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Strengthening Perioperative Patient Safety Through Non-Technical Skills Training Among Surgical Teams at Hakim Gezaw Teaching Hospital, Ethiopia

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ABSTRACT

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Declaration:

Authors' Contributions:

Abebe: Conceptualization, methodology, analysis and drafting; Prof. Owokole: Supervision, methodology and critical revision; Demelash: Investigation, resources and editing; Kebede: Investigation and data curation; Tadesse: Investigation and editing. All authors approved the manuscript.

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Background: Non-technical skills like communication, teamwork, situational awareness, decision-making, adaptability, task management, and leadership, are important for keeping patients safe during surgery. However, evidence evaluating context-adapted multidisciplinary NTS interventions and their relationship with patient-level safety outcomes remains limited in low- and middle-income countries, including Ethiopia.

Aim: To assess changes in NTS following context-adapted training and examine selected perioperative patient safety outcomes at Hakim Gezaw Teaching Hospital, Ethiopia.

Methods: A mixed-methods quasi-experimental pre-post study was conducted among 24 multidisciplinary operating-room professionals and 672 adult surgical patients. Staff NTS was assessed before training, immediately after training, and one month later using an eight-item, five-point Likert-scale instrument informed by NOTSS, ANTS, and SPLINTS frameworks. Changes in NTS were analyzed using linear mixed-effects models with participant-level random intercepts. Patient outcomes were compared between 336 pre-intervention and 336 post-intervention patients. Focus group discussions conducted before and one month after training were analyzed thematically and integrated with quantitative findings.

Result: Mean overall NTS scores increased from 3.36 ± 0.37 at baseline to 3.82 ± 0.34 immediately after training and 4.04 ± 0.61 at one month. Compared with baseline, adjusted mean differences were 0.464 (95% CI: 0.161–0.766; effect size=1.06) immediately after training and 0.679 (95% CI: 0.373–0.985; effect size=1.55) at one month. Situational awareness, adaptability, and task management improved significantly. Post-intervention periods were associated with fewer adverse events, delays, and communication-related safety events and higher patient satisfaction. Qualitative findings supported improvements in teamwork, communication, shared awareness, coordination, and speaking up.

Conclusion: Context-adapted NTS training was associated with improved team NTS, sustained at one month. Improvements in patient safety outcomes occurred concurrently but cannot be attributed causally to the intervention because there was no control group. Integration into routine practice, refresher training, and supportive leadership may help sustain gains.

Keywords: Non-technical skills; Patient safety; Teamwork; Communication; Operating room; Ethiopia.

INTRODUCTION

Perioperative care involves delivery of service in complex, high risk environment where patient safety depends not only on technical expertise but also on effective use of Non-Technical skill (NTS)(1). These abilities are described include situational awareness, decision-making, communication, teamwork, leadership, adaptability, and task management. Failure to perform these skills can cause preventable harm, communication breakdown and inadequate coordination where as effective teamwork and structured communication can produce shared mental models, early identification of hazards, and coordinated responses to intraoperative challenges(2, 3).

Common behavioral framework including Non-Technical Skills for Surgeons (NOTSS), Anaesthetists' Non-Technical Skills (ANTS), and the Scrub Practitioners' List of Intraoperative Non-Technical Skills (SPLINTS), are used to observe domains for NTS (4, 5). Evidence suggests that Structured interventions such as simulation, team training, briefings, debriefings, and TeamSTEPPS-based approaches, can improve teamwork, communication, situational awareness, and other team behaviors especially in high resource settings (6, 7).

There is a clear gap in evidence generation in low- and middle-income countries, where operating rooms often work with limited resources, high workloads, changing staff, and strict team hierarchies (6). Studies on perioperative research focus on issues like lack of proper training in teamwork and communication, or concerns about safety culture, but not on evaluating new team training programs in a proper, forward-looking way (8, 9). Also, these studies usually use different ways to measure results, often looking only at individual groups or relying on people's own reports, with little follow-up or focus on actual patient outcomes (10). Because of this, there is not much proof yet about whether adapting teamwork training to local settings can improve team performance and lead to better patient safety during surgeries. In Ethiopia, this lack of evidence is especially important because there isn't much research on structured teamwork training programs for surgical teams, using repeated checks and looking at safety outcomes at the patient level (11). It is needed to find out if such training can be part of regular surgical practices and whether changes in team behavior led to better safety results (12).

So, this study looked at a locally adapted teamwork training program for surgical teams at Hakim Gezew Teaching Hospital in Ethiopia. It checked how teamwork improved right after the training and one month later. It also compared key patient safety measures like bad outcomes, delays in care, communication problems, and patient satisfaction before and after the training. The study also looked at what team members thought, how they felt things had changed, and what challenges they faced in keeping up the better safety practices.

Aim and Objectives

The aim of this study was to evaluate changes in non-technical skills following a structured, context-adapted NTS training intervention among multidisciplinary surgical teams at Hakim Gezew Teaching Hospital, Ethiopia, and to examine concurrent changes in selected perioperative patient safety outcomes, including adverse events, delays in care, communication-related safety events, and patient satisfaction

METHODOLOGY

Study design and Setting

A mixed-methods quasi-experimental pre-post intervention design was used to assess changes in non-technical skills (NTS) among multidisciplinary operating-room teams and selected perioperative patient safety outcomes following a context-adapted NTS training intervention. Quantitative assessment of NTS was conducted at baseline, immediately after the intervention, and at one-month follow-up. Selected patient safety outcomes were compared between the pre-intervention and post-intervention periods. Qualitative data were collected through focus group discussions (FGDs) before and one month after the intervention to explore participants' experiences and perceptions of teamwork, communication, leadership, situational awareness, and implementation of NTS practices. Quantitative and qualitative findings were integrated through mixed-methods triangulation.

The study was conducted at Hakim Gezew Teaching Hospital, a teaching hospital affiliated with Debre Berhan University, Ethiopia. The hospital provides surgical services including general, orthopedic, pediatric, obstetric and gynecologic, neurologic, and emergency surgery. Perioperative care is delivered by multidisciplinary teams comprising surgeons, anesthetists, and operating-room nurses. The study was conducted from December 2025 to September 2026.

Study Population / Data Source

The study population consisted of multidisciplinary operating-room professionals and adult surgical patients at Hakim Gezew Teaching Hospital. For the NTS component, the population comprised eligible surgeons, anesthetists, and operating room nurses who routinely participated in perioperative care. The final quantitative NTS analysis included 24 staff participants. Twenty-four participants contributed baseline and immediate post-training observations, while 23 contributed data at one-month follow-up because one participant was lost to follow-up following a change in location. A total of 672 adult surgical patients were included, consisting of 336 patients in each period.

Eligibility Criteria

Staff Inclusion Criteria

Participants were included who are licensed surgeons, anesthetists, and operating-room nurses working at Hakim Gezew Teaching Hospital; had at least six months of operating-room experience; were routinely involved in perioperative care; and were willing to participate in the intervention and associated assessments.

Staff Exclusion Criteria

Staff were excluded if they were temporary staff, interns, students, or not regularly assigned to the operating rooms; were on leave, rotation, or otherwise unavailable during the intervention period; or declined participation or did not provide informed consent.

Patient Eligibility

Adult patients undergoing major surgical procedures under anesthesia during the defined study periods were eligible and data was extracted from the electronic medical record.

Sampling and Sample Size

Census sampling was used for the staff component, with all eligible multidisciplinary operating-room professionals invited to participate because of the small available workforce. Consecutive sampling was used for the patient component, with eligible adult surgical patients recruited sequentially until 336 patients per period (672 total) were included. Purposive sampling was used for the qualitative component to ensure representation of surgeons, anesthetists, and operating-room nurses.

For the staff component, the sample size was estimated using a paired t-test, assuming a mean difference of 2 points, standard deviation of paired differences of 3.5, 95% confidence, and 80% power. The estimated requirement was 24 staff members.

For patient outcomes, assuming a reduction in adverse events from 16% to 10%, the initial sample size was approximately 493 per period. Finite population correction for an estimated population of 800 reduced this to approximately 305 per period; allowing 10% for incomplete records resulted in a final target of 336 patients per period. The calculation was based primarily on the expected change in adverse events and was not intended to ensure adequate power for all secondary outcomes.

Data Collection / Study Procedures

Data collection was conducted sequentially among eligible multidisciplinary operating-room staff and surgical patients. After informed consent, baseline staff NTS assessments and pre-intervention FGDs were conducted, and patient outcomes were collected for the pre-intervention period. The NTS intervention was then delivered to participating staff. Staff NTS was reassessed immediately after training and again at one month; 23 of the 24 original

staff participants completed the one-month assessment, with one unavailable because of relocation. Patient outcomes were subsequently collected for 336 post-intervention patients and compared with the 336 pre-intervention patients. Four FGDs were conducted: two at baseline and two at one-month follow-up, with 12 multidisciplinary operating-room professionals at each time point, representing surgeons, anesthetists, and nurses. Discussions explored teamwork, communication, leadership, decision-making, situational awareness, psychological safety, safety practices, and implementation barriers and facilitators. FGDs were facilitated by Dr. Brook Ameha Kebede and Molla Amsalu Tadesse, conducted in English, and documented using detailed notes rather than audio recording. Qualitative data were analyzed inductively using thematic analysis and integrated with quantitative findings through mixed-methods triangulation.

Non-Technical Skills Training Intervention

A 2-day, three-session, context-adapted NTS training programme was delivered to participating multidisciplinary operating-room staff. The programme addressed situational awareness, decision-making, communication, teamwork and coordination, leadership, adaptability, and task management, drawing on NOTSS, ANTS, and SPLINTS frameworks. Training was delivered by Tadele Mesfine and facilitated by Melkam Mulugeta using interactive presentations, group discussion, simulation, role-play, and practical exercises on briefing, debriefing, closed-loop communication, teamwork, and situational awareness. Examples and scenarios were adapted to the workflow and locally identified challenges of Hakim Gezew Teaching Hospital.

Data Quality Assurance

Study instruments and procedures were reviewed before implementation, and study personnel were oriented on data collection, confidentiality, and ethical procedures. Quantitative data were checked for completeness, consistency, and errors before and after entry. Qualitative data were systematically coded, and quotations were anonymized. Internal consistency of the eight-item NTS instrument was assessed using Cronbach's alpha. Overall reliability was acceptable ($\alpha = 0.776$), while the two-item situational-awareness domain showed poor internal consistency ($\alpha = 0.060$; inter-item correlation = -0.031), which was considered when interpreting the findings.

Statistical / Qualitative Analysis

Quantitative data were analyzed using Stata 17.0. Descriptive statistics included means and standard deviations for continuous variables and frequencies and percentages for categorical variables. NTS changes over time were assessed using linear mixed-effects models, with time as a fixed effect and participant as a random intercept; Bonferroni-adjusted pairwise comparisons and standardized effect sizes were reported. Pre- and post-intervention patient outcomes were compared using chi-square or Fisher's exact tests, with 95% confidence intervals. Patient satisfaction was assessed using ordinal regression. Statistical significance was set at $p < 0.05$.

Qualitative data were analyzed using inductive thematic analysis. Quantitative and qualitative findings were integrated through triangulation to assess convergence, complementarity, and differences.

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board of Hakim Gezew Teaching Hospital (AWHSC-IRB; approval reference AWHSC-IRB-447) on 17 March 2026. The study was conducted in accordance with the Declaration of Helsinki and applicable Ethiopian guidelines for health research. Data collection and participant involvement commenced only after ethical approval. Written informed consent was obtained from participating surgical team members and patients, as applicable. Participation was voluntary, and participants were informed of their right to withdraw without consequences. Confidentiality was maintained throughout the study; direct identifiers were removed during data collection, and each participant was assigned a unique, non-identifying study code. For focus group discussions, participants were asked to respect the confidentiality of information shared by others. Study data were stored on password-protected devices with access restricted to the research team, and only anonymized findings were reported.

RESULTS

Participant Characteristics

A total of 24 surgical team members participated with mean age of 34.71 ± 4.36 years (range: 26-45 years). Fifteen (62.5%) of the participants were male and surgical nurses comprised the largest professional group (33.3%) followed by Anesthesia professionals (25%). Half of the participants hold MSc degree and ten were specialists (41.7%). Out of the 24 participants nine (37.5%) reported previous non-technical skill (NTS) training. The mean professional experience was 10.42 ± 4.57 years differing significantly across professional roles (Kruskal–Wallis $\chi^2(5) = 17.30$, $p = 0.004$). (Table 1)

All 24 participants completed the baseline and immediate post-training assessments. At one-month follow-up, 23 (95.8%) participants completed the assessment, with one participant (4.2%) lost to follow-up because of a change in location.

Table 1: Sociodemographic and professional characteristics of participants included in the non-technical skill (NTS) training study (n = 24).

Variable	Category	N	Percentage
Previous NTS training experience	Yes	9	37.5
	No	15	62.5
Sex	Male	15	62.5
	Female	9	37.5
Role	Surgical nurse	8	33.33
	Senior anesthetist	6	25.00
	Surgical specialist	4	16.67
	Ob/Gyn	3	12.5
	Orthopedic surgeon	2	8.33
	Neurosurgeon	1	4.17
Educational Qualification	BSc	2	8.33
	MSc	12	50
	Specialist	10	41.67
Total Participants		24	100.0

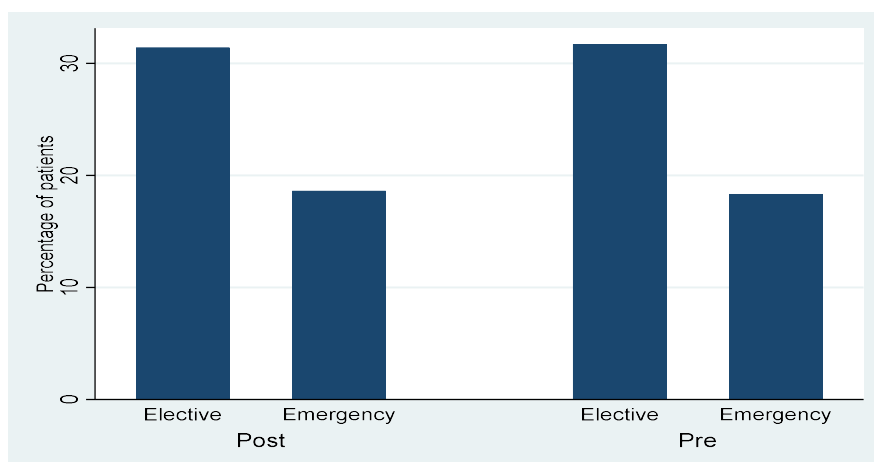


Figure 1: Distribution of Surgical Urgency Before and After Intervention

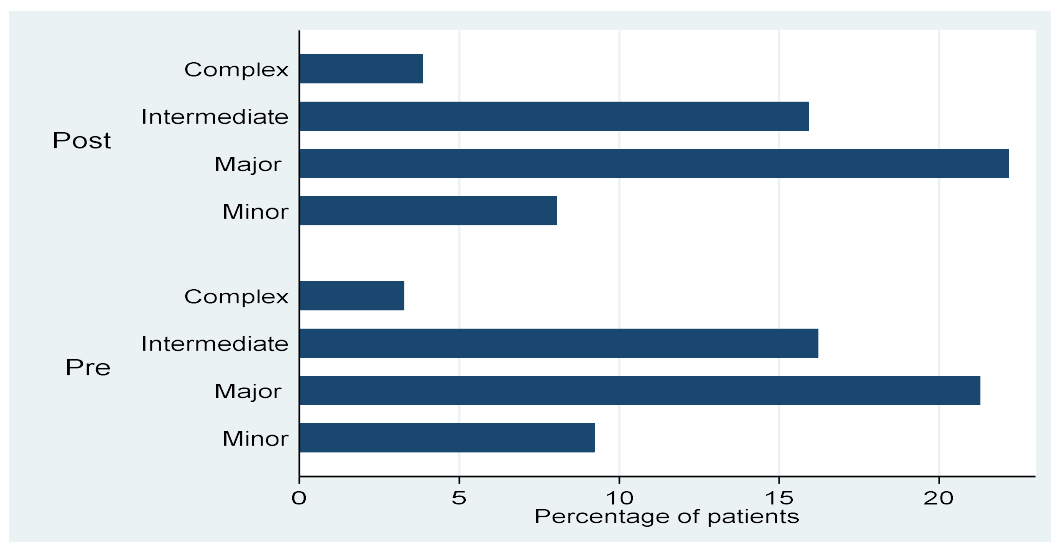


Figure 2: Distribution of Procedure Complexity by Intervention Period

Primary Findings

This study used qualitative and quantitative methods following the Implementation of context adapted non-technical skill (NTS) intervention. changes in NTS among surgical teams and selected perioperative patient safety outcomes were assessed.

At baseline, the overall mean NTS Score was 3.36 ± 0.37 on a five-point scale. Following the implementation of the training intervention, the mean score increased to 3.82 ± 0.34 immediately after training and to 4.04 ± 0.61 at one month. (Table 2)

Table 2: Overall NTS scores by assessment time

Time point	n	Mean	SD	Median	IQR
Pre-training	24	3.36	0.37	3.38	3.13–3.56
Immediate post-training	24	3.82	0.34	3.75	3.63–4.00
One-month follow-up	23	4.04	0.61	3.88	3.75–4.63

Values are descriptive statistics. The linear mixed-effects model used all available repeated observations and accounted for within-participant correlation.

Pairwise analysis and LLM was done to evaluate the NTS was retained, declined and its long-term impact. Comparisons between immediate post-training and pre-training performance showed statically significant (95% CI: 0.161-0.766, $P=0.001$) improvement in competencies with adjusted mean score of 0.464 points. The magnitude of this effect was high with a model-standardized effect size of 1.06 (Table 3)

The one month follow up was also evaluated against the pre-training baseline which showed the participants NTS scores remained significantly higher with an adjusted mean difference of 0.679 points (95% CI: 0.373-0.985, $P<0.001$). The magnitude of this long-term change was remarkably profound, resulting in a model-standardized effect size of 1.55 (Table 3).

While the comparison between the one month follow up and the immediate post training assessment, which was used to assess the skill decay, showed a non-significant adjusted mean difference of 0.215 point (95% CI: -0.091-0.522, $P=0.277$) and a model-standardized effect size of 0.49. This change demonstrated the improvement achieved immediately after training was maintained at one month rather than demonstrating a statistically significant further increase (Table 3).

Table 3: Linear mixed effects model pairwise comparisons of Overall NTS scores

Pairwise comparison	Adjusted mean difference	95% CI	Model-standardized effect	Bonferroni-adjusted p-value
Immediate post-training vs. pre-training	0.464	0.161–0.766	1.06	0.001
One-month follow-up vs. pre-training	0.679	0.373–0.985	1.55	<0.001
One-month follow-up vs. immediate post-training	0.215	–0.091–0.522	0.49	0.277

Model-standardized effect was calculated as the LMM-estimated adjusted mean difference divided by the residual standard deviation from the fitted model (residual SD = 0.438). Pairwise comparisons were adjusted using the Bonferroni method.

Domain-specific findings showed different patterns of improvement. Situational awareness, adaptability, and task management demonstrated significant improvements immediately after training that were sustained at one month (all $p < 0.001$). Decision-making, communication, and teamwork/coordination showed progressive increases, but their immediate post-training comparisons were not statistically significant; significant improvements were evident only at one month compared with baseline ($p = 0.007$, $p = 0.002$, and $p = 0.003$, respectively). Leadership did not show a statistically significant change across the three time points (Wald $\chi^2(2) = 1.62$, $p = 0.444$). Although qualitative findings indicated perceived improvements in shared leadership and speaking up, the quantitative measure did not demonstrate a significant leadership improvement (Table 4).

Table 4: Domain-specific changes in non-technical skill across assessment time points

NTS Domain	Baseline	Immediate Post-training	One-month Follow-up	Overall/Pairwise Statistical Result	Interpretation
Situational awareness	3.08 (2.85–3.31)	3.88 (3.64–4.11)	4.09 (3.85–4.32)	Wald $\chi^2(2) = 43.49$, $p < 0.001$; immediate vs baseline MD=0.79, $p < 0.001$; 1-month vs baseline MD=1.00, $p < 0.001$; 1-month vs immediate MD=0.21, $p = 0.565$	Significant improvement immediately after training, maintained at one month.
Decision-making	3.75 (3.41–4.09)	4.25 (3.91–4.59)	4.50 (4.16–4.84)	Wald $\chi^2(2) = 9.55$, $p = 0.0085$; immediate vs baseline MD=0.50, $p = 0.129$; 1-month vs baseline MD=0.75, $p = 0.007$; 1-month vs immediate MD=0.25, $p = 0.936$	Improvement became statistically significant at one month, but not immediately after training.

Adaptability	3.58 (3.30– 3.87)	4.29 (4.01– 4.58)	4.57 (4.28– 4.86)	Wald $\chi^2(2)=30.77$, p<0.001 ; immediate vs baseline MD=0.71, p<0.001 ; 1-month vs baseline MD=0.99, p<0.001 ; 1-month vs immediate MD=0.28, p=0.380	Significant early improvement, sustained at one month.
Task management	3.36 (3.01– 3.70)	4.14 (3.80– 4.49)	4.25 (3.89– 4.60)	Wald $\chi^2(2)=20.81$, p<0.001 ; immediate vs baseline MD=0.79, p=0.001 ; 1-month vs baseline MD=0.89, p<0.001 ; 1-month vs immediate MD=0.10, p=1.000	Significant improvement immediately after training, maintained at one month.
Communication	2.92 (2.56– 3.27)	3.42 (3.06– 3.77)	3.78 (3.42– 4.15)	Wald $\chi^2(2)=11.29$, p=0.0035 ; immediate vs baseline MD=0.50, p=0.153; 1-month vs baseline MD=0.87, p=0.002 ; 1-month vs immediate MD=0.37, p=0.473	Improvement became statistically significant at one month, but not immediately after training.
Teamwork/coordination	3.21	3.58	4.00	Pairwise: immediate vs baseline MD=0.375, p=0.339; 1-month vs baseline MD=0.796, p=0.003 ; 1-month vs immediate MD=0.421, p=0.236	Improvement became statistically significant at one month, with no significant immediate post-training difference.
Leadership	3.81 (3.45– 4.16)	3.50 (3.15– 3.85)	3.56 (3.20– 3.92)	Wald $\chi^2(2)=1.62$, p=0.444 ; immediate vs baseline MD=-0.31, p=0.686; 1-month vs baseline MD=-0.25, p=1.000; 1-month vs immediate MD=0.06, p=1.000	No statistically significant change across assessment time points.

Note: Values are adjusted model means with 95% confidence intervals where available. Pairwise comparisons are Bonferroni-adjusted. Situational awareness should be interpreted cautiously because the two-item subscale demonstrated poor internal consistency (Cronbach's $\alpha=0.060$; inter-item $r=-0.031$). The exact overall Wald statistic for teamwork/coordination was not retained in the final statistical output available here; therefore, only its final pairwise results are reported.

Patient safety outcomes

The post-intervention period demonstrated substantially lower frequencies of perioperative adverse events, delays in care and communication-related safety events, together with higher patient satisfaction. These findings occurred concurrently with improvements in staff NTS and are directionally consistent with literature linking effective teamwork and communication with safer perioperative care. However, the study design does not permit attribution of these changes solely to the NTS intervention. The absence of a concurrent control group means that secular trends, changes in case mix, staffing, workflow, institutional practices or other unmeasured factors may have contributed to the observed differences. Furthermore, staff NTS and patient outcomes were analyzed at different levels and individual improvements in staff NTS could not be directly linked to individual patient outcomes. The patient findings should therefore be interpreted as important post-intervention associations that warrant further controlled evaluation (Table 5).

Table 5: Comparison of perioperative patient safety outcomes and patient satisfaction before and after the non-technical skill intervention (n= 672)

Patient safety outcome	Pre-intervention (n=336)	Post-intervention (n=336)	Statistical test	P-value
Perioperative adverse event				
yes	40 (11.9%)	6 (1.8%)	$\chi^2 = 26.98$	<0.001
No	296 (88.1%)	330 (98.2%)		
Delay in care				
Yes	54 (16.1%)	18 (5.4%)	$\chi^2 = 20.16$	<0.001
No	282 (83.9%)	318 (94.6%)		
Communication-related safety event				
Yes	13 (3.9%)	1 (0.3%)	$\chi^2 = 10.50$	0.001
No	323 (96.1%)	335 (99.7%)		
Patient satisfaction score				
Mean $\pm$ SD	2.97 $\pm$ 1.44	3.70 $\pm$ 1.29		
Median (IQR)	3 (2–4)*	4 (3–5)*	Mann–Whitney U; z = 6.645	<0.001

QUALITATIVE FINDINGS

Focus group discussions conducted before and one month after the intervention identified four main themes: (1) from fragmented interaction to coordinated teamwork; (2) improved communication and shared awareness through structured practices; (3) greater opportunity for speaking up and shared leadership; and (4) adoption of safety practices despite operational constraints.

Theme 1: From Fragmented Interaction to Coordinated Teamwork

Participants discussed a change from relative division, profession-specific working often focusing on individual responsibility before the intervention to a greater teamwork and collaboration in one month after the intervention. This is corroborated in a FGD by a surgeon pre-intervention as “Most of us focus on our own responsibilities. We work in the same operating room, but not always as one coordinated team.” Participants also identified limited chance for the surgical team to discuss.

However, participants described better teamwork and shared understanding of surgical plans after the intervention. A surgeon reported “We now discuss every case together before incision and everyone understands the plan.” Furthermore, participants described more collaborative environment, with more willingness to raise questions, discuss concern and participate in team discussions. An anesthetist noted “People now actively ask for input from other professions before making decisions.” This suggests a shift in team coordination towards multidisciplinary interaction which is also complemented by the quantitative result demonstrating significant improvement in overall NTS performance and teamwork at one-month follow-up.

Theme 2: Improved Communication and Shared Situational Awareness Through Structured Practices

Before the intervention, communication was described as an important area of difficulty before the intervention. Participants reported limited preoperative briefing, incomplete sharing of information, and communication difficulties. One anesthetist described “There is rarely a structured briefing before surgery, so I sometimes don't know the surgeon's complete plan.”. This difficulty was evident during emergencies, when multiple professionals communicate simultaneous in a more stressful environment. A surgeon reported before the intervention “During emergencies several people speak at the same time, making it difficult to know whose instruction to follow.”

Following the intervention, participants reported improvement in use of structured communication practices, including team briefings, closed-loop communication, and more frequent information sharing suggesting clinically important information was more consistently shared across the team. An anesthetist reported “Everyone now updates each other whenever the patient's condition changes.” The qualitative and quantitative result are consistent showing communication scores increased from baseline to one month, with the one-month score significantly higher than baseline. Situational awareness also demonstrated significant improvement over time. The qualitative accounts provide contextual evidence for these changes by illustrating how information sharing and structured communication were incorporated into operating-room practice.

Nevertheless, participants still reported in maintaining of these behaviors especially in emergencies. One anesthetist noted that although the training was helpful, sustaining the new behaviors during emergencies remained difficult. Similarly, participants reported that busy schedules could lead to parts of the briefing or other communication practices being skipped. Thus, improved communication practices were accompanied by continuing contextual challenges.

Theme 3: Creating Space for Speaking Up and Shared Leadership

Professional hierarchies as mentioned by participants to be barriers to openly communicate and speak up before the intervention especially junior team members hesitate to question senior members even if they recognize problems. An OR nurse describes this reaction as “Sometimes I keep quiet because I don't want to interrupt the surgeon.” Nevertheless, participants recognized the important of creating a setup where any concern could be raised irrespective of professional role.

One month after the intervention, participants described greater confidence in speaking up. An OR nurse reported “I feel much more confident reminding the team if something has been missed.” Participants also described more structured leadership during procedures. A surgeon explained “The team leader now summarizes the surgical plan before every procedure.” These show perceived changes of both psychological safety and leadership practices with team members improved confidence to rise concerns and clearly coordinate surgical plans. These findings, however, are only partially consistent with the quantitative domain result. The quantitative result didn't show statistically significant change in leadership score, although participants clearly showed improvements in leadership practice. This difference may indicate that perceived changes in leadership behavior were not sufficiently consistent or large enough to be detected by the quantitative measure during the study period.

Theme 4: Embedding Safety Practices Despite Operational Constraints

Before the training, participants described the use of WHO surgical safety checklist as only a documentation requirement rather than an active mechanism for team communication. An OR nurse explained “The checklist is

completed, but sometimes just to satisfy documentation requirements.” Participants also identified a broader gap in formal training related to teamwork and communication. An anesthetist noted “We’ve had many technical trainings but almost nothing on teamwork or communication.”

After the intervention, participants described more active communication with the checklist. An OR nurse stated, “The checklist has become a real discussion rather than simply reading the form.” The shift in checklist use towards an opportunity for communication and team discussion is also observed in the quantitative result where improvement is observed in task management, teamwork/coordination, and communication.

However, participants recognize constraints like emergency surgery where there is limited time to implement structured communication and collaborated by one surgeon stating, “Emergency surgeries remain difficult because there is little time for structured communication.” Additionally, workloads are barriers for implementation of NTS practices specially in demanding clinical schedules and environments. Despite these challenges, participants emphasized the implementation and embedding of NTS practices and trainings in everyday clinical practice as an important to improve patient safety. One OR nurse recommended “The training should become part of orientation for all new staff.” Similarly, a surgeon suggested “Regular refresher sessions would help maintain these new behaviors.”

The qualitative and quantitative findings show consistence. Overall, the NTS score increases 3.36 at baseline to 3.82 after the intervention and to 4.04 after one month. This matches the description of teamwork, clearer communication, greater situational awareness, smoother coordination and more participants from different discipline. Leadership has become indistinct and multidisciplinary team has felt more confident speaking up yet the quantitative leadership scores did not change significantly.

An important area of divergence emerged for leadership. Quantitatively, leadership scores did not change significantly across the three assessment points. However, qualitative findings suggested greater shared participation, clearer communication of team plans and increased confidence among participants to raise concerns. This apparent discordance may indicate that changes in relational or shared leadership behaviors were experienced by participants but were not adequately captured by the quantitative measure or were insufficient in magnitude to produce a statistically detectable change within the small staff sample. Rather than representing contradictory findings, the two data sources provide complementary perspectives on how leadership behaviors may have evolved following the intervention.

The descriptive data also explained NTS training has improved task management, adaptability and decision-making skills and why there were lower adverse events and delays and higher patient satisfaction. Still staff NTS measures could not be directly linked to outcomes for patients, so these results show a consistent pattern, across all data sources.

Table 6: Adjusted odds ratios for selected perioperative patient outcomes following the intervention (N = 672)

Patient outcome	Comparison / factor	Crude OR	p-value	Adjusted OR	95% CI	p-value
Perioperative adverse event	Post-intervention vs pre-intervention	0.13	0.13	0.13	0.06–0.32	<0.001
	Age, years	1.01	1.00	1.00	0.99–1.02	0.859
	ASA III–V vs I–II	0.97	0.943	1.08	0.43–2.74	0.867
	Intermediate vs minor procedure	1.67	0.293	1.78	0.67–4.69	0.245
	Major/complex vs minor procedure	1.27	0.616	1.36	0.52–3.54	0.526

Delay in care	Post-intervention vs pre-intervention	0.30	<0.001	0.29	0.17–0.52	<0.001
	GYNI vs general surgery	0.16	0.076	0.15	0.02–1.09	0.060
	NEURO vs general surgery	0.34	0.075	0.33	0.10–1.09	0.069
	OBS vs general surgery	2.04	0.049	1.81	0.88–3.74	0.108
	ORTHO vs general surgery	0.88	0.709	0.89	0.44–1.81	0.751
Communication-related event	Post-intervention vs pre-intervention	0.07†	0.012	-	-	-
Patient satisfaction	Post-intervention vs pre-intervention	2.54	<0.001	2.60	1.97–3.43	<0.001
	Spinal vs general anesthesia	1.18	0.257	1.18	0.89–1.58	0.250
	Other vs general anesthesia	0.64	0.049	0.59	0.38–0.92	0.020

Reference categories: pre-intervention period; ASA I–II; minor procedure; general surgery; and general anesthesia. There were only 14 communication events, an adjusted multivariable model was not fitted.

Table 7: Joint Display of Quantitative and Qualitative Findings

DISCUSSION

Study finding/construct	Quantitative findings	Qualitative findings	Integrated interpretation
Overall NTS	NTS increased significantly over time	Greater coordination and teamwork were described after training	Convergence: qualitative findings support the observed improvement in NTS
Communication	Communication improved, particularly at 1-month follow-up	Increased use of closed-loop communication and information sharing	Convergence: structured communication practices may explain the quantitative improvement
Situational awareness	Significant improvement from baseline	More frequent sharing of patient-condition changes	Convergence: improved information sharing supports improved situational awareness
Teamwork/coordination	Significant improvement at 1 month	Greater cooperation, mutual respect, and multidisciplinary input	Convergence: qualitative findings reinforce quantitative improvement
Decision-making	Significant overall time effect and improvement at 1 month	Greater participation of different professional groups	Convergence: qualitative findings help explain

			improved decision-making
Adaptability	Significant improvement	Better coordination, but emergency situations remained challenging	Convergence with qualification: improvement occurred, but context affected implementation
Task management	Significant improvement	More structured planning and active checklist discussions	Convergence: qualitative evidence explains the behavioral changes underlying improvement
Leadership	No statistically significant quantitative improvement	Participants described clearer leadership and team-leader roles	Discordance/partial convergence: qualitative improvement was not detected quantitatively
Patient safety	Adverse events and delays decreased significantly after intervention	Better communication, teamwork, speaking up and safety practices	Complementarity: qualitative findings provide a plausible mechanism for the observed patient improvements
Sustainability	—	Need for orientation, refresher training, and organizational support	Expansion: qualitative findings identify conditions needed to sustain quantitative improvements

This mixed-methods quality-improvement study evaluated changes in non-technical skills among multidisciplinary operating-room professionals following a context-adapted NTS training intervention and examined concurrent changes in selected perioperative patient safety outcomes. Three principal findings emerged. First, overall NTS scores improved significantly immediately after training and remained significantly above baseline at one month. Second, improvement varied across individual NTS domains, with some competencies demonstrating immediate change and others becoming evident at one-month follow-up, while leadership showed no statistically significant quantitative change. Third, the post-intervention period was associated with fewer adverse events, delays in care and communication-related safety events and with higher patient satisfaction. Qualitative findings largely complemented these results by describing improvements in teamwork, structured communication, shared situational awareness and speaking up, while also identifying workload, emergency pressures and hierarchy as continuing barriers to implementation.

Changes in overall non-technical skills

The overall NTS score increased from 3.36 at baseline to 3.82 immediately after training and 4.04 at one month. The mixed-effects model showed a significant increase of 0.464 points immediately after training and 0.679 points at one month compared with baseline. The corresponding model-standardized effects were 1.06 and 1.55, respectively. The difference between immediate post-training and one-month follow-up was not statistically significant, suggesting that

the improvement achieved immediately after training was maintained rather than showing evidence of further statistically significant change.

This finding is consistent with previous literature showing that structured NTS interventions can improve teamwork and other NTS among healthcare professionals. Perioperative studies also found use of TeamSTEPPS-based interventions have improved adherence to briefings, debriefings, communication practices, and other safety processes (13, 14). This study expands on these findings to a multidisciplinary operating-room team in an Ethiopian teaching hospital, a setting where formal NTS training has been less extensively evaluated.

The number and consistency of the observed improvement are also important to the research gap identified. Previous studies had frequently relied on self-reported attitudes or single follow up, making it difficult to determine sustainability of NTS. In this study, the one-month assessment remained substantially higher than baseline, providing some evidence of short-term retention. This is relevant because previous literature has warned that gains in team behavior may decline when training is not reinforced over time (15).

The persistence of improvement may partly reflect the practical structure of the intervention. The training used interactive workshops, scenario-based learning, simulation-oriented activities, briefing and debriefing, closed-loop communication, and coaching. These methods allowed participants to practice behaviors rather than only receive information. The qualitative findings support this interpretation: participants described increased use of team briefings, closed-loop communication, sharing of changes in patient condition, and greater involvement of different professional groups in decision-making. Thus, the quantitative increase in NTS scores was accompanied by reports of changes in actual team interaction.

Domain-specific changes in NTS

Situational awareness, adaptability, and task management showed significant improvements immediately after training and remained improved at one month. These findings are consistent with the literature describing the importance of situational awareness and adaptability in the operating room, where teams must respond to changing patient conditions, equipment problems, workload, and unexpected events (16, 17). Previous observational studies have also linked poor situational awareness with avoidable intraoperative incidents (18, 19). However, these studies were observational not intervention studies.

The mixed-methods study of 167 cases provides another useful comparison because it linked higher NOTSS performance and intraoperative communication practices with efficient case turnover and first-case-on-time starts (6). Unlike the current study, this study examines the relationship between observed team skills and workflow outcome. The present study instead measures changes over time following an intervention, the cross-section of these results suggests communication, situational awareness, teamwork, and task management are relevant to perioperative functioning, although the available evidence comes from different methodological designs.

The intervention used in this study shares important components with TeamSTEPPS-based training, particularly structured briefing and debriefing, closed-loop communication, shared mental models, and team-based problem solving (6). Previous TeamSTEPPS implementation studies have reported improvements in teamwork processes and, in some settings, patient safety outcomes (13). However, these studies differ from the present study in intervention intensity, implementation period, organizational resources, and outcome measurement.

In addition, a TeamSTEPPS implementation study reported improvement in perioperative mortality, unplanned reoperation, and low-risk mortality (18). These findings provide an important clinical comparison, but they should be interpreted alongside the differences in study design and implementation scale. System-level implementation programs may influence multiple processes simultaneously, including communication, teamwork, checklist use, leadership, and organizational safety practices. The present study was conducted at a single hospital and therefore provides more limited evidence about the independent contribution of NTS training to patient outcomes.

Patient safety outcomes: comparison with clinical evidence.

The reduction in adverse events, delays, and communication-related safety events after the intervention is clinically important and is consistent with the direction of evidence from studies linking effective NTS with safer perioperative

care. The patient-level analysis showed substantially fewer adverse events and delays in the post-intervention period, and regression analysis remained consistent with lower odds of adverse events and delays after adjustment for measured patient and procedural factors. Nevertheless, the absence of a concurrent control group means that other temporal changes cannot be completely excluded. The communication-related outcome should also be interpreted cautiously because only 14 events were recorded, preventing a stable adjusted model.

These results are different from a previous study that looked at NTS interventions, which didn't find clear improvements in key patient results (21). The difference might be because of how outcomes were defined, how the programs were set up, how many people were studied, where the care was given, and which results were checked. This study looked at certain problems that happened during perioperative period, communication issues, and patient satisfaction in one hospital, not at things like mortality, returning to the hospital, or how long patients stayed, which were looked at in other studies. So, these results shouldn't be taken as proof that NTS training always lowers the risk of surgery complications.

The qualitative findings help explain the changes. Before the training, people talked about teamwork mainly focusing on each person's own job, with not much teamwork across different professions. One month after the training, they said there was more teamwork during planning, more use of clear communication that goes both ways, more sharing about how patients were doing, and more confidence in speaking up about problems in the perioperative period. These results match with the improvements seen in the overall teamwork skills, especially in talking with each other, working together, knowing what's happening around them, and managing tasks.

At the same time, the qualitative results also showed ongoing challenges, like heavy workloads, emergency situations, time pressure, and a strict hierarchy. These findings are important because they show that training alone isn't enough, it depends on the work environment. The training can improve knowledge and awareness of good teamwork, but keeping these changes needs support from leaders, chances to speak up, ongoing encouragement, and a workplace that lets staff practice these skills.

So, the results should be seen as supporting each other rather than just agreeing with earlier studies. Observational studies show that good teamwork is linked to safer surgery; intervention studies show that training can change team behavior; and this study adds to that by showing that a training program tailored to the local setting can improve teamwork skills quickly in an Ethiopian hospital and also improve some safety measures. However, the effects on patient safety are still linked, not proven, because there wasn't a group that didn't get the training to compare with.

IMPLICATIONS / RECOMMENDATIONS

The findings suggest that NTS training can strengthen perioperative communication, teamwork, situational awareness, coordination, and decision-making. Structured briefings, closed-loop communication, shared patient updates, debriefings, and meaningful use of the surgical safety checklist should be integrated into routine operating-room practice. NTS should also be incorporated into staff orientation, simulation-based learning, and continuing professional development, with regular refresher training. Hospital leadership should promote psychological safety and multidisciplinary participation while addressing workload, emergency pressures, and hierarchical barriers. These practices should be integrated into existing patient-safety and quality-improvement systems rather than treated as isolated training activities.

Future research should use larger samples, longer follow-up, and multicenter or controlled designs where feasible to assess the sustainability of NTS improvements and their association with patient safety outcomes. Further studies in Ethiopian healthcare settings could help determine how NTS interventions can be adapted, implemented, and sustained across different hospitals and resource contexts.

LIMITATIONS

This study has several limitations. First, it used a single-Centre quasi-experimental pre-post design without a concurrent control group. Consequently, changes observed during the post-intervention period cannot be attributed

exclusively to the NTS training, as temporal, organizational or other unmeasured factors may have contributed. Second, the staff component included only 24 multidisciplinary operating-room professionals. Although this represented the available eligible workforce and retention was high, the small sample limits statistical precision, subgroup analyses and generalizability beyond the study setting.

Third, follow-up was limited to one month. The study therefore provides evidence of short-term retention but cannot determine whether improvements in NTS would persist over longer periods without reinforcement or refresher training. Fourth, the adapted NTS instrument demonstrated acceptable overall internal consistency, but the two-item Situational Awareness subscale showed poor reliability. Findings for this individual domain should therefore be interpreted cautiously. Fifth, the NTS assessment relied on participant-reported ratings and may therefore have been susceptible to response or social-desirability bias following training.

Sixth, although patient outcomes improved during the post-intervention period, residual confounding cannot be excluded despite adjustment for selected patient and procedural characteristics. Staff NTS measurements and patient outcomes were also collected at different analytical levels, preventing direct linkage of an individual staff member's NTS improvement with outcomes in individual patients. Finally, the qualitative findings reflect participants' experiences within a single institutional and cultural setting. Although they provide important contextual explanation of the quantitative findings, their transferability to other hospitals and surgical systems requires further evaluation.

CONCLUSION

Context-adapted NTS training was associated with significant improvement in overall non-technical skills among multidisciplinary operating-room professionals at Hakim Gezaw Teaching Hospital, with improvements maintained at one-month follow-up. Patterns of change differed across individual NTS domains, while qualitative findings provided complementary evidence of improved teamwork, structured communication, shared situational awareness, coordination and confidence in speaking up.

The post-intervention period was also associated with fewer perioperative adverse events, delays in care and communication-related safety events and with higher patient satisfaction. However, given the uncontrolled pre-post design, these patient-level changes cannot be attributed causally to the intervention.

The findings support the feasibility and potential value of context-adapted multidisciplinary NTS training within this perioperative environment. Sustaining these improvements is likely to require integration of NTS practices into routine operating-room systems, periodic reinforcement, supportive leadership and an organizational culture that promotes multidisciplinary communication and psychological safety. Larger controlled multicenter studies with longer follow-up are required to determine sustainability and establish the relationship between NTS improvement and patient outcomes more robustly.

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ETHICAL APPROVAL

Ethical approval was obtained from the Institutional Review Board of Asrat Woldeyes Health Science Campus (approval reference AWHSC-IRB-447) on 17 March 2026. Written informed consent was obtained from participating surgical team members and patients, as applicable. Participation was voluntary, and confidentiality was maintained throughout the study. Direct identifiers were removed during data collection, and participants were assigned unique study codes. All study data were securely stored on password-protected devices and accessed only by the research team.

DECLARATIONS

Conflict Of Interests

The authors declare no conflicts of interest relevant to the content of this manuscript.

Use of Artificial Intelligence

During manuscript preparation, the authors used ChatGPT (OpenAI), Consensus, and Gemini (Google) for drafting, language editing, restructuring, formatting, literature organization, and reference formatting. These tools were not used to collect, generate, analyze, or interpret study data or results. All data, analyses, findings, and scientific interpretations are the authors' own. The authors reviewed and verified all AI-assisted content and take full responsibility for the final manuscript.

Author Contributions (Credit)

Melkam Mulugeta Abebe: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Project administration, Writing – original draft.

Prof. Adebisola Adenike Owokole: Supervision, Methodology, Writing - review & editing.

Tadele Mesfine Demelash: Investigation, Resources, Writing - review & editing.

Brook Ameha Kebede: Investigation, Data curation.

Molla Amsalu Tadesse: Investigation, Writing - review & editing.

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REFERENCES

1. Mohammadi M, Omid A, Tarrahi MJ, Ghadami A. The impact of intraoperative non-technical skills training on scrub practitioners' self-efficacy: a randomized controlled trial. *BMC Medical Education*. 2025;25(1):670.
2. Duclos A, Frits ML, Iannaccone C, Lipsitz SR, Cooper Z, Weissman JS, et al. Safety of inpatient care in surgical settings: cohort study. *bmj*. 2024;387.
3. Alexandrino H, Martinho B, Ferreira L, Baptista S. Non-technical skills and teamwork in trauma: from the emergency department to the operating room. *Front Med (Lausanne)*. 2023;10:1319990.
4. Mathis MR, Janda AM, Yule SJ, Dias RD, Likosky DS, Pagani FD, et al. Nontechnical Skills for Intraoperative Team Members. *Anesthesiol Clin*. 2023;41(4):803-18.
5. Pradarelli JC, Gupta A, Lipsitz S, Blair PG, Sachdeva AK, Smink DS, et al. Assessment of the Non-Technical Skills for Surgeons (NOTSS) framework in the USA. *Br J Surg*. 2020;107(9):1137-44.
6. Kerray FM, Abahuje E, Tambyraja AL, Yule SJ. We asked the experts: The evolving role of non-technical skills for surgery in low- and middle-income countries. *World J Surg*. 2024;48(2):316-9.
7. Robertson JM, Dias RD, Yule S, Smink DS. Operating Room Team Training with Simulation: A Systematic Review. *J Laparoendosc Adv Surg Tech A*. 2017;27(5):475-80.
8. Alayande BT, Forbes C, Kingpriest P, Adejumo A, Williams W, Wina F, et al. Non-technical skills training for Nigerian interprofessional surgical teams: a cross-sectional survey. *BMC Med Educ*. 2024;24(1):547.
9. Achanga BA, Bisimwa CW, Femi-Lawal VO, Akwo NS, Toh TF. Surgical Practice in Resource-Limited Settings: Perspectives of Medical Students and Early Career Doctors: A Narrative Review. *Health Sci Rep*. 2025;8(1):e70352.
10. Ounounou E, Aydin A, Brunckhorst O, Khan MS, Dasgupta P, Ahmed K. Nontechnical Skills in Surgery: A Systematic Review of Current Training Modalities. *J Surg Educ*. 2019;76(1):14-24.
11. Abahuje E, Bartuska A, Dias RD, Muneza E, Sibomana I, Williams W, et al. Learning NOTSS While Tying Knots: Integrating the Nontechnical Skills for Surgeons Course With Technical Surgical Skills Training, A Mixed Methods Study. *Ann Surg Open*. 2022;3(1):e133.

12. Pimenta I, Mata Á NS, Bezerra INM, de Araújo RMP, Santana JLA, Capucho HC, et al. Effectiveness of non-technical skills training in intensive care units: a systematic review. *BMC Med Educ.* 2025;25(1):847.
13. Rhee AJ, Valentin-Salgado Y, Eshak D, Feldman D, Kischak P, Reich DL, et al. Team Training in the Perioperative Arena: A Methodology for Implementation and Auditing Behavior. *Am J Med Qual.* 2017;32(4):369-75.
14. Abahuje E, Cong L, Nguyen M, Iroz CB, Stey A, Johnson JK, et al. Relationship Between Surgeon Nontechnical Skills and Operating Team Efficiency: A Mixed-Methods Study. *J Am Coll Surg.* 2026;242(2):379-88.
15. Armour Forse R, Bramble JD, McQuillan R. Team training can improve operating room performance. *Surgery.* 2011;150(4):771-8.
16. Reato F, Ivziku D, Lommi M, Bresil A, Andreotti A, D'Angelo C, et al. Transversal Competencies in Operating Room Nurses: A Hierarchical Task Analysis. *Nurs Rep.* 2025;15(6).
17. Mahendran V, Turpin L, Boal M, Francis NK. Assessment and application of non-technical skills in robotic-assisted surgery: a systematic review. *Surg Endosc.* 2024;38(4):1758-74.
18. Siu J, Maran N, Paterson-Brown S. Observation of behavioural markers of non-technical skills in the operating room and their relationship to intra-operative incidents. *Surgeon.* 2016;14(3):119-28.
19. Catchpole K, Mishra A, Handa A, McCulloch P. Teamwork and error in the operating room: analysis of skills and roles. *Ann Surg.* 2008;247(4):699-706.
20. Norton J, Janda AM, Howie E, Pohl N, Abahuje E, Harrington SD, et al. Impact of surgical non-technical skills on clinical outcomes: systematic review. *Br J Surg.* 2025;113(1).
21. Muhammad I, Valiyakathu M, Raison N. 1146 The Impact of Non-Technical Skills Training on Patient Outcomes in Surgery: A Systematic Review and Meta Analysis. *BJS.* 2026;113(Supplement_6).

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