

# Effects of Implementation of W.H.O Surgical Safety Check List: Our Institutional Analysis

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**Abstract** To err is human. Human errors and flaws in the system and quality of health care persist despite patient safety initiatives and identification of new strategies of improvement. A significant focus in surgery is to identify strategies and improve patient safety, prevent postoperative complications and any adverse events. The World Health Organization (WHO) surgical safety checklist has been shown to decrease mortality and complications and has been adopted worldwide. A retrospective pre-intervention study was done from September 2014 to August 2015, data analysed, necessary training, changes and awareness was implemented over 1 month and then, a prospective study was done post-intervention using WHO safety check list from October 2015 to September 2016 both at Rajarajeswari Medical College and Hospital, Bangalore, India by implementing the safety check list and by corrections of errors present during the pre-intervention phase. A total of 216 patients were recorded during the pre-intervention phase, and a total of 248 patients were included in the post-intervention analysis after implementing the WHO safety check list. Our study showed a reduction of intraoperative surgical complications from 5.1 to 2.41% and from 6.48 to 4.44% in postoperative surgical complications after the implementation of safety check list. There were significant reductions in anaesthesia complications, during and after surgery post implementation (intraoperative from 2.78 to 1.61%, postoperative from 1.4 to 0.8%). We also observed a significant change in the death rates post-implementation. Intraoperative death reduced from

1.4 to 0.4% and postoperative deaths reduced from 12.04 to 8%. Surgical safety check list improves the quality of patient care and improves perceptions on patient safety. It significantly reduces the morbidity and mortality by reducing the complications and improving the quality of treatment and health care. It is easy to understand and implement the surgical safety check list after training, proper guidance, and education. It is a must to implement the surgical safety check list in all institutions to improve the patient safety and to reduce the errors in patient care.

**Keywords** Surgical safety · Check list · Patient care · Implementation

## Introduction

Health care is a team effort. When human limitations are combined with organizational complexity, human error becomes inevitable. Average error rates of 10% are seen in hospital admissions [1].

Numerous changes have since been advocated to improve patient safety like mandating minimum nurse to patient ratios, reducing working hours of trainee/resident doctors, introduction of ‘care bundles’ that improve patient outcomes, introduction of safety checklists and advances in the science of simulation and teamwork training.

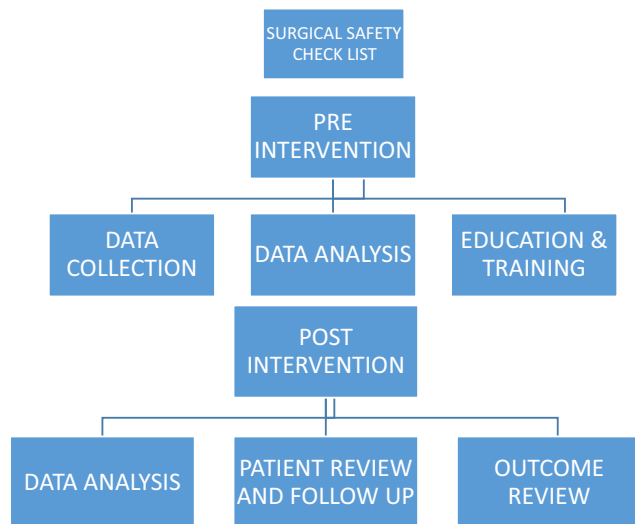
The WHO launched Global Patient Safety Challenge: Safe Surgery Saves Lives (SSSL) in 2006 in response to the global need to improve outcomes in surgery.

A checklist is more than a technical solution; if used properly, it ensures that few things will be reviewed at certain times.

For these reasons, incident reporting appears to be a surrogate marker of safety culture.

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**Fig. 1** Flow chart of the study about the use of surgical safety check list

In our hospital, implementation of surgical safety checklist was started from September 2015.

## Aims and Objectives

The main aim of this study is to assess the effectiveness of surgical safety checklist in our Institution. We also study and analyse the errors in our operation theatre, compare with international standards, train and educate the theatre personnel and implement the necessary corrections to avoid errors and ensure maximum safety for the patients.

## Methods

### Study Design

This study was conducted in the Department of General Surgery at Rajarajeswari Medical College and Hospital, Bangalore, India. All the elective surgical cases were included and all the emergency cases were excluded in our study.

A retrospective study of pre-intervention from September 2014 to August 2015 was done to analyse the errors in surgical safety and then, a prospective study of post-intervention from October 2015 to September 2016 was done by implementing the safety check list and by corrections of errors present during the pre-intervention phase (Fig. 1).

A local investigator was chosen and was trained in the identification and reporting of process, measures, errors and complications. This person worked on the study full-time and did not have clinical responsibilities at the study site. Data analysis and implementation of the check list was done by the principal investigator, in this case the author and his assistant, the co-author (Fig. 2).

Ten essential objectives for safe surgery were identified:

- (i) Correct site of surgery
- (ii) Provision of safe anaesthesia
- (iii) Management of airway problems
- (iv) Management of haemorrhage
- (v) Avoiding known allergies
- (vi) Minimizing the risk of surgical site infection
- (vii) Preventing the retention of swabs and instruments
- (viii) Accurate identification of specimens

World Health Organization		
SURGICAL SAFETY CHECKLIST (FIRST EDITION)		
Before induction of anaesthesia	Before skin incision	Before patient leaves operating room
<b>SIGN IN</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> PATIENT HAS CONFIRMED               <ul style="list-style-type: none"> <li>• IDENTITY</li> <li>• SITE</li> <li>• PROCEDURE</li> <li>• CONSENT</li> </ul> </li> <li><input type="checkbox"/> SITE MARKED/NOT APPLICABLE</li> <li><input type="checkbox"/> ANAESTHESIA SAFETY CHECK COMPLETED</li> <li><input type="checkbox"/> PULSE OXIMETER ON PATIENT AND FUNCTIONING</li> <li>DOES PATIENT HAVE A:               <ul style="list-style-type: none"> <li>KNOWN ALLERGY?                   <ul style="list-style-type: none"> <li><input type="checkbox"/> NO</li> <li><input type="checkbox"/> YES</li> </ul> </li> <li>DIFFICULT AIRWAY/ASPIRATION RISK?                   <ul style="list-style-type: none"> <li><input type="checkbox"/> NO</li> <li><input type="checkbox"/> YES, AND EQUIPMENT/ASSISTANCE AVAILABLE</li> </ul> </li> <li>RISK OF &gt;500ML BLOOD LOSS (7ML/KG IN CHILDREN)?                   <ul style="list-style-type: none"> <li><input type="checkbox"/> NO</li> <li><input type="checkbox"/> YES, AND ADEQUATE INTRAVENOUS ACCESS AND FLUIDS PLANNED</li> </ul> </li> </ul> </li> </ul>	<b>TIME OUT</b> <ul style="list-style-type: none"> <li><input type="checkbox"/> CONFIRM ALL TEAM MEMBERS HAVE INTRODUCED THEMSELVES BY NAME AND ROLE</li> <li><input type="checkbox"/> SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE VERBALLY CONFIRM               <ul style="list-style-type: none"> <li>• PATIENT</li> <li>• SITE</li> <li>• PROCEDURE</li> </ul> </li> <li>ANTICIPATED CRITICAL EVENTS               <ul style="list-style-type: none"> <li><input type="checkbox"/> SURGEON REVIEWS: WHAT ARE THE CRITICAL OR UNEXPECTED STEPS, OPERATIVE DURATION, ANTICIPATED BLOOD LOSS?</li> <li><input type="checkbox"/> ANAESTHESIA TEAM REVIEWS: ARE THERE ANY PATIENT-SPECIFIC CONCERNS?</li> <li><input type="checkbox"/> NURSING TEAM REVIEWS: HAS STERILITY (INCLUDING INDICATOR RESULTS) BEEN CONFIRMED? ARE THERE EQUIPMENT ISSUES OR ANY CONCERNS?</li> </ul> </li> <li>HAS ANTIBIOTIC PROPHYLAXIS BEEN GIVEN WITHIN THE LAST 60 MINUTES?               <ul style="list-style-type: none"> <li><input type="checkbox"/> YES</li> <li><input type="checkbox"/> NOT APPLICABLE</li> </ul> </li> <li>IS ESSENTIAL IMAGING DISPLAYED?               <ul style="list-style-type: none"> <li><input type="checkbox"/> YES</li> <li><input type="checkbox"/> NOT APPLICABLE</li> </ul> </li> </ul>	<b>SIGN OUT</b> <ul style="list-style-type: none"> <li>NURSE VERBALLY CONFIRMS WITH THE TEAM:               <ul style="list-style-type: none"> <li><input type="checkbox"/> THE NAME OF THE PROCEDURE RECORDED</li> <li><input type="checkbox"/> THAT INSTRUMENT, SPONGE AND NEEDLE COUNTS ARE CORRECT (OR NOT APPLICABLE)</li> <li><input type="checkbox"/> HOW THE SPECIMEN IS LABELLED (INCLUDING PATIENT NAME)</li> <li><input type="checkbox"/> WHETHER THERE ARE ANY EQUIPMENT PROBLEMS TO BE ADDRESSED</li> </ul> </li> <li><input type="checkbox"/> SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE REVIEW THE KEY CONCERNS FOR RECOVERY AND MANAGEMENT OF THIS PATIENT</li> </ul>

**Fig. 2** WHO surgical safety check list

**Table 1** Scores among theater personnel based on questionnaire before and after implementation

	Before implementation	After implementation
Doctor (consultants)	6	9
Doctor (residents)	4	7
Anaesthesiologists	5	8
Nursing staff	2	5
Technical staff	1	4

- (ix) Effective communication within the surgical team  
 (x) Routine surveillance of surgical outcomes.

### Intervention

After collecting baseline data retrospectively, the local investigator was given information to identify errors and deficiencies and was then asked to implement the 19-item WHO safe-surgery checklist. The checklist consists of an oral confirmation by surgical teams at the time of sign in, time out and sign out.

The Departments of Surgery and Anaesthesiology, the operation theatre personnel and the design team created an education program focused on the checklist. The education program consisted of oral, online education module and an educational video showing the checklist process, elements involved, theatre and perioperative service area. A weekly frequently asked question communications to surgical team members and theatre. The local investigator introduced the checklist to operating-room staff, using lectures, written materials or direct guidance. The checklist was introduced over a period of 1 month. Personnel training regarding the benefits of the checklist and the checklist process was conducted for a period of 1 month.

### Data Collection

Standardized data sheets completed by the local investigators and the clinical teams involved in surgical care were analysed.

**Table 2** Questionnaire

Introduction	Setting	Operation	Post procedure
Patient medically fit for procedure?	Crash kit available?	Patient identity, procedure and consent checked?	Inadvertent events documented?
Procedure details and type of anaesthesia reviewed?	Oxygen source and suction checked?	Is the site and side marked and identified?	Patient and the doctors' satisfaction assessed?
Post procedure plans reviewed?	Anticipated duration recorded?	Patient monitoring as per protocol? Adverse events discussed prior to surgery? Antibiotic prophylaxis? DVT prophylaxis?	

Perioperative data included the demographic characteristics of patients, procedural data and the type of anaesthesia used as per the WHO surgical safety check list.

Patients were followed prospectively until discharge or for 30 days, whichever came first, for death and complications. Outcomes were identified through chart monitoring and communication with clinical staff. Completed data forms were directed to primary investigator.

### Who Surgical Safety Check List

Knowledge of the safety checklist was analysed based on a questionnaire used before and after implementation for the surgeons, anaesthesiologists and the theatre personnel. The scoring was done on a scale of ten and the following results were drawn as per Table 1.

The questionnaire as shown in Table 2 was based on a Likert type scale and a yes/no question. Post-implementation also included the above questionnaire along with open-ended questions like the overall satisfaction of using the check list, ease and benefits of using the check list and if it would be beneficial in implementing the check list for patient's safety.

### Results

A total of 216 patients were included in the pre-intervention study and a total of 248 patients were included in the post-intervention study. The intraoperative and the postoperative complications both due to surgery and the anaesthesia were assessed and recorded (Table 3).

The effectiveness of the safety check list was studied and analysed by comparing the intraoperative and postoperative complications before and after its implementation.

Our study showed a reduction of intraoperative surgical complications from 5.1 to 2.41% and from 6.48 to 4.44%

**Table 3** Complications assessed and recorded using safety checklist

Intraoperative		Postoperative	
Surgical	Anaesthetic	Surgical	Anaesthetic
Haemorrhage	Decreased saturation	Surgical site infections	Inadequate analgesia
Long duration of surgery	Inadequate fluid management/shock	Unplanned return to OT	Pneumonia
Wrong surgery	Cardiac arrest	Burst abdomen	Spinal headache
Lathogenic damage	Multiple pricks/intubations	Multiple transfusions	
	Inefficient induction/relaxation	Prolonged hospital stay	
		DVT	

**Table 4** Intra operative and post operative complication rates before and after implementation of the safety check list

Intraoperative surgical complications		Intraoperative anaesthetic complications		Postoperative surgical complications			
Before implementation	After implementation	Before implementation	After implementation	Before implementation	After implementation	Before implementation	After implementation
11 (5.1%)	6 (2.41%)	6 (2.78%)	4 (1.61%)	14 (6.48%)	11 (4.44%)	3 (1.4%)	2 (0.8%)

in postoperative surgical complications after the implementation of safety check list (Table 4).

There was a significant reduction in anaesthesia complications, both during and after surgery post-implementation (intraoperative from 2.78 to 1.61%, postoperative from 1.4 to 0.8%) as shown in Table 4.

We also observed a significant change in the death rates post-implementation. Intraoperative death reduced from 1.4 to 0.4% and postoperative deaths reduced from 12.04 to 8% (Table 5).

The data we analysed before and implementation of the safety check list was comparable with the studies done by B Haynes [2] et al. and Haugen et al. [3]. Complications before implementation in our study were 15.76% as compared to Haynes et al. [2] which was 21 and 2.93% in Haugen et al. [3] study. Post-implementation, our study showed 9.26% in the complication rate while their studies showed 12 and 2.77%, respectively (Fig. 3).

Death rate in our study was 13.44 and 1.20% before and after implementation, while the study done by B Haynes et al. [2] had a comparison of 1.10 and 0.30% before and after implementation. Study done by Haugen et al. [3] had no mortality rate (Fig. 3).

**Table 5** Death rates before and after implementation of safety check list

Intraoperative death		Postoperative death	
Before implementation	After implementation	Before implementation	After implementation
3 (1.4%)	1 (0.4%)	26 (12.04%)	20 (8%)

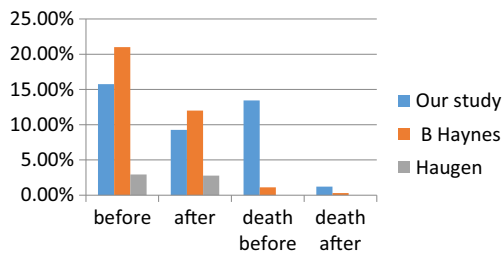
## Discussion

The implementation of WHO surgical safety checklist showed significant and positive changes, with overall improvement in the awareness of patient safety, communication and quality of care. Improvements were noted in the perception of value and participation in the time-out process, surgical team communication and the establishment and clarity of patient care needs.

Use of this check list will help to bring about effective modifications in the process of execution as an ongoing quality improvement in our institution.

The checklist has garnered significant worldwide enthusiasm, with programs implemented in 26 countries and more than 3000 hospitals worldwide within 3 years of its introduction. [4].

It has been suggested that the simplicity of the checklist facilitates a rapid and effective implementation process [5]. The surgical safety checklist has been shown to improve postoperative morbidity and mortality [6]. Poor communication between surgeons and surgical team members has been previously reported, and team training may be required for effective checklist use [7].



**Fig. 3** Comparison of our study with other studies before and after implementation of safety check list

Humans are fallible, and this checklist enhances consistency in surgical team performance at critical times, fostering good communication, teamwork and a culture of patient safety [8].

There was improvement in patient safety following implementation of surgical safety checklist in our study suggested by a reduction in percentage of complications by 5.3% and percentage of deaths by 4.03%.

## Conclusion

By this study, it is eminently evident that surgical safety checklist can be implemented in all the institutions.

Implementation of surgical safety checklist is a prerequisite in surgical health care team to reduce the errors associated and for improved patient safety.

Knowledge about surgical safety checklist in surgical team has scope for improvement.

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