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RESEARCH ARTICLE

UTILIZATION OF WHO SURGICAL SAFETY CHECK LIST IN AYDER COMPREHENSIVE SPECIALIZED HOSPITALMEKELLE, TIGIRAY, NORTHERN ETHIOPIA, 2017

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ABSTRACT

Background: Appropriate utilization and compliance of Surgical Safety Checklist reduces occurrence of perioperative surgical complications and improve patient outcomes. However, data on compliance of surgical checklists are scarce in the study area. Therefore, the aim of this study was to evaluate compliance of checklist completionat ayder comprehensive specialized hospital, mekelle, Ethiopia. **Methods:** Institutional based cross sectionalstudy was conducted among 132 patients undergoing elective and emergency surgery from April to June 2017. Compliance and completeness rate with implementation of Sign-in, Time-out, and Sign-out domains was computed with SPSS 20 package. **Results:** A total of 132 operations were performed and checklists were utilized in 69.7 % (92/132) of cases. Among these, most checklists were employed during emergency procedures (72 %) and in plastic and neurology surgical specialty were (100) completed. The overall compliance and completeness rate were 69.7% and 2.2 % respectively. The sign-in, time-out and sign-out completeness rate were in 60.9% (56/92), 8.9% (8/92) and 7.6 % (7/92) respectively. **Conclusions and recommendations:** The compliance rate was satisfactory but the overall completeness rate was low. Moreover, frequent use of the checklist during emergency cases has been deemed to be of value by clinicians. Supplementary training and attention to actual checklist use would be indicated to ensure that this valuable tool could be used more routinely and improve communication. Conducting regular audit of checklist utilization is also recommended.

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INTRODUCTION

Surgical service is one of the fundamental health care services given in the healthcare system (Weiser, 2008). Over 234 million surgical operations are performed annually worldwide and complications are occurred in 3–16 % of surgical procedures (Weiser, 2008 and WHO, 2008). Surgical complications are a major cause of morbidity and mortality and also pose a major financial burden to patients and providers (World Health Organization, 2008). But it has been estimated that at least half of the complications that occur are avoidable (WHO, 2008 and Kable, 2002). 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 (Ginsburg, 2013). Studies have shown that structured briefings and checklists improve team communication, the sharing of information, decision making and planning (Lingard, 2008 and Einav, 2010 and Haynes, 2009).

In 2008, the World Health Organization (WHO) published guidelines identifying multiple recommended practices to ensure the safety of surgical patients worldwide. After implementation of the WHO surgical safety check list (SSC) in eight diverse institutions around the globe, there were statistically significant reductions in the rates of death and complications (Baradaranbinazir, 2015). The implementation of a modified world health organization surgical safety checklist has been implemented in locations from Iran (Semel, 2010) to America (Oak, 2015), in pediatric surgery (Patel, 2014) and adult surgery and across specialties (Levy, 2012). WHO claims it to be universally applicable as theimplementation of the checklist is associated with concomitant reductions in the rates of death and complications in a diverse group of hospitals and specialties. The WHO surgical safety checklist essentially identifies three distinct phases of an operation each corresponding to a specific period in the normal flow of work: before the induction of anesthesia, before the incision of the skin, before the patients leaves the operating facility. In each phase a 'checklist coordinator 'must confirm that the surgical team has completed the listed tasks

before it proceeds with the procedure. Introduction of the checklist into a hospital is not sufficient to improve outcomes and compliance and understanding of the checklist may be a reason for the variation in the impact in surgical outcomes (Van Klei, 2012; Fourcade, 2012; Kwok, 2013 and Conley, 2011). Conley et al 2010 investigated the factors influencing implementation of the checklist in five Washing tonhospitals and concluded that effectiveness was dependent on the ability of leaders to persuasively explain why and adaptively show how to use the checklist (Aveling, 2013). Socioeconomics may also play a part in disparities incompliance, with a comparison of the surgical safety checklist use in high-income and low income families found compliance higher in the high income setting (http://www.who.int/patientsafety/safesurgery/knowledge_base /SSSL_Brochure_final) Following the WHO'sSafe Surgery Saves Livescampaign (https://gis.harvard.edu/services/project-consultation/project-resume/surgical-safety-web-map) approximately 1790 institutions worldwide are now reported to be using the checklist (Weiser, 2008). ayder comprehensive specialized hospital introduced the checklist in early 2014 with acopy of the Surgical Safety Checklist (SSC) in each of the patient's notes. Approximately 12 surgeries are performed a day in aydersplit between orthopedics, general surgery, plastic surgery, ear nose and throat(ENT) and ophthalmology, and each specialty is required to fill in the SSC. As introduction of the check list on its own is insufficient to improve outcomes, observations of utilization should be done in order to achieve maximum benefit from the checklist.

Statement of the Problem

The WHO has estimated that 234 million operations are performed annually around the globe (National Reporting and Learning System, 2015). And adverse events in surgery were reported to occur in 14 % of patientsof which 50% are thought to be preventable (Anderson, 2013). A systematic review including over 74 000 patient records found a median incidence of in-hospital adverse events of 9.2% with approximately half of those events being operation or drug-related and 43% deemed preventable (24) http://www.nrls.npsa.nhs.uk/resources/collections/quarterly-data-summaries/?entryid45=135410). In England and Wales, the National Reporting and Learning System (NRLS) reported 10526 patients died or came to severe harm secondary to incidents in 2013-2014. Over 3000 of these incidents were related to treatment or procedure, or implementation of care and ongoing monitoring/review (Room, 2010). These figures, when extrapolated to the global number of surgeries conducted, are alarming and provide clear motivation to make surgery safer.

Ethiopia, one of the developing countries with a population of 82.8 million (Federal Democratic Republic of Ethiopia Ministry of Health, 2010), currently undergoing extensive development of healthcare services. Data on surgical outcomes is limited but published figures showed an all-cause surgical mortality of 7 % (Haynes, 2009). The Clinton Health Access Initiative (CHAI) and Yale Global Health Leadership Institute (GHLI) are working together with the Ethiopian Federal Ministry of Health to improve healthcare services across Ethiopia through the introduction of Ethiopian Hospital Reform Implementation Guidelines (EHRIG) in 2010 (Bosk2009). The WHO Surgical Safety Checklist is an important tool and its introduction to Ethiopian hospitals is an integral part of the EHRIG. While critics point out that checklists alone are not sufficient to improve patient safety, and must be accompanied by wider strategies for quality improvement, it is hoped that implementation of the checklist will reduce surgical mortality and morbidity (Rogers, 2003 and Girard, 2007). The benefits of the Checklist, however, depend upon the individual hospitals' ability to implement it effectively.

Significance of the study

The WHO Surgical Safety Checklist is an important tool. Despite the existing evidence for the use of the SSC, little is known about its real usage rate. To date, there are no reports in the medical literature on the usage rate of the SSC. Furthermore, usage habits of the SSC and reasons and circumstances of non-users of the SSC have not been explored. Knowledge of the usage rate SSC is essential for proper utilization. This study will identify the gap; so that this finding will have contributed for policy makers and significant others to take possible to improve knowledge of the proper utilization of WHO surgical safety check list and may provide a base line for further study on implementation.

LITERATURE REVIEW

According to The Safe Surgery Saves Lives Study Group at the World Health Organization published a perioperative surgical safety checklist (SSC) in 2008 (WHO, *2008*). The introduction of the SSC in eight hospitals around the world was associated with a reduction in deaths from 1.5 % to 0.8 % and in major complications from 11.0 % to 7.0 % (Aveling, 2013). In a following study, de Vries *et al.* reported that implementation of a comprehensive checklist in hospitals with a high standard of care was associated with a reduction in postoperative complication rate from 27.3 % to 16.7 % (DeVries, 2010). In 2010, Semel *et al.* performed a hypothetical decision analysis of the checklist introduction (Semel, 2010). Per-use cost of the SSC was only $11 and it generated cost savings once it prevented at least five major complications, since the cost of a major surgical complication was found to be $11,626 on average (Dimick, 2004). Furthermore, hospitals may realize savings through gains in efficiency by introduction of the SSC. A checklist use in operating rooms resulted in improved nurse retention and a decrease in the number of operations that were cancelled or delayed (Nundy, 2008). Additional evidence suggests that operative briefings may actually decrease disruptions to the surgical workflow (Henrickson, 2009).

Accordingly, Norton *et al.* reported that 89 % of hospital staff believed that the checklist has improved patient safety in the perioperative environment (Norton, 2014). According to perspectives in quality designing the WHO Surgical Safety Checklist the use of checklists in health care is increasingly commonone of the first widely publicized checklists was for the insertion of central venous catheters. This checklist, in addition to other team-building exercises, helped significantly decrease the central line infection rate per 1000 catheter days from 2.7 at baseline to zero (Pronovost, 2006). Building on this early success, the World Health Organization's Patient Safety Programmed 'Safe Surgery Saves Lives' developed a Surgical Safety Checklist as a means of improving the safety of surgical care around the world. In a multinational study involving eight hospitals from diverse economic settings, its use improved

compliance with standards of care by 65% and reduced the death rate following surgery by nearly 50% (Fuller, 2009). According to the studyin Switzerland Implementation of the Surgical Safety Checklist and Perceptions of Its Benefitssurgical procedures are performed to save lives and to improve patient's quality of life, unsafe practice and medical errors have also been incriminated in causing serious complications. Such preventable complications have been estimated to increase the total hospital cost by an average 10% (Haynes, 2009). The implementation of the SSC resulted in a 30% reduction in operative mortality and major complications, in both high and low income countries (Baradaranbinazir, 2015). According to the prospective survey the usage rate of the SSC was 91 % in urological departments in Germany. Recent surveys reported a slightly lower usage rate in Switzerland of 79 % (Mascherek, 2013) and in Ireland of 78 % (*Nugent, 2013*).

Conceptual frame work

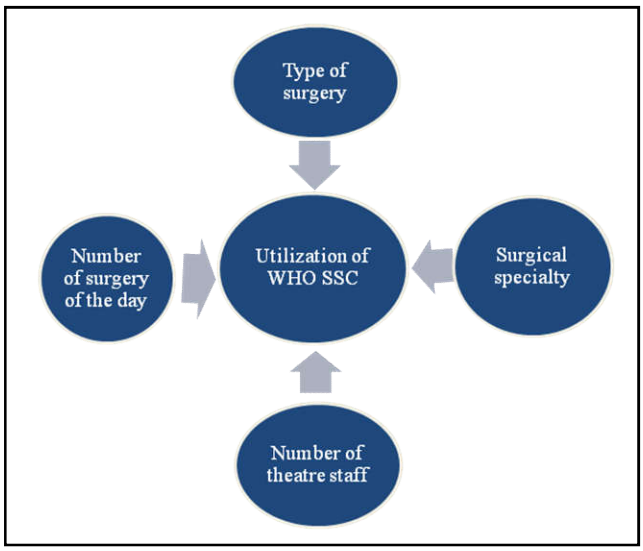

Figure 1. Conceptual frame work

The above conceptual frame work is adopted from different literatures. In the above conceptual frame work there are factors that are not included completely in our research that including only Type of surgery ,Surgical specialty, Number of theatre staffs and Number of surgery of the day were included in this research

Objective

General objective: To assess proper utilization of surgical safety check list in ayder comprehensive specialized hospital 2017.

Specific objectives

- Toassess proper compliance rate of the signin phase of the WHO surgical safety checklist inayder comprehensive specialized hospital.
- Toassess proper compliance rate of the time out phase of the WHO surgical safety checklist inayder comprehensive specialized hospital.
- Toassess proper compliance rate of the sign out phase of the WHO surgical safety checklist inayder comprehensive specialized hospital.

METHODOLOGY

Study area and period: Institutional based cross sectional study was conducted at ayder comprehensive specialized hospitalmekelle from April to June 2017.It serve's for more than 5 million people and it have 500 bedsestimatly. Mekelle is the capital city of Tigray Administrative regional state located783 kilometers north part of Addis Ababa.

Study design: Institutional based cross sectionalstudywere be conducted 2017.

Source population: All major surgeries cases which are performed with in the period of studyat ayder comprehensive specialized hospital.

Study population: All major surgeries cases which are performed with in the period of study at ayder comprehensive specialized hospital.

Eligibility Criteria

Inclusion criteria: All major surgeries cases which are performed with in the period of studyare included.

Exclusion criteria: Minor surgeries cases which are performed in the minor operation theater and major operation theater are not included.

Sample size: The sample size is calculated using single population proportion formula (P = 78), confidence level of 95% and 5% significance level by using the following formula.

$$n = \frac{(Z\alpha)^2 p(1-p)}{w^2}$$

$\frac{(1.96)^2(0.78)\,(1-0.78)}{(0.05)2}$ = 264 isour estimated sample size

n_f=no/1+(no/N)

264/1+264/252 = 132 is our sample size

Where n = required sample size

Z = critical value for normal distribution at 95% confidence level which equals to 1.96 (z value at α =0.05)
P = (0.78) according to the Recent surveys reported a slightly lower usage rate in Ireland of 78 %
W = 0.05 (5% margin of error);
nf= corrected sample size,
no= estimated sample size
N=Total population (average12surgeries performed per day in ayder comprehensive specialized hospital x3weeks=252 is our total population)

Sampling procedure: We weredirect observed 132 major operative cases for 3 consecutive weeksto assess the utilization of WHO surgical check list inaider comprehensive specialized hospital.

Variables

Dependent variables

- Sing in
- Time out
- Sing out

Independent variables

- Type of surgery
- Surgical specialty
- Number of theatre staff
- Number of surgery of the day

Method of Data Collection: Data was collected through direct observation during the procedure is performed for 3weeks in ayder comprehensive specialized hospital. All the group members were assigned to collect data and daily discussion the overall activities of data collection process.

Data quality control: The data was collected through the standard WHO surgical safety check list and overall data collection process before the actual time of data collection. Data were coded, cleaned, entered and analyzed using SPSS Version 20. Descriptive statistic was used to display checklist compliance and completeness rate.

Data analysis and interpretation: Data was entered and analyzed using SPSS software (version 20.0). Tables were used to present the results.

Operational definitions

WHO surgical safety check list: The world health organization (WHO) published the WHO surgical safety checklist and implementation manual in 2008 in order to increase the safety of the patients undergoing surgery which is the 19 components in three phases are full filled.

Sing in: The first phase of WHO surgical safety check list that is implemented before induction of anaesthesia, ideally with surgeon present, but not essential Verbally verify which is the all (7) components are full filled.

Time out: The second phase of WHO surgical safety check list that is implemented after induction and before surgical incision, entire team which is the all(7) components are full filled.

Sing out: The third phase of WHO surgical safety check list that is implemented during or immediately after wound closure, before moving the patient out of the operating room, whilst surgeon still present which are the all (5) components are full filled.

Utilization: to use (something) for a particular purpose

Ethical Consideration: Ethical clearance and official permission was secured to conduct the study from office of Health Research Ethics Review Committee (HRERC) of College of Health Sciences, Mekelle University and medical director of ayder comprehensive specialized Hospital respectively. After we were get permission from the hospital, we were communicating with the operation theater head nurses office before starting the study. Confidentiality was assured for all the information observed, no personal identifiers had be used on the observational check list.

Dissemination of the result: The result of this study will be submitted to the department of nursing. It will be disseminated also to the concerned bodies accordingly.

RESULTS

Compliance of use and checklist completeness: During the study period, 132 operations were performed with spinal and general anesthesia. Checklist was used in 69.7% (92/132) of operations; within used checklists, 2.2 % (2/92) were complete (i.e. all items of the checklist had been 'ticked off') and 97.8 % (90/92) were partially complete (i.e. all items of the checklist have not been 'ticked off'). As a result, the overall compliance and completeness rate were 69.7 and 2.2 % respectively. As shown in Table 1, most checklists were employed during emergency surgery (72 %), and in neurology and plastic surgical specialty (100%) completed.

Table 1. Surgical Safety Checklist utilization among operated surgical patients at ayder comprehensive specialized hospital, 2017(N = 132)

Variable	Use of surgical safety check list		Total (n=132)
	Yes (n=92)	No (n=40)	
Types of surgery			
Elective	74 (69.2)	33(30.8)	107(81.1)
Emergency	18(72)	7(28)	25(18.9)
Total	92(69.7)	40(30.3)	132(100)
Surgical specialty			
General	37(69.8)	16(30.2)	53(40.2)
Ortho	16(69.6)	7(30.4)	23(17.4)
Gyn-obs	17(85)	3(15)	20(15.2)
Neurology	2(100)	0(0)	2(1.5)
ENT	6(60)	4(40)	10(7.6)
plastic	2(100)	0(0)	2(1.5)
Urology	10(55.6)	8(44.4)	18(13.6)
Other	2(50)	2(50)	4(3)
Total	92(69.7)	40(30.3)	132(100)

As shown in Table 2, most checklists were completely employed in to 3&2 respectively, in the other hand partially completed in 4 (75%) of the number of surgery of the day.

Table 2. WHO surgical safety checklist utilization among number of surgery of the day

Numbers of surgery of the day	WHO surgical safety checklist			Total (n=132)
	Completed	Partially completed	Not used	
1	0(0)	50(70.4)	21(29.6)	71(53.8)
2	1(2.8)	22(61.1)	13(36.1)	36(27.3)
3	1(5.9)	12(70.6)	4(23.5)	17(12.9)
4	0(0)	6(75)	2(25)	8(6)

As shown in Table 3, most checklists were completely employed 2&3 respectively, in the other hand most checklists were missed in category 1(40%).

Analysis of phases and individual items of the checklists: The analysis included 92 surgical procedures. Overall, 92 checklists were handed in and 1748 items were analyzed to find out which items were most commonly used/missed. From these check items evaluated, 18.1 % (317/1748) were missed. The most frequently missed checklist items were item 19 (85 times), 14 (83 times) and 7 (26 times) that state "surgeon, anesthesia professional and nurse review the key concerns for

recovery and management of this patient", whether essential imaging displayed" and whether the patient have arisk of blood loss >500 ml and require blood or not respectively (Table 2). The sign-in, time-out and sign-out were missed in 7.8 % (50/644), 21.4 % (138/644) and 28% (129/460) respectively. Confirmation of how specimen is labeled and Confirmation of any equipment problems to be addressed 87% of the cases. On the other hand, the surgical teams discussed the main concerns of recovery room condition and patient management in 7.6 % of cases (Table 4).

Table 3. WHO surgical safety checklist utilization among number of theatre staffs

Numbers of theatre staff categories	Category	WHO surgical safety checklist			Total (n=132)
		Completed	Partially completed	Not used	
4-6	Category 1	0(0)	21(60)	14(40)	35(26.5)
7-9	Category 2	1(1.5)	52(76.5)	15(22)	68(51.5)
10-12	Category 3	1(3.4)	17(58.6)	11(37.9)	29(22)

Table 4. Missing items in Checklists at ayder comprehensive specialized hospital, April-June 2017 Ethiopia

Item no	Checklist items	Number of times missing	%
Sign in			
1.	Has the patient confirmed his/her identity, site, procedure and consent?	1	0.3
2.	Is the site marked?	10	3.2
3.	Anesthesia safety check complete?	6	1.9
4.	Pulse oximeter on patient and functioning	2	0.6
5.	Does the patient have a known allergy?	3	0.9
6.	Does the patient have a difficult airway or aspiration risk?	2	0.6
7.	Is risk of blood loss >500 ml and require blood?	26	8.2
Subtotal		50	15.8
Time out			
8.	Confirm all tem members have introduced themselves by name and role	20	6.3
9.	Confirm the patient's name, procedure and site of incision	9	2.8
10.	Anticipated critical events: surgeon reviews	5	1.6
11.	Anticipated critical events: anesthesia team reviews	5	1.6
12.	Anticipated critical events: nursing team reviews	5	1.6
13.	Has antibiotic prophylaxis been given within the last 60 min?	11	3.5
14.	Is essential imaging displayed	83	26.2
Subtotal		138	43.5
Sign out			
15.	Nurse verbally confirms name of procedure	10	3.2
16.	That Instruments, sponges and needle counts are correct	10	3.2
17.	Confirmation of how specimen is labeled	12	3.8
18.	Confirmation of any equipment problems to be addressed	12	3.8
19.	What are the key concerns for recovery and management of this patient?	85	26.8
Subtotal		129	40.7
Total		317	100

Before induction (sign-in period): In this period, 99 % of the patients were confirmed on his/her identity, site, procedure and consent. Site marking was confirmed 89%. Anesthetic machines, equipments and drugs were checked in 93.5 % of the cases. Oxygen saturation measurement instrument, pulse oximetry, was attached to the patient and was functional in 98% cases. Every case was assessed for potential drug allergy (97%); difficult airway, risk of aspiration (98 %) and anticipated blood loss (71.7%). In line with these, appropriate protective measures were taken for every identified risk which was reminded by the checklist (Table 4).

Before skin incision (time-out period): Surgical teams were introduced themselves by name and role in only 78.3 % of the cases. But the patient's identity, operative site, and type of procedure performed were confirmed in 90.2 % of the cases. 94.6 % of the cases were anticipated critical events reviewed by surgeon, anaesthesia and nurses by the checklist and 88% of the cases antibiotic prophylaxis was administered 1 h before incision (Table 4).

Before patient left operating room (sign-out period): In sign-out period, the result depicted that nurses verbally confirmed the names of performed procedure in 89.1 % of the cases. But materials used for the operations were counted before the closure of the incision in 89.1 % of the cases.

DISCUSSION

The implementation of a checklist is intended to improve the outcome of surgical care and thus the quality of care in general (Hedden, 2004). Nevertheless, the findings of this study showed thatslightly lower usage rate (69.7%) from that of Recent surveys reported a slightly lower usage rate in Switzerland of 79 % (Mascherek, 2013) and in Ireland of 78 % (*Nugent, 2013*). Sign-in period was relatively administered in a higher rate (92.2 %), of which the greatest fulfillment was verbally confirms with the patient his or her identity, the type of procedure planned, the site of surgery and that consent for surgery has been given.this step is essential for ensuring that the team does not operate on the wrong patient or site or perform the wrong procedure (WHO, 2008). Moreover, functional pulse oximetrywas attached and aspiration risk, anticipation of a difficult airway was tick off in the majority of the cases which helps to detect desaturation and aspiration riskat the early stage. In contrast, items of, allergic history, anaesthesia safety checklist,site marked and estimated blood loss were found unchecked in most cases, all of them could lead to loss of life (Nongyao, 2012). Surgical team communication is one of the key intentions of the WHO Surgical Safety Checklist (Lingard, 2005). In Time-out period, surgical teams are expected to introduce each other by name and functional role. Nevertheless, the findings of this study

showed that only 78.3 % of team members were introduced themselves by names and roles. The reason might be explained by surgical teams were communicated and introduced themselves for a long period of time in their practical place. Moreover, people often introduce each other only during the first contact. In this respect, many studies depicted that serious complications could occur when there are unsuccessful communication and cooperation among the surgical team members (Mishra, 2008). In this study finding, Sign-out period was poorly performed (72 %) compared with other sections. The potential causes for this period could be tightly preoccupied surgical teams (nursing teams with final instrument count, processing and preparation for the next case, surgical and anesthetic teams with patient extubation, oxygen preparation in recovery room, procedure note writing and patient transfer) during that procedure. 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 (De Leval, 2000). This problem was in line with current study finding, missing of WHO surgical safety checklist in the operation room is one sources of communication error. 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 (Haynes, 2011 and Hancorn, 2010).

Limitation of the study: This study has some limitations. It was conducted in only one setting and in a brief period of time which comprise of relatively small sample; therefore, the results might not be applicable to other settings throughout the country.

Conclusion and recommendations

Despite checklist was not used in all operations, all the three parts (all items) of the checklist had not been completed 'ticked off' in majority of the operations among those who utilized the checklist. As a result, the completeness rate was low but the overall compliance rate was good. The present study did not assess outcomes, but it is assumed that poor compliance puts patients at risk. Sign-in period were performed in satisfactory manner The time out and Sign-out section was clearly seen as more difficult, and less important, to complete than other sections. Regular and appropriate implementation of checklist is used as a tool for improving team communication; strengthening teamwork and improving patient safety. On top that, to amplify consistency, the active team members should be motivated to utilize the checklist during their work practice regularly. Awareness creation should be in place especially for new nursing/anesthetic staffs because of high turnover. Moreover, conducting regular audit of checklist utilization, offering regular refreshment and multidisciplinary training to improve communication may increase the rates of completeness with the checklist. Supplementary training and attention to actual checklist use would be indicated to ensure that this valuable tool could be used more routinely.

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