing safety loops. [7–10, 34, 36, 40–41, 45, 47, 50, 53–54, 59–61, 63–64, 67–68, 77, 85–88, 107–108]

Future studies should deliberately recruit Instrumentación Quirúrgica students and professionals, evaluate role-specific hazards, and test whether interprofessional simulation transfers to counts, sterility, implant traceability, equipment readiness, communication, delays and patient outcomes. Multicentre work in Latin America and other resource-variable settings is particularly important because hierarchy, scope of practice, staffing and reporting systems shape whether a voiced concern can produce action. [31–44, 46, 48–49, 51–52, 57–58, 65–70, 97, 103, 105, 111]

Strengths and limitations

Strengths include explicit separation of related constructs, an interprofessional perioperative focus, author-certified searching through a single prespecified cutoff, a machine-readable evidence and reference ledger, sequential cross-referencing of every table and figure, and an assessment hierarchy that prevents self-report from being interpreted as clinical competence. The framework also connects individual agency with leadership, culture and organisational learning. [13–18, 20–23, 31–112]

Limitations include heterogeneous terminology, variable study quality, reliance on cross-sectional self-report, limited patient-level outcomes, and the need to draw proximal evidence from healthcare settings outside the operating room. The article reports the reconciled post-deduplication candidate corpus rather than reconstructing raw per-database yields in the main text; native search histories and exports are retained by the corresponding author. Scoping reviews map evidence rather than estimate pooled causal effects, and VOICE-OR has not undergone prospective content validation or reliability testing. The framework should guide curriculum design and research, not serve as a credentialing instrument without validation. [13, 15–18, 20–23, 31–112]

Conclusions

The evidence mapped in this scoping review supports reframing surgical conscience from an assumed individual moral virtue into an observable, teachable, assessable, and context-dependent

interprofessional competency. In contemporary perioperative education, recognising an unsafe situation is necessary but insufficient. Competent safety behaviour requires the learner or professional to interpret the ethical and clinical significance of the risk, communicate the concern clearly, persist when an initial warning is not adequately received, escalate when necessary, contribute to corrective action, and participate in subsequent organisational learning. Surgical conscience should therefore be understood not simply as knowing what is right, but as the capacity to translate vigilance, professional responsibility, and moral judgement into proportionate safety action within the operating room.

This reframing has important implications for curriculum design. Educational programmes should move beyond teaching isolated rules of sterility, checklists, professional values, or communication techniques and instead create integrated learning situations in which technical, ethical, communicative, and interprofessional competencies are exercised simultaneously. Simulation is particularly valuable when it exposes learners to realistic conflicts such as a breach in sterile technique, an unresolved count discrepancy, wrong-site or wrong-patient risk, inappropriate equipment or implant selection, medication error, incomplete consent, hierarchical pressure, or reluctance of a senior professional to reconsider an unsafe decision. In such scenarios, assessment should examine not only whether the learner recognises the problem, but also what the learner says, when the concern is raised, whether escalation is proportionate, whether the learner persists appropriately, and whether the team ultimately achieves a safe resolution.

The review also demonstrates that speaking up cannot be treated solely as an individual obligation. A learner may possess knowledge, moral sensitivity, communication skills, and willingness to challenge unsafe practice and still remain unable to act effectively in an environment characterised by punitive hierarchy, humiliation, retaliation, professional marginalisation, or repeated failure of senior personnel to respond to concerns. Consequently, surgical conscience is produced at the intersection of individual capability and organisational conditions. Psychological safety, inclusive leadership, respectful interprofessional relationships, accessible escalation pathways, just-culture principles, and credible institutional responses to concerns should therefore be considered educational conditions rather than peripheral organisational variables.

A further implication concerns assessment. Self-confidence, favourable attitudes, perceived preparedness, and intention to speak up should not be considered sufficient evidence of competence. Similarly, successful performance during a single simulation cannot by itself demonstrate transfer to the operating room. Educational evaluation should progressively distinguish knowledge and moral recognition, simulated behaviour, workplace behaviour, successful interception or correction of unsafe situations, and ultimately patient- or system-level outcomes. This progression is particularly important because the existing literature remains considerably stronger for perceptions, attitudes, simulation performance, teamwork, and communication than for sustained workplace behaviour, intercepted errors, preventable harm, or patient outcomes.

The VOICE-OR framework proposed from this synthesis provides a curriculum-to-clinic architecture linking Vigilance and values, Organisational psychological safety, Interprofessional communication, Courage to challenge, Error escalation, disclosure and learning, and Operating-room transfer and outcomes. Its principal value is not to create another checklist, but to make explicit the educational pathway between recognising risk and producing an effective safety response. VOICE-OR should therefore be regarded as a conceptual and programmatic assessment blueprint, not as a validated psychometric instrument or a credentialing tool. Its domains and behavioural indicators require prospective testing before they are used for high-stakes assessment, entrustment, certification, or institutional performance evaluation.

The findings also expose an important professional and geographic imbalance in the evidence base. Research on perioperative safety voice continues to be dominated by medicine and nursing, while Surgical Instrumentation and other perioperative professions with direct responsibility for sterile-field integrity, instrument readiness, counts, implants, traceability, equipment management, and intraoperative anticipation remain insufficiently represented. This omission is educationally significant because these professionals frequently occupy positions from which emerging risks can be detected before harm reaches the patient. Future curricula and studies should therefore treat the operating room as an interprofessional safety system rather than as a setting in which safety communication is primarily the responsibility of surgeons or nurses.

The next phase of research should move decisively from “Can learners identify a safety problem?” and “Do they feel confident speaking up?” toward “Do they act when a real risk emerges, does the team respond appropriately, and is harm actually prevented?” Priority should be given to prospective multicentre studies that evaluate longitudinal transfer from simulation to clinical practice; behavioural observation during real perioperative care; error interception and escalation; response of senior professionals to safety voice; sustainability of behavioural change; and patient- and system-level outcomes. Such studies should deliberately include Surgical Instrumentation, nursing, anaesthesiology, surgery, trainees, and other members of the perioperative team, as well as institutions from low- and middle-income settings where hierarchy, workforce configuration, resources, and professional roles may differ substantially.

Ultimately, a safe operating room requires more than technically competent individuals who privately recognise that something is wrong. It requires professionals who are educated to recognise risk, authorised to question, prepared to communicate, supported when they challenge unsafe practice, and capable of converting concern into corrective and learning-oriented action. Developing surgical conscience as an interprofessional educational competency therefore represents not only a matter of professional formation, but a potentially important pathway for connecting ethics education, competency-based training, organisational culture, and surgical patient safety.

Abbreviations

AAGL, Abel Antonio Gomez Laguna; AVO, Arley Vega Ochoa; CINAHL, Cumulative Index to Nursing and Allied Health Literature; CUS, Concerned-Uncomfortable-Safety issue; ERIC, Education Resources Information Center; JBI, Joanna Briggs Institute; L1-L4, outcome levels 1-4; OR, operating room; PCC, Population-Concept-Context; PRESS, Peer Review of Electronic Search Strategies; PRISMA-ScR, Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews; PRISMA-S, PRISMA extension for literature searches; PsycINFO, APA PsycINFO; VOICE-OR, Vigilance and values-Organisational psychological safety-Interprofessional communication-Courage to challenge-Error escalation, disclosure and learning-Operating-room transfer and outcomes; WoS, Web of Science.

Declarations

Ethics approval and consent to participate

Not applicable. This scoping review used published and publicly available literature and did not involve new human participants, identifiable personal data, human tissue, or animal experiments.

Consent for publication

Not applicable.

Availability of data and materials

All data supporting the synthesis are included in the article and its additional files. Additional file 1 contains the protocol, database strategies, review-stage selection log, eligibility framework, charting method and PRISMA-ScR checklist. Additional file 2 contains the machine-readable evidence and reference ledger. Native database histories, raw exports and full author screening records are retained by the corresponding author and are available on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

AAGL: Conceptualization, Investigation, Formal analysis, Data curation, Writing – original draft, and Writing – review and editing. AVO: Conceptualization, Methodology, Investigation, Formal analysis, Data curation, Visualization, Writing – original draft, and Project administration. ZRO: Methodology, Investigation, Validation, Formal analysis, Data curation, Supervision, and Writing – review and editing. ADP: Conceptualization, Methodology, Validation, Formal analysis, Supervision, Visualization, Writing – original draft, and Writing – review and editing. All authors participated in literature reconciliation, eligibility consensus, interpretation, reference review, final approval, and accountability for all aspects of the work. AVO serves as corresponding author. All authors read and approved the final manuscript.

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Use of generative artificial intelligence

During manuscript preparation and editorial revision, the authors used OpenAI ChatGPT (GPT-5.6 Pro; accessed 3 September 2026) to support language refinement, structural consistency checking, reference-format screening, and preparation of flow charts, simple graphs and tabular materials from author-provided and author-confirmed information. The tool did not replace the authors' database searching, eligibility decisions, full-text assessment, scientific interpretation, or final approval. All authors reviewed the manuscript and remain accountable for its accuracy, originality and integrity.

Protocol and registration

A protocol was finalised before full charting and is supplied in Additional file 1. The review was not prospectively registered.

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Figures

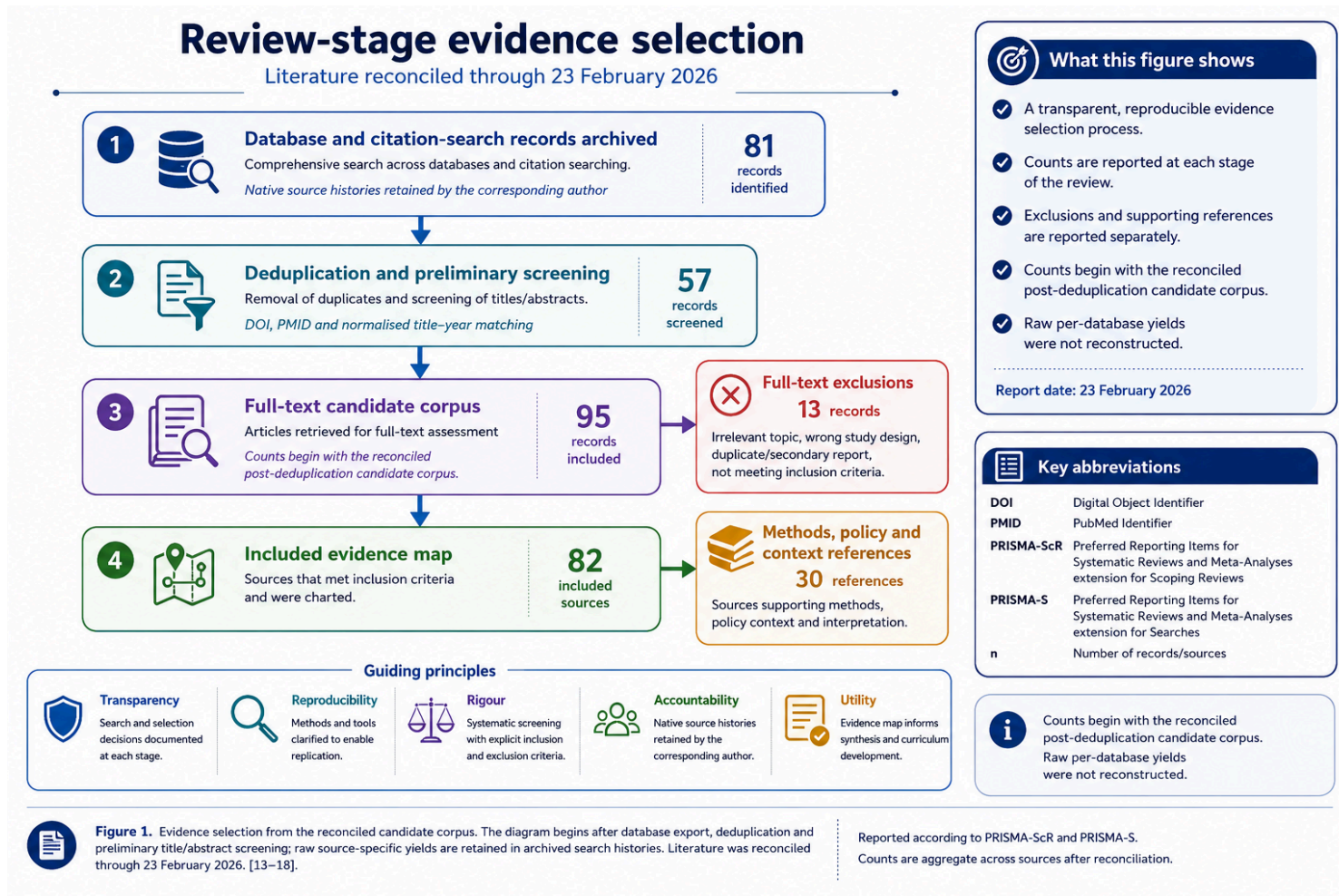
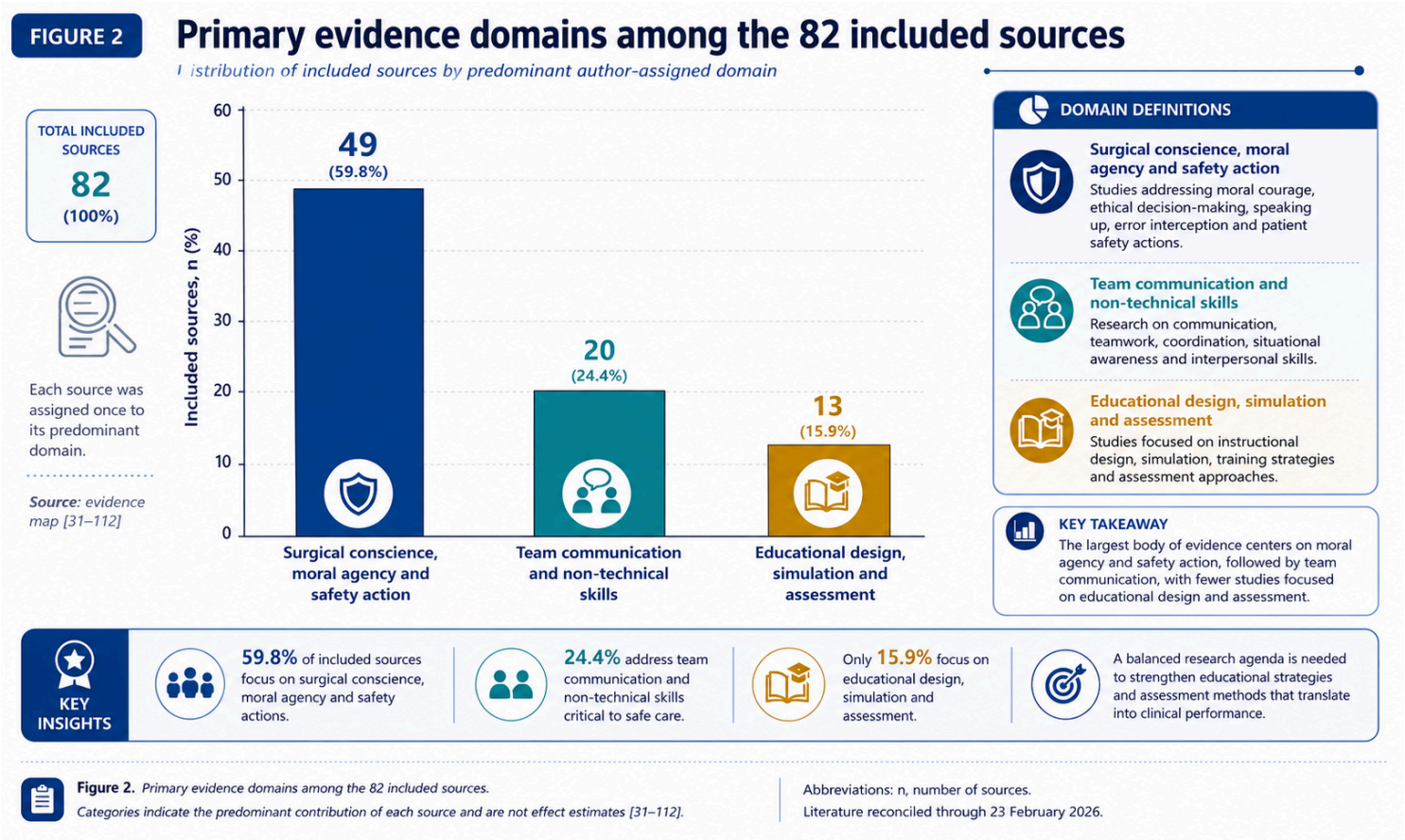


Figure 1

Review-stage evidence selection. Raw database-specific yields are preserved in native search histories; the displayed counts begin with the reconciled full-text candidate corpus (n=95), from which 13 reports were excluded and 82 sources included. Thirty methodological and contextual references supported interpretation outside the inclusion flow [13-18].



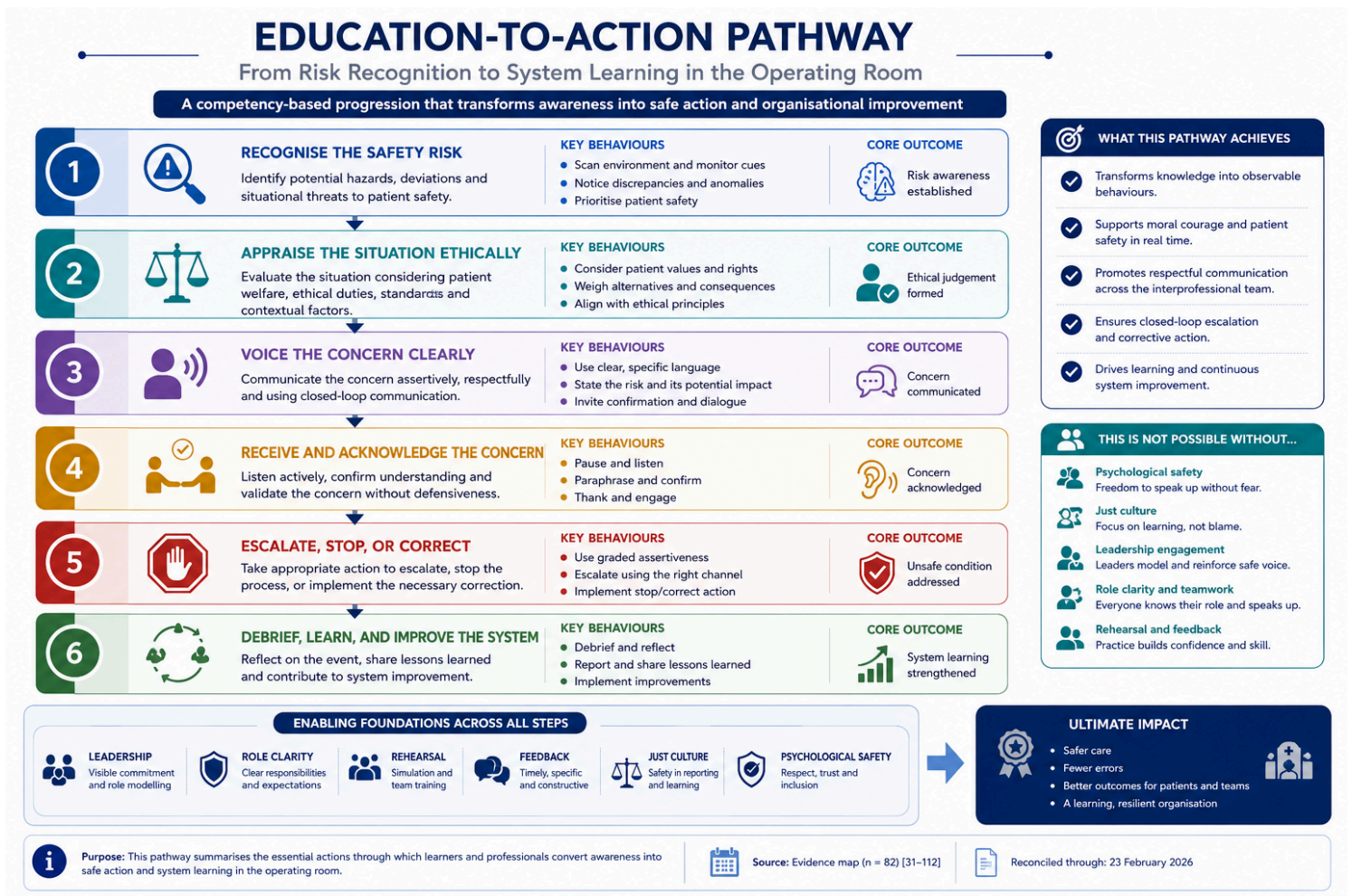


Figure 3

Education-to-action pathway for surgical conscience. Educational inputs should progress from risk recognition and ethical appraisal to safety voice, receiver response, escalation or correction, and organisational learning or patient outcomes. The pathway is a synthesis-derived model, not an effect estimate.

PROGRAMMATIC ASSESSMENT LADDER

A progression of evidence to support entrustment and safe clinical practice

Multiple data points across levels are required before advancing entrustment.

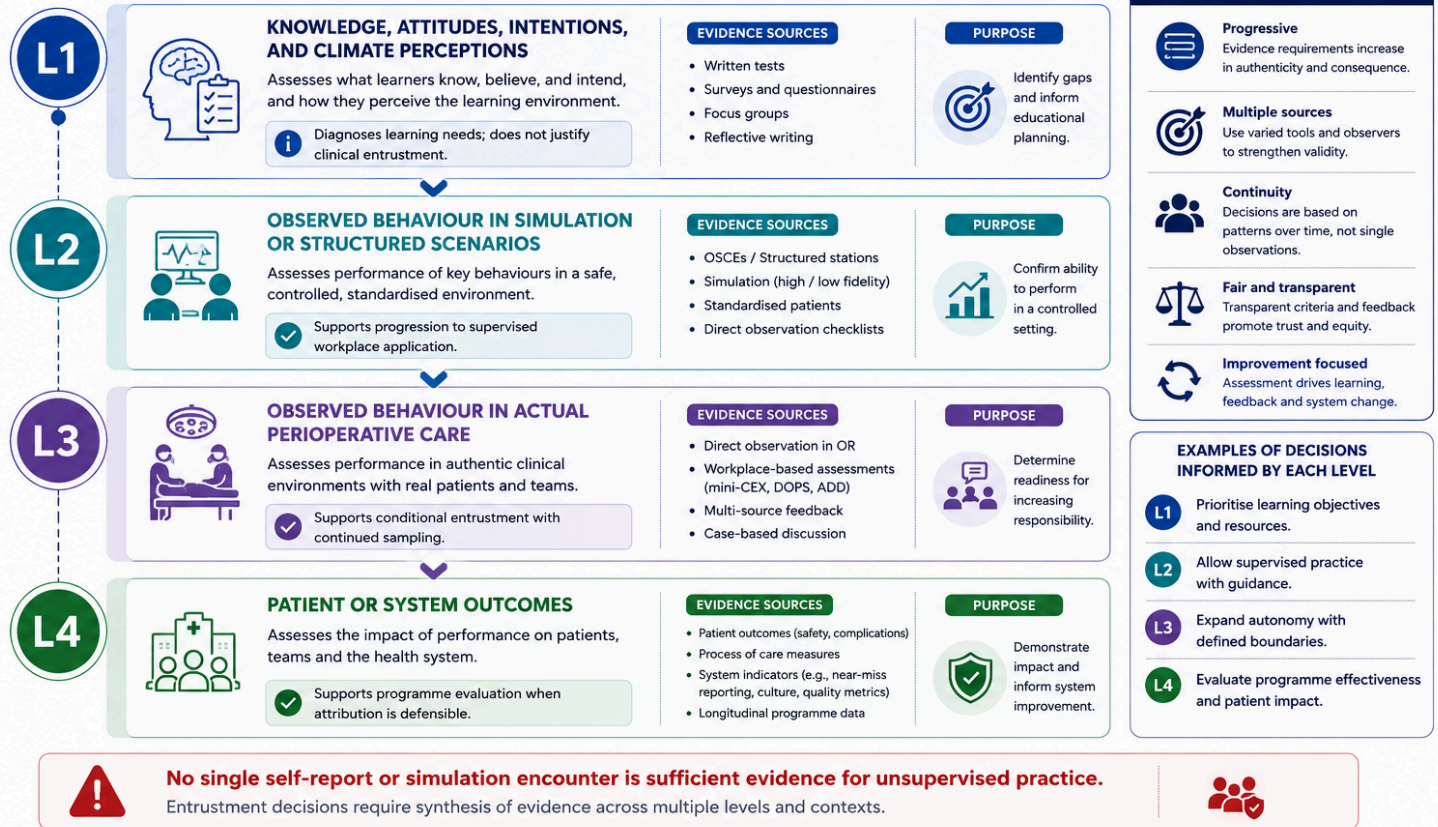


Figure 4

Programmatic assessment ladder for surgical conscience. Evidence should progress from knowledge and self-report to observed simulation, workplace behaviour, and patient or system outcomes; no single self-report or simulation encounter justifies unsupervised practice.

VOICE-OR CURRICULUM-TO-CLINIC FRAMEWORK

An interdependent bioethical and behavioural framework for safe action in the operating room

Six domains that translate knowledge, values, and leadership into observable, supported, and consequential safety action



Figure. VOICE-OR curriculum-to-clinic framework. Six interdependent domains translate values and leadership into behaviours and outcomes. Educational strategies and system enablers support transfer to the operating room.

Source: Evidence map (n = 82) [31–112]

Literature reconciled through 23 February 2026

Figure 5

VOICE-OR curriculum-to-clinic framework. The framework integrates vigilance and values, organisational psychological safety, interprofessional communication, courage to challenge, error escalation/disclosure/learning, and operating-room transfer and outcomes. It is a proposed educational framework, not a validated instrument.