

Study on Compliance of Surgical Safety Checklist at Burn and
Plastic Surgery Department, Guru Teg Bahadur Hospital

By

Smita Kumari

*Dissertation submitted for the partial fulfillment of the
MBA Hospital and Health Management*

Academic year, 2016-2018



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TO WHOMSOEVER MAY CONCERN

This is to certify that **Dr. Smita Kumari** student of MBA Rural Management from The IIHMR University, Jaipur has undergone dissertation at **Guru Teg Bhadur Hospital, New Delhi** from **13th Feb 2018 to 12th May-2018.**

The Candidate has successfully carried out the study designated to her during dissertation training and her approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements.

I wish her all success in all his future endeavors.



Dr (Col) Ashok Kaushik

Dean, Academics and Student Affairs

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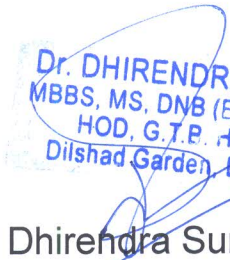
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Dated: 15/05/18

To Whom It May Concern

This is to certify Mrs. Smita Kumari from IIHMR Jaipur has successfully completed dissertation "COMPLIANCE OF SURGICAL SAFETY CHECK-LIST AT BURN AND PLASTIC SURGERY DEPARTMENT". Duration of her dissertation was from February 13th to may 12th, 2018.

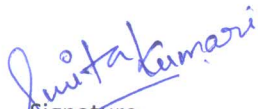
Her performance was satisfactory and we wish her success in the future.


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This is to certify that the dissertation, A Study on Compliance of Surgical Safety Checklist at Burn AND Plastic Surgery Department of Guru Teg Bahadur Hospital, New Delhi, submitted by **Dr. Smita Kumari** Enrollment No- **IIHMR-U/01/2016-18/0502** under the supervision of **Dr. Arindam Das** for award of **MBA in Health and hospital management** of the IIHMR University carried out during the period from **13th FEBRUARY 2018 to 12th MAY 2018** embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other institute or other similar institution of higher learning.


Signature

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ABOUT GURU TEG BAHADUR HOSPITAL

Guru Teg Bahadur Hospital (GTBH) is a 1700-bed hospital is the prestigious and largest Hospital of Govt of NCT of Delhi in the Trans-Yamuna Area(East Delhi) . GTBH was established in 1979 (fully functional in 1987) with 350-bed capacity which has now been expanded to 1700-bed capacity. The hospital is located in Dilshad Garden,very close to DTC Bus Terminal of Nand Nagari and Dilshad Garden.

It is a teaching hospital associated with the University College of Medical Science, University of Delhi and, therefore, also serves as a training center for undergraduate and post-graduate medical students.

It is the first Delhi Government tertiary care hospital in Trans-Yamuna (East Delhi) area, catering to the East Delhi population as well as patients from adjacent states

The hospital is providing health care facilities to the needy population of East Delhi and adjoining areas of other states with an average daily OPD attendance of about 4000 patients. The hospital is equipped with :

- Round the clock emergency service in common clinical disciplines.
- Neurosurgery facilities for road side accident and other trauma victims.
- Burn care facilities.
- Thalassemia day care center.
- CT-Scan.
- Hemo-dialysis and Peritoneal dialysis.

The hospital is in the process of computerization . OPD and IPD registration, Blood Sample collection centers, admission and enquiry, lab investigation services and medical record data have already been computerized and integrated through LAN .

FACILITIES

- Anti-Retroviral Treatment (ART)for HIV & AIDS treatment
- Out Patient Clinics (Outpatient department or OPD)
- Inpatient care (admissions)
- Emergency services
- Critical care
- Suraksha Clinic
- Specialist care
- Laboratory services
- Imaging services
- Medico legal aid
- Nodal Center under National Programs
- Teaching facilities
- Examination services

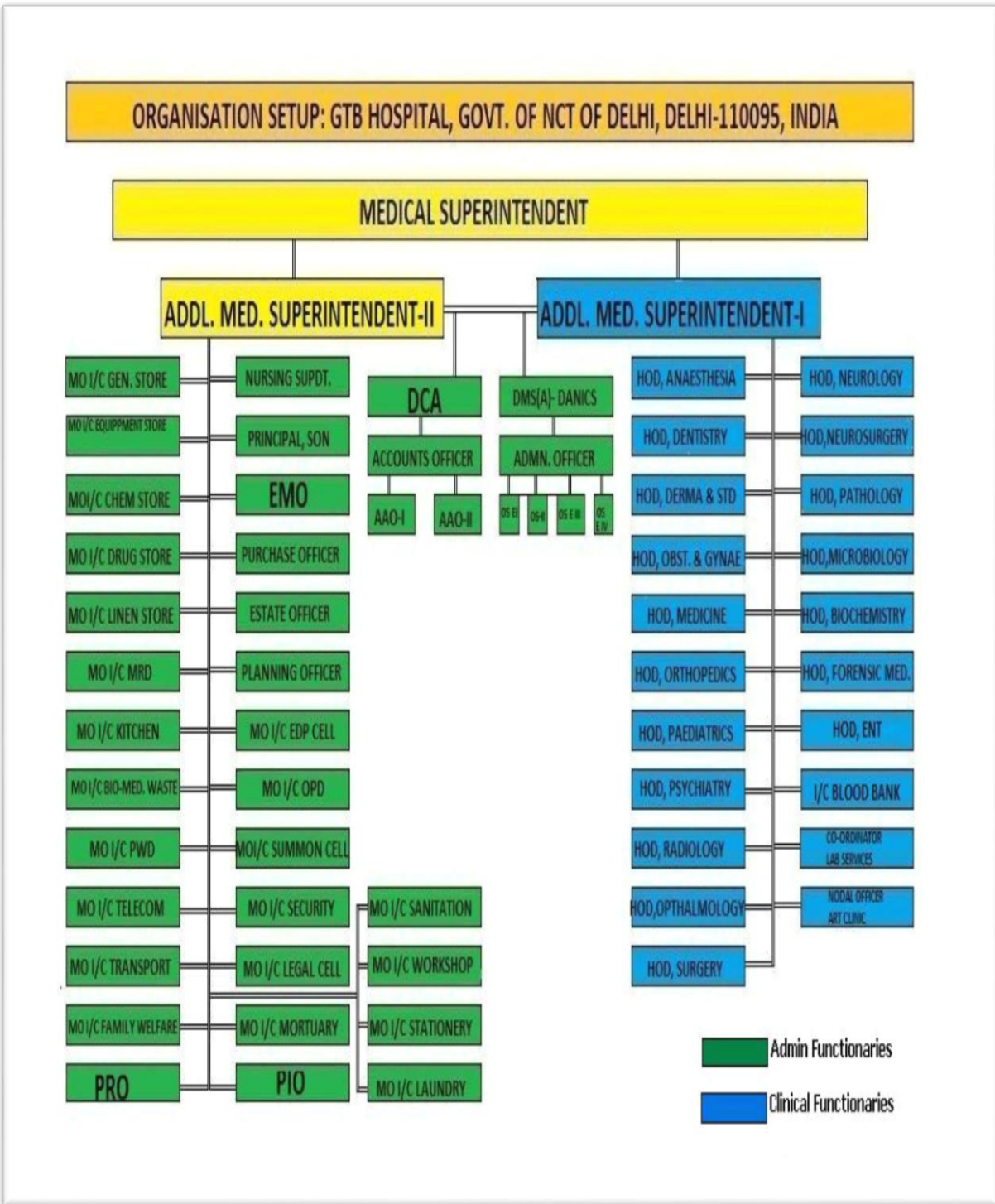


FIGURE: ORGANISATIONAL SETUP

PROJECT TOPIC

COMPLIANCE OF SURGICAL SAFETY CHECKLIST AT BURN AND PLASTIC SURGERY

DEPARTMENT

DR. SMITA KUMARI

MBA HM 21 (0502)



INTRODUCTION

The world health organization (WHO) launched the safe surgery saves lives campaign in 2008 to improve consistency of surgical care and adherence to beneficial safety practices. To help achieve this goal, the surgical safety checklist was created through an international consultative process. It is designed to help operating room staff improve teamwork and ensure the consistent use of safety processes .

It consists of a series of checks that occur :

- Before the induction of anesthesia (Sign-in)
- Before skin incision (Time-out), and
- Before the patient leaves the operating room (Sign-out).

Surgical Safety Checklist		
 World Health Organization		Patient Safety A World Alliance for Safer Health Care
Before induction of anaesthesia (with at least nurse and anaesthetist)	Before skin incision (with nurse, anaesthetist and surgeon)	Before patient leaves operating room (with nurse, anaesthetist and surgeon)
Has the patient confirmed his/her identity, site, procedure, and consent? ☐ Yes	☐ Confirm all team members have introduced themselves by name and role.	Nurse Verbally Confirms: ☐ The name of the procedure ☐ Completion of instrument, sponge and needle counts ☐ Specimen labelling (read specimen labels aloud, including patient name) ☐ Whether there are any equipment problems to be addressed
Is the site marked? ☐ Yes ☐ Not applicable	☐ Confirm the patient's name, procedure, and where the incision will be made.	To Surgeon, Anaesthetist and Nurse: ☐ What are the key concerns for recovery and management of this patient?
Is the anaesthesia machine and medication check complete? ☐ Yes	Has antibiotic prophylaxis been given within the last 60 minutes? ☐ Yes ☐ Not applicable	
Is the pulse oximeter on the patient and functioning? ☐ Yes	Anticipated Critical Events	
Does the patient have a:	To Surgeon: ☐ What are the critical or non-routine steps? ☐ How long will the case take? ☐ What is the anticipated blood loss?	
Known allergy? ☐ No ☐ Yes	To Anaesthetist: ☐ Are there any patient-specific concerns?	
Difficult airway or aspiration risk? ☐ No ☐ Yes, and equipment/assistance available	To Nursing Team: ☐ Has sterility (including indicator results) been confirmed? ☐ Are there equipment issues or any concerns?	
Risk of >500ml blood loss (7ml/kg in children)? ☐ No ☐ Yes, and two IVs/central access and fluids planned	Is essential imaging displayed? ☐ Yes ☐ Not applicable	

This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged.

Revised 1 / 2009 © WHO, 2009

FIGURE : WHO SURGICAL SAFETY CHECKLIST

LITERATURE REVIEW

Surgical service is one of the fundamental health care services given in the healthcare system [1]. Over 234 million surgical operations are performed annually “worldwide” and complications are occurred in 3–16 % of surgical procedures [1, 2]. Surgical complications are a major cause of morbidity and mortality and also pose a major financial burden to patients and providers [3]. But it has been estimated that at least half of the complications that occur are avoidable [3, 4]. The importance of a strong safety culture that enhances patient safety initiatives has been reiterated for years in the healthcare system and the safety of surgical care therefore is a global concern [5].

Evidence showed implementation of different effort modalities for an improved surgical outcome [6–8]. As part of its efforts to improve patient safety, the World Health Organization launched Safe Surgery Saves Lives programme in 2008 . The aim was to harness political commitment and clinical will to address important patient safety issues, including inadequate anesthetic safety practice, avoidable surgical infection and poor communication among team members [3, 9, 10]. Since the development of checklists for use in operating rooms, their use (compliance to all the three time frame) has become greater than ever and associated with a significant reduction in postoperative complications and mortality [11–13]. Recently, however, questions have arisen about their ease of introduction into workflow patterns and their true impact on safety [14].

To establish highly successful implementation processes of Surgical Safety Checklist, every health care provider including hospital managers, have to actively lead the processes [15, 16], deliberately enroll to the work [17, 18], create an extensive multidisciplinary discussion and communication, arrange update trainings [11, 19], offer ongoing constructive feedbacks and conduct regular audits [20–22]. In general, implementing Surgical Safety Checklists needs high level interaction among social, cultural, and operational reasons in the health system [23, 24].

WHO surgical safety checklist is used worldwide in operation theatres for safety of patients. G.T.B.H. is using it religiously in Operation theatres. It has been made mandatory in all procedures performed outside operating room where anesthesia services are provided.

Appropriate utilization and compliance of Surgical Safety Checklist reduces occurrence of perioperative surgical complications and improve patient outcomes. The implementation of a checklist is intended to improve the outcome of surgical care and thus the quality of care in general. Sign-in period was relatively administered in a higher rate, of which the greatest fulfillment was anesthetic equipment and medication checking. These items are important in preventing the most common errors that causes serious harm to the patient [31] Surgical team communication is one of the key intentions of the WHO Surgical Safety Checklist [33]. Communication errors are the most common cause of adverse events in healthcare . For instance, information does not reach the right person, or is inaccurate, or issues remain unresolved until they become critical . In the operating theatre, this leads to mistakes, inefficient use of resources, wasted equipment, frustration, poor morale and delays [36]. In Time-out period, surgical teams are expected to introduce each other by name and functional role. Literature indicates that over time, compliance of surgical staff is good but needs follow up and sustained education sessions including meetings to review and address the barriers in a comprehensive way [9, 22].

SIGNIFICANCE OF A SURGICAL SAFETY CHECKLIST

- Reinforces accepted safety practices
- Fosters better communication and team work between clinical disciplines.
- Improves the safety of operations
- Avoids inadequate anesthetic safety practices
- Reduces avoidable surgical infection
- Reduces unnecessary surgical deaths and complications

RATIONALE

- Surgical service is one of the fundamental health care services given in the healthcare system . This paper focuses on identifying the problems which impacts on surgical safety of patients.

- A database was taken from the hospital designated department then it was decided to study and analyse collectively the entire surgical procedure of patients.
- 100 patients from the hospital were randomly identified in order to study surgical safety for each step and process as mentioned in the WHO surgical safety checklist was observed.

AIM

To evaluate checklist compliance and identify challenges and barriers in utilization of checklist.

OBJECTIVE

General Objective:

- To assess the compliance of surgical safety in Burn and Plastic department of G.T.B.H., Delhi.

Specific Objective:

- To analyze the compliance for various items in the checklist.
- To search the area of problem and find the reasons for the same.
- To give recommendations for the further improvement in the surgical safety of patients.

METHODOLOGY

- Study Design – 1.Observational study,
2. Quantitative Study (assessing checklist compliance),
3. Qualitative (describe reasons for non-compliance of checklist)
- Study Area – Operation theatre of Burn and Plastic Department of G.T.B.H.
- Duration of Study – 3 Months
- Sample Size – 100 surgical patients
- Sampling Method -convenience sampling
- Data Collection Tool - Checklist
- Study Population – Surgery patients, surgeons, anesthetists, senior residents, junior residents, OT nurses

- Inclusion criteria – All the patients in burn and plastic surgery unit undergoing surgery under GA in the month of March and April above the age of 14 year, anaesthetist, surgeons and OT nurses.

DATA COLLECTION

The circulating nurse was designated as the checklist coordinator to guide the team throughout all questions and ticked the checkboxes . But the sign-in, time-out and sign-out phase had to be initiated/checked by anesthetists and residents or/and operating nurses respectively.

The team decides to utilize the checklist which contains a total of 25 items covering three time frames:

1. Before anesthesia ('sign in'—eight items),
2. Before skin incision ('time out'—eleven items),
3. Before leaving the operating room ('sign out'—six items)

Patient UR number, name, type of anesthesia, and adherence to the Surgical Safety Checklist (sign-in, time-out, and sign-out) were collected.

Data were entered and analyzed using Microsoft Excel. Data based statistic was used to display checklist compliance and completeness.

INCLUSION CRITERIA

All the patients in burn and plastic surgery unit undergoing surgery under GA in the month of March and April above the age of 14 year, anaesthetist, surgeons, junior residents, senior residents and OT nurses.

DATA INTERPRETATION AND SPECIFIC PROJECT FINDINGS

The checklist contains a total of 25 items covering three timeframes:

1. Before induction ('sign in'—eight items),”
2. Before skin incision ('time out'—eleven items),

3. Before leaving the operating room ('sign out'—six items).

Each item was given score of

- 1 marks – Compliance
- 0 mark – Non compliance

The score of each timeframe will be in percentage that can be calculated by using formula:

$$\frac{\text{Score obtained by items in timeframe of 100 cases for compliance or non-compliance}}{\text{Total no. of item in timeframe of checklist of 100 cases for compliance and non-compliance}} \times 100$$

Total no. of item in timeframe of checklist of 100 cases for compliance and non-compliance

The total score of checklist will be in percentage that can be calculated by using formula:

$$\frac{\text{Score obtained by items in checklist of 100 cases for compliance or non-compliance}}{\text{Total no. of item in checklist of 100 cases for compliance and non-compliance}} \times 100$$

The analysis included 100 surgical procedures. Overall, 100 checklists were handed in and 25 items in each checklist were analyzed to find out which items were compliant and non-compliant.

From these check items evaluated, missed items = 2.24% (56/2500).

The most frequently missed checklist items were :

- a. item no. 4(10 times)
- b. item no. 11 (10 times)

that state “Pulse oximetry is attached and functional”, Has antibiotic prophylaxis been given within the last 60 min” respectively .

The missed items in : sign-in =2.37 %,
time-out = 3.09 % and sign-out = 2.24 % , respectively.

Items in Checklists at Guru Tez Bahadur Hospital			
Sign in			
Item no.	Checklist items	COMPLIANCE(1)	NON-COMPLIANCE(0)
1	Has the patient confirmed his/her identity, site, procedure and consent?	100	0
2	Is the site marked?	98	2
3	Are the anesthesia equipment and medication checks complete?	100	0
4	Pulse oximetry is attached and functional	90	10
5	Does the patient have a known allergy?	98	2
6	Does the patient have a difficult airway or aspiration risk?	98	2
7	Is risk of blood loss >500 ml and require blood?	97	3
8	Does the assigned person put his/her name and signature?	100	0
Subtotal		781	19
Sign In		Compliance	Non-Compliance
800		97.625	2.375
Time out			
Item no.	Checklist items	COMPLIANCE(1)	NON-COMPLIANCE(0)
9	Confirm all team members have introduced themselves by name and role	100	0
10	Confirm the patient's name, procedure and site of incision	100	0
11	Has antibiotic prophylaxis been given within the last 60 min?	90	10
Anticipated critical events to surgeon:			
12	What are the critical or non-routine steps	95	5
13	How long will the operation take?	93	7
14	Is the anticipated blood loss > 500 Is?	97	3
Anticipated critical events to anesthetist:			
15	Are there any patient-specific concerns?	95	5
Anticipated critical events to nursing team:			
16	Sterility confirmed	100	0
17	Are there equipment issue or any concern	96	4
18	Is essential imaging displayed	100	0
19	Does the assigned person put his/her name and signature?	100	0
Subtotal		1066	34
Time Out		Compliance	Non-Compliance
1100		96.90909091	3.090909091
Sign out			
Item no.	Checklist items	COMPLIANCE(1)	NON-COMPLIANCE(0)
20	Nurse verbally confirms name of procedure	100	0
21	Completion of instrument, sponge, needle and suture counts	100	0
22	Are there any equipment problems to be addressed?	97	3
23	What are the key concerns for recovery and management of this patient?	100	0
24	Specimen labeled correctly	100	0
25	Does the assigned person put his/her Name and signature?	100	0
Subtotal		597	3
Sign Out		Compliance	Non-Compliance
600		99.5	0.5
Total		2444	56
Checklist Compliance		Compliance	Non-Compliance
2500		97.76	2.24

FIGURE: MARKED AND NOT MARKED ITEMS IN THE CHECKLIST AT G.T.B.H. SCROE OF MAEKED ITEMS IS 1 (COMPLIANCE) AND NOT MARKED ITEM IS 0 (NON-COMPLIANCE); TOTAL NUMBER CASE IS 100

1. BEFORE INDUCTION (SIGN-IN PERIOD)

- In this period, the patients confirmed on his/her identity, procedure, consent and assigned person signature were 100% .
- Anesthetic machines, equipment and drugs were checked in 100 % of the cases and corrective measures were taken .
- Oxygen saturation measurement instrument, pulse oximetry, was attached to the patient and was functional in 90 % cases.
- Every case was assessed for potential drug allergy and difficult airway, risk of aspiration (98 %) and anticipated blood loss (97%).

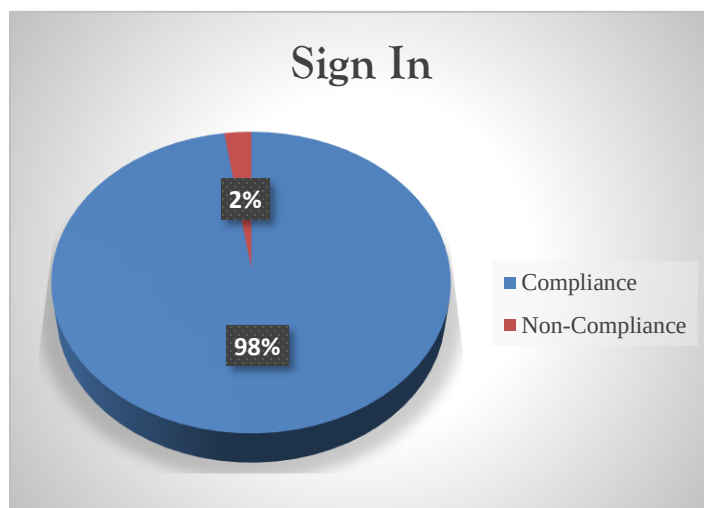


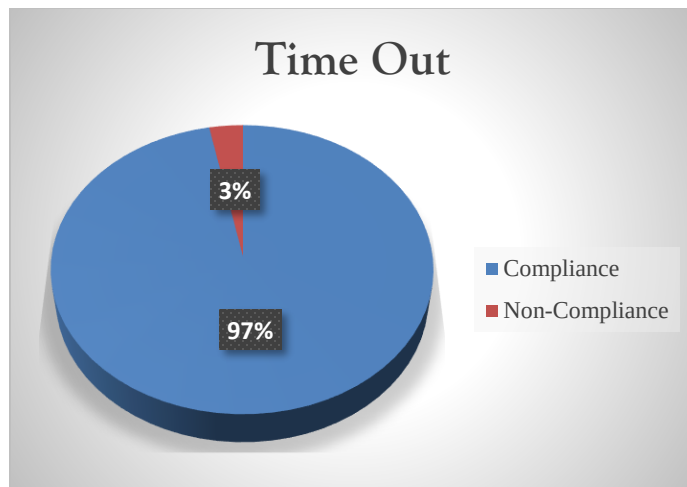
Figure : Sign-in compliance; eight sign-in items in checklist compliance, total number of case is 100.



2. BEFORE SKIN INCISION (TIME-OUT PERIOD)

- Surgical teams were introduced themselves by name and role , confirmed patient name and procedure , sterility, essential imaging display and assigned person signature in 100 % of the cases.
- But the antibiotic prophylaxis within 60 minutes were confirmed in 90% of the cases.

Figure: Time-out compliance; eight time-out items in checklist compliance, total number of case is 100.

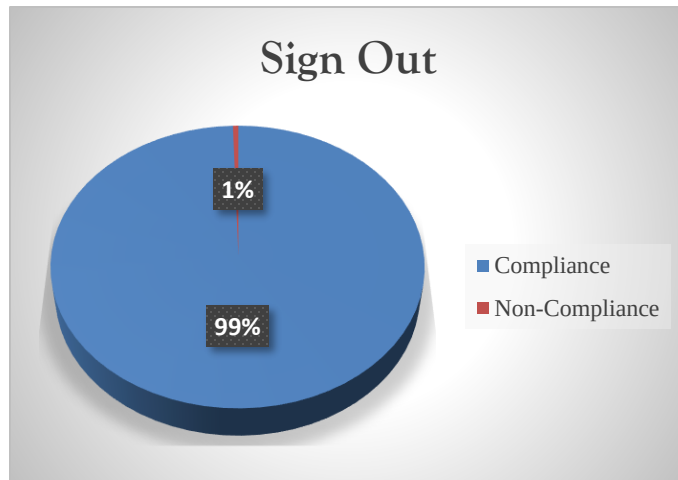


3. BEFORE PATIENT LEFT OPERATING ROOM (SIGN-OUT PERIOD)

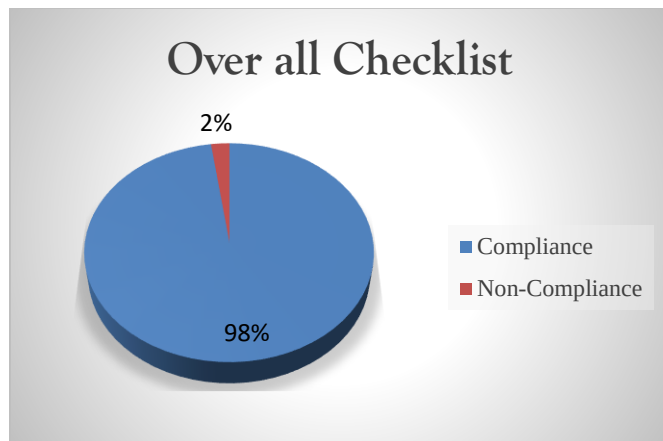
- In sign-out period, the result depicted that nurses verbally confirmed the names of performed procedure, complete count of instruments, sponge, checked for post-operative care of patient, correct label of specimen and assigned person signature in 100% of the cases.

- The equipment process addressed were in 3% of the cases.

Figure: Sign-out compliance; six sign-out items in checklist compliance, total number of case is 100.



OVERALL COMPLIANCE OF CHECKLIST



OBSERVATION

The implementation of a checklist is intended to improve the outcome of surgical care and thus the quality of care in general. In this observational study we have found, although the hospital reported 100 % utilization of the checklist in the operation room , a 98 % compliance and 2 % non-compliance .

- Sign-out period was relatively administered in a higher rate (99.5 %), of which the greatest fulfillment was verbal confirmation, count of instruments, sponge, needles, postoperative concerns for patient, specimen label and assigned person signature.
- Surgical team communication is one of the key intentions of the WHO Surgical Safety Checklist [33]. In Time-out period with compliance of 96.9%, surgical teams are expected to introduce each other by name and functional role. Nevertheless, the findings of this study showed that only 100 % of team members were introduced themselves and also because the team members were well known with each other as they are working in same department.
- In this study finding, sign-in period was 97.62% compliance. The potential causes for this period could be the sight marked may change accordingly to cover defect, sometimes very minor operative procedure is done so we may omit to put pulse oximeter, most of the time patient knows the cause of allergy but some time patient does not know

the drug to which he/she is allergic, very rarely the blood loss may be more than the expected because of many reasons.

- Despite checklist was used in all operations. As a result, the completeness rate was satisfactory, but the overall compliance rate was suboptimal. Time-out and Sign-out period were performed in satisfactory manner, yet it was not performed with equal frequency in all aspects of the items. The sign-in section was clearly seen as more difficult, to complete than other sections. The main reasons cited while utilizing the checklist were lack of previous training and over occupied operation theatre team . On top that, to amplify consistency, the active team members should be motivated to utilize the checklist during their work practice regularly . Moreover, conducting regular audit of checklist utilization, offering regular refreshment and multidisciplinary training to improve communication may increase the rates of compliance with the checklist. Supplementary training and attention to actual checklist use would be indicated to ensure that this valuable tool could be used more accurately .

REASONS FOR NON-COMPLIANCE

- To cover the defect, flap design may need to change during surgery, so the site marked is also changed.
- Sometimes very minor operative procedure is done this may omit to put pulse oximeter.
- Most of the time patient knows the cause of allergy but some time patient does not know the drug to which he/she is allergic.
- Very rarely the blood loss may be more than the expected because of many reasons.
- Sometimes we do very minor operative procedure which is clean and non contaminated, in that case we give antibiotic immediately after procedure.
- In plastic surgery there are many way to treat the problem, so we may need to change the plan accordingly.
- In any surgery, the predicted time of procedure may vary but rarely.
- Very rarely the blood loss may be more than the expected because of many reason.

- To anticipate patient specific concern in some cases, it all depends on the recovery from anesthesia and the operative steps performed by the surgeon.
- Over burden of surgery cases and repeated need of same kind instrument in Burn and Plastic surgery department raises equipment related issue sometimes.
- Because of equipment's being used on another patients as there are shortage of equipment's and over burden of patients.

RECOMMENDATION

1. Offering regular refreshment and multidisciplinary training to improve utilization may increase the rates of compliance with the checklist
2. Gap between knowledge and practice needs to be bridged. Greater awareness and education is required.
3. There was gap seen in equipment availability during surgery. As this was repeated, problem should be raised and more instruments should be made available to operation theatre.
4. Validated evidence based initiatives needs to be emphasized and published.
5. Conducting regular audit of checklist utilization.
6. Supplementary training and attention to actual checklist use would be indicated to ensure that this valuable tool could be used more routinely.
7. The OT is headed by clinical staff, an association of OT manager inside OT can bring significant changes to current scenario.

REFERENCES

1. Weiser TG, Regenbogen SE, Thompson KD, et al. An estimation of the global volume of surgery: a modeling strategy based on available data. *Lancet*. 2008;372:139–144. doi: 10.1016/S0140-6736(08)60878-8. [PubMed] [Cross Ref]
2. World Health Organization. Safe surgery saves lives. Geneva: WHO; 2008. http://www.who.int/features/factfiles/safe_surgery/en/index.html. Accessed 14 February 2012.
3. World Alliance for Patient Safety . Safe surgery saves lives. Geneva: World Health Organization; 2008. p. 8.
4. Kable AK, Gibberd RW, Spigelman AD. Adverse events in surgical patients in Australia. *Int J Qual Health Care*. 2002;14:269–276. doi: 10.1093/intqhc/14.4.269. [PubMed] [Cross Ref]
5. Ginsburg LR, Tregunno D, Norton PG, Mitchell JI, Howley H. Not another safety culture survey: using the Canadian patient safety climate survey (CAN-PSCS) to measure provider perceptions of PSC across health settings. *BMJ Qual Saf*. 2013;1–9. [PMC free article] [PubMed]
6. Runciman WB. Iatrogenic harm and anaesthesia in Australia. *Anaesth Intensive Care*. 2005;33:297–300.[PubMed]
7. Mazzocco K, Petitti DB, Fong KT, et al. Surgical team behaviors and patient outcomes. *Am J Surg*. 2008;11:67–75. [PubMed]
8. Lingard L, Regehr G, Orser B, et al. Evaluation of a preoperative checklist and team briefing among surgeons, nurses, and anesthesiologists to reduce failures in communication. *Arch Surg*. 2008;143:12–18. doi: 10.1001/archsurg.2007.21. [PubMed] [Cross Ref]
9. Haynes AB, Weiser TG, Berry WR, et al. Changes in safety attitude and relationship to decreased postoperative morbidity and mortality following implementation of a checklist-based surgical safety intervention. *Qual Saf Health Care*. 2011;20:102–107. [PubMed]

10. De Vries EN, Eikens-Jansen MP, Hamersma AM, et al. Prevention of surgical malpractice claims by use of a surgical safety checklist. *Ann Surg*. 2011;253:624–628. doi: 10.1097/SLA.0b013e3182068880. [PubMed] [Cross Ref]
11. De Vries EN, Prins HA, Crolla RM, et al. SURPASS Collaborative Group. Effect of a comprehensive surgical safety system on patient outcomes. *N Engl J Med*. 2010;363:1963–1965. doi: 10.1056/NEJMsa0911535. [PubMed] [Cross Ref]
12. Vats A, Vincent CA, Nagpal K, et al. Practical challenges of introducing WHO surgical checklist: UK pilot experience. *BMJ*. 2010;340:54–63. doi: 10.1136/bmj.b5433. [PubMed] [Cross Ref]
13. Edmondson AC, Bohmer RM, Pisano GP. Disrupted routines: team learning and new technology implementation in hospitals. *Adm Sci Q*. 2001;46:685–716. doi: 10.2307/3094828. [Cross Ref]
14. Conley DM, Singer SJ, Edmondson L, et al. Effective surgical safety checklist implementation. *J Am Coll Surg*. 2011;212(5):873–879. doi: 10.1016/j.jamcollsurg.2011.01.052. [PubMed] [Cross Ref]
15. Vats A, et al. Practical challenges of introducing WHO surgical checklist: UK pilot experience. *Br Med J*. 2010;340:b5433. doi: 10.1136/bmj.b5433. [PubMed] [Cross Ref]
16. Kariyo PC, Hightower J, Ndiokubwayo JB, Tumusiime P, Mwikisa C. Challenges facing the introduction of the WHO surgical safety checklist: a short experience in African countries. *Afr Health Monitor*. March 2013; 36–9.
17. Bosk CL, Dixon-Woods M, Goeschel CA, et al. Perspective: reality checks for checklists. *Lancet*. 2009;375:444–445. doi: 10.1016/S0140-6736(09)61440-9. [Cross Ref]
18. Hales BM, Pronovost PJ. The checklist—a tool for error management and performance improvement. *J Crit Care*. 2006;21:231–235. doi: 10.1016/j.jcrc.2006.06.002. [PubMed] [Cross Ref]

19. Cooper K. Errors and error rates in surgical pathology: an Association of Directors of Anatomic & Surgical Pathology Survey. *Arch Pathol Lab Med*. 2006;130:607–609. [PubMed]
20. Haynes AB, Weiser TG, Berry WR, et al. A surgical safety checklist to reduce morbidity and mortality in a global population. *N Engl J Med*. 2009;360:491–499. doi: 10.1056/NEJMsa0810119. [PubMed][Cross Ref]
21. Birkmeyer JD, Miller DC. Surgery: can checklists improve surgical outcomes? *Nat Rev Urol*. 2009;6:245–246. doi: 10.1038/nrurol.2009.57. [PubMed] [Cross Ref]
22. Hancorn K, Blair S. Checklist culture: who needs changing? *BMJ*. 2010;340:90–99. doi: 10.1136/bmj.c909. [PubMed] [Cross Ref]
23. World Health Organization. Ethiopia: health profile. <http://www.who.int/gho/countries/eth.pdf>webcite.
24. Biluts H, Bekele A, Kottiso B, Enqueselassie F, Munie T. In-patient surgical mortality in TikurAnbessa Hospital: a five-year review. *Ethiop Med J*. 2009;47:135–142. [PubMed]
25. Federal Democratic Republic of Ethiopia Ministry of Health. Ethiopian Hospital reform implementation guidelines; 2010. <http://www.nationalplanningcycles.org/planning-cycle/ETH>. Accessed 2 January 2013.
26. Haynes AB, et al. Safe Surgery Saves Lives Study Group: a Surgical Safety Checklist to reduce morbidity and mortality in a global population. *N Engl J Med* 2009;360:491–509. [PubMed]
27. Bosk CL, Dixon-Woods M, Goeschel CA, Pronovost PJ. Reality check for checklists. *Lancet*. 2009;374:444–445. doi: 10.1016/S0140-6736(09)61440-9. [PubMed] [Cross Ref]
28. Rogers EM. Diffusion of innovations. New York: Free Press; 2003.
29. Girard NJ. The view from the other side. *AORN J*. 2007;86:545–546. doi: 10.1016/j.aorn.2007.09.002.[PubMed] [Cross Ref]

30. Hedden T, Gabrieli JD. Insights into the ageing mind: a view from cognitive neuroscience. *Nat Rev Neurosci*. 2004;5:87–96. doi: 10.1038/nrn1323. [PubMed] [Cross Ref]
31. World Health Organization. (2008) World alliance for patient safety. Guidelines for safe surgery, 1st edn. Geneva: WHO; 2008.
32. Nongyao K, Wilawan S, Jittaporn C, et al. Implementation of the World Health Organization Surgical Safety Checklist at a University Hospital in Thailand. *Surg Infect*. 2012;13:50–56. doi: 10.1089/sur.2011.043. [PubMed] [Cross Ref]
33. Lingard L, Espin S, Rubin B, et al. Getting teams to talk: development and pilot implementation of a checklist to promote inter professional communication in the OR. *Qual Saf Health Care*. 2005;14:340–346. doi: 10.1136/qshc.2004.012377. [PMC free article] [PubMed] [Cross Ref]
34. Lingard L, Espin S, Whyte S, et al. Communication failures in the operating room: an observational classification of recurrent types & effects. *Qual Saf Health*. 2004;13:330–334. doi: 10.1136/qshc.2003.008425. [PMC free article] [PubMed] [Cross Ref]
35. Mishra A, Catchpole K, Dale T, McCulloch P. The influence of non-technical performance on technical outcome in laparoscopic cholecystectomy. *Surg Endosc*. 2008;22:68–73. doi: 10.1007/s00464-007-9346-1. [PubMed] [Cross Ref]
36. De Leval MR, Carthey J, Wright DJ, Farewell VT, Reason JT. Human factors and cardiac surgery: a multi-center study. *J Thorac Cardiovasc Surg*. 2000;119:661–672. doi: 10.1016/S0022-5223(00)70006-7. [PubMed] [Cross Ref]
37. Carthy J, de Leval MR, Wright DJ, et al. Behavioral markers of surgical excellence. *Saf Sci*. 2003;41:409–425. doi: 10.1016/S0925-7535(01)00076-5. [Cross Ref]
38. McCulloch P, Mishra A, Handa A, et al. The effects of aviation-style non-technical skills training on technical performance and outcome in the operating theatre. *Qual Saf Health Care*. 2009;18:109–115. doi: 10.1136/qshc.2008.032045. [PubMed] [Cross Ref]

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