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Observational Study to evaluate compliance with WHO Safety Surgery Checklist in Operation at Goyal Hospital Jodhpur Rajasthan

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Abstract

Background: The World Health Organization (WHO) Surgical Safety Checklist (SSC) is an evidence-based tool to enhance communication, teamwork, and patient safety in operating theatres. Although it helps in reductions in perioperative morbidity and mortality, compliance remains inconsistent. In India, partial or superficial checklist use is frequently reported, especially during emergency surgeries. At Goyal Hospital & Research Centre, Jodhpur, the WHO SSC has been implemented since 2018 under NABH requirements.

Aim: To assess compliance with the WHO Surgical Safety Checklist and identify factors associated with incomplete or incorrect use.

Methods: A prospective observational study was conducted over three months (January–March 2024) in the main and emergency operation theatres of Goyal Hospital & Research Centre. A total of 385 surgical procedures were observed using a structured audit proforma. Completion of checklist sections (Sign In, Time Out, Sign Out), checklist leadership, time taken, interruptions, and teamwork were recorded. Staff-reported barriers were collected through questionnaire. Data were analysed using descriptive statistics, chi-square tests, and multivariate logistic regression.

Results: Overall checklist compliance was 67.5% (260/385). Compliance was significantly higher in elective surgeries (73.7%) than emergency surgeries (50.0%; $p = 0.001$). Sign In had the highest completion rate (90.9%), followed by Time Out (72.7%) and Sign Out (70.1%). Nurse-led checklists showed the highest compliance (75.0%) compared to anaesthetist-led (70.0%) and surgeon-led (55.0%). Emergency surgery were significant predictors of incomplete compliance. Major barriers included time pressure, heavy workload, and poor team cooperation.

Conclusion: Moderate compliance with the WHO SSC was observed, with notable gaps during emergency procedures. Nurse-led checklist execution improved adherence. Addressing workload, strengthening leadership, and regular audit with feedback are essential to enhance surgical safety practices.

Keyword: World Health Organization Surgical Safety Checklist, Checklist Compliance, Patient Safety, Operating Theatre, Emergency Surgery, Teamwork and Communication

1. Introduction

The World Health Organization (WHO) introduced the Safe Surgery Saves Lives initiative in 2008, which included the

WHO Surgical Safety Checklist (SSC) — a simple, 22-item tool designed to improve communication and teamwork in

the operating theatre and to reduce preventable perioperative complications and deaths.

Globally, an estimated 234 million surgeries are performed annually. Surgical complications occur in 3–16% of cases, and nearly half are preventable (Weiser *et al.*, *Lancet*, 2008). Implementation of the WHO checklist has been associated with a 30–40% reduction in postoperative morbidity and mortality.

However, despite its proven benefits, compliance remains variable, particularly in low- and middle-income countries. Several audits have reported completion rates ranging from 30% to 90%, with partial or superficial compliance being common. In India, studies from tertiary centres in Delhi, Chennai, and Bengaluru have shown compliance levels between 45–75%, often affected by workload, staff awareness, and leadership.

Here are some India-specific statistics on compliance with the WHO Surgical Safety Checklist (SSC) — these may help bolster the “Introduction / background” section of your audit report:

- A tertiary-referral cancer hospital in India found for 200 elective surgeries: the “Sign In” part had 100% compliance, “Time Out” 78%, “Sign Out” 76.5%. Lippincott Journals
- In a general surgery department in Bengaluru (262 surgeries observed): only 16.03% of checklists were *completely* performed; 55.72% were partially done; 28.2% had none of the components filled. rfpl.co.in
- Among Indian orthopaedic surgeons (513 respondents): 90.3% were aware of SSC; only 55.8% used it routinely in their practice.
- In a rural/semi-urban hospital survey: the SSC was used (in part or full) in only 35% of hospitals. PubMed central
- In a study of cataract surgeries at a centre in India: before intervention mean compliance $\sim 37\% \pm 10.1$; after a modified checklist and interventions it improved to $\sim 62.7\% \pm 10.3$. msjonline.org+1

These statistics suggested Even when awareness is high (e.g., $\sim 90\%$), routine use is significantly lower (e.g., $\sim 55.8\%$). Full completion (all items) is far from ideal — many checklists are partially completed or omitted. There is substantial variation depending on specialty (e.g., general surgery vs ophthalmology vs orthopaedics), setting (tertiary vs rural), and elective vs emergency cases. Interventions (training, modifications, audit & feedback) can improve compliance notably (as in the cataract and audit studies).

At Goyal Hospital & Research Centre, Jodhpur, the checklist was implemented in 2018 as part of NABH quality assurance. Yet, no formal audit had evaluated the level of compliance or identified the barriers to its consistent use. Understanding current practices is vital to improve surgical safety, reduce adverse events, and maintain accreditation standards.

2. Aim

To evaluate the level of compliance with the WHO Safe Surgery Checklist in all operating theatres at Goyal Hospital and identify factors associated with incomplete or incorrect use.

3. Objectives

1. Measure the overall compliance rate with the WHO Safe Surgery Checklist across elective and emergency procedures.

2. Compare compliance by theatre, surgery type (elective vs emergency), and staff category leading the checklist.
3. Identify barriers to full compliance (staffing, knowledge, time pressure, checklist availability).
4. Provide targeted, practical recommendations to improve compliance.

4. Study Design

- Type: Prospective observational study.
- Duration: 3 months from 1st January 2024–31st March 2024.
- Method: Direct, non-participant observation of surgical cases using a structured checklist audit form.

5. Setting and Population

- Setting: Main and emergency operation theatres, Goyal Hospital & Research Centre, Jodhpur.
- Population: All surgical cases during the study period where the WHO checklist is applicable.
- Observers: Trained anaesthesia or quality Nursing officers through records (not involved in the operating team for the observed case).

6. Inclusion and Exclusion Criteria

- **Inclusion**
 - All cases in main routine and emergency OT where the WHO checklist should be used.
- **Exclusion**
 - Minor bedside procedures or endoscopic cases outside OT.
 - Emergency cases where observation was not feasible due to criticality or privacy issues.

7. Data Collection Tool

A structured audit proforma was developed, capturing:

- Presence of checklist in the OT
- Completion of each phase:
 - Sign In (before induction)
 - Time Out (before incision)
 - Sign Out (before patient leaves OT)
- Leader of the checklist (Surgeon/Anaesthetist/Nurse)
- Type of surgery (elective/emergency)
- ASA grade, theatre name, interruptions, time taken
- Observed teamwork and communication
- Staff feedback on barriers (via short anonymous questionnaire)

8. Sample Size

Using standard formula for proportion estimates:

$$n = Z^2 \times p(1-p) / d^2$$

$$= 1.96^2 \times 0.5(1-0.5) / 0.05^2 = 384.16 \approx 385 \text{ procedures.}$$

9. Data Analysis

- Descriptive statistics: Percentages, means, and 95% confidence intervals.
- Comparative tests: Chi-square or Fisher’s exact test for categorical variables
- Regression: Multivariate logistic regression for predictors of incomplete checklist use.

10. Results

A total of 385 surgical cases were included in the study. Of these, 199 patients (52%) were female and 186 (48%) were male.

The surgical safety checklist was fully completed in 260 cases, giving an overall compliance rate of 67.5% (95% CI: 62.7–72.3).

Checklist completion varied significantly by type of surgery. Elective procedures demonstrated higher compliance, with 210 of 285 cases (73.7%) fully completed, compared to 50 of 100 emergency cases (50.0%). This difference was statistically significant ($\chi^2 = 12.4$, $p = 0.001$).

Among the individual checklist components, Sign In showed the highest completion rate (90.9%), followed by Time Out (72.7%) and Sign Out (70.1%).

Completion rates differed according to the designated checklist leader. Nurse-led checklists achieved the highest compliance (75.0%), followed by anaesthetist-led checklists (70.0%), while surgeon-led checklists had the lowest completion rate (55.0%). Nurse leadership was significantly associated with higher checklist completion ($p < 0.05$).

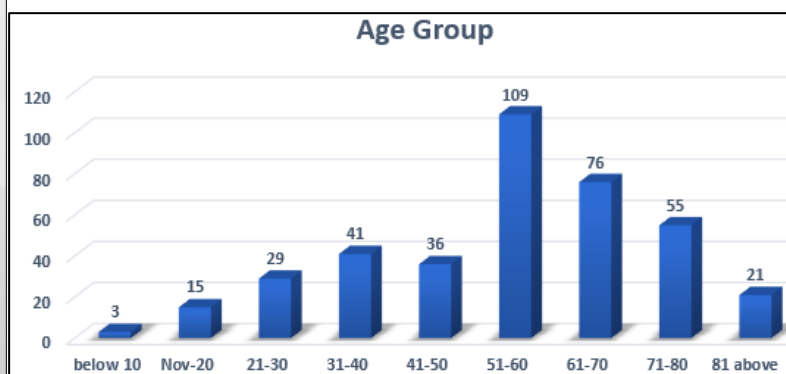
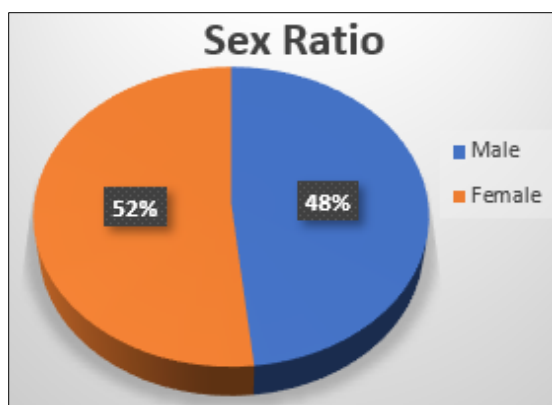
The mean time required to complete the checklist was 2.8 ± 0.9 minutes. Interruptions during checklist execution were

observed in approximately 25% of cases, potentially affecting compliance.

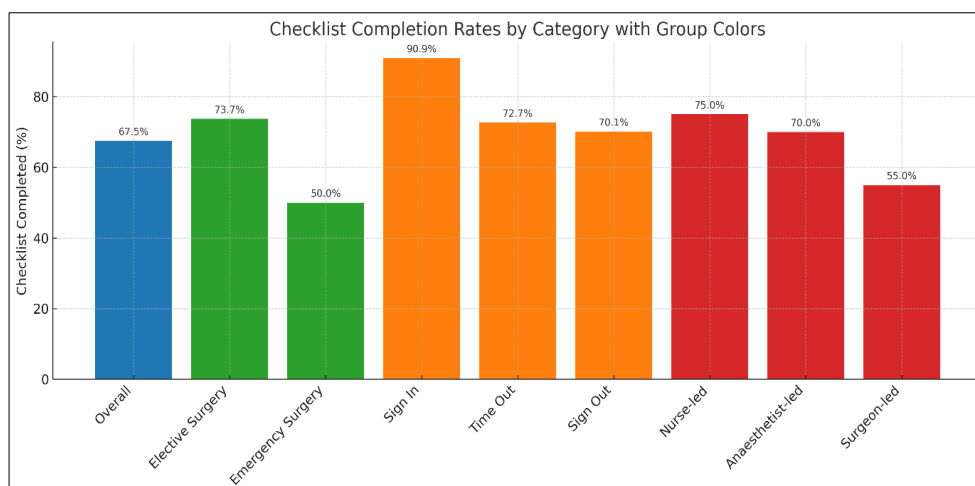
A total of 60 staff responses were analyzed to identify barriers to checklist completion. The most frequently reported barrier was time pressure or high case load (60%), followed by lack of team cooperation (45%). Other reported barriers included poor accessibility of the checklist (30%), lack of awareness regarding its importance (28%), absence of a clear checklist leader (25%), and perception of the checklist as additional paperwork (20%).

Multivariate logistic regression analysis identified several significant predictors of incomplete checklist compliance. Emergency surgery was associated with a higher likelihood of non-compliance (OR = 2.4, $p = 0.002$). Absence of nurse leadership also significantly increased the risk of incomplete checklist use (OR = 1.9, $p = 0.04$). Additionally, a high surgical case load per day was a strong predictor of incomplete compliance (OR = 2.7, $p = 0.01$).

Male	48% (186)
Female	52% (199)



Variable	Category	No. of Cases (n=385)	Checklist Fully Completed n (%)
Overall		385	260 (67.5%)
Type of Surgery	Elective (n=285)	210 (73.7%)	
	Emergency (n=100)	50 (50.0%)	
Checklist Sections	Sign In	350 (90.9%)	
	Time Out	280 (72.7%)	
	Sign Out	270 (70.1%)	
Checklist Leader	Nurse-led	150 (75.0%)	
	Anaesthetist-led	60 (70.0%)	
	Surgeon-led	50 (55.0%)	



Mean time for checklist completion: 2.8 ± 0.9 minutes
 Interruptions during checklist: observed in 25% of cases

11. Staff-Reported Barriers (n=60 responses)

Barrier	Frequency (% of respondents)
Time pressure / case overload	60%
Lack of team cooperation	45%
Checklist not easily accessible	30%
Lack of awareness of importance	28%
No clear leader	25%
Perception as “extra paperwork”	20%

12. Statistical Analysis Summary

- Overall compliance: 67.5% (95% CI: 62.7–72.3)
- Elective vs emergency difference: $\chi^2 = 12.4$, $p = 0.001$ (significant)
- Nurse-led checklists showed highest completion rate ($p < 0.05$).
- Predictors of incomplete compliance (from logistic regression):
 - Emergency surgery (OR = 2.4, $p = 0.002$)
 - Lack of nurse leadership (OR = 1.9, $p = 0.04$)
 - High case load per day (OR = 2.7, $p = 0.01$)

13. Discussion

This audit demonstrated a moderate overall compliance rate (67.5%) with the WHO Surgical Safety Checklist at Goyal Hospital. The rate is comparable to Indian tertiary centres (50–75%) but below international benchmarks (>90%).

Compliance was significantly lower in emergency surgeries, consistent with global findings, likely due to time constraints and perceived urgency. The “Sign In” phase was most frequently completed, as it aligns with anaesthesia protocols, while “Sign Out” often received less attention, reflecting end-of-case fatigue or workflow pressures.

Nurse-led checklists were more successful, suggesting that empowering nursing staff and defining clear leadership improves adherence.

Key barriers included time pressure, lack of ownership, and inconsistent checklist availability.

These findings underscore the importance of training, workflow integration, and leadership accountability in sustaining checklist compliance.

14. Recommendations

1. Education and Orientation:
 - ❖ Conduct refresher sessions for all OT staff on the purpose and evidence behind the checklist.
 - ❖ Include it in induction training for new surgeons and residents.
2. Checklist Availability:
 - ❖ Ensure laminated copies or digital versions are visibly displayed in each OT.
3. Leadership and Accountability:
 - ❖ Designate a nurse leader or anaesthetist to initiate and verify checklist completion before each phase.
4. Audit and Feedback:
 - ❖ Monthly feedback to OT teams on compliance performance.
 - ❖ Recognize teams with highest adherence.
5. Process Redesign:
 - ❖ Integrate checklist items into existing workflow (e.g., anaesthesia record start, nursing counts, etc.).

6. Re-Audit:

- ❖ Conduct follow-up audit after 6 months to evaluate improvement and sustainability.

15. Limitations

- Hawthorne effect: Staff may behave differently under observation.
- Single-centre study; generalizability is limited.
- Observation bias possible despite observer training.

16. Conclusion

The audit reveals that while the WHO Safe Surgery Checklist is implemented at Goyal Hospital, consistent adherence remains suboptimal, especially in emergency settings.

Structured leadership, regular education, and performance feedback are essential to ensure that the checklist serves its intended purpose — making every surgery safer.

Continuous monitoring and periodic re-audits are recommended to embed a culture of safety and teamwork.

17. Implementation Plan

Timeline	Activity
Month 0	IEC approval, observer training, pilot (10 cases)
Months 1–4	Data collection (20–30 cases/week)
Month 5	Analysis and presentation to OT committee
Month 6	Implementation of corrective actions, re-audit planning

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