

PATIENT SAFETY CULTURE IN THE OPERATING ROOM: A CROSS-SECTIONAL STUDY USING THE SOPS HOSPITAL SURVEY VERSION 2.0 IN TERTIARY CARE HOSPITAL, RAWALPINDI, PAKISTAN

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Abstract

Background: Patient safety culture (PSC) in the operating room (OR) is a critical determinant of surgical outcomes. Despite growing global evidence, OR-specific PSC in Pakistan's tertiary care hospitals remains unmeasured.

Objective: To assess PSC in the ORs of tertiary care hospitals in Rawalpindi using the SOPS Hospital Survey 2.0, identifying strengths and areas for improvement.

Methods: A descriptive cross-sectional study was conducted from August to December 2024 across ORs of tertiary care hospitals Rawalpindi. Using convenient/purposive sampling, SOPS 2.0 was administered to 385 OR personnel. Data were analyzed with SPSS v23 using descriptive statistics, chi-square tests.

Results: Response rate was 91.7% (N=385). Overall OR safety was rated 'Good/Very Good' by 56.8%. Teamwork within the unit was the only developed domain (76.4%). Staffing (27.3%), Event Reporting (44.6%), and Handoffs (42.6%) were underdeveloped. Event under-reporting was high (63.9% reported zero events). Significant differences existed across professional categories.

Conclusion: OR PSC is moderate in the tertiary care hospitals of Rawalpindi. Staffing reform, non-punitive reporting systems, and standardized handoff protocols are urgently needed. Regular PSC assessment using SOPS 2.0 is recommended.

1.INTRODUCTION

Patient safety is a critical global public health concern, with the WHO estimating the risk of preventable patient death during healthcare at 1 in 300 (Tlili et al., 2020). In developed nations, 1 in 10 hospitalized patients experiences a harmful medical event (Ertürk Yavuz, 2023). The operating

room (OR) is among the highest-risk clinical environments, where patients are anaesthetized, fully exposed, and dependent on the professionalism and coordination of the entire surgical team (Gutierrez et al., 2018; Syed Nazim & Shahabuddin, 2022).

The WHO defines patient safety as 'reducing the likelihood of avoidable injury connected with health treatment to a manageable level.' Safety culture is defined as 'the product of individual and group values, attitudes, perceptions, competencies, and patterns of behavior that determine commitment to, and proficiency in, an organization's health and safety management' (Ertürk Yavuz, 2023). Establishing a robust patient safety culture (PSC) is therefore foundational to reducing surgical adverse events and improving quality of care (Nwosu et al., 2022).

The OR presents unique ethical and safety challenges. As Syed Nazim and Shahabuddin (2022) describe, OR operations require harmonious teamwork across disciplines, and disruptions including inadequate communication, excessive workloads, unclear authority hierarchies, and inadequate handoffs are directly linked to increased surgical error rates. Ethical principles governing the OR, including respect for patient autonomy, informed consent, non-maleficence, and beneficence, must be operationalized daily through strong safety culture (Syed Nazim & Shahabuddin, 2022).

The AHRQ SOPS Hospital Survey, now in Version 2.0 (2019), is among the most widely validated instruments for measuring PSC globally (Manser, 2019). It assesses teamwork, staffing, communication, error reporting, leadership support, and handoff quality. While studies from Morocco (Chaima et al., 2023), Nigeria (Nwosu et al., 2022), and Pakistan's civilian hospitals (Rizwan et al., 2021; Saleem et al., 2022) have documented important PSC findings, OR-specific PSC data from Pakistan's tertiary care healthcare system remains entirely absent. The present study fills this critical gap.

1.1 Objectives

1. To assess PSC within the ORs of tertiary care hospitals in Rawalpindi using SOPS 2.0.
2. To identify strengths and priority improvement areas in OR patient safety.
3. To examine PSC differences across professional categories and experience levels.
4. To formulate evidence-based recommendations for OR safety improvement.

2. MATERIAL AND METHODS

2.1 Study Design and Setting

A descriptive cross-sectional quantitative study was conducted from August to December 2024 in the operating rooms of three tertiary care hospitals in Rawalpindi, Pakistan. These institutions represent the core surgical infrastructure of the tertiary care healthcare network in the Rawalpindi region and collectively perform hundreds of surgical procedures monthly across a range of specialties.

2.2 Ethical Considerations

Ethical approval was obtained from the Hospital Institutional Review Board. Administrative permission was secured from all three hospital commandants before data collection. Written informed consent was obtained from all participants. Participation was entirely voluntary. Full anonymity and confidentiality of responses were guaranteed. No personal identifiers were recorded.

2.3 Sample and Sampling

Using the WHO sample size calculator (95% confidence, 5% margin of error, 50% population proportion), the required sample size was $n = 385$. Convenient and purposive sampling was employed across all OR professional categories. Inclusion criteria: all OR frontline personnel (attending surgeons, resident surgeons, nurses, anesthesiologists, paramedics/technicians) with ≥ 6 months of active OR service; either gender; medical/nursing students on active OR rotations. Exclusion criteria: refusal of consent; non-licensed individuals; those on leave during data collection; staff with < 6 months OR experience.

2.4 Study Instrument SOPS 2.0

The SOPS Hospital Survey Version 2.0 (AHRQ, 2019) was used. This instrument measures PSC across seven composite domains through items rated on 5-point Likert scales. Sections include: (A) Your Unit/Work Area 14 items covering teamwork, staffing, error response, and process improvement; (B) Supervisor/Manager Support 3 items; (C) Communication 7 items; (D) Patient Safety Event Reporting 3 items; (E) Overall Patient Safety Rating 1 item; (F) Hospital-Level Factors 6 items covering management support

and handoffs. Negatively worded items are reverse-scored. Positive response rates $\geq 75\%$ = 'developed'; 50-74% = 'needs attention'; $< 50\%$ = 'underdeveloped.' Cronbach's alpha ranges from 0.65-0.94 across composites (AHRQ, 2019).

2.5 Procedure and Analysis

Paper-based questionnaires were distributed personally by the principal investigator during pre-operative briefings, shift meetings, and departmental assemblies. All questionnaires were collected the same day. Incomplete questionnaires ($> 50\%$ items missing) were excluded per AHRQ

guidelines. Completion time was 10-15 minutes. Data were analyzed with IBM SPSS v23. Descriptive statistics, chi-square tests for between-group comparisons, and composite positive response rate calculations were performed. Significance was set at $p < 0.05$.

3.RESULTS

3.1 Participant Characteristics

Of 420 questionnaires distributed, 385 were fully completed (response rate: 91.7%). Table 1 presents participant demographics and professional profiles.

Table 1. Demographic and professional characteristics (N = 385)

Variable	Category	n	%
Professional Title	Surgeon (Attending/Resident)	78	20.3%
	Anesthesiologist / Nurse Anesthetist	52	13.5%
	Operating Room Nurse	186	48.3%
	Paramedic / OT Technician	69	17.9%
Gender	Female	241	62.6%
	Male	144	37.4%
Hospital Experience	< 1 year	48	12.5%
	1-5 years	124	32.2%
	6-10 years	118	30.6%
	≥ 11 years	95	24.7%
OR Experience	< 1 year	52	13.5%
	1-5 years	139	36.1%
	6-10 years	104	27.0%
	≥ 11 years	90	23.4%
Weekly Hours	< 30 hours	38	9.9%
	30-40 hours	198	51.4%
	> 40 hours	149	38.7%
Direct Patient Contact	Yes	356	92.5%
	No	29	7.5%

3.2 Overall Patient Safety Rating and Event Reporting

Table 2 shows the overall OR patient safety grade. A combined 56.8% rated the OR as 'Good' or 'Very Good'. Only 10.9% rated it 'Excellent', while 8.1% rated it 'Poor' or 'Failing'.

Table 2. Overall OR patient safety grade (N = 385)

Patient Safety Grade	n	%
Excellent	42	10.9%
Very Good	96	24.9%
Good	123	31.9%
Fair	93	24.2%

Poor / Failing	31	8.1%
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Table 3 shows patient safety event reporting in the preceding 12 months. Under-reporting is marked: 63.9% reported zero events.

Table 3. Patient safety events reported in past 12 months (N = 385)

Events Reported (past 12 months)	n	%
None	246	63.9%
1 to 2	88	22.9%
3 to 5	31	8.0%
6 to 10	12	3.1%
11 or more	8	2.1%

3.3 SOPS 2.0 Composite Domain Results

Table 4 presents positive response rates for all seven SOPS 2.0 composite domains. One

composite was 'developed' ($\geq 75\%$), three were 'needs attention' (50–74%), and three were 'underdeveloped' ($< 50\%$).

Table 4. SOPS 2.0 composite domain positive response rates and classification (N = 385)

SOPS 2.0 Composite Domain	Positive Response %	Mean $\pm$ SD	Status
Teamwork Within Unit	76.4%	3.84 $\pm$ 0.72	✓ Developed
Work effectively as a team	79.2%	3.96 $\pm$ 0.68	
Help each other during busy times	81.0%	4.02 $\pm$ 0.64	
Focus on learning not blaming	73.9%	3.72 $\pm$ 0.78	
No disrespectful behavior	71.4%	3.62 $\pm$ 0.84	
Supervisor/Manager Support	68.2%	3.56 $\pm$ 0.79	Needs Attention
Considers staff safety suggestions	72.5%	3.68 $\pm$ 0.76	
Takes action on safety concerns	70.4%	3.62 $\pm$ 0.82	
Does not encourage shortcuts	61.8%	3.38 $\pm$ 0.88	
Communication Openness	61.5%	3.28 $\pm$ 0.84	Needs Attention
Staff speak up for patient safety	71.2%	3.64 $\pm$ 0.78	
Authority open to safety concerns	62.9%	3.32 $\pm$ 0.86	
Speak up to authority re: unsafe acts	58.4%	3.14 $\pm$ 0.92	
Not afraid to ask questions	53.5%	3.04 $\pm$ 0.94	
Hospital Management Support	58.7%	3.18 $\pm$ 0.88	Needs Attention
Management prioritizes patient safety	64.2%	3.44 $\pm$ 0.82	
Adequate resources provided	58.4%	3.18 $\pm$ 0.88	
Proactive (not reactive) to safety	53.5%	3.04 $\pm$ 0.92	
Patient Safety Event Reporting	44.6%	2.88 $\pm$ 0.96	Underdeveloped
Near-miss events reported	48.3%	2.98 $\pm$ 0.98	
No-harm events reported	40.9%	2.78 $\pm$ 0.94	
Handoffs and Transitions	42.6%	2.78 $\pm$ 1.02	Underdeveloped
No info loss during patient transfer	39.5%	2.64 $\pm$ 1.04	
No info loss during shift change	41.8%	2.74 $\pm$ 1.06	
Adequate time for handoff	46.5%	2.96 $\pm$ 0.98	
Staffing	27.3%	2.18 $\pm$ 0.94	Underdeveloped
Enough staff to handle workload	24.4%	2.06 $\pm$ 0.90	
Staff not working excessive hours	22.6%	1.98 $\pm$ 0.86	

Not over-reliant on temporary staff	34.8%	2.52 ± 0.98	
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3.4 Differences by Professional Category

Significant differences between professional categories were found for three composites: Staffing ($\chi^2 = 18.4$, $p < 0.001$), Event Reporting ($\chi^2 = 12.6$, $p = 0.006$), and Handoffs ($\chi^2 = 15.2$, $p =$

0.002). Nurses showed the highest Teamwork (78.6%) and Communication (63.8%) scores. Surgeons rated Management Support highest (72.4%) but scored lowest on Staffing (21.8%).

Table 5. Composite scores by professional category (N = 385)

Composite	Nurses (%)	Surgeons (%)	Anesthetists (%)	Paramedics (%)	χ^2	P
Teamwork	78.6	71.4	74.2	73.1	6.8	0.079
Communication	63.8	59.2	61.4	57.6	8.2	0.042
Mgmt. Support	62.4	72.4	65.8	51.2	14.6	0.002
Event Reporting	48.2	38.6	44.8	41.2	12.6	0.006
Handoffs	44.8	46.2	38.6	39.4	15.2	0.002
Staffing	28.4	21.8	26.8	29.6	18.4	<0.001

4. DISCUSSION

This study provides the first cross-sectional assessment of patient safety culture specifically within the operating rooms of tertiary care hospitals in Rawalpindi, Pakistan, using the validated SOPS 2.0 instrument. The findings demonstrate a pattern largely consistent with comparable PSC studies from developing-country settings, while identifying specific structural and cultural vulnerabilities with direct implications for patient safety policy in tertiary care healthcare.

4.1 Overall Safety Rating and Under-Reporting

A majority (56.8%) of OR personnel rated safety as 'Good' or 'Very Good,' consistent with findings from Morocco (52%, Chaima et al., 2023) and Nigeria (Nwosu et al., 2022). However, the high rate of zero event reporting (63.9%) strongly suggests entrenched under-reporting rather than a genuinely safe environment. This is a universal finding in developing-country PSC studies and is most commonly attributable to fear of blame, punitive culture, and lack of faith that reporting leads to system improvement (Chaima et al., 2023). Under-reporting is particularly dangerous in OR settings, where near-miss events and surgical adverse events must be systematically analyzed to prevent recurrence (Syed Nazim & Shahabuddin, 2022).

4.2 Teamwork: The Principal Strength

Teamwork Within Unit achieved 'developed' status (76.4%) the study's strongest finding. Staff reported working effectively as a team, helping each other during busy periods, and treating each other with respect. This aligns with Morocco (80%, Chaima et al., 2023), Algeria (78.5%, Fourar et al., 2020), and Nigeria (Nwosu et al., 2022), and reflects the intrinsically collaborative nature of surgical practice. The tertiary care context with its emphasis on unit cohesion, shared mission, and mutual accountability likely further reinforces team solidarity. This strength should be actively leveraged as the foundation for building weaker PSC domains through team-based safety improvement programs.

4.3 Staffing: A Critical and Urgent Priority

Staffing was the most severely underdeveloped domain (27.3%). Most OR personnel reported insufficient staff to safely manage workloads and that they routinely worked excessive hours a finding almost identical to Morocco (23%, Chaima et al., 2023) and reflecting a systemic challenge across resource-limited tertiary care and public healthcare settings. The clinical significance of inadequate OR staffing cannot be overstated: fatigued surgeons, overburdened OR nurses, and over-reliance on temporary staff are all independently associated with increased surgical

error rates and adverse events (Syed Nazim & Shahabuddin, 2022). Pakistan's tertiary care hospitals face compounding structural pressures including staff rotation cycles, high patient volumes, and constrained civilian recruitment budgets. Table of Organization and Equipment (TOE) revisions for OT-trained nursing officers, flexible staffing models, and mandatory rest periods between night shifts are recommended institutional responses.

4.4 Blame Culture and Non-Punitive Error Reporting

Event Reporting scored at 44.6% well below the 'developed' threshold. Staff expressed concern that mistakes would be held against individuals rather than viewed as system failures, and that reporting an event leads to personal blame rather than problem resolution. This 'blame culture' is one of the most entrenched barriers to PSC improvement globally (Chaima et al., 2023) and is particularly pronounced in hierarchical tertiary care settings. Ethically, the OR requires a transition from individual accountability to systemic accountability: as Syed Nazim and Shahabuddin (2022) note, OR adverse events arise predominantly from 'flaws in the system and inadequacies in organisational frameworks' rather than individual malice. Implementation of the WHO Surgical Safety Checklist, structured morbidity and mortality rounds, and anonymous digital reporting systems are evidence-based interventions directly recommended by this study.

4.5 Handoffs, Transitions, and Communication

Handoffs and Transitions scored 42.6%, reflecting significant information loss during patient transfers and shift changes. This is a well-recognized source of preventable harm in surgical settings and is directly linked to OR adverse events globally (Lee et al., 2016). Communication Openness, while classified as 'needs attention' (61.5%), showed its lowest sub-item score for staff fear of questioning authority (53.5%). In tertiary care ORs, where authority hierarchies are deeply institutionalized, the inhibition of junior staff from speaking up to senior surgeons or anesthesiologists about safety concerns represents a structural cultural risk. Standardized SBAR

(Situation-Background-Assessment-Recommendation) handoff protocols and crew resource management (CRM) training approaches proven effective in aviation and applied to surgical settings are urgently recommended (Aouicha et al., 2022).

4.6 Patient Privacy and Surgical Ethics in the OR

Beyond the SOPS 2.0 domains, the broader research context of this study encompasses patient privacy and OR ethics dimensions identified as poorly addressed in Pakistani OR settings (newreport, 2023). Pakistan's Constitution (Article 14.1) guarantees the inviolability of privacy, yet studies from Lahore (Humayun et al., 2008) document widespread inadequacy in its practical application in clinical settings. The operating room, where patients are physically exposed, anaesthetized, and entirely dependent on staff professionalism, is the highest-stakes environment for privacy maintenance. Syed Nazim and Shahabuddin (2022) specifically highlight the importance of OR personnel safeguarding patient autonomy and privacy, and the ethical obligations surrounding informed consent for overlapping surgery, live surgical broadcasts, and DNR orders in the OR. Incorporating surgical ethics training and patient privacy modules into mandatory OR staff development curricula is recommended for all three study hospitals.

4.7 Limitations

Limitations include the cross-sectional design (precluding causal inference), convenient sampling within a hierarchical tertiary care environment (potential selection bias), social desirability bias inherent to self-report instruments, and restriction to three hospitals in Rawalpindi (limiting generalizability in tertiary care settings). Future research should employ longitudinal designs, multi-site sampling, and qualitative methods to explore the mechanisms underlying identified PSC deficiencies.

5. CONCLUSION

This study provides the first OR-specific assessment of patient safety culture in Pakistan's

tertiary care hospitals using the SOPS Hospital Survey 2.0. PSC is moderate overall: teamwork is the single developed domain, reflecting genuine strengths in OR collaboration and mutual support. Staffing adequacy, non-punitive error reporting, and handoff communication are the most critically underdeveloped domains, representing urgent priorities for institutional reform. These findings closely parallel PSC studies from Morocco, Algeria, and Nigeria, suggesting shared systemic challenges in resource-limited healthcare settings regardless of national context. The study calls for immediate action on five fronts: staffing ratio reform and mandatory rest periods; implementation of non-punitive anonymous reporting systems; standardized SBAR-based handoff protocols; crew resource management and surgical ethics training for all OR personnel; and bi-annual PSC surveillance using SOPS 2.0. Patient safety in the operating room is not merely a clinical imperative it is a professional, ethical, and constitutional obligation for every OR healthcare worker and administrator in Pakistan's tertiary care health system.

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