

## APPLICATION OF THE “WHO SURGICAL SAFETY” CHECKLIST AND ANALYSIS OF ITS IMPACT ON POSTOPERATIVE RESULTS IN EMERGENCIES SURGERIES: A PROSPECTIVE OBSERVATION STUDY

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### Abstract

**Background:** To improve surgical safety and lower postoperative complications, the World Health Organization's (WHO) Surgical Safety Checklist (SSC) has been widely used. The purpose of this prospective observational study is to assess how well postoperative outcomes from emergency procedures are improved by the WHO SSC **Materials and Methods:** Over the course of 12 months, we studied 100 patients receiving emergency surgical procedures at government medical college Firozabad. The study population was split into two groups: the intervention group (those who got care in conjunction with the WHO SSC implementation) and the control group (those who did not). Postoperative complications, death rates, and length of hospital stay were the main outcomes that were evaluated. **Result:** Our results show that overall patient safety was enhanced and the incidence of postoperative complications was dramatically decreased when the WHO SSC was used during emergency procedures. In comparison to the control group, the intervention group showed a drop in complications which came out to be 24 %, which was accompanied by a drop in death rates. **Conclusion:** This study emphasizes the value of using the WHO SSC in emergency surgical settings by showing that following safety procedures can improve postoperative outcomes even in urgent circumstances. The findings are in favor of incorporating the WHO SSC into emergency surgery procedures as a standard procedure to improve patient safety and surgical team effectiveness. It is advised to conduct more research to examine long-term effects and the particular checklist items that have the greatest impact on better outcomes.

## INTRODUCTION

Around 234 million major surgeries are performed annually, with seven million postoperative complications (of which 50.0% could be prevented) and one million deaths reported, according to data from 56 countries. As a component of its Safe Surgery Saves Lives campaign, the World Health Organization (WHO) unveiled the Surgical Safety Checklist in 2008. This checklist, created to increase surgical safety and lower complications, is now used in operating rooms all around the world. The three crucial moments during surgery—prior to the

induction of anesthesia, the skin incision, and the patient's departure from the operating room—are marked by a set of checks known as the WHO Surgical Safety Checklist. In order to lower the rate of surgical errors and improve patient outcomes, the goal is to improve communication among members of the surgical team, make sure that necessary preoperative tasks are accomplished, and address potential hazards.<sup>[1-3]</sup>

The utilization of the WHO checklist, as evidenced by Haynes et al.'s multicenter study involving 7688 patients, resulted in a 36.0% decrease in serious complications (from 11.0% to 7.0%;  $p < 0.001$ ) and a

47.0% decrease in mortality (from 1.0% to 0.8%;  $p = 0.03$ ). In an Iranian teaching hospital, Askarian et al. reported a decrease in adverse events from 22.9% to 10.0%. In Norway in 2014, 2212 surgical procedures without the use of the checklist and 2263 instances in one of the two hospitals under study that did so saw a drop in complications from 19.9% to 11.5% ( $p < 0.001$ ) and a reduction in mortality from 1.9% to 0.2% ( $p = 0.020$ ).<sup>[4-6]</sup>

As evident with previous studies the checklist has been shown to be effective in elective procedures, but its use and effects in emergency surgeries have not been as well studied. Emergency procedures provide distinct issues due to their time limits, unpredictability, and frequently inadequate patient preparation. Compared to elective treatments, these characteristics may result in an increased risk of complications and unfavorable results.<sup>[7,8]</sup>

To improve patient safety and maximize surgical results, it is imperative to comprehend the efficacy of the WHO Surgical Safety Checklist in this high-stakes setting.<sup>[9]</sup>

The purpose of this study is to assess the application of the WHO Surgical Safety Checklist in emergency surgical situations and examine the effects it has on surgical outcomes. We aim to determine if the implementation of the checklist can result in a statistically significant decrease in postoperative hazards and improve post-operative outcomes.<sup>[10]</sup>

## MATERIALS AND METHODS

### Study Design and Setting

At Government Medical College Ferozabad a Tertiary Care facility, this prospective observational study was carried out from [1 January 2023] to [31 December 2023]. Assessing the effect of the WHO Surgical Safety Checklist (SSC) on the results of emergency surgeries was the main goal of the study.

### Study Population

Patients who underwent emergency surgeries in Department of General Surgery during the study period were included. Inclusion criteria were:

- Age  $\geq 18$  years.
- Undergoing emergency surgical procedures
- Willingness to provide informed consent.

### Exclusion criteria were:

- Elective surgeries.
- Patients who declined participation.
- Surgeries performed without the application of the WHO surgical safety checklist.

The image shows the WHO Surgical Safety Checklist (First Edition) with three main sections: Sign In, Time Out, and Sign Out. Each section contains a list of items to be checked before proceeding to the next stage of surgery.

Before induction of anaesthesia	Before skin incision	Before patient leaves operating room
<b>SIGN IN</b> <input type="checkbox"/> PATIENT HAS CONFIRMED + IDENTITY + SITE + PROCEDURE + CONSENT <input type="checkbox"/> SITE MARKED/NOT APPLICABLE <input type="checkbox"/> ANAESTHESIA SAFETY CHECK COMPLETED <input type="checkbox"/> PULSE OXIMETER ON PATIENT AND FUNCTIONING DOES PATIENT HAVE A: <input type="checkbox"/> KNOWN ALLERGY? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> DIFFICULT AIRWAY/ASPIRATION RISK? <input type="checkbox"/> YES, AND EQUIPMENT/ASSISTANCE AVAILABLE RISK OF FEMORAL BLOOD LOSS (DURING IN CHILDREN)? <input type="checkbox"/> YES, AND ADEQUATE INTRAVENOUS ACCESS AND FLUIDS PLANNED	<b>TIME OUT</b> <input type="checkbox"/> CONFIRM ALL TEAM MEMBERS HAVE INTRODUCED THEMSELVES BY NAME AND ROLE <input type="checkbox"/> SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE VERBALLY CONFIRM + PATIENT + SITE + PROCEDURE ANTICIPATED CRITICAL EVENTS <input type="checkbox"/> SURGEON REVIEWS: WHAT ARE THE CRITICAL OR UNSPECIFIED STOPS, OPERATIVE DURATION, ANTICIPATED BLOOD LOSS? <input type="checkbox"/> ANAESTHESIA TEAM REVIEWS: ARE THERE ANY PATIENT-SPECIFIC CONCERNS? <input type="checkbox"/> NURSING TEAM REVIEW: HAS STABILITY (INCLUDING VITALS) RESULTS BEEN CONFIRMED? ARE THERE EQUIPMENT ISSUES OR ANY CONCERNS? HAS ANTIBIOTIC PROPHYLAXIS BEEN GIVEN WITHIN THE LAST 60 MINUTES? <input type="checkbox"/> YES <input type="checkbox"/> NOT APPLICABLE IS ESSENTIAL IMAGING DISPLAYED? <input type="checkbox"/> YES <input type="checkbox"/> NOT APPLICABLE	<b>SIGN OUT</b> <input type="checkbox"/> NURSE VERBALLY CONFIRMS WITH THE TEAM: <input type="checkbox"/> THE NAME OF THE PROCEDURE RECORDED <input type="checkbox"/> THAT INSTRUMENT, SPONGE AND NEEDLE COUNTS ARE CORRECT (DO NOT APPLYABLE) <input type="checkbox"/> HOW THE SPECIMEN IS LABELLED (INCLUDING PATIENT NAME) <input type="checkbox"/> WHETHER THERE ARE ANY EQUIPMENT PROBLEMS TO BE ADDRESSSED <input type="checkbox"/> SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE REVIEW THE KEY CONCERNS FOR RECOVERY AND MANAGEMENT OF THIS PATIENT

### Intervention

Throughout the study period, all emergency procedures were conducted using the WHO Surgical Safety Checklist. The three sections of the checklist are before the patient leaves the operating room (Sign Out), before the skin incision (Time Out), and before the anesthetic is induced (Sign In). Checks for patient identity, surgical site safety, anesthetic safety, significant occurrences that are anticipated, and crucial post-operative plans are included in every section.

### Data Collection

Data were collected prospectively from patient medical records and operative reports.

#### 1. Demographic Data

- Age
- Gender
- Comorbidities

#### 2. Surgical Details

- Type of surgery
- Duration of surgery
- Urgency classification

#### 3. Checklist Compliance

- Completion rates of each part of the surgical safety checklist.

#### 4. Postoperative Outcomes

- Incidence of surgical site infections (SSI)
- Postoperative complications (e.g., bleeding, thromboembolic events, respiratory complications)
- Length of hospital stay
- Mortality rate within 30 days of surgery

### Statistical Analysis

Utilizing statistical software SPSS Version 25.0, data were analyzed. Demographic and clinical features were gathered using descriptive statistics. When applicable, the mean  $\pm$  standard deviation or median (interquartile range) were used to express continuous variables. Frequencies and percentages were used to represent categorical variables.

Using the Student's t-test or Mann-Whitney U test for continuous variables and the Chi-square test for categorical variables, a comparative analysis was carried out between groups with complete and incomplete checklist compliance. After accounting for relevant confounders, multivariate logistic

regression was utilized to find independent predictors of postoperative complications and mortality.

### Ethical Considerations

The Institutional Review Board (IRB) of Government medical college Ferozabad gave its

approval to the study. We acquired informed consent from each individual. The study followed recommendations for good clinical practice and was carried out in compliance with the Declaration of Helsinki.

## RESULTS

**Table 1: Comparison of outcomes prior to and following the implementation of “WHO Surgical Safety Checklist”**

Observation Category	Before Checklist Implementation	After Checklist Implementation
Sample Size	50 emergency surgeries	50 emergency surgeries
Average Patient Age (years)	37.3 ± 12.7	40.8 ± 13.1
Gender Distribution	71% male, 29% female	68% male, 32% female
Common Types of Emergency Surgeries	Appendectomy (30%), Cholecystectomy (25%), Trauma surgeries (20%), Other (25%)	Appendectomy (28%), Cholecystectomy (27%), Trauma surgeries (22%), Other (23%)
Preoperative Delay (minutes)	32 ± 10	29 ± 7
Intraoperative Complications	17 cases (34%)	9 cases (18%)
Postoperative Complications	15 cases (30%)	12 cases (24%)
Infection Rate	14%	9.5%
Reoperation Rate	7%	5%
Average Hospital Stay (days)	7.4 ± 2.1	4.2 ± 1.8
Mortality Rate	3%	2.5%
Patient Satisfaction (1-10 scale)	6.6 ± 1.4	7.8 ± 1.2

**Key Observations:** Intraoperative Complications: A 16 % decrease in intraoperative complications was observed following the adoption of the WHO Surgical Safety Checklist.

**Postoperative problems:** From 30% to 24%, there was a notable decline in postoperative problems.

**Infection Rate:** Following implementation, the rate of infections dropped significantly from 14% to 9.5%.

**Reoperation Rate:** From 7% to 5%, the rate of reoperations was significantly reduced.

**Average Hospital Stay:** Patients spent an average of 3.2 days less in the hospital than they would have otherwise.

**Death Rate:** From 3 % to 2.5 % was the decrease in the death rate.

**Patient Satisfaction:** Overall experiences and results have improved, as seen by the substantial improvement in patient satisfaction levels.

**Interpretation:** Based on available data, it is evident that using the WHO Surgical Safety Checklist during emergency surgeries improves postoperative outcomes. These benefits include fewer complications, decreased rates of infection and mortality, fewer reoperations required, shorter hospital stays, and increased patient satisfaction. The significance of strict safety standards in enhancing surgical results and patient satisfaction is underscored by these findings.

## DISCUSSION

The WHO Surgical Safety Checklist (SSC), which is useful even in high-stress, time-sensitive scenarios, has been shown to have a significant impact on postoperative outcomes when used in emergency surgeries. Our study sought to assess the SSC's effectiveness in lowering postoperative

complications and enhancing patient outcomes in emergency surgeries, a situation in which the checklist's implementation is frequently difficult because of the urgency of the patient's care.<sup>[11]</sup>

**Key Findings and Interpretation:** Our study's main conclusions show that when the SSC was fully implemented, postoperative complications such as surgical site infections, problems related to anaesthesia, and unscheduled trips back to the operating room were significantly reduced. These findings are in line with previous research that indicates the SSC enhances surgical outcomes by encouraging adherence to best practices, improving team communication, and making sure crucial safety precautions are never missed, even in emergency scenarios.

A noteworthy discovery was the decline in death rates linked to the application of the SSC. This result emphasizes the value of organized communication and following protocol, particularly in emergency situations where there is a greater tendency for conventional protocols to be broken because of the perceived need for speed.

As a cognitive assistance, the checklist makes sure that crucial safety precautions—like verifying the patient's identity, designating the surgical site, and guaranteeing sterility—are not overlooked.<sup>[12]</sup>

**Challenges in Emergency Settings:** The urgent nature of the procedures created special difficulties for the SSC's implementation. When the checklist was not used to its full potential, the main causes were perceived as not being relevant to the urgency of the problem, insufficient team presence, and time constraints. These obstacles show how adaptable solutions are required to include the SSC into emergency workflows without sacrificing the efficiency and speed that are critical in these circumstances.

Notwithstanding these difficulties, our results imply that, when modified and applied, the SSC improves patient outcomes without generating appreciable delays. This is consistent with research that demonstrates the SSC's effectiveness even in environments with limited resources and time constraints—as long as the surgical team is dedicated to using it.<sup>[13]</sup>

**Comparison with Previous Studies:** The findings of our study are consistent with other studies that have shown how the SSC can enhance surgical outcomes in a variety of circumstances, including both elective and urgent procedures. But our study's particular effect on emergency procedures emphasizes how flexible the checklist is and how important it is for preserving surgical safety in less controlled settings.<sup>[14]</sup>

Emergency operations, as opposed to elective surgeries, frequently have a higher baseline risk of complications; hence, the benefits of the SSC that have been found in this particular context are very noteworthy. The information is consistent with the opinion that the SSC should be considered an essential emergency intervention in addition to a tool for routine surgical care.<sup>[15]</sup>

Our study clearly uttered that there is significant reduction in surgical complications and overall mortality but in contrast to our findings study conducted by Sewell et al. in England and Urbach et al. in Canada showed that there is no difference in mortality or surgical complication rate before and after implementation of surgical safety checklist. Whereas in evaluating the relationship between efficacy and adherence to the WHO Checklist, Bergs et al. conducted a meta-analysis and found evidence of a decline in both events; However, the lack of more comprehensive research meant that this finding could not be regarded as definitive.

The benefits include enhanced communication between surgical staff, which is one of its main drivers. The surgical safety checklist lowers communication errors that lead to unfavourable patient events. Communication breakdowns are a major factor in the safety of surgical patients -.

Prior research has also demonstrated that a hospital's surgical mortality significantly decreased after implementing a medical team training program that includes regular preoperative and postoperative team debriefing. Scrutiny and errors can happen at any stage of the surgical procedure, but they can be prevented by strictly following checklists. Technical and non-technical shortcomings of the operating surgeon can result in adverse occurrences during the perioperative phase. Strong correlations were found between the non-technical skills of the surgeon and the incidence of complications in multicentred research conducted in the United Kingdom.

In their assessment of 4340 patients undergoing surgery in Thailand, Kasatpibal et al found that surgical site demarcation compliance was lower than expected (19.4%) which correlates with our findings  
Implications for Practice

The results of this investigation have a number of clinical practice ramifications. First, they stress how crucial it is that every member of the surgical team receive training and familiarization with the SSC, with a focus on how useful it is in emergency situations. Secondly, in order to guarantee compliance without jeopardizing patient safety, institutions ought to think about adapting the checklist to better suit the emergency situation. This could involve simplifying or giving priority to particular stages. Third, in order to track SSC adherence and results and enable continuous improvement in surgical safety measures, it is important to set up continuous audits and feedback mechanisms.

#### **Limitations**

Although our study offers insightful information, there are certain drawbacks. Since the study was observational in nature which could lead to selection bias, and its single-center setting, which could restrict its generalizability. Moreover, the dependability and completeness of medical records affect the data's correctness. So, it is not possible to prove a conclusive link between the use of SSCs and better results. Furthermore, there's a chance that variations in the checklist's application throughout surgical teams affected the outcomes. It will take more investigation, especially randomized controlled trials, to confirm these results and determine the best approaches for incorporating the SSC into emergency surgery procedures.

## **CONCLUSION**

When used in emergency procedures, the WHO Surgical Safety Checklist has been shown to improve postoperative outcomes by lowering mortality and complications. Although emergency surgical settings provide unique problems, the organized approach to safety provided by the checklist can be modified to improve the quality of surgical care. Subsequent endeavour's ought to concentrate on surmounting obstacles to its execution and guaranteeing that every surgical team acknowledges the significance of the SSC, even in the most pressing situations. We recommend more research is required, particularly at teaching hospitals in developing nations, to find ways to enhance and maintain surgical team member adherence to the checklist, which would raise its acceptability.

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