BMC Health Services Research

RESEARCH

Open Access

Multicenter audit of operating room staff compliance with the surgical safety checklist: a cross-sectional study from a low- and middle-income country

Sana J. Yaseen[1,2], Sari Taha[3,4], Abdulsalam Alkaiyat[4*] and Sa'ed H. Zyoud[5,6*]

Abstract

Background Unsafe surgical practices are a preventable cause of morbidity and mortality. The WHO published its surgical safety checklist (SSC) to help reduce surgical errors and complications and improve patient outcomes. This study aims to audit compliance with the WHO's SSC and explore attitudes toward its implementation in hospitals within a low- and middle-income country.

Methods This was a two-part, cross-sectional study in which a retrospective desk review was used to audit compliance with SSC use, and a questionnaire was used to explore attitudes toward the SSC. The data were collected between September and November 2021 from two major governmental and nongovernmental hospitals. Surgeons, anesthesiologists, and surgical nurses were invited to complete a self-administered questionnaire that measured attitudes across five domains via a 5-point Likert scale.

Results The final sample consisted of 340 patients whose records were retrieved from one governmental hospital (n=170) and one nongovernmental hospital (n=170). Among those patients, 93 (27.4%) underwent general surgery, 49 (14.4%) underwent orthopedic surgery, and 45 (13.2%) underwent pediatric surgery. The SSCs were fully completed for 27.9% of the patients, partially completed for 43.2% of the patients, and left blank for 28.8% of the patients. Compliance with the use of the SSC was significantly associated with age (p=0.002), sex (p=0.022), type of surgery (p<0.001), classification of surgery (p=0.006) and hospital sector (p<0.001). None of the patients at the governmental hospital had a completely filled the SSC, whereas none of those at the nongovernmental hospital had a blank SSC. Among the final sample of 80 operating room staff members included in the study that explored their attitudes, 41.3%, 40.0%, and 18.8% were surgeons, surgical nurses, and anesthesiologists, respectively. The participants demonstrated positive attitudes toward the SSC across all the attitude domains. The majority said that lack of time (56.3%), staff assertiveness (55.0%), and training (53.8%) were the most important barriers to implementing the SSC. The hospital sector was significantly associated with higher scores across all domains.

Conclusions While the majority of operating room staff used the SSC, only a minority filled the list completely. The attitudes toward using the WHO's SSC trended positively, which encourages the official implementation of the SSC

*Correspondence:
Abdulsalam Alkaiyat
a.khayyat@najah.edu
Sa'ed H. Zyoud
saedzyoud@yahoo.com
Full list of author information is available at the end of the article

at the national level. Addressing the identified barriers may enhance the quality of implementation by providing educational sessions. Future reaudits are recommended to enhance the adaptability of the SSC.

Keywords Surgical safety checklist, Patient safety, Surgical safety, SSC, Audit

Background

Globally, more than 234 million major surgeries are performed every year [1]. Failure to adhere to good surgical practices and safety guidelines before, during, and after surgery could jeopardize patients' health [2]. Unsafe surgical procedures are a preventable cause of morbidity and mortality. The WHO estimated that the mortality rate after major surgery ranges between 0.5% and 5%, with serious complications observed in nearly 25% of inpatient surgeries [3]. In addition to direct harm to patients, surgical errors increase the length of hospital stay and healthcare costs [4, 5].

Patient safety is a healthcare concept that has emerged in the context of the increasing complexity of healthcare systems and the associated potential for patient harms. By preventing and reducing the risks, errors, and harms patients might face, a focus on patient safety in surgeries is fundamental to the delivery of safe, patient-centered, and high-quality health services [6–8]. Therefore, several safety measures are universally taken to ensure patient safety, such as the sterilization of instruments, staff adherence to sterile protocols, and preoperative testing and evaluation [3, 9].

Global Health organizations such as the World Health Organization (WHO) have launched several global and regional initiatives to address and improve the safety of patients during surgeries. In 2008, the WHO published its Surgical Safety Checklist (SSC), which became a universal tool that can promote the safety of patients during surgery. The SSC identified three surgery stages, each corresponding to a specific period of the usual course of action: before anesthetics are injected (check-in), before the skin is incised (time-out), and before the patient leaves the operating room (check-out). At each stage, the checklist coordinator must confirm that the surgical team has completed the tasks before proceeding with the surgery. The WHO recommends that only one healthcare provider be responsible for checking each item on the SSC. The goal of this SSC was to improve patient safety, ensure accountability of the operating team, and prevent errors in patient identity, site of surgery, and type of surgery [3]. The SSC has been shown to improve communication, reduce surgical errors, complications, morbidity and mortality, and enhance patient outcomes [3, 10–12].

Previous studies have shown a trend toward positive attitudes toward the WHO's SSC among OR team members in different income settings globally [13–17]. Although the SSCs are widely adopted worldwide, studies have often revealed their poor quality of use. For example, a study that was conducted in 29 French hospitals and included 834 OR team members and 5677 patients revealed that the SSCs were used in 83% of the cases but were fully completed in only 35% of the cases [18]. Moreover, the SSCs are less likely to be used in healthcare facilities in low-human development index countries, emergency surgical operations, and obstetrical and gynecological surgical operations than in healthcare facilities in high-human development index countries, elective surgical operations, and abdominal surgeries, respectively [19]. Documenting, monitoring, and evaluating the application of the SSC in the field is crucial for ensuring its proper use and improvement. Only a few studies have investigated the implementation and application of the SSCs regionally, revealing positive attitudes among healthcare professionals [15, 20–22]. Although several governmental and nongovernmental Palestinian hospitals have implemented the SSC, data on the extent of compliance, enforcement, and monitoring are lacking. Moreover, no published study has investigated the adoption of the SSC and healthcare workers' perceptions of the SSC in Palestine. This study aims to audit compliance with the WHO's SSC and explore attitudes toward its implementation in Palestine.

Methods

Study design and settings

This was a cross-sectional study in which a questionnaire and a retrospective desk review were used to audit compliance with and attitudes toward using the SSC in Palestinian hospitals. The data were collected between September 2021 and November 2021.

The study was conducted in two major governmental and nongovernmental Palestinian hospitals in the northern West Bank that perform general, orthopedic, plastic, pediatric, vascular, urologic, and otorhinolaryngologic surgeries. The governmental hospital has 200 beds and 5 operating rooms, with an estimated 8,000 to 12,000 surgeries performed per year. The nongovernmental hospital has 120 beds and 4 operating rooms, with an estimated 3000 to 3600 surgeries performed annually.

The study comprises two parts. The first part used a retrospective review of surgical patient medical records to audit the compliance rate with using the SSC. The plan to conduct the audit employed the Plan, Do, Study, Act

(PDSA) cycle framework to plan the audit (Additional file 1) [23]. The cycle plan addresses the change concept, the target healthcare workers, timeline, and audit design and indicators. A complete filling rate of at least 95% was adopted as the standard of measurement and aim of change. This audit will be used to inform policies proposing the mandatory use of the WHO's SSC in Palestine, coupled with adequate educational and training resources. This will be followed by reauditing of surgical patient records at the same two hospitals using the same audit design to test for a change. The second part used a questionnaire to explore the attitudes of operating room (OR) staff toward using the SSC.

Study population and sampling

This study targeted healthcare workers who were participating in surgeries at Palestinian hospitals. All of the surgeons, anesthesiologists, and surgical nurses working at the two hospitals were eligible and invited to participate in the study. The surgical records of patients who underwent surgeries at the two hospitals were eligible for record review. Patients who underwent endoscopy; cardiac catheterization; or minor, emergency, cardiac, or ophthalmic surgeries were excluded. The surgical records were randomly selected from each hospital. The minimum sample size was calculated to be 384 via the following formula:

$n = Z^2.P.(1 - P)/d^2$, where:

n is the sample size.

Z is the Z *value* of 1.96 corresponding to the 95% confidence level.

P is the estimated compliance rate (if unknown, 0.5 is used to provide the widest confidence interval and maximize the sample size).

d is the margin of error (0.05).

The final sample size was calculated to be 340 after adjusting for the finite population per the total number of patient records at the two hospitals via the following formula:

$N\ adjusted = n/1+(n-1/N)$, where N is the population count.

Data collection

Compliance with the SSC was assessed by auditing the surgical records of patients, which were retrieved from the electronic health record systems of each hospital. The SSCs whose items were left unchecked were labeled "blank"; the SSCs with one or more missing items were labeled "partially filled"; and the SSCs whose items were all checked were labeled "completely filled". Data concerning the following variables were retrieved from each patient's record: age (≤18, 19–30, 31–40, 41–50, >50 years), sex (male or female), type of surgery (pediatric, orthopedic, gastrointestinal, urologic, plastic, vascular, otorhinolaryngological, neurological, or general surgery), and classification of surgery (major or nonmajor) as defined by the European Surgical Association [24].

For the attitude study, the participants completed a self-administered questionnaire that comprised two sections. The first section collected demographic and personal information, including age (≤30, 31–40, 41–50, or >50 years), gender (male or female), profession (surgeon, anesthesiologist, or surgical nurse), years of practice (≤5, 5–10, or >10), academic qualifications (diploma, bachelor's degree, or postgraduate degree), and the hospital sector in which a participant is employed (governmental or nongovernmental). The second section comprises items used to explore the attitudes of OR team members toward the implementation of the SSC. The questionnaire used in this study was developed by O'Connor et al. Attitudes were measured via a 5-point Likert scale ranging from strongly disagree to strongly agree and were subdivided into five domains measuring attitudes toward the following: hospital norms on the use of the SSC (6 items); the impact of the SSC on safety and teamwork (5 items); support for the SSC from specific groups (6 items); and the intention to initiate the SSC (2 items). The single-item responses were scored as 1 for 'strongly disagree' to 5 for 'strongly agree'. The score for each domain was calculated by summing the single-item scores and reported as raw and percentage scores [13]. In addition, the questionnaire included a question about the barriers to using the SSC.

Data analysis

The data were entered into a Microsoft Excel spreadsheet (Microsoft Excel, 2016) and then uploaded to the IBM Statistical Package for Social Sciences (IBM SPSS, v.21.0). The median and interquartile range (IQR) were reported for the attitude scores, and the frequencies and percentages were reported for the categorical variables. This includes the complete filling rate as the major indicator contributing to the PDSA framework in this audit and future reaudits. The chi-square test and Fisher's exact test were used to test the bivariate associations between compliance with using the SSC and other variables, as appropriate. The compliance rate is the sum of the partially and completely filled SSCs. The Mann–Whitney and the Kruskal–Wallis tests were used to test the bivariate associations between the attitude scores and other variables. The internal consistency of the tool was assessed via Cronbach's alpha statistics. A p value of less than 0.05 indicated statistical significance.

Ethical considerations

Approval for conducting the audit and study was obtained from the Institutional Review Board (IRB)

of An-Najah National University (ANNU). Additional approval was obtained from the two hospitals where the study was conducted. All participants were informed about the nature and objectives of the study and provided informed consent before participation. The privacy of the participants was maintained, and the data were kept confidential.

Results

Characteristics of the included patients

Exactly one-half of the total sample of 340 patients had surgery at a governmental hospital (n =170), and the other half had one at a nongovernmental hospital (n = 170), with the majority being male (60.6%) and older than 30 years (56.5%). Among those patients, 93 (27.4%) underwent general surgery, 49 (14.4%) underwent orthopedic surgery, and 45 (13.2%) underwent pediatric surgery. Just above one third had a major surgery (33.5%) (Table 1).

Auditing compliance with filling the SSC

The SSCs were completely filled for 95 patients (27.9%), partially filled for 147 patients (43.2%), and left blank for 98 patients (28.8%). Nongovernmental hospitals fared better, as none of the patients had a blank SSC (0%), and the SSCs were completely filled for the majority of patients (55.9%). In contrast, none of the patients at the governmental hospital had a completely filled the SSC (0%), and most SSCs were blank (57.6%). Compliance with the use of the SSC was significantly associated with age (p=0.002), sex (p=0.022), type of surgery (p<0.001), classification of surgery (p=0.006) and the hospital sector in which the surgery was performed (p<0.001) (Table 1).

Characteristics of the participating operating room team members

Among the final sample of 80 participants, 72 (90.0%) were male, and eight (10.0%) were female. Among those, 13 (16.5%) were 30 years old or younger, 37 (46.3%) were between 31 and 40 years old, 22 (27.5%) were between 41 and 50 years old, and eight (10.0%) were 50 years or older.

Table 1 Compliance with the surgical safety checklist (SSC) for surgical patients whose records were included in the study and associated characteristics

Variable		Frequency *n* (%)	Compliance with SSC – frequency *n* (%)		*p* value
Age			Blank	Filled	0.002*
	≤ 18	88 (25.9)	28 (31.8)	60 (68.2)	
	19–30	60 (17.6)	14 (23.3)	46 (76.7)	
	31–40	56 (16.5)	23 (41.1)	33 (58.9)	
	41–50	61 (17.9)	23 (37.7)	38 (62.3)	
	> 50	75 (22.1)	10 (13.3)	65 (86.7)	
Gender					0.022*
	Male	206 (60.6)	50 (24.3)	156 (75.7)	
	Female	134 (39.4)	48 (35.8)	86 (64.2)	
Type of surgery					<0.001*
	General surgery	93 (27.4)	37 (39.8)	56 (60.2)	
	Pediatric surgery	45 (13.2)	6 (13.3)	39 (86.7)	
	Orthopedic surgery	49 (14.4)	21 (42.9)	28 (57.1)	
	Gastrointestinal surgery	40 (11.8)	3 (7.5)	37 (92.5)	
	Urological surgery	26 (7.6)	10 (38.5)	16 (61.5)	
	Plastic surgery	15 (4.4)	4 (26.7)	11 (73.3)	
	Vascular surgery	21 (6.2)	2 (9.5)	19 (90.5)	
	Otorhinolaryngological surgeries	33 (9.7)	13 (39.4)	20 (60.6)	
	Neurosurgery	18 (5.3)	2 (11.1)	16 (88.9)	
Classification of surgery					0.006*
	Major	114 (33.5)	22 (19.3)	92 (80.7)	
	Nonmajor	226 (66.5)	76 (33.6)	150 (66.4)	
Hospital sector					<0.001*
	Governmental	170 (50.0)	98 (57.6)	72 (42.4)	
	Nongovernmental	170 (50.0)	0 (0.0)	170 (50.0)	

* p value is below the threshold value for significance (0.05)

The participants were either surgeons (41.3%), anesthesiologists (18.8%), or surgical nurses (40.0%). One-half of the participants were employed by the governmental hospital (50%), whereas the other half were employed by the nongovernmental hospital (50%). Nearly one-half of the participants had 10 years or more of experience (48.8%) (Table 2).

Attitudes of the participating operating room team members toward the implementation of the WHO's SSC

The Cronbach's alpha values were 0.77 for the norms items, 0.73 for the impact items, 0.91 for the support items, 0.58 for the initiate items, and 0.82 for the barrier items. The overall Cronbach's alpha value for all the domains was 0.82, which indicated acceptable internal consistency. The median for the norm's raw scores was 21/30 [IQR=16.3–24.0], the norm's percentage score was 70.0% [IQR=54.2–80.0], the impact on teamwork and safety raw score was 20/25 [IQR=18.0–22.0], the impact on teamwork and safety percentage score was 80.0% [IQR=72.0–88.0], the support raw score was 24/30 [IQR=23.0–26.0], the support percentage score was 80.0% [IQR=76.7–86.7], the initiate raw score was 8/10 [6.0, 9.0], and the initiate percentage score was 80.0% [IQR=60.0–90.0].

Table 2 Characteristics of the participating operating room staff

Variable	Frequency *n* (%)
Age	
≤ 30	13 (16.5)
31–40	37 (46.3)
41–50	22 (27.5)
> 50	8 (10.0)
Gender	
Male	72 (90.0)
Female	8 (10.0)
Profession	
Surgeon	33 (41.3)
Anesthesiologist	15 (18.8)
Surgical nurse	32 (40.0)
Years of practice	
≤ 5	12 (15.0)
5–10	29 (36.3)
> 10	39 (48.8)
Academic qualification	
Diploma	6 (7.5)
Bachelor's degree	24 (30.0)
Postgraduate degree	50 (62.5)
Hospital sector	
Governmental	40 (50)
Nongovernmental	40 (50)

The majority of participants agreed or strongly agreed that the SSC is used for every surgery (63.8%); the surgical staff pay full attention during the filling of the SSC (52.5%), and the assigned individual always ensured that the required steps have been completed (57.5%). While only a minority of participants agreed or strongly agreed that failing to use the SSC is reflective of poor professional practice (41.3%), most agreed or strongly agreed that using it reduces the probability of human error (93.8%), improves patient safety (93.8%), and enhances teamwork (85.0%). Most participants agreed or strongly agreed that surgeons (85%), anesthesiologists (82.5%), and surgical nurses (93.8%) support the use of the SSC (Table 3). Moreover, most participants cited a lack of time as the major barrier to using the SSC (56.3%), followed by a lack of staff assertiveness (55.0%) and a lack of training (53.8%).

Higher attitude scores in the norm domain were significantly associated with years of practice (p=0.039) and hospital sector (p<0.001), whereas higher scores in the impact on teamwork and safety domain were significantly associated with academic qualifications (p=0.002) and the hospital sector (p=0.014). In the support domain, higher scores were significantly associated with age (p=0.028), years of practice (p=0.037), academic qualification (p=0.047), and hospital sector (p=0.007). In the initiate domain, higher scores were associated with years of practice (p=0.002), academic qualification (p=0.048), and the hospital sector (p=0.013) (Table 4).

Discussion

Unsafe surgical practices contribute to preventable complications, deaths, and increased healthcare costs. The WHO developed the SSC as a practical tool to reduce surgical errors and improve patient outcomes. This study audited surgical patients' records to assess compliance with the use of the SSC by surgical teams. The findings revealed that the majority of the respondents adhered to the SSC, although most of those used lists were only partially filled. Compliance with the SSC was significantly associated with age, sex, type of surgery, classification of surgery, and hospital sector. Additionally, the participants demonstrated positive attitudes toward using the SSC.

Despite capturing positive attitudes, this study demonstrates the suboptimal use of the SSC. While 71.1% of patients underwent surgeries that used the SSC, fewer than one-third were completely filled. This finding aligns with an unpublished study conducted in three hospitals in the southern West Bank, which reported positive attitudes but low compliance with each of the three items in the SSC [25].

Since its introduction in 2008, the WHO's SSC has been widely adopted by professional bodies globally,

Table 3 Responses of the participating operating room staff to the attitude questions

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Domain	**Statement**	***n*** **(%)**	***n*** **(%)**	***n*** **(%)**	***n*** **(%)**	***n*** **(%)**
Norms	There is little difference between the surgical checklist in the nongovernmental hospital/governmental hospital and the WHO surgical safety checklist.	11 (13.8(	16 (20.0)	27 (33.8)	24 (30.0)	2 (2.5)
	The complete checklist is used for every procedure in every operation in the nongovernmental hospital/governmental hospital.	2 (2.5)	15 (18.8)	12 (15.0)	23 (28.8)	28 (35.0)
	The complete checklist is used for every procedure in which I am involved in theatre.	2 (2.5)	19 (23.8)	10 (12.5)	19 (23.8)	30 (37.5)
	When the checklist is being carried out, everyone in the theatre stops what they are doing and listens until it is completed.	4 (5.0)	21 (26.3)	13 (16.3)	22 (27.5)	20 (25.0)
	Sometimes sections of the checklist are not completed.	6 (7.5)	28 (35.0)	11 (13.8)	29 (36.3)	6 (7.5)
	The individual who signs the checklist personally ensures that the relevant steps have been completed.	3 (3.8)	20 (25.0)	11 (13.8)	36 (45.0)	10 (12.5)
Impact on teamwork and safety	I believe that failing to use the checklist is poor professional practice.	5 (6.3)	28 (35.0)	14 (17.5)	21 (26.3)	12 (15.0)
	I believe using the checklist reduces the likelihood of human error.	0 (0.0)	3 (3.8)	2 (2.5)	38 (47.5)	37 (46.3)
	I believe using the checklist improves patient safety.	0 (0.0)	2 (2.5)	3 (3.8)	31 (38.8)	44 (55.0)
	I believe using the checklist improves teamwork in theatre.	0 (0.0)	6 (7.5)	6 (7.5)	38 (47.5)	30 (37.5)
	The use of the checklist should be mandatory for every case.	1 (1.3)	7 (8.8)	10 (12.5)	27 (33.8)	35 (43.8)
Support	Surgical personnel support the use of the checklist.	0 (0.0)	4 (5.0)	8 (10.0)	52 (65.0)	16 (20.0)
	Anesthetic personnel support the use of the checklist.	0 (0.0)	9 (11.3)	5 (6.3)	52 (65.0)	14 (17.5)
	Nursing staff support the use of the checklist.	0 (0.0)	4 (5.0)	1 (1.3)	51 (63.8)	24 (30.0)
	Senior theatre personnel support the use of the Checklist.	0 (0.0)	3 (3.8)	3 (3.8)	51 (63.8)	23 (28.8)
	Junior theatre personnel support the use of the checklist.	0 (0.0)	3 (3.8)	7 (8.8)	51 (63.8)	19 (23.8)
	Management supports the use of the checklist.	1 (1.3)	2 (2.5)	21 (26.3)	36 (45.0)	20 (25.0)
Initiate	I have initiated the use of the checklist in the past.	0 (0.0)	21 (26.3)	14 (17.5)	29 (26.3)	16 (20.0)
	I intend to initiate the use of the checklist in the future.	0 (0.0)	6 (7.5)	10 (12.5)	40 (50.0)	24 (30.0)

Table 4 Associations between the attitude domains and the characteristics of the participating operating room staff

	Age	Gender	Profession	Years of practice	Academic qualification	Hospital sector
Domain						
Norms	0.522	0.546	0.790	0.039*	0.672	<0.001*
Teamwork and safety	0.240	0.173	0.055	0.058	0.002*	0.014*
Support	0.028*	0.226	0.459	0.037*	0.047*	0.007*
Initiate	0.312	0.397	0.337	0.002*	0.048*	0.013*

* *p* value is below the threshold value for significance (0.05)

especially in high-income countries [26]. In the UK, for example, the use of the SSC has been mandatory in England and Wales since 2010. This has led to its compulsory implementation in two-thirds of UK surgical departments, resulting in a total mandatory and voluntary use rate of 93% [27]. However, global studies have reported variable uptake and use of the SSC. Delisle et al. conducted a study to assess SSC use in 94 countries with different development indexes and reported that 75.4% of surgeries used the list, which is comparable to the findings of our study. However, the rate identified by our study was higher than that in medium- (60.4%) and low- (29.8%) human development indexes (HDI) [19]. The variability in the compliance rate is better demonstrated by a systematic review conducted by Borchard et al., which revealed that the rate ranged between 12% and 100% [28].

While the SSC is widely recommended in many countries, its practical use remains suboptimal. In the present study, nearly half of the SSCs were partially filled. Similarly, partial checking of items was reported by several global studies. For instance, a French multicenter study reported a compliance rate of 90.2% but a completion rate of only 61% [29]. Another study conducted in an American pediatric surgery department reported that none of the surgeries performed had a completely filled the SSC [30]. Partial compliance may compromise the intended benefits of the list, whereas full compliance is crucial for ensuring checklist effectiveness and maximizing patient safety, which emphasizes the need to monitor the implementation of the SSC in practice.

The attitudes of OR staff participating in this study showed a positive trend. The reported attitude scores indicate that participants were aware of the benefits of using the SSC to minimize human error (93.8%), improve patient safety (93.8%), and enhance teamwork (85.0%). Support for using the SSC seems to be strong and consistent between different healthcare providers, as no considerable differences were reported between surgeons, anesthesiologists, surgical nurses, or managers. Years of practice and the hospital sector were particularly associated with multiple attitude domains. More years of practice, greater exposure to adverse events, greater participation in continuous medical education, and enhanced leadership roles increase OR team members' sense of responsibility and reinforce the importance of adopting safety protocols, which consequently fosters a positive attitude toward using the SSC. Additionally, none of the patient records retrieved from nongovernmental hospitals in this study had a blank SSC. The greater compliance with the SSC and the more positive attitudes of the OR staff in nongovernmental hospitals may be attributed to the adoption of different organizational cultures with a strong emphasis on quality improvement and patient safety. This is especially true when resources are more available to implement adequate training, organizational measures, and technology to facilitate the use of the SSC.

This study positions Palestine higher than most low- and middle-income countries (LMICs) in compliance with the use of the SSC. The national health authorities and professional bodies should capitalize on the positive attitudes and voluntary compliance with the use of the SSC to officially recommend and implement the list in all surgical departments. While high-income countries are the most vocal in recommending SSC use in surgical departments, some LMICs have devised plans to officially implement the SSC, as is the case in Jordan [31]. The findings of the present study and the regional experience of Jordan can both inform the SSC implementation in Palestine, especially given the cultural and institutional similarities. Indeed, the barriers identified by the participants in this study were similar to those reported by the OR staff in Jordan [22]. Past studies have shown that a lack of resources, support systems, accountability, and transparency may often lead to poor-quality SSC implementation, especially in LMICs [26, 32]. To ensure high-quality SSC implementation, policymaking must extend beyond mere recommendations by addressing the potential barriers that might undermine the optimal use of SSC in the field. As most participants in this study cited problems related to time and training, implementation should be coupled with education and training sessions to raise awareness about the importance of the SSC and facilitate its use, including when and how to use the checklist amid the congested schedule and excessive workload in surgery. Importantly, the implementation plan should be informed by audits and a quality improvement strategy, outlining feedback mechanisms received from OR staff to guide and improve the implementation and adaptation of the SSC [26, 33, 34]. Reaudits, guided by the PDSA plan, evaluate changes against the prespecified standards and in comparison to the first audit. This study adopted the PDSA cycle framework by planning and conducting the first audit in a cycle of repeated audits, quality improvement strategy, and further actions built on these reaudits.

Strengths and limitations

This audit study had several limitations. First, the study audited OR staff working in two major hospitals within one northern governorate of the Palestinian West Bank, which limits the generalizability of the findings to other hospitals at the national level. However, initial audits, unlike conventional academic research, are often better conducted at a small scale involving fewer healthcare professionals, which allows for more focused actions and aligns with resource limitations and the goals of quality

improvement [35]. This audit can also be the first step toward scaling up to a broader population at the national level. Second, the study may be subject to social desirability bias, as it relies on self-reported data on such a safety measure that is perceived as beneficial. Furthermore, the exclusion of certain types of surgeries might have overlooked important contexts related to these surgeries. However, exclusion of these surgeries was a trade-off between losing these contexts and improving internal validity by increasing specificity. Specialized surgeries include specific procedures and safety measures that might be different from general surgeries. Moreover, using quantitative measures, such as filling rates, may not necessarily reflect the effective use of the checklist in improving patient safety. The checklist was created as a quality improvement tool to enhance adherence to safety measures in surgeries and not merely as a box-checking exercise. As safety checklists are easy to monitor, their use may inadvertently lead to abandoning other safety check mechanisms [36]. The findings of this audit can be useful if integrated with other official quality checks to ensure the full and effective use of the SSC. Nonetheless, this was the first audit to address the use of the SSC locally and among the first to address it regionally. The findings can help inform policymaking regarding the recommendation and implementation of the SSC at the national level. Moreover, the audit provides the basis for future reaudits aimed at monitoring and evaluating the implementation of the SSC.

Conclusions

This study found that most participants used the SSC, but the audit using a retrospective desk review revealed that most checklists were only partially filled. Compliance with the SSC was significantly associated with age, sex, type of surgery, classification of surgery, and hospital sector. The OR team members at the participating hospital demonstrated positive attitudes toward the SSC. Lack of time, staff assertiveness, and training were the most cited barriers to implementing the SSC. The use of the SSC should be officially recommended and implemented at all hospitals through national policymaking. Addressing the identified barriers may enhance the quality of implementation by providing guiding educational sessions on the use of the SSC. Moreover, future reaudits and feedback are recommended to improve the implementation and adaptation of the SSC.

Abbreviations

WHO	World Health Organization
SSC	Surgical safety checklist
OR	Operating room
IRB	Institutional Review Board
ANNU	An-Najah National University
LMICs	Low- and middle-income countries

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12913-025-12288-6.

Additional file 1: The audit plan adopted in the present study using the Plan, Do, Study, Act (PDSA) cycle framework.

Acknowledgements

The authors would like to thank An-Najah National University for providing the opportunity to conduct this study.

Authors' contributions

The first draft of the manuscript was written by SJY, who also collected the data and performed the analysis. A.A. offered logistical support, supervised and designed the study, and assisted in producing the final version of the manuscript. ST prepared the final manuscript, performed the analysis, and participated in data interpretation. S.H.Z. conceptualized and designed the study, analyzed and coordinated the data, organized and supervised the field study, critically reviewed the manuscript, interpreted the results, and contributed to writing the final version. Finally, all the authors approved the final manuscript.

Funding

Not available

Data availability

The data from our surveillance are not available in the public domain owing to privacy and ethical restrictions, but anyone interested in using the data for scientific purposes is free to request permission from the corresponding authors.

Declarations

Ethics approval and consent to participate

Approval for conducting the audit and study was obtained from the Institutional Review Board (IRB) of An-Najah National University (ANNU) and the relevant ethics committees at the two hospitals where the study was conducted. The research was carried out in accordance with the principles of the Declaration of Helsinki and applicable national guidelines. All participants were fully informed about the nature and objectives of the study, and written informed consent was obtained prior to participation. The privacy and confidentiality of the participants were strictly maintained throughout the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]Faculty of Graduate Studies, Public Health Management Program, An-Najah National University, Nablus 44839, Palestine. [2]Quality and Patient Safety Department, An-Najah National University Hospital, Nablus 44839, Palestine. [3]An-Najah Global Health Institute (GHI), An-Najah National University, P.O. Box 7, Nablus, Palestine. [4]Department of Public Health, Faculty of Medicine and Health Sciences, An-Najah National University, P.O. Box 7, Nablus, Palestine. [5]Department of Clinical and Community Pharmacy, Faculty of Medicine and Health Sciences, An-Najah National University, Nablus 44839, Palestine. [6]Clinical Research Centre, An-Najah National University Hospital, Nablus 44839, Palestine.

Received: 7 September 2024 Accepted: 16 January 2025
Published online: 20 January 2025

References

1. Weiser TG, Regenbogen SE, Thompson KD, Haynes AB, Lipsitz SR, Berry WR, Gawande AA. An estimation of the global volume of surgery: a modelling strategy based on available data. Lancet. 2008;372(9633):139–44.

2. Sykes AG, Seyi-Olajide J, Ameh EA, Ozgediz D, Abbas A, Abib S, Ademuyiwa A, Ali A, Aziz TT, Chowdhury TK, et al. Estimates of Treatable Deaths Within the First 20 Years of Life from Scaling Up Surgical Care at First-Level Hospitals in Low- and Middle-Income Countries. World J Surg. 2022;46(9):2114–22.
3. Who: WHO Guidelines for Safe Surgery,. Safe Surgery Saves Lives. Geneva: World Health Organization; 2009. p. 2009.
4. Encinosa WE, Hellinger FJ. The impact of medical errors on ninety-day costs and outcomes: an examination of surgical patients. Health Serv Res. 2008;43(6):2067–85.
5. Haidar S, Vazquez R, Medic G. Impact of surgical complications on hospital costs and revenues: retrospective database study of Medicare claims. J Comp Eff Res. 2023;12(7): e230080.
6. Panagioti M, Khan K, Keers RN, Abuzour A, Phipps D, Kontopantelis E, Bower P, Campbell S, Haneef R, Avery AJ, et al. Prevalence, severity, and nature of preventable patient harm across medical care settings: systematic review and meta-analysis. BMJ. 2019;366: l4185.
7. Wagner C, Kristensen S, Sousa P, Panteli D: Patient safety culture as a quality strategy. In: Improving healthcare quality in Europe: Characteristics, effectiveness and implementation of different strategies [Internet]. edn.: European Observatory on Health Systems and Policies; 2019.
8. Haugen AS, Sevdalis N, Softeland E. Impact of the World Health Organization Surgical Safety Checklist on Patient Safety. Anesthesiology. 2019;131(2):420–5.
9. Hussain AK, Kakakhel MM, Ashraf MF, Shahab M, Ahmad F, Luqman F, Ahmad M, Mohammed Nour A, Varrassi G, Kinger S. Innovative Approaches to Safe Surgery: A Narrative Synthesis of Best Practices. Cureus. 2023;15(11): e49723.
10. Haynes AB, Weiser TG, Berry WR, Lipsitz SR, Breizat AH, Dellinger EP, Herbosa T, Joseph S, Kibatala PL, Lapitan MC, et al. A surgical safety checklist to reduce morbidity and mortality in a global population. N Engl J Med. 2009;360(5):491–9.
11. Fudickar A, Horle K, Wiltfang J, Bein B. The effect of the WHO Surgical Safety Checklist on complication rate and communication. Dtsch Arztebl Int. 2012;109(42):695–701.
12. Pugel AE, Simianu VV, Flum DR, Patchen Dellinger E. Use of the surgical safety checklist to improve communication and reduce complications. J Infect Public Health. 2015;8(3):219–25.
13. O'Connor P, Reddin C, O'Sullivan M, O'Duffy F, Keogh I. Surgical checklists: the human factor. Patient Saf Surg. 2013;7(1):14.
14. Russ SJ, Rout S, Caris J, Moorthy K, Mayer E, Darzi A, Sevdalis N, Vincent C. The WHO surgical safety checklist: survey of patients' views. BMJ Qual Saf. 2014;23(11):939–46.
15. Sokhanvar M, Kakemam E, Goodarzi N. Implementation of the surgical safety checklist in hospitals of Iran; operating room personnel's attitude, awareness and acceptance. Int J Health Care Qual Assur. 2018;31(6):609–18.
16. Urban D, Burian BK, Patel K, Turley NW, Elam M, MacRobie AG, Merry AF, Kumar M, Hannenberg A, Haynes AB, et al. Surgical Teams' Attitudes About Surgical Safety and the Surgical Safety Checklist at 10 Years: A Multinational Survey. Ann Surg Open. 2021;2(3): e075.
17. Ilorah OV, Harrichandparsad R, Naidoo M. Knowledge, attitudes, beliefs and practices of the WHO surgical checklist in neurosurgery at a quaternary referral hospital, Durban. South Africa Interdisciplinary Neurosurgery. 2024;36: 101880.
18. Sens F, Viprey M, Piriou V, Peix JL, Herquelot E, Occelli P, Bourdy S, Gawande AA, Carty Mj MJ, Michel P, et al. Safety Attitude of Operating Room Personnel Associated With Accurate Completion of a Surgical Checklist: A Cross-sectional Observational Study. J Patient Saf. 2022;18(5):449–56.
19. Delisle M, Pradarelli JC, Panda N, Koritsanszky L, Sonnay Y, Lipsitz S, Pearse R, Harrison EM, Biccard B, Weiser TG, et al. Variation in global uptake of the Surgical Safety Checklist. Br J Surg. 2020;107(2):e151–60.
20. ÖNler E, Yildiz T, Arar MC, HorozoĞLu F, NalR F: Ameliyathane ve cerrahi servis çalışanlarının DSÖ Güvenli Cerrahi Kontrol Listesine ilişkin düşünceleri. Namık Kemal Tıp Dergisi 2020, 8(1):36-42.
21. Alsadun D, Arishi H, Alhaqbani A, Alzighaibi R, Masuadi E, Aldakhil Y, Yousef Z, Almalki S, Alnaser M, Boghdadly S. Do We Feel Safe About the Surgical Safety Checklist? A Cross-Sectional Study Between Two Periods. Glob J Qual Saf Healthc. 2021;4(4):135–40.
22. Albsoul R, Alshyyab MA, Al Odat BA, Al Dwekat NB, Al-masri BE, Alkubaisi FA, Flefil SA, Al-Khawaldeh MH, Sa'ed RA, Abu Ajamieh MW, et al. Surgical team perceptions of the surgical safety checklist in a tertiary hospital in Jordan: a descriptive qualitative study. The TQM Journal. 2022;35(6):1394–416.
23. Taylor MJ, McNicholas C, Nicolay C, Darzi A, Bell D, Reed JE. Systematic review of the application of the plan-do-study-act method to improve quality in healthcare. BMJ Qual Saf. 2014;23(4):290–8.
24. Martin D, Mantziari S, Demartines N, Hubner M, Group ESAS. Defining Major Surgery: A Delphi Consensus Among European Surgical Association (ESA) Members. World J Surg. 2020;44(7):2211–9.
25. Abu Zwayed M: Compliance and attitude of operating rooms staff toward WHO Surgical Safety Checklist at Hebron Hospitas. Al-Quds University; 2022.
26. Treadwell JR, Lucas S, Tsou AY. Surgical checklists: a systematic review of impacts and implementation. BMJ Qual Saf. 2014;23(4):299–318.
27. The World Health Organization's 'Surgical Safety Checklist': should evidence-based initiatives be enforced in hospital policy? - Niroshan Sivathasan, Krzysztof R M Rakowski, Bernard F M Robertson, Lavnya Vijayarajan, 2010.
28. Borchard A, Schwappach DL, Barbir A, Bezzola P. A systematic review of the effectiveness, compliance, and critical factors for implementation of safety checklists in surgery. Ann Surg. 2012;256(6):925–33.
29. Fourcade A, Blache JL, Grenier C, Bourgain JL, Minvielle E. Barriers to staff adoption of a surgical safety checklist. BMJ Qual Saf. 2012;21(3):191–7.
30. Levy SM, Senter CE, Hawkins RB, Zhao JY, Doody K, Kao LS, Lally KP, Tsao K. Implementing a surgical checklist: more than checking a box. Surgery. 2012;152(3):331–6.
31. Lancet T. WHO's patient-safety checklist for surgery. Lancet. 2008;372(9632):1.
32. Aveling EL, McCulloch P, Dixon-Woods M. A qualitative study comparing experiences of the surgical safety checklist in hospitals in high-income and low-income countries. BMJ Open. 2013;3(8): e003039.
33. Styer KA, Ashley SW, Schmidt I, Zive EM, Eappen S. Implementing the World Health Organization surgical safety checklist: a model for future perioperative initiatives. AORN J. 2011;94(6):590–8.
34. Bohmer AB, Wappler F, Tinschmann T, Kindermann P, Rixen D, Bellendir M, Schwanke U, Bouillon B, Gerbershagen MU. The implementation of a perioperative checklist increases patients' perioperative safety and staff satisfaction. Acta Anaesthesiol Scand. 2012;56(3):332–8.
35. Improvement NHS. Plan, Do, Study, Act (PDSA) cycles and the model for improvement. 2018. https://aqua.nhs.uk/wp-content/uploads/2023/07/qsir-pdsa-cycles-model-for-improvement.pdf (accessed January 2 2025).
36. Rydenfalt C, Johansson G, Odenrick P, Akerman K, Larsson PA. Compliance with the WHO Surgical Safety Checklist: deviations and possible improvements. Int J Qual Health Care. 2013;25(2):182–7.

Publisher's Note