

Do We Feel Safe About the Surgical Safety Checklist? A Cross-Sectional Study Between Two Periods

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ABSTRACT

Introduction: The aim of this study was to evaluate the change in the healthcare providers' perceptions regarding the World Health Organization Surgical Safety Checklist (WHO SSC) and patient safety in the operating room (OR) at a tertiary hospital in Riyadh, Saudi Arabia. **Methods:** This cross-sectional study was conducted at King Abdulaziz Medical City. Data were collected from two years (2011 and 2019) for comparison. The co-investigators distributed a self-administered Likert scale questionnaire in the various operating areas (35 ORs). **Results:** The total sample was 461. Number of participants enrolled from both years was 235 (51%) and 226 (49%), respectively. The results indicated a statistically significant difference in the attitude of the participants regarding all aspects of patient safety in the OR when the two periods were compared ($p < 0.001$). Similarly, healthcare providers' perceptions regarding the importance of the WHO SSC increased from 50% (2011) excellent to 68% excellent (2019) ($p < 0.001$). **Conclusions:** Currently, more healthcare providers recognize the importance of the WHO SSC, and more have a positive attitude toward teamwork, communication, and feeling free to speak out when surgical safety is compromised. All of these cultural changes have positive impact on the overall safety of the OR; however, there are still aspects requiring improvement to provide a safer OR and surgery. Educational interventions regarding the importance of communication and teamwork would improve the safety of surgical care in the OR.

INTRODUCTION

Patient safety is a priority for both the surgeon and hospital, as surgical errors are devastating.¹ In comparison with other hospital settings, mistakes in the operating room (OR) result in severe consequences for the patient, surgeon, and the institution.^[1] According to the Joint Commission on Accreditation of Healthcare Organizations, miscommunication is the most frequent cause of wrong-side surgeries.^[1] Miscommunication can result in errors such as a mismatched organ transplant or blood transfusion and wrong-side operations.^[2] Not all adverse events are preventable, but if a patient got an

anaphylaxis due to a documented allergy that a physician did not notice, it is a preventable adverse event.^[3] Many studies suggest that approximately 10% of patients admitted to the hospital would suffer from a harmful event, half of which can be prevented.^[4] In a systematic review regarding adverse events in hospital, 39.6% were surgical related.^[5]

The World Health Organization (WHO) implemented a Surgical Safety Checklist (SSC) in 2009.^[6] The 19-item checklist enhances interdisciplinary perioperative checking and communication of important information. The checklist is divided into three phases: the period before induction of anesthesia, the period before the surgical

incision, and the period before removing the patient from the OR.^[7] A study indicated that 74% of surgical adverse events are preventable.^[8] When the WHO SSC was introduced in eight hospitals, a significant reduction of 36% in mortality and postoperative complications was achieved.^[9] The reduction rate of complications and mortality provides evidence that the WHO SSC plays a major role in patient safety in the OR.^[9] In a multicenter study, the improvement in the safety culture after the introduction of perioperative briefings reduced the complication rate from 75% to 4%, depending on the center.^[10] A retrospective study stated that the use of the WHO SSC could prevent 85.3% of all wrong-side errors.^[10,11] There were institutional and cultural barriers preventing the uptake, utilization, and belief in the WHO SSC.^[11] There are few data comparing the perception of healthcare provider of the WHO SSC over a period of time, and these data would help institutions to understand the limitations of the implementation of the checklist, which is an important safety measure. The WHO SSC is a mandatory protocol done for every surgical intervention occurring in this institution. The aim of this study was to evaluate the change in the healthcare providers' perceptions of the WHO SSC and patient safety in the OR at a tertiary hospital in Riyadh, Saudi Arabia.

METHODS

The study was approved by the Institutional Review Board at King Abdullah International Medical Research Center. Written informed consent was provided by all participants.

This cross-sectional study included healthcare providers employed in an OR (i.e., surgeons, anesthesiologists, nurses, and anesthetic technicians) at King Abdulaziz Medical City (KAMC) in Riyadh, Saudi Arabia. KAMC is a tertiary care center with a bed capacity of 1501. It has a level 1 (I) trauma center, with five main operating areas. The WHO SSC was first introduced in KAMC at 2011 and it is mandatory for all operations. The co-investigators distributed a self-administered questionnaire in the various operating areas, including the main OR (11 ORs), surgical tower OR (4 ORs), daycare surgery OR (4 ORs), King Abdullah Specialized Children's Hospital OR (12 ORs), and the Cardiac Center OR (4 ORs). Data were collected from two different years by the research team in 2011 and 2019. The sample size was calculated using Raosoft as 271 with a population of 912, with a 5% margin of error and a confidence interval of 95%.^[12]

A questionnaire using a 5-point Likert scale was developed by the research team. The first section included two demographic questions, the participant's specialty, and the OR area. The second section consisted of 11 questions, two related to communication, three to safety in the OR, four rated the safety of specialties, and the last two of questions assessed the perceptions related to the WHO SSC. Each item was scaled from 1 to 5, 1

Table 1. Baseline characteristics of the participants (N = 461)

	n (%)
OR area	
Main OR	287 (62.3)
Surgical tower	56 (12.1)
KASCH	83 (18)
DCOR	28 (6.1)
Cardiac center	7 (1.5)
Specialty	
Surgeons	161 (34.9)
Anesthesiologists	75 (16.3)
Nurses	184 (39.9)
Anesthesia technicians	41 (8.9)
Period	
2011	235 (51)
2019	226 (49)

DCOR: Day care operating room; KASCH: King Abdulaziz Specialized Children Hospital; OR: operating room.

being strongly disagree and 5 strongly agree. A safety scale was developed with the minimum score 11 and the maximum score 55. The content validity was assessed by two experts, and in terms of reliability, the Cronbach alpha of the pretest was 0.89.

Data Analysis

The Statistical Package for the Social Sciences (SPSS) version 20.0 software (IBM Corp.) was used for data entry and analysis. Categorical variables are presented as frequency and percentage, and the numerical variables as mean and SD. The χ^2 test was used to compare the categorical variables between 2011 and 2019. A general linear model was used to compare the safety scores between 2011 and 2019 adjusted by area and specialty. A test with a *p* value of less than 0.05 was considered as statistically significant.

RESULTS

The total sample was 461 participants, with most being nurses (*n* = 184, 39.9%) and surgeons (*n* = 161, 34.9%). Most (*n* = 287, 62.3%) were from the Main OR. An almost equal number of participants were enrolled in the study from both years, 235 (51%) and 226 (49%) in 2011 and 2019, respectively (Table 1). Table 2 shows the distribution of participants based on period. Comparing the two years, a statistically significant difference was found in the attitude of participants regarding all aspects related to patient safety in the OR and the WHO SSC (*p* < 0.001) (Table 3). There was an improvement in the overall safety level of the OR comparing the two years (*B* = 3.2; 95% CI: 1.9–4.6; *p* < 0.001). Moreover, surgeons had a higher safety score compared with anesthesia technicians (*B* = 4.7; 95% CI: 2.4 – 7.1; *p* < 0.001) (Table 4). In 2019, an excellent rating was given to most questions, compared with a good rating in 2011. However, the WHO SSC-related questions were rated as excellent in both years (Table 3). Regarding patient safety-related questions, a change in the attitude of the

Table 2. Baseline characteristics of the participants by year

	2011, n (%)	2019, n (%)
OR Area		
Main OR	181 (77)	106 (46.9)
Surgical Tower	27 (11)	29 (12.8)
KASCH	27 (11.5)	56 (24.8)
DCOR	0 (0)	28 (12.4)
Cardiac center	0 (0)	7 (3.1)
Specialty		
Surgeons	68 (28.9)	93 (41.2)
Anesthesiologists	38 (16.2)	37 (16.4)
Nurses	109 (46.4)	75 (33.2)
Anesthesia technicians	20 (8.5)	21 (9.3)
Total	235 (100)	226 (100)

DCOR: Day care operating room; KASCH: King Abdulaziz Specialized Children Hospital; OR: operating room.

participants was noticed. The response to the question “Is the teamwork in the OR good?” increased from 8.1% excellent to 39.6% ($p < 0.001$). The response to the question “Does everyone in the OR do what is in the best interest of the patient?” increased from 14.9% excellent to 38.9% ($p < 0.001$). Similarly, “Are you comfortable speaking up when you have a safety concern?” changed from 21% to 42% ($p < 0.001$) (Fig. 1).

The safety ratings between specialties are displayed in Table 5. Almost half of the surgeons reported themselves as good (49.1%), anesthesiologists as good (49.7%), nurses as excellent (49.7%), and anesthetic technicians as good (47.8%). Almost half of the anesthesiologists rated themselves as good (48%), surgeons as good (38.7%), nurses as good (54.7%), and anesthetic technicians as good (44%). Similarly for the nurses, 48.9% rated

themselves as good, surgeons as good (38.6%), anesthesiologists as good (39.1%), and anesthetic technicians as neutral (32.1%). From the perspective of the anesthetic technicians, their own evaluation was good (43.9%), surgeons as neutral (39%), anesthesiologists as good (48.8%), and nurses as excellent (39%) (Table 5).

DISCUSSION

The WHO SSC aims to improve surgical care by guaranteeing adherence to evidence-based standards.^[13] Safety checklists are intended to result in improved teamwork and communication.^[14] Using checklists and briefings improve communication and teamwork in the OR and it enhances collaboration between healthcare providers.^[10,15] The current study indicated an improvement in communication and teamwork. Similarly, Bohmer et al^[16] reported positive interprofessional communication, possibly due to reduced hierarchical barriers and unfamiliarity, with introducing team members in timeout, as indicated in the checklist. Effective OR organization reduces avoidable errors and consequently, the patient's risk.^[7,9] In a study with 257 clinicians, most (80.2%) considered the checklist easy to use and 93.4% would want the checklist to be used if they were to have an operation.^[10] In the current study, for the question “If you were a patient, would you like to have a WHO safety checklist applied?” 58% agreed in 2011 and 76.0% in 2019. The Main OR has a higher load of surgeries because most operations occur in it and therefore most surveys were taken from there ($n = 287$, 62.3%). The attitude of participants in 2011 and 2019

Table 3. Attitude of participants regarding aspects related to patient safety by year

Variables	Year	Poor		Fair		Neutral		Good		Excellent		p value
		n	%	n	%	n	%	n	%	n	%	
Is the teamwork in the OR good?	2011	12	5.1	14	6.0	80	34.0	110	46.8	19	8.1	< 0.001
	2019	2	0.9	17	7.6	43	19.1	74	32.9	89	39.6	
Would you feel comfortable having your own surgery performed in the OR which you work?	2011	12	5.1	14	6.0	68	28.9	100	42.6	41	17.4	< 0.001
	2019	7	3.1	17	7.5	33	14.6	80	35.4	89	39.4	
Does everyone in the OR do what is in the best interest of patients?	2011	8	3.4	24	10.2	63	26.8	105	44.7	35	14.9	< 0.001
	2019	3	1.3	8	3.5	40	17.7	87	38.5	88	38.9	
How strong is the communication?	2011	18	7.7	29	12.3	85	36.2	97	41.3	6	2.6	< 0.001
	2019	5	2.2	15	6.6	55	24.3	96	42.5	55	24.3	
Are you comfortable speaking up when you have a safety concern?	2011	8	3.4	16	6.8	48	20.4	114	48.5	49	20.9	< 0.001
	2019	3	1.3	11	4.9	36	16.1	80	35.9	93	41.7	
Surgeons	2011	10	4.3	18	7.7	79	33.6	112	47.7	16	6.8	< 0.001
	2019	8	3.5	16	7.1	49	21.7	78	34.5	75	33.2	
Anesthesiologists	2011	3	1.3	22	9.4	61	26.0	121	51.5	28	11.9	< 0.001
	2019	1	0.4	8	3.6	47	21.0	86	38.4	82	36.6	
Nurses	2011	3	1.3	9	3.8	49	20.9	128	54.5	46	19.6	< 0.001
	2019	0	0.0	1	0.4	22	9.8	75	33.5	126	56.2	
Anesthesia technicians	2011	10	4.3	36	15.3	64	27.2	107	45.5	18	7.7	< 0.001
	2019	12	5.4	23	10.3	51	22.8	76	33.9	62	27.7	
Do you consider WHO checklist an important safety tool?	2011	7	3.0	7	3.0	32	13.6	72	30.6	117	49.8	< 0.001
	2019	0	0.0	1	0.4	16	7.1	55	24.3	154	68.1	
If you were a patient, would you like to have a WHO safety checklist applied?	2011	5	2.1	8	3.4	20	8.5	65	27.7	137	58.3	< 0.001
	2019	1	0.4	0	0.0	12	5.3	41	18.2	171	76.0	

OR: operating room; WHO: World Health Organization.

Table 4. Improvement in overall safety levels between years

Parameter	B	p value	95% CI for B	
			Lower	Upper
Intercept*	43.5	< 0.001	38.0	49.0
Year				
2019	3.2	< 0.001	1.9	4.6
2011 (ref)	0.0			
Area				
Main OR	-1.0	0.714	-6.1	4.2
Surgical tower	-0.6	0.829	-6.0	4.8
KASCH	2.0	0.460	-3.3	7.3
DCOR	1.1	0.715	-4.6	6.7
Cardiac center (ref)	0.0			
Specialty				
Surgeons	4.7	< 0.001	2.4	7.1
Anesthesiologists	1.5	0.271	-1.1	4.0
Nurses	-1.6	0.184	-3.9	0.7
Anesthesia technician (ref)	0			

*Intercept is the average safety score for the reference group. DCOR: Day care operating room; KASCH: King Abdulaziz Specialized Children Hospital; OR: operating room; ref: Reference group.

changed significantly, indicating a higher acceptance of the WHO SSC. Briefings and debriefings have shown to improve teamwork and the overall safety perception.^[2] In this study, most (76%) participants would use the SSC for themselves if they were to have a surgery, similar to a study in which almost all respondents wanted the checklist to be used for themselves as well.^[10] The safety

levels increased from 40.5/55 (2011) to 45.2/55 (2019) ($p < 0.001$), which indicates improved communication and an overall safer OR after the introduction of the checklist. In 2011, the majority graded most questions as good, including questions related to patient safety and the importance of the WHO SSC, which changed to excellent in 2019, providing statistically significant evidence that the healthcare providers are more aware of the importance of the checklist. The samples rated patient safety-related questions such as “Does everyone in the OR do what is in the best interest of the patient?” and “Are you comfortable speaking up when you have a safety concern?” as excellent in both periods, yet the difference was statistically significant in 2019. Healthcare providers are becoming more familiar with the checklist and its importance, resulting in more effective use. Using the checklist as a tick-box was a disadvantage when the checklist was implemented, as this produced a false sense of security.^[17] To increase the awareness of the WHO SSC, lectures and presentations on a regular basis can be used to emphasize how important and crucial the checklist is.

Regarding the safety of each specialty, almost half of the sample rated each specialty, including themselves, as good or excellent. However, some specialties were rated by other specialties as fair or poor, which is a red flag. For any specialty, safety should not be rated low, and additional research is required to investigate the reason for the low rating. Although the fair and poor ratings

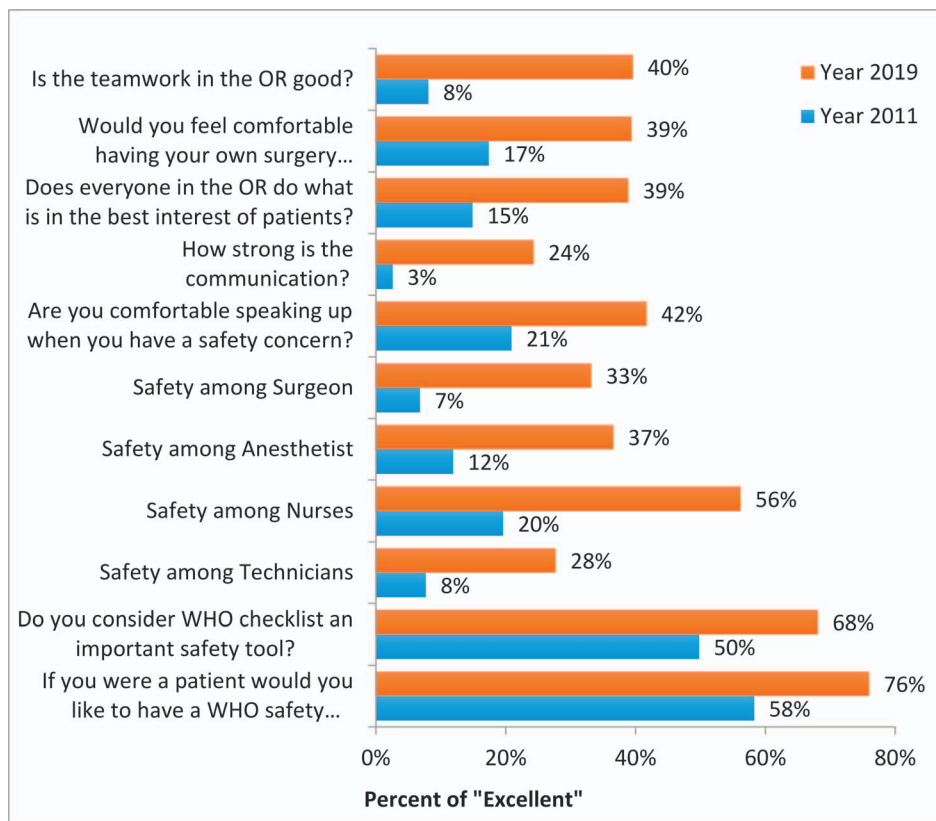
**Figure 1.** Percentage of participants who rated safety levels as “Excellent” by year.

Table 5. Safety level ratings within specialties in 2011 and 2019

Specialty	Poor		Fair		Neutral		Good		Excellent	
	n	%	n	%	n	%	n	%	n	%
Surgeon rating										
Surgeons	1	0.6	1	0.6	18	11.2	79	49.1	62	38.5
Anesthesiologists	0	0.0	1	0.6	23	14.5	79	49.7	56	35.2
Nurses	0	0.0	3	1.9	19	11.9	58	36.5	79	49.7
Anesthesia technicians	1	0.6	11	6.9	31	19.5	76	47.8	40	25.2
Anesthesiologist rating										
Surgeons	2	2.7	9	12.0	26	34.7	29	38.7	9	12.0
Anesthesiologists	0	0.0	2	2.7	12	16.0	36	48.0	25	33.3
Nurses	1	1.3	0	0.0	8	10.7	41	54.7	25	33.3
Anesthesia technicians	1	1.3	9	12.0	15	20.0	33	44.0	17	22.7
Nurse rating										
Surgeons	13	7.1	20	10.9	68	37.0	71	38.6	12	6.5
Anesthesiologists	3	1.6	24	13.0	64	34.8	72	39.1	21	11.4
Nurses	1	0.5	5	2.7	36	19.6	90	48.9	52	28.3
Anesthesia technicians	18	9.8	38	20.7	59	32.1	56	30.4	13	7.1
Anesthesia technician rating										
Surgeons	2	4.9	4	9.8	16	39.0	11	26.8	8	19.5
Anesthesiologists	1	2.4	3	7.3	9	22.0	20	48.8	8	19.5
Nurses	1	2.4	2	4.9	8	19.5	14	34.1	16	39.0
Anesthesia technicians	2	4.9	1	2.4	10	24.4	18	43.9	10	24.4

were for a small proportion, that does not eliminate risk, as poor safety could indicate poor communication and teamwork, which can affect the outcome of the operation.

One person should not complete all the items in the checklist without revising the content with another healthcare provider.^[13] There were some errors in the implementation of the checklist, like completing the checklist without the presence of all team members or starting the operation without completing the checklist. The intention is not for a single person to complete all the items on the list, without verifying the content with their colleagues.^[13] Formal interviews with five physician team leaders in Washington indicated that the quality of the implementation is dependent on the physician's ability to explain the use of the checklist.^[18,19] To improve the implementation of the checklist, a study suggested a coordinator for every department responsible for educating colleagues regarding the principles of safety in general and to meet with members regularly, listen to problems, and work with them to solve any difficulties to ensure proper implementation.^[20] An additional method is to train the healthcare provider by completing the checklist in an OR simulator and as well as educational videos.^[6] In the Kearns et al^[21] study, humorous training posters, in addition to training and empowering teams to remind each other, were used after the initial assessment at 3 months. The compliance at 3 months was 61%, which at 1 year, improved to 85%.^[21] Focusing on promoting a strong culture for safety in a hospital is important for the implementation of checklists, increasing the probability that checklists will be used for its purpose rather than seen as a complicated procedure.^[17]

Limitations of this study were using a single center, and the effectiveness of the checklist related to patient morbidity and mortality was not assessed. Moreover, the study focused only on OR areas and did not include other areas such as invasive care units, interventional radiology procedures, and cardiology procedures. Also, the type of surgery and stressful situations that could have influenced the results were not included. The level of experience of the participant was not included, which may have introduced bias, as seniors may have an improved understanding of the SSC compared with juniors. Similarly, demographics like ethnicity, sex, and age were not included, which could have an impact.

CONCLUSION

In conclusion, the study highlighted the positive change in culture after 8 years of implementing the WHO SSC and the change in healthcare providers' attitudes toward it. There was a significant improvement in responses to all questions when comparing 2011 versus 2019. The safety levels increased as well, with a significant difference; however, some specialties were rated as fair or poor in some safety aspects. Various methods are suggested to improve the implementation of the WHO SSC.

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