**An-Najah National University**

**Faculty of Graduate Studies**

# ATTITUDE OF OPERATING SURGICAL ROOMS TEAMS TOWARDS THE IMPLEMENTATION OF WHO SURGICAL SAFETY CHECKLIST AND EVALUATION OF THE COMPLIANCE OF FILLING OUT THE CHECKLIST IN HOSPITALS OF PALESTINE

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**This Thesis is Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Public Health Management, Faculty of Graduate Studies, An-Najah National University, Nablus - Palestine.**

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# Dedication

I dedicate my thesis to my family and many friends. Special gratitude to my loving parents, Although they are no longer of this world, their memories continue to regulate my life..... I love you and miss you so much. May God have mercy on you.

A huge hug to my brothers and sisters for their endless and unconditioned love.

I also dedicate this dissertation to my love who encouraged me to pursue my dreams and finish my dissertation.

Thank you. My love for you all can never be quantified...

*Sana Yaseen*

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# Declaration

I, the undersigned, declare that I submitted the thesis entitled:

**ATTITUDE OF OPERATING SURGICAL ROOMS TEAMS TOWARDS THE IMPLEMENTATION OF WHO SURGICAL SAFETY CHECKLIST AND EVALUATION OF THE COMPLIANCE OF FILLING OUT THE CHECKLIST IN HOSPITALS OF PALESTINE**

I declare that the work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

**Student's Name:** سناء جبر عايد ياسين

**Signature:** سناء ياسين

**Date:** 11/6/2023

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# ATTITUDE OF OPERATING SURGICAL ROOMS TEAMS TOWARDS THE IMPLEMENTATION OF WHO SURGICAL SAFETY CHECKLIST AND EVALUATION OF THE COMPLIANCE OF FILLING OUT THE CHECKLIST IN HOSPITALS OF PALESTINE

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## Abstract

**Background:** The World Health Organization introduced the surgical safety checklist (SSC) to promote patient safety in surgery. This study was carried out to assess the attitudes of the operating room team members toward implementing the SSC in governmental and non-governmental hospitals in Palestine. Another objective was to determine the adherence to the currently used SSC in government and nongovernmental hospitals in Palestine.

**Methods:** This study was carried out in two parts. The attitudes part was conducted in a cross-sectional design using a questionnaire adopted and modified from previous studies. The adhesion part was conducted in a retrospective design. The surgical files of the patients were audited against items in the SSC.

**Results:** Participants had positive attitudes toward the SSC. The members of the operating room team who the non-governmental hospital employed were 76.23-fold (95% CI: 8.08 to 718.84) more likely to score ≥ 80% in the norm domain, 4.15-fold (95% CI: 1.23 to 13.94) to score ≥ 80% in the initiating domain, and 3.96-fold (95% CI: 1.13 to 13.93) to score ≥ 80% in the support domain. Participants who worked in a government hospital had 46.69-fold (95% CI: 6.25 to 348.65) to score ≥ 80% in the barrier domain. The SSC was completed (completely filled out) for 95 (27.9%) patients. SSC was left blank (complete) for 0 (0.0%) patients in the non-governmental hospital. On the other

hand, the SSC was completed fully for 0 (0.0%) patients included in the governmental hospital.

**Conclusions:** The operating room team members who the nongovernmental hospital employed had a more positive attitude toward the SSC. However, the adhesion to filling out the SSC in all hospitals was suboptimal.

**Keywords:** Surgical checklist, Surgery, Patient safety

# Chapter One

# Introduction and Theoretical Background

Globally, more than 310 million major surgical operations are performed yearly (Dobson, 2020). Surgery is a medical technique based on medical intervention to treat the affected tissues. As a rule, any procedure in which tissue incisions or wounds are sutured from previous injuries is considered a surgical operation. Other procedures, such as catheterization or endoscopy, do not specifically follow this description. Still, it may also be considered a surgical procedure if it includes regular preparations for surgical operations, such as anesthesia, a sterile environment, and surgical tools for sewing or stapling (Chatterjee et al., 2019). In addition, all types of surgeries are considered invasive procedures; therefore, a non-invasive excision is referred to as a non-invasive surgery, such as laser ablation of the cornea, and radiosurgery, such as those used in radiation therapy for tumors may fall under this description.

Generally, medical interventions are supposed to be very accurate as clinicians/surgeons do not interfere in the patient's body except with good faith and sound intent. The surgeon is obligated to the patient to take the necessary care when performing the surgery. Therefore, surgeons are responsible for patient safety and take all important precautions before, during and after the surgical operation. Despite the anticipated benefits of surgeries in managing a variety of health problems, the failure to adhere to good surgical practices and safety guidelines before, during and after the surgical operation could jeopardize the patients' health (Ramsay et al., 2019; Sykes et al., 2022). In the US, a 2012 analysis reported about 80,000 surgical errors that resulted in death or significant disability that occurred in hospitals between 1990 and 2010 (Mehtsun, Ibrahim, Diener-West, Pronovost, & Makary, 2013). The same analysis showed that the patients died or experienced permanent or temporary injuries. Furthermore, judgments related to surgical malpractices totaled US$ 1.3 billion (Mehtsun et al., 2013).

It has been estimated that unsafe surgical care procedures cause complications in at least 25% of patients, and approximately 7 million surgical patients suffer serious complications yearly (Biccard et al., 2018; Jhanji et al., 2008). Approximately 1 million patients die during or immediately after surgery. Surgeon malpractices included wrong surgical procedures, wrong site surgeries, wrong patients, and foreign bodies (Epstein,

2021). In addition to direct harm to the patient, surgical errors also increased the length of hospital stay and healthcare costs (Ribeiro et al., 2019).

Recently, the number of surgeries has increased significantly in recent decades. Therefore, health regulatory authorities such as the World Health Organization (WHO) have launched several global and regional initiatives to address and improve the safety of patients during surgeries. For example, the global initiative for emergency, basic surgical care, and basic trauma care have focused on improving access to surgical services and the quality of surgical services provided to patients. Furthermore, the second global patient safety challenge: The safe surgery saves lives campaign, addressed the safety of surgical services (Vogts, Sturge, Merry, & Mitchell, 2011).

Patient safety is a healthcare specialty that emerged in the context of the increasing complexity of healthcare systems and the resulting increase in patient harm in healthcare facilities. Patient safety aims to prevent and reduce the risks, errors, and harms patients face while accessing health care. The cornerstone of this specialization is a continuous improvement based on learning from errors and adverse events (Etchells, O'Neill, & Bernstein, 2003; Haugen, Sevdalis, & Søfteland, 2019; Papadakis, Meiwandi, & Grzybowski, 2019).

Today, patient safety is fundamental to the delivery of essential high-quality health services. Indeed, there is a clear consensus that global high-quality health services should be effective, safe, and patient-centered. Furthermore, to achieve the desired benefits of good quality health care, health services must be timely, equitable, integrated, and effective (Etchells et al., 2003). It has been argued that successful implementation of patient safety strategies requires clear policies, leadership capabilities, data on improving safety, qualified healthcare professionals, and effective patient participation in their care (Organization, 2009).

### 1.1 Surgical operation precautionary measures

In today’s hospitals, surgeries are often performed in operating rooms using surgical tools, surgical tables, and other instruments. The environment and procedures used in the operating rooms are subject to sterilization principles, whereby sterile (free of microorganisms) tools are separated from nonsterile or contaminated tools. All surgical instruments must be sterile and replaced or re-sterilized in case of contamination (because

of contaminated use or contact with non-sterile surfaces). Staff members in the operating room must also wear sterile clothing (gown, hat, gloves, and sterile masks). In addition, they should wash their hands and arms with disinfectants before each operation (Tanner, Dumville, Norman, & Fortnam, 2016; Zhou et al., 2020) (Gómez-Gil et al., 2002).

Before performing the surgical operation, the surgeon orders several medical tests for the patient (special tests before surgery), and the patient's physical conditions are evaluated according to the American Society of Anesthesiologists classification for physical evaluation (Horvath, Kloesel, Todd, Cole, & Prielipp, 2021). Because the patient might lose a significant amount of blood during the surgical operation, an adequate amount of blood may need to be infused before surgery.

Before major surgeries, especially gastrointestinal surgeries, the patient is often instructed to take a laxative the night before the day of the surgical operation to prepare the bowel (Saltzman et al., 2015). Additionally, patients might also be instructed to abstain from food or drink (after midnight the night before the day of the operation to reduce the effect of stomach contents on the medications administered to the patient before the operation and to reduce the risk of the patient vomiting during or after the operation).

In the preoperative stage, patients are instructed to replace their clothing with sterile clothes and are asked to confirm the details of the operation that will be performed on them (Wolfe & Moore, 1993). Subsequently, the vital signs of the patients are recorded. The nutritional fluids are then delivered to one of the limbs and some drugs (antibiotics, analgesics, etc.) are also administered. When patients enter the operating room, the area where the operation will be performed will be sterilized with antiseptics. Hair around the site of the surgical operation will be removed before surgery. The patient is then anesthetized to prevent pain when making a wound, moving or cutting tissue, and when suturing the wounds (Bierle, Raslau, Regan, Sundsted, & Mauck, 2020; McDougall & Enright, 2018). Depending on the type of surgical operation, the type of anesthesia may vary, local or general.

An incision is made to reach the surgical site (Arnold et al., 2020). The surrounding blood vessels shrink to prevent bleeding. The retractor can provide a better view of the surgical site or keep the incision open. Incisions may be required, and several layers are dissected to reach the surgical site, as is the case in gastrointestinal surgery, where an incision

occurs. In the skin and subcutaneous tissue, then incision three layers of muscle, and then the layer around the tendons and ligaments. In some cases, the bones may be cut to reach more internal areas of the body, such as cutting the skull for the brain.

## 1.2 Overview and historical perspectives

In 2004, the World Health Assembly (WHA) established the WHO International Patient Safety Alliance to address the adverse effects of unsafe health care (Organization, 2009). In addition, the Essential Surgical Care and Emergency Global Initiative and the WHO's Essential Trauma Care Guidelines focused on the quality and access pattern (Mock et al., 2006; Spiegel, Abdullah, Price, Gosselin, & Bickler, 2013). Due to the high mortality rates among surgical patients, the WHO highlighted the importance of patient safety in surgery (Organization, 2009). In 2005, the WHO formed a group of clinicians and healthcare professionals to build a checklist that can promote the safety of patients in surgery.

In January 2007, an international advisory meeting was held on the Second Global Patient Safety Challenge (Organization, 2009). During the meeting, it was suggested that a surgical safety checklist be used for various surgical operations. This checklist would include tasks, measures to be taken, and boxes to be checked. In 2008, the WHO published its surgical safety checklist (SSC), which became a safety and regulatory tool (Organization, 2009; Papadakis et al., 2019; Sotto, Burian, & Brindle, 2021).

The SSC identified three different surgery stages, each corresponding to a specific period of the usual course of action: a) before anesthetics are injected, b) before the skin is incised, and c) before the patient leaves the operating room. At each stage, the review coordinator must confirm that the surgical team has completed the tasks before proceeding with the surgery (Organization, 2009). The goal of this SSC was to systematically and effectively ensure that all conditions were optimal for patient safety. Furthermore, the SSC aimed to ensure that all members of the medical team were unique and accountable, prevent errors in patient identity, site of surgery, and type of surgery. By taking a few critical steps, healthcare professionals can reduce the most common and avoidable risks to the life and safety of patients scheduled for surgical operations (Organization, 2009).

Today, the WHO SSC is being used to promote congruence in service delivery, improve communication, reduce surgical errors and complications, reduce surgical mortality, improve overall patient safety, and improve patient outcomes (Eslahpazir et al., 2021; Fudickar, Hörle, Wiltfang, & Bein, 2012; Papadakis et al., 2019; Pugel, Simianu, Flum, & Patchen Dellinger, 2015; Sotto et al., 2021). Additionally, hospitals must adopt and use the SSC to be accredited by the Joint Commission International (JCI) for accreditation of hospitals (Sokhanvar, Kakemam, & Goodarzi, 2018).

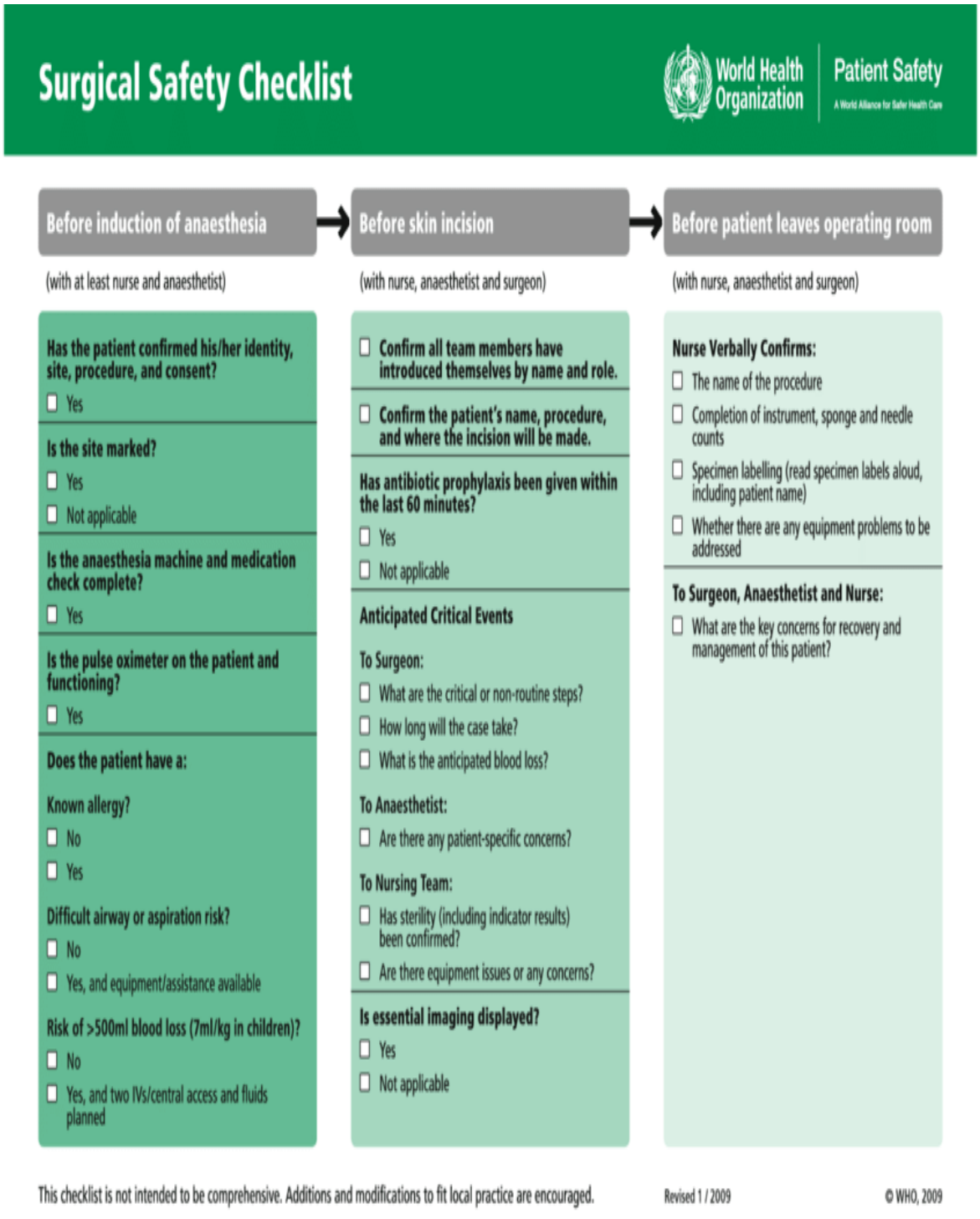
### 1.3 Contents of the WHO's SSC

The WHO's SSC contains items that were organized in 3 stages: 1) check-in (while the patient is still conscious before the anesthetics are injected), 2) time-out (in the presence of the surgeon, before the skin is incised), and 3) check-out (before the patient leaves the operating room) (Organization, 2009). The SSC is shown in Figure 1.

At each of these stages, members of the surgical team check that the corresponding safety items have been implemented (or that there is a good reason to waive this requirement for the procedure). To avoid ambiguity in defining and documenting the completion of each step, the WHO recommends that there should be only one healthcare provider (usually a general nurse
responsible for identifying each item on the SSC (Organization, 2009).

**Figure 1**

*The WHO's SSC*



### 1.3.1 First stage: check-in

This stage is before induction of anesthesia that consists of a group of questions (7 questions) as the following:

1. Has the patient confirmed his identity, location, procedure, and consent?

   This question was developed to avoid errors on site, patient, and procedure. Although these errors are uncommon, these errors could be serious surgical errors. These errors could be detected in 1 in 50,000 to 100,000 surgical procedures in the US.

2. Is the site marked?

   Operating on a faulty bilateral structure (e.g. left arm versus right arm) or multiple structures (e.g., ribs) is relatively uncommon. However, such errors could be publicized and undermine confidence in surgeons and surgery.

3. Are the anesthesia machine and medication check complete?

   The SSC guidelines recommend screening for "ABCDEs": "airway equipment, breathing system (including oxygen and inhalation agents), absorbers, medications and devices, emergency medications, and equipment and aids."

4. Is the pulse oximeter on the patient and functioning?

   Although there are no randomized controlled trials, the SSC guidelines recommend using a pulse oximeter during surgery because of its extremely low risk and potential usefulness in detecting catastrophic anesthesia complications such as ventilator disconnection.

5. Does the patient have a known allergy?

   Allergic reactions occur in about 1 in 10,000 to 20,000 cases. Therefore, the WHO recommended using an oxygen supply, ventilator, antihistamines, and fluids (for intravenous administration) as prophylaxis measures against possible adverse events that can occur during the surgical operation.

6. Does the patient have a difficult airway or aspiration risk?

   The SSC guidelines recommend checking if the patient has a difficult airway or is at risk of aspiration.

7. Does the patient have a risk of excessive bleeding during surgery (more than 500 ml of blood for adults or 7 mL/kg for children)?

Due to the risk of hypovolemic shock after blood loss in certain procedures, the surgical team may need to prepare the large lumen of the vein for crystalline access (such as saline) or blood transfusion.

### 1.3.2 Second stage: time-out

This stage is before the skin incision. At this stage, the SCC checks for the following items:

1. Ensure that all team members have introduced themselves by name and role.
   By doing so, all team members know who is who and their roles and responsibilities. This would also promote confidence between team members and accountability.

2. Confirm the patient's name, procedure, and where the incision will be made.
   This would prevent wrong patient, wrong procedure, wrong procedure, and wrong site.

3. Has a prophylaxis antibiotic been administered within the last hour?
   This should prevent infections at the surgical site that cause significant morbidity and mortality.

4. Expected Critical Events for the surgeon: What are the critical or nonroutine steps? How long would the case stay in the operation room? and What is the expected amount of blood that will be lost?
5. Expected critical events for the anesthesiologist: Are there concerns from the patient?
6. Critical events for the nursing team: Has sterility (including the results of the indications) been confirmed? Are there any problems with the operating equipment or potential concerns?
7. Is essential imaging displayed? Including the necessary radiographic images (e.g., X-ray, CT scan, MRI).

### 1.3.3 Third stage: check-out

This stage occurs before the patient leaves the operating room. This stage consists of confirming the following items:

1. The nurse should verbally confirm the name of the procedure.
2. The nurse should verbally confirm the completion of the instrument, needle, and sponge counts.
3. The nurse should verbally confirm the labels of the samples (all labeling should be read aloud).
4. The nurse should verbally confirm whether there were any problems with the equipment and if any concerns need to be addressed.
5. Team members (surgeons, anesthesiologists, and nurses) should know if there are concerns about the particular patient's recovery and the treatment plan for the particular patient.

## 1.4 Other checklists used in surgery

Currently, many surgical checklists are used in different hospitals worldwide. These checklists include the checklist of the Joint Commission Universal Global Protocol for Preventing Wrong Site, Wrong Procedure, and Wrong Person Surgery that was introduced in 2014 as a perioperative test to ensure the safety of the patient, the correctness of the surgical procedure, and surgical site (Ragusa, Bitterman, Auerbach, & Healy, 2016). In addition, the Surgical Patient Safety System (SURPASS) is another checklist that was introduced in The Netherlands to detect surgical errors that occur outside the operating room (de Vries, Dijkstra, Smorenburg, Meijer, & Boermeester, 2010).

Siddiqi et al. (2012) surveyed hospitals in developing countries, including Jordan, Egypt, Pakistan, Tunisia, Morocco, Sudan, and Yemen for patient safety friendliness (Siddiqi et al., 2012). The study used the standards in the initiative of the patient safety-friendly hospital. The initiative included 20 critical, 90 core, and 30 developmental standards. Compliance in the hospitals surveyed was between 8% to 78%. The study demonstrated that compliance with patient safety standards can be measured and benchmarked.

In another study, Alahmadi (2010) evaluated the degree to which Saudi hospitals supported patient safety culture (Alahmadi, 2010). The study tool was a questionnaire

that was distributed to 13 hospitals in Saudi Arabia. Patient safety was graded as either excellent or very good in more than half (60%) of the hospitals. The majority of the nurses, medical staff, and technicians who responded to the questionnaire reported that managers often overlooked patient safety problems. Communication about errors, learning, continuous improvements, and teamwork within units were areas of strength for the majority of the hospitals. Under-reporting error events, lack of staff, and lack of punitive response to errors were areas for potential improvements.

### 1.5 Uptake, compliance to use, and impact of the SSC

The acceptance and adoption of SSC vary greatly between and within hospitals worldwide. A recent study assessed the adoption and use of SSC by different healthcare facilities worldwide (Delisle et al., 2020). The study included 1464 healthcare facilities in 94 different countries around the world. In these facilities, 85,957 patients were treated. The study reported that 75.4% of healthcare facilities used the SSC. The study showed that SSC was less likely to be used in healthcare facilities in low-human development index countries, emergency surgical operations, and obstetrical and gynecological surgical operations compared to healthcare facilities in high-human development index countries, elective surgical operations, and abdominal surgeries. The study concluded that although the adoption and use of the SSC were high, there was significant variability in the adoption and use of the SSC existed.

The Safe Surgery Saves Lives Group conducted a study in 8 hospitals in different countries (Canada, India, Jordan, New Zealand, Philippines, Tanzania, England, and the United States) to investigate the effect of using the SSC on the mortality rate and incidence of complications (Haynes et al., 2009). The study analyzed data for 3,955 patients. The study reported a significant reduction in mortality rate (pre-implementation = 1.5%, after implementation = 0.8%, $p = 0.003$). The study also reported a significant reduction in the occurrence of complications (pre-implementation = 11.0%, post-implementation = 7.0%, p-value < 0.001). The study concluded that implementing the SSC reduced mortality rates and complications in different hospitals worldwide. Another international study conducted in 76 countries involved 4,843 patients who underwent emergency laparotomy (Collaborative, 2019). The study reported that using SSC reduced the 30-day mortality rates at 30 days (OR 0.60, 0.50 to 0.73, p-value < 0.001). Furthermore, another study reported improved safety culture, such as greater sharing of

important case information, improved decision-making and team coordination, openness about knowledge gaps, and improved team cohesion (Haugen et al., 2019).

Another study showed that regular inspection of common safety issues and better team communication and dynamics could reduce perioperative morbidity and mortality (Haugen et al., 2019). These preliminary results have been confirmed by another detailed work showing that patient safety was significantly improved when the WHO's SSC was implemented appropriately. However, despite these improvements, the introduction of SSCs was not as simple as it appeared and required management skills, flexibility, and teamwork in ways different from current practice.

Another study evaluated adherence to the completion of the SSC in a university hospital in northwest Ethiopia (Melekie & Getahun, 2015). The study showed that 39.7% of 282 surgical operations met the SSC. The overall adherence to the use of the SSC was 39.7%, and the overall completeness was 63.4%. The study showed that the sign-in section was missed in 30.5%, the time-out was missed in 35.4% and the sign-out was missed in 45.7% of the cases. Lack of training and cooperation were the most cited reasons for not filling out the SSC.

### 1.6 Attitudes toward implementing the WHO's SSC

A previous qualitative study in Jordan explored the views of the operating theater staff toward the use of the WHO's SSC in one of the main tertiary hospitals (Albsoul et al., 2022). A total of 3 main themes emerged from the collected qualitative data. The themes were: 1) compliance with the WHO's SSC, 2) impact of the WHO's SSC, and 3) facilitators and barriers to using the WHO's SSC. The operating theater staff viewed that the WHO's SSC should enable effective communication and improve the safety of the patients. Heavy workloads, lack of awareness and training, and congestion in the work hampered compliance with the WHO's SSC. The operating theater staff thought that increasing awareness and training could improve compliance with the WHO's SSC (Albsoul et al., 2022).

In a previous study, the attitudes of the operating room team members toward WHO'S SSC were assessed (O'Connor, Reddin, O'Sullivan, O'Duffy, & Keogh, 2013). A total of 107 operating room team members participated in this study. The general attitudes of the operating room team members towards the WHO's SSC were positive. However, the

study reported a less-than-optimal application of the SSC. Compared to surgeons and anesthesiologists, the theater nurses were more sensitive to barriers to implementing the SSC.

A study was conducted in China to assess the operating room team members' attitudes toward implementing the WHO's SSC using a questionnaire (Tan et al., 2021). The study was carried out in 138 hospitals and included 846 operating room team members. The study reported a wide acceptance of WHO's SSC and positive attitudes toward its ability to improve patient safety. In 860 surgical operations, compliance was reported in 79.8% of the procedures.

Another study evaluated patients' views on the WHO's SSC (Russ et al., 2014). In this study, 141 postoperative patients participated. The patients had positive attitudes toward the SSC. In addition, patients expressed their beliefs about the power of this checklist to improve their safety during surgery and the performance of the operating room team.

Another cross-sectional study evaluated the operating room team members' views on the presence of a fully completed SSC in the surgical safety environment (Sens et al., 2022). The study was carried out in 29 hospitals in France and included 834 members of the operating room team and 5,677 patients. The study showed the presence of SSCs in 83% of the cases. However, fully completed SSCs were present in 35% of the cases. The presence of fully completed SSCs was associated with better communication, higher safety attitudes, aloud reading, and SSC reading.

In Iran, knowledge, attitudes, and acceptance of the operating room team members of the WHO'S SSC were evaluated (Sokhanvar et al., 2018). The study was conducted among 145 surgeons, anesthesiologists, and theater nurses. The study showed that 92% of the participants knew that the WHO SSC existed. The general attitudes of the participants toward the WHO's SSC was positive. Compared to theater nurses and anesthesiologists, the surgeons were more sensitive to the barriers to the implementation of the SSC.

### 1.7 The problem of the study

Several studies and research have recently focused on the prevalence of medical error and the high mortality risk among patients undergoing surgical operations. As a result, health regulatory organizations such as the WHO recognized the importance of reducing human

errors and improving patient safety in surgery. The WHO's SSC was developed to improve communication, prevent/minimize human errors, reduce surgical complications and mortality, and improve general patient safety in surgery.

Previous studies have shown that the adoption and use of SSC varied between and within different hospitals worldwide. It has been argued that having positive attitudes toward implementing a safety program is a prerequisite for the success of such a program.

Currently, little is known about the attitudes of the operating room team members (surgeons, anesthesiologists, and nurses) toward the implementation of the WHO's SSC in government and nongovernmental hospitals in Palestine. Furthermore, little is known about the barriers that hinder the implementation of the SSC in Palestinian hospitals. Additionally, little is known about the adherence to filling out the SSCs used in the governmental and non-governmental hospitals in Palestine.

### 1.8 Questions of the study

The problem of the study can be stated in the following major questions.

- What are the members of the attitudes of the operating surgical room team in governmental and nongovernmental hospitals toward implementing the WHO's SSC in Palestinian hospitals, and what is the degree of compliance in filling the currently used SSCs in governmental and non-governmental hospitals in Palestine?

The problem of the study can be more explicitly posed in the following related questions:

1. What are the members of the attitudes of the operating surgical room team of governmental and nongovernmental hospitals toward implementing the WHO's SSC?
2. Are there significant differences in the attitudes of the operating surgical room team members of governmental and non-governmental hospitals toward implementing the WHO's SSC?
3. What is the degree of compliance in filling out the currently used SSCs in government and nongovernmental hospitals in Palestine?
4. Are there significant differences in the degree of compliance in filling out the currently used SSCs in governmental and non-governmental hospitals in Palestine?

## 1.9 Hypotheses of the study

The hypotheses of the study are as follows:

1. There are statistically significant differences at ($\alpha \leq 0.05$) in the attitudes of the operating room team members in governmental and non-governmental hospitals toward implementing the implementation of the WHO's SSC with respect to their gender, age, profession, practical experience, academic qualifications, and place of employment.

2. There are statistically significant differences at ($\alpha \leq 0.05$) in compliance with the current SSCs used SSCs in governmental and nongovernmental hospitals with respect to the age of the patient, gender of the patient, surgical specialty, classification of the surgery, and type of the hospital.

## 1.10 Objectives of the study

The study was conducted with the following objective:

1. Assess the attitudes of the operating room team members towards the WHO's SSC in governmental and non-governmental hospitals in Palestine.
2. Assess the extent of compliance with the filing of the currently used SSCs in governmental and non-governmental hospitals in Palestine.
3. To investigate whether there were statistically significant differences at ($\alpha \leq 0.05$) in the attitudes of the operating room team members in governmental and non-governmental hospitals toward implementing the implementation of the WHO's SSC with respect to their gender, age, profession, length of practical experience, academic qualifications, and place of employment.
4. To investigate whether there were statistically significant differences at ($\alpha \leq 0.05$) in compliance with the SSC currently used SSCs in governmental and nongovernmental hospitals with respect to age of the patient, gender of the patient, surgical specialty, classification of the surgery, and hospital type.

## 1.11 Significance of the study

Surgeries are essential healthcare services provided to patients in all healthcare systems worldwide. Many surgical operations are life-saving. Millions of major and minor surgical operations are performed in hospitals worldwide (Dobson, 2020). Recent studies have reported that the WHO's SSC improved congruence in service provision, improved

communication, reduced human errors, reduced surgical complications, reduced mortality, and improved patient outcomes (Eslahpazir et al., 2021; Fudickar et al., 2012; Papadakis et al., 2019; Pugel et al., 2015; Sotto et al., 2021). In addition, hospitals need to implement SSC to receive JCI accreditation (Sokhanvar et al., 2018).

To successfully implement the WHO'S SSC in Palestinian hospitals, the operating room team members should have positive attitudes toward implementing this checklist. Therefore, the findings of this study could be informative to the top management of governmental and non-governmental hospitals in Palestine to correct the members of the attitudes of the operating room team toward implementing the WHO'S SSC in Palestinian hospitals. Additionally, the findings of this study could be informative to the top management of the governmental and non-governmental hospitals in Palestine and other decision-makers in the Palestinian health authorities to increase the adhesion to filling out the SSCs and improve patient safety in surgery.

# Chapter Two

# Methods

## 2.1 Study design

This study was conducted using a retrospective, documentary, cross-sectional, and quantitative design. Data were collected through a questionnaire and review of a random sample of medical records of patients who underwent surgical operations. The data were collected in the period between September 2021 and November 2021.

## 2.2 Study settings

This study was carried out in two hospitals in Palestine: a) a major government hospital and b) a main nongovernmental hospital. The governmental hospital had 200 beds and five operating rooms. The operating room team members perform approximately 8,000 to 12,000 surgical operations in different specialties each year.

The non-governmental hospital consisted of 120 beds, four operating rooms, and 35 external clinics. Approximately 250 to 300 surgical operations were performed monthly at the non-governmental hospital. These surgical operations included orthopedics, general surgery, plastic surgery, pediatric surgery, vascular surgery, urology, and otorhinolaryngology.

The operating room team members in both types of hospitals were surgeons, theater nurses, and anesthetists. For each surgical operation, a surgical safety checklist was required to be filled in.

## 2.3 Study population

This study's population was the surgical records of patients who underwent surgical operations during the study period. For the attitude part, the study population was members of the operating room team (surgeons, anesthetists, and theater nurses).

## 2.4 Sample size

Because the study population was relatively small, a comprehensive sampling approach was used to recruit participants for the attitudes part. In this study, all members of the operating room team (surgeons, anesthetists, and theater nurses) were invited to participate in the attitudes part of the study.

For adherence, the surgical records of 170 patients in each hospital were randomly selected and reviewed. To reduce the risk of selection bias, surgical records were randomly selected from all months of the year.

### 2.5 Inclusion criteria

In this study, all members of the operating room team (surgeons, anesthetists, and theater nurses) were invited to participate in the attitudes part of the study. Members of the operating room team were informed that their participation was voluntary.

The surgical records of patients who underwent general surgeries, pediatric surgeries, orthopedic surgeries, gastrointestinal surgeries, urological surgeries, plastic surgeries, vascular surgeries, otorhinolaryngological surgeries, and neurosurgeries were randomly selected included.

### 2.6 Exclusion criteria

In this study, members of the operating room team who did not agree to fill out the questionnaire were excluded. In addition, surgical records for patients who underwent minor surgeries, emergency surgeries, endoscopy procedures, ophthalmic procedures, heart surgeries, and catheterization were excluded.

### 2.7 Data collection

After explaining the study's design and objectives, all operating room team members in both types of hospitals were invited to participate. Members of the operating room team who provided verbal informed consent verbally to participate in the study received a copy of the questionnaire to complete.

Surgical records were recovered from each hospital's electronic health record system. The surgical records were reviewed for adherence to the SSC.

### 2.8 Study tools

For the attitudes part, the questionnaire contained two sections. The first section collected the demographic and professional variables of the participants, such as gender, age, profession, length of practical experience, academic qualification, and place of employment. The second section contained items that were used to expose the attitudes of the operating room team members toward the implementation of the SSC. The questionnaire used in this study was based on that used in a previous study (O'Connor et

al., 2013). The attitudes were organized in 5 domains: 1) attitudes of the operating room team members toward the hospital norms on the use of the SSC (6 items), 2) the impact of the SSC on safety and teamwork (5 items), 3) support of the SSC from specific groups (6 items), 4) intention to initiate the SSC (2 items), and 5) barriers to use of the SSC (5 items). In addition, the operating room team members had to express their attitudes using a 5-point Likert scale (1 = strongly disagree and 5 = strongly agree). The questionnaire is provided in Appendix A.

Adherence to the SSC was assessed by auditing the patients' surgical records of the patients. When all the items in the SSC were left blank, the file was rated as 0 (blank), when some items in the SSC were left blank, the file was rated as 1 (partially completed), and when all the items in the SSC were completed, the file was rated as 2 (fully completed) (Sparks, Wehbe-Janek, Johnson, Smythe, & Papaconstantinou, 2013).

### 2.8.1 Internal consistency of the tool

The internal consistency of the tool was assessed using Cronbach's alpha statistics. The Cronbach's alpha values were: 0.77 for the 6 norms items, 0.73 for the 5 impact items, 0.91 for the 6 support items, 0.58 for the 2 initiate items, and 0.82 for the 5 barrier items. The overall Cronbach's alpha value for the 24 items in all domains was 0.82 which indicated acceptable internal consistency.

## 2.9 Statistical analysis

Data were entered into Microsoft Excel Spreadsheet (Microsoft Excel, 2016) and then uploaded to IBM Statistical Package for Social Sciences (IBM SPSS, v.21.0). Continuous data were expressed as median with the corresponding interquartile range (IQR) that was computed by subtracting the first quartile (Q1) from the third quartile (Q3). As appropriate, the differences between scores in categories were assessed using the Mann-Whitney U test or the Kruskal-Wallis test. In addition, a multiple linear regression model was used to control for confounding variables and to assess the strength of the association between scores and the demographic and professional variables of members of the operating room team. All variables were retained in the model.

Scores were also stratified into < 80% and 80%. Pearson's exact chi-square test / Fisher's exact test was used to investigate differences between categories. The odds ratios (OR)

for scoring <80% were calculated using a multivariate logistic regression model. A p-value of < 0.05 indicated statistical significance.

### 2.10 Ethical considerations

This study was approved by the Institutional Review Board (IRB) of An-Najah National University. The study also received approval from the government and nongovernmental hospitals in which the study was conducted. All participants provided their informed consent before participating in the study.

# Chapter Three

# Results

## 3.1 Characteristics of the operating room team members who responded to the questionnaire

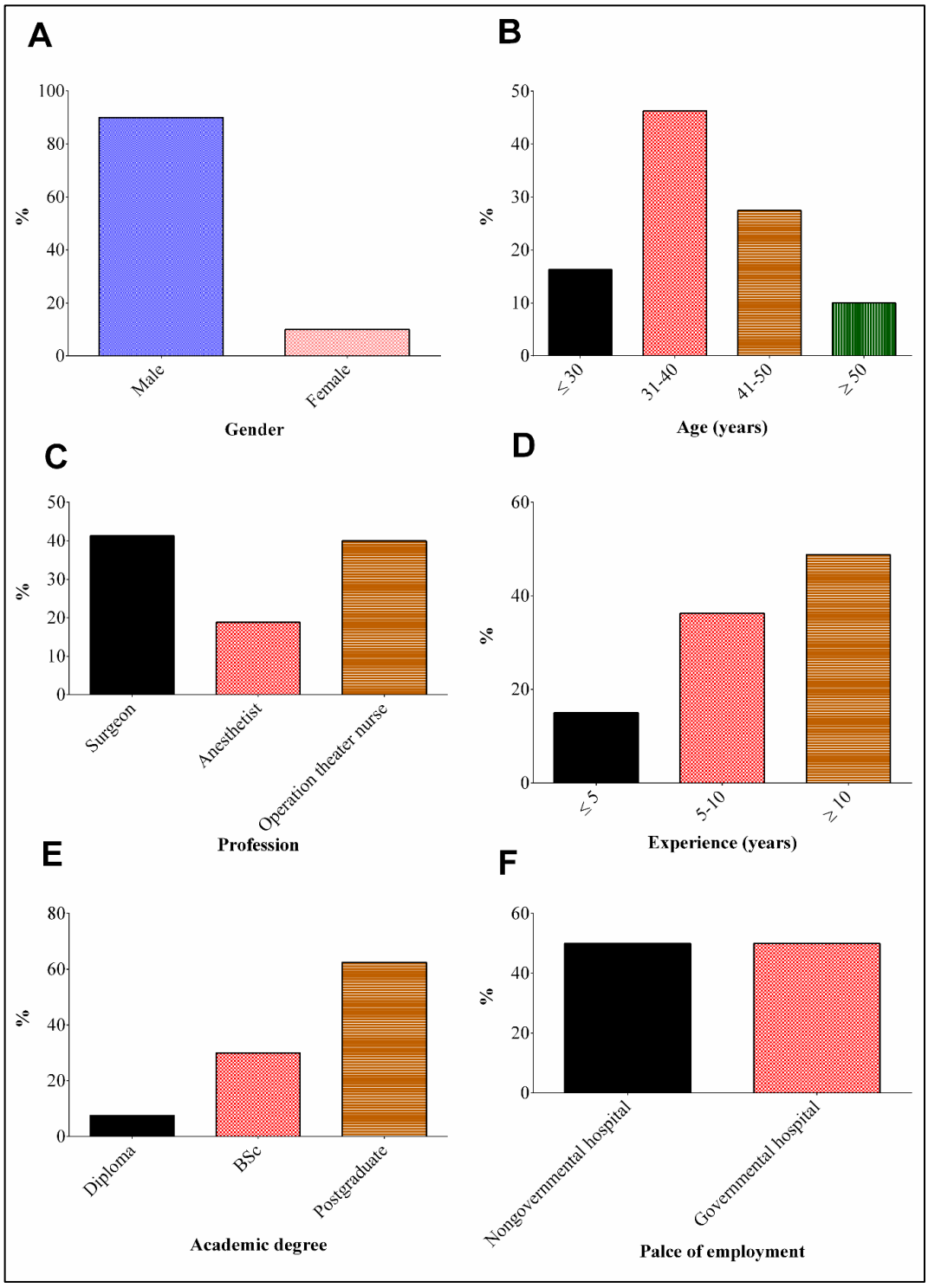
Of the members of the operating room team, 72 (90.0%) were male and 8 (10.0%) were female. The participants were stratified into the following age groups: 13 (16.3%) were 30 years or younger, 37 (46.3%) were between the age of 31 and 40 years, 22 (27.5%) were between the age of 41 and 50 years, and 8 (10.0%) were 50 years or older.

Of the participants, 33 (41.3%) were surgeons, 15 (18.8%) were anesthetists, and 32 (40.0%) were operation theater nurses. Of the participants, 39 (48.8%) had a practical experience of 10 or more years, 29 (36.3%) had a practical experience of more than 5 years and less than 10 years, and 12 (15.0%) had a practical experience of 5 or less years.

On the other hand, 50 (62.5%) of the participants had postgraduate education, 24 (30.0%) had a bachelor of science (BSc), and 6 (7.5%) had a diploma. Of the participants, 40 (50.0%) were employed by governmental hospitals and 40 (50.0%) were employed by nongovernmental hospitals. The detailed characteristics of the operating room team members who participated in this study are shown in Figures 2 (A-F) and Supplementary Table 1.

**Figure 2**

*Characteristics of the operating room team members (n = 80)*



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

This study evaluated the operating room team members' attitudes toward SSC implementation in both types of hospitals. The attitudes of 80 members of the operating room team were measured. In this study, 40 from the non-governmental hospital of operating room team members were recruited, and 40 operating room team members were recruited from the governmental hospital.

The attitudes of the operating room team members towards the SSC are shown in Supplementary Table 2. In this study, only 32.5% of the operating room team members agreed or strongly agreed that there were few differences between the SSC used in the non-governmental hospital or the governmental hospital and the WHO's SSC (standard item #1) and 43.8% of the operating room team members either agreed or strongly agreed that sometimes the SSC were not completed (norms item #5). More than 50% of the operating room team members either agreed or strongly agreed on the other norms items including that the SSC was completed for every operation in the hospital (norms item #2), the SSC was used for every operation that the operating room team members was involved (norms item #3), the operating room team members stopped what they were doing and listened to the SSC (norms item #4). In addition, every step in the SSC was ensured was completed by the operating room team member who signed it (norms item #6).

When the attitudes of the operating room team members about the impact of the SSC on teamwork and safety were measured, the majority (> 77%) agreed or strongly agreed that the use of the SSC reduced the likelihood of human error (impact on teamwork and safety item #2), improved patient safety (impact on teamwork and safety item #3), improved teamwork in the theater (impact on teamwork and safety item #4), and the use of the SSC should be mandatory (impact on teamwork and safety item #5). On the other hand, only 41.3% of the operating room team members believed that not using the SSC was a poor professional practice (impact on teamwork and safety item #1).

The majority (> 70%) of the operating room team members agreed or strongly agreed that the surgical (support item #1), anesthesia (support item #2), nursing (support item #3), senior theater (support item #4) and top management personnel supported the use of the SSC (support item #5).

In this study, 56.3% of the operating room team members stated that they have already initiated the use of the SSC (initiate item #1), and the majority (80.0%) indicated that they intended to initiate the use of the SSC in the future (initiate item #2).

In this study, about half of the operating room team members indicated that the required signatures (barriers item # 1), lack of staff's assertiveness (barriers item #2), lack of time (barriers item #3), lack of training (barriers item #4), and lack of electronic versions of the SSC (barriers item #5) were important barriers hindering the applicability of the SSC.

### 3.3 Attitude scores of the operating room team members in the different domains

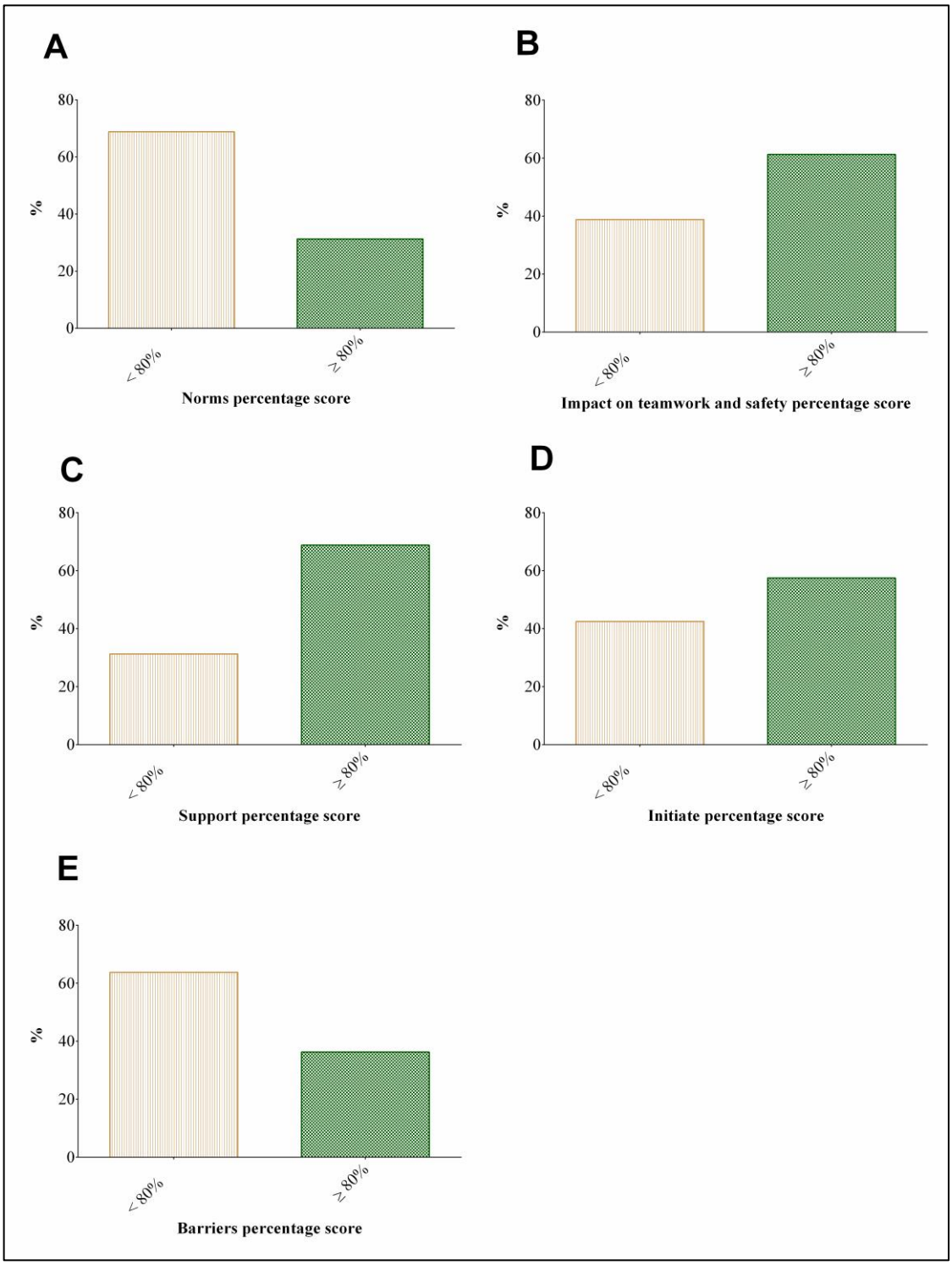
The median scores of the operating room team members in the different domains are shown in Supplementary Table 3.

In this study, the median norms raw score was 21.0 [16.3, 24.0], the median norms percentage score was 70.0 [54.2, 80.0], the median impact on teamwork and safety raw score was 20.0 [18.0, 22.0], the median impact on teamwork and safety percentage score was 80.0 [72.0, 88.0], the median support raw score was 24.0 [23.0, 26.0], the median support percentage score was 80.0 [76.7, 86.7], the median initiate raw score was 8.0 [6.0, 9.0], the median initiate percentage score was 80.0 [60.0, 90.0], the median barriers raw score was 17.0 [13.0, 20.0], and the median barriers percentage score was 68.0 [52.0, 80.0].

Of the operating room team members, 31.3%, 61.3%, 38.8%, 57.5%, and 36.3% scored 80% on the norms, impact on teamwork and safety, support, initiate, and barriers domains, respectively (Figure 3 and Supplementary Table 4).

**Figure 3**

*Number of the operating room team members who scored ≥ 80% in the different domains*



## 3.4 Association between the demographic and professional characteristics of the operating room team members with their attitudes towards the SSC

### 3.4.1 Scores of the norm domain

In this study, attitude scores in the norm domain were significantly higher for the operating room team members who had an experience of more than five years and those who were employed by a nongovernmental hospital compared to those who had experience of 5 years or less and those who were employed by governmental hospital (Supplementary Table 5).

On the other hand, there was no significant differences in the norm scores between the male and female participants, participants from different age groups, surgeons, anesthetists, and operating theater nurses, and those who had diploma, BSc, and postgraduate education.

When the norms scores were converted to percentages and stratified into < 80% and ≥ 80%, again more operating room team members scored ≥ 80% as shown in Supplementary Table 6. On the other hand, there was no significant differences in scoring ≥ 80% norm scores between male and female participants, participants from different age groups, different experience years, surgeons, anesthetists, and operating theater nurses, and those who had diploma, BSc, and postgraduate education.

A multiple linear regression model was used to control confounding variables and to assess the strength of association between the scores and the demographic and professional variables of the operating room team members. The model showed that the norm scores were associated with the place of employment, as shown in Table 1.

**Table 1**

*Details of the multiple linear regression model with the norm scores*

| Domain | Variable | Unstandardized Coefficients | SE | Standardized Coefficients | t | p-value |
|---|---|---|---|---|---|---|
| Norms | Gender | 0.32 | 1.33 | 0.02 | 0.24 | 0.808 |
| | Age | -0.13 | 0.66 | -0.02 | -0.20 | 0.842 |
| | Profession | 0.84 | 0.67 | 0.16 | 1.25 | 0.214 |
| | Length of practical experience | 0.79 | 0.71 | 0.12 | 1.11 | 0.269 |
| | Academic qualification | 1.57 | 0.94 | 0.21 | 1.68 | 0.098 |
| | Place of employment | -7.29 | 0.77 | -0.76 | -9.45 | 0.000 |

*Note.* SE: Standard error

When the odds ratios for scoring ≥ 80% in the norm domain were calculated using a multivariate logistic regression model, the operating room team members who the nongovernmental hospital employed were 76.23-fold (95% CI: 8.08 to 718.84) more likely to score ≥ 80% as shown in Table 2.

On the other hand, there were no statistically significant differences between male and female participants, participants from different age groups, different experience years, surgeons, anesthetists, and operating theater nurses, and those who had diploma, BSc, and postgraduate education.

**Table 2**

*The multivariate logistic regression model of the norm scores*

| Variable | β | S.E. | Wald | p-value | OR | 95% C.I. for OR | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower | Upper |
| Gender | | | | | | | |
| Male | 0.97 | 1.49 | 0.42 | 0.515 | 2.64 | 0.14 | 48.79 |
| Female | Reference | | | | | | |
| Age (years) | | | | | | | |
| ≤ 30 | 1.86 | 1.98 | 0.89 | 0.346 | 6.44 | 0.13 | 310.31 |
| 31-40 | 2.07 | 1.68 | 1.51 | 0.219 | 7.90 | 0.29 | 212.95 |
| 41-50 | 0.31 | 1.30 | 0.06 | 0.809 | 1.37 | 0.11 | 17.33 |
| ≥ 50 | Reference | | | | | | |
| Profession | | | | | | | |
| Surgeon | 2.19 | 1.89 | 1.34 | 0.247 | 8.91 | 0.22 | 362.12 |
| Anesthetist | 0.80 | 1.53 | 0.27 | 0.601 | 2.23 | 0.11 | 45.03 |
| Operation theater nurse | Reference | | | | | | |
| Length of practical experience (years) | | | | | | | |
| ≤ 5 | -1.86 | 1.73 | 1.16 | 0.281 | 0.16 | 0.01 | 4.59 |
| 5-10 | -0.09 | 1.09 | 0.01 | 0.933 | 0.91 | 0.11 | 7.78 |
| ≥ 10 | Reference | | | | | | |
| Academic qualification | | | | | | | |
| Diploma | -1.51 | 1.84 | 0.67 | 0.414 | 0.22 | 0.01 | 8.22 |
| BSc | 0.00 | 1.38 | 0.00 | 0.998 | 1.00 | 0.07 | 15.09 |
| Postgraduate | Reference | | | | | | |
| Place of employment | | | | | | | |
| Nongovernmental hospital | 4.33 | 1.14 | 14.33 | < 0.001 | 76.23 | 8.08 | 718.84 |
| Governmental hospital | Reference | | | | | | |

### 3.4.2 Scores of the impact on teamwork and safety domain

In this study, attitude scores in the impact on teamwork and safety domain were significantly higher for the operating room team members who had postgraduate degrees and those who were employed by the nongovernmental hospital compared to those who had BSc or diploma and those who were employed by the governmental hospital (Supplementary Table 7).

On the other hand, there were no statistically significant differences between male and female participants, participants from different age groups, different experience years, and surgeons, anesthetists, and operating theater nurses.

A multiple linear regression model was used to control confounding variables and to assess the strength of association between the scores and the demographic and professional variables of the operating room team members. The model showed that the impact on teamwork and safety scores were associated with the place of employment, as shown in Table 3.

**Table 3**

*Details of the multiple linear regression model with the impact on teamwork and safety scores*

| Domain | Variable | Unstandardized Coefficients | SE | Standardized Coefficients | t | p-value |
|---|---|---|---|---|---|---|
| Impact on teamwork and safety | Gender | -0.51 | 1.12 | -0.05 | -0.45 | 0.651 |
| | Age | -0.15 | 0.55 | -0.04 | -0.27 | 0.791 |
| | Profession | 1.03 | 0.56 | 0.30 | 1.84 | 0.069 |
| | Length of practical experience | 0.61 | 0.60 | 0.14 | 1.02 | 0.311 |
| | Academic qualification | 3.21 | 0.79 | 0.64 | 4.08 | < 0.001 |
| | Place of employment | -1.77 | 0.65 | -0.28 | -2.73 | 0.008 |

When the impact on teamwork and safety scores were converted to percentages and stratified into < 80% and ≥ 80%, more surgeons and postgraduate-educated operating room team members scored ≥ 80% as shown in Supplementary Table 8.

On the other hand, there were no statistically significant differences between male and female participants, participants from different age groups, different experience years, and place of employment.

When the odds ratios for scoring ≥ 80% in the impact on teamwork and safety domain were calculated using a multivariate logistic regression model, the operating room team members who had an experience of 5-10 years and those who had an experience of ≥ 10 years had 22.96-fold (95% CI: 1.78 to 297.02) and 19.55-fold (95% CI: 1.09 to 351.39) to score ≥ 80% as shown in Table 4.

On the other hand, there were no statistically significant differences between male and female participants, participants from different age groups, surgeons, anesthetists, and operating theater nurses, and working place.

**Table 4**

*The multivariate logistic regression model of the impact on teamwork and safety scores*

| Variable | β | S.E. | Wald | p-value | OR | 95% C.I. for OR | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower | Upper |
| Gender | | | | | | | |
| Male | 0.69 | 1.05 | 0.43 | 0.511 | 1.99 | 0.26 | 15.59 |
| Female | | | | Reference | | | |
| Age (years) | | | | | | | |
| ≤ 30 | -0.27 | 1.80 | 0.02 | 0.881 | 0.76 | 0.02 | 26.18 |
| 31-40 | -1.15 | 1.50 | 0.59 | 0.444 | 0.32 | 0.02 | 6.02 |
| 41-50 | -1.49 | 1.38 | 1.17 | 0.279 | 0.23 | 0.02 | 3.35 |
| ≥ 50 | | | | Reference | | | |
| Profession | | | | | | | |
| Surgeon | -21.48 | 17890.02 | 0.00 | 0.999 | 0.00 | 0.00 | |
| Anesthetist | -18.74 | 17890.02 | 0.00 | 0.999 | 0.00 | 0.00 | |
| Operation theater nurse | | | | Reference | | | |
| Length of practical experience (years) | | | | | | | |
| ≤ 5 | | | | Reference | | | |
| 5-10 | 3.13 | 1.31 | 5.76 | 0.016 | 22.96 | 1.78 | 297.02 |
| ≥ 10 | 2.97 | 1.47 | 4.07 | 0.040 | 19.55 | 1.09 | 351.39 |
| Academic qualification | | | | | | | |
| Diploma | -24.72 | 17890.01 | 0.00 | 0.999 | 0.00 | 0.00 | |
| BSc | -22.43 | 17890.01 | 0.00 | 0.999 | 0.00 | 0.00 | |
| Postgraduate | | | | Reference | | | |
| Place of employment | | | | | | | |
| Nongovernmental hospital | 1.09 | 0.60 | 3.29 | 0.070 | 2.99 | 0.92 | 9.76 |
| Governmental hospital | | | | Reference | | | |

### 3.4.3 Scores of the impact on the support domain

In this study, attitude scores in the impact on the support domain were significantly higher for the operating room team members who were 31-40 years old, had 5-10 years of experience, had BSc or postgraduate education, and were employed by the nongovernmental hospital as shown in Supplementary Table 9.

On the other hand, there were no statistically significant differences between male and female participants, different experience years, and surgeons, anesthetists, and operating theater nurses.

A multiple linear regression model was used to control confounding variables and to assess the strength of association between the scores and the demographic and professional variables of the operating room team members. The model showed that the support scores were associated with the profession and academic qualification, as shown in Table 5.

On the other hand, there were no statistically significant differences between male and female participants, different age groups, experience years, and place of employment.

**Table 5**

*Details of the multiple linear regression model with support scores*

| Domain | Variable | Unstandardized Coefficients | SE | Standardized Coefficients | t | p-value |
|---|---|---|---|---|---|---|
| Support | Gender | -1.74 | 1.39 | -0.14 | -1.25 | 0.216 |
| | Age | 0.17 | 0.69 | 0.04 | 0.25 | 0.802 |
| | Profession | 1.51 | 0.70 | 0.37 | 2.16 | 0.034 |
| | Length of practical experience | -0.34 | 0.74 | -0.07 | -0.46 | 0.644 |
| | Academic qualification | 2.83 | 0.98 | 0.49 | 2.88 | 0.005 |
| | Place of employment | -1.39 | 0.81 | -0.19 | -1.71 | 0.091 |

When the support scores were converted to percentages and stratified into < 80% and ≥ 80%, more postgraduate educated operating room team members scored ≥ 80% as shown in Supplementary Table 10.

On the other hand, there were no statistically significant differences between male and female participants, different age groups, experience years, surgeons, anesthetists, and operating theater nurses, and place of employment.

When the odds ratios for scoring ≥ 80% in the support were calculated using a multivariate logistic regression model, the operating room team members who were employed by the nongovernmental hospital had 3.96-fold (95% CI: 1.13 to 13.93) to score ≥ 80% as shown in Table 6.

**Table 6**

*The multivariate logistic regression model of the support scores*

| Variable | β | S.E. | Wald | p-value | OR | 95% C.I. for OR | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower | Upper |
| Gender | | | | | | | |
| Male | 0.74 | 1.03 | 0.52 | 0.472 | 2.09 | 0.28 | 15.65 |
| Female | | | | Reference | | | |
| Age (years) | | | | | | | |
| ≤ 30 | -1.91 | 1.71 | 1.25 | 0.263 | 0.15 | 0.01 | 4.21 |
| 31-40 | -1.31 | 1.46 | 0.80 | 0.371 | 0.27 | 0.02 | 4.75 |
| 41-50 | -1.65 | 1.33 | 1.54 | 0.215 | 0.19 | 0.01 | 2.61 |
| ≥ 50 | | | | Reference | | | |
| Profession | | | | | | | |
| Surgeon | -21.84 | 16639.59 | 0.00 | 0.999 | 0.00 | 0.00 | |
| Anesthetist | -20.27 | 16639.59 | 0.00 | 0.999 | 0.00 | 0.00 | |
| Operation theater nurse | | | | Reference | | | |
| Length of practical experience (years) | | | | | | | |
| ≤ 5 | -0.12 | 1.16 | 0.01 | 0.920 | 0.89 | 0.09 | 8.71 |
| 5-10 | 1.30 | 0.88 | 2.19 | 0.140 | 3.66 | 0.66 | 20.43 |
| ≥ 10 | | | | Reference | | | |
| Academic qualification | | | | | | | |
| Diploma | -23.99 | 16639.59 | 0.00 | 0.999 | 0.00 | 0.00 | |
| BSc | -22.36 | 16639.59 | 0.00 | 0.999 | 0.00 | 0.00 | |
| Postgraduate | | | | Reference | | | |
| Place of employment | | | | | | | |
| Nongovernmental hospital | 1.38 | 0.64 | 4.60 | 0.032 | 3.96 | 1.13 | 13.93 |
| Governmental hospital | | | | Reference | | | |

On the other hand, there were no statistically significant differences between male and female participants, different age groups, experience years, surgeons, anesthetists, and operating theater nurses, and academic degrees.

### 3.4.4 Scores of the impact on the initiate domain

In this study, attitude scores in the impact on the initiate domain were significantly higher for the operating room team members who had more than five years of experience, had BSc or postgraduate education, and were employed by the nongovernmental hospital as shown in Supplementary Table 11.

On the other hand, there were no statistically significant differences between male and female participants, different age groups, surgeons, anesthetists, and operating theater nurses.

A multiple linear regression model was used to control confounding variables and to assess the strength of association between the scores and the demographic and professional variables of the operating room team members. The model showed that the initiate scores were associated with academic qualification and place of employment, as shown in Table 7.

On the other hand, there were no statistically significant differences between male and female participants, different age groups, surgeons, anesthetists, and operating theater nurses, and length of practical experience.

**Table 7**

*Details of the multiple linear regression model with initiate scores*

| Domain | Variable | Unstandardized Coefficients | SE | Standardized Coefficients | t | p-value |
|---|---|---|---|---|---|---|
| Initiate | Gender | 0.13 | 0.61 | 0.02 | 0.22 | 0.830 |
| | Age | -0.07 | 0.30 | -0.03 | -0.22 | 0.828 |
| | Profession | 0.36 | 0.30 | 0.20 | 1.17 | 0.246 |
| | Length of practical experience | 0.50 | 0.32 | 0.22 | 1.56 | 0.123 |
| | Academic qualification | 1.20 | 0.43 | 0.46 | 2.82 | 0.006 |
| | Place of employment | -1.02 | 0.35 | -0.31 | -2.90 | 0.005 |

When the initiate scores were converted to percentages and stratified into < 80% and ≥ 80%, more operating room team members who had experience of more than 5 years, who had BSc or postgraduate education, and were employed by the nongovernmental hospital scored ≥ 80% as shown in Supplementary Table 12.

On the other hand, there were no statistically significant differences between male and female participants, different age groups, surgeons, anesthetists, and operating theater nurses.

When the odds ratios for scoring ≥ 80% in the initiate were calculated using a multivariate logistic regression model, the operating room team members who were employed by the nongovernmental hospital had 4.15-fold (95% CI: 1.23 to 13.94) to score ≥ 80% as shown in Table 8.

On the other hand, there were no statistically significant differences between male and female participants, different age groups, surgeons, anesthetists, and operating theater nurses, length of practical experience, and academic degrees.

**Table 8**

*The multivariate logistic regression model of the initiate scores*

| Variable | β | S.E. | Wald | p-value | OR | 95% C.I. for OR | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower | Upper |
| Gender | | | | | | | |
| Male | -1.23 | 1.01 | 1.50 | 0.220 | 0.29 | 0.04 | 2.09 |
| Female | | | | Reference | | | |
| Age (years) | | | | | | | |
| ≤ 30 | -1.58 | 1.56 | 1.02 | 0.312 | 0.21 | 0.01 | 4.40 |
| 31-40 | -1.01 | 1.26 | 0.64 | 0.424 | 0.36 | 0.03 | 4.33 |
| 41-50 | -0.72 | 1.04 | 0.48 | 0.487 | 0.49 | 0.06 | 3.72 |
| ≥ 50 | | | | Reference | | | |
| Profession | | | | | | | |
| Surgeon | -0.65 | 1.54 | 0.18 | 0.674 | 0.52 | 0.03 | 10.71 |
| Anesthetist | -0.06 | 1.70 | 0.00 | 0.974 | 0.95 | 0.03 | 26.54 |
| Operation theater nurse | | | | Reference | | | |
| Length of practical experience (years) | | | | | | | |
| ≤ 5 | -1.82 | 1.28 | 2.01 | 0.157 | 0.16 | 0.01 | 2.01 |
| 5-10 | 1.23 | 0.83 | 2.17 | 0.141 | 3.41 | 0.67 | 17.37 |
| ≥ 10 | | | | Reference | | | |
| Academic qualification | | | | | | | |
| Diploma | | | | | | | |
| BSc | -2.40 | 1.75 | 1.90 | 0.169 | 0.09 | 0.00 | 2.77 |
| Postgraduate | -2.16 | 1.47 | 2.17 | 0.141 | 0.12 | 0.01 | 2.04 |
| Place of employment | | | | Reference | | | |
| Nongovernmental hospital | 1.42 | 0.62 | 5.29 | 0.021 | 4.15 | 1.23 | 13.94 |
| Governmental hospital | | | | Reference | | | |

### 3.4.5 Scores of the barrier domain

In this study, attitude scores in the impact on the barrier domain were significantly higher for the operating room team members employed by the nongovernmental hospital, as shown in Supplementary Table 13.

On the other hand, there were no statistically significant differences between male and female participants, different age groups, surgeons, anesthetists, and operating theater nurses, length of practical experience, and academic degrees.

A multiple linear regression model was used to control confounding variables and to assess the strength of association between the scores and the demographic and professional variables of the operating room team members. The model showed that the support scores were associated with the place of employment, as shown in Table 9.

On the other hand, there were no statistically significant differences between male and female participants, different age groups, surgeons, anesthetists, and operating theater nurses, length of practical experience, and academic degrees.

**Table 9**

*Details of the multiple linear regression model with barrier scores*

| Domain | Variable | Unstandardized Coefficients | SE | Standardized Coefficients | t | p-value |
|---|---|---|---|---|---|---|
| Barriers | Gender | 2.65 | 1.44 | 0.20 | 1.84 | 0.069 |
| | Age | 0.14 | 0.71 | 0.03 | 0.20 | 0.842 |
| | Profession | -0.23 | 0.72 | -0.05 | -0.31 | 0.755 |
| | Length of practical experience | 0.12 | 0.77 | 0.02 | 0.15 | 0.880 |
| | Academic qualification | 0.15 | 1.01 | 0.02 | 0.14 | 0.886 |
| | Place of employment | 3.59 | 0.83 | 0.45 | 4.31 | 0.000 |

When the barrier scores were converted to percentages and stratified into < 80% and ≥ 80%, more male operating room team members and those employed by the governmental hospital scored ≥ 80% as shown in Supplementary Table 14.

On the other hand, there were no statistically significant differences between participants from the different age groups, surgeons, anesthetists, and operating theater nurses, length of practical experience, and academic degrees.

When the odds ratios for scoring ≥ 80% in the barrier were calculated using a multivariate logistic regression model, the operating room team members who were male had 23.44-fold (95% CI: 2.02 to 272.31), who had an experience of 5 years and less had 24.44-fold (95% CI: 1.36 to 439.83), and those who were employed by the governmental hospital had 46.69-fold (95% CI: 6.25 to 348.65) to score ≥ 80% as shown in Table 10.

On the other hand, there were no statistically significant differences between participants from the different age groups, surgeons, anesthetists, and operating theater nurses, and academic degrees.

**Table 10**

*The multivariate logistic regression model of the barrier scores*

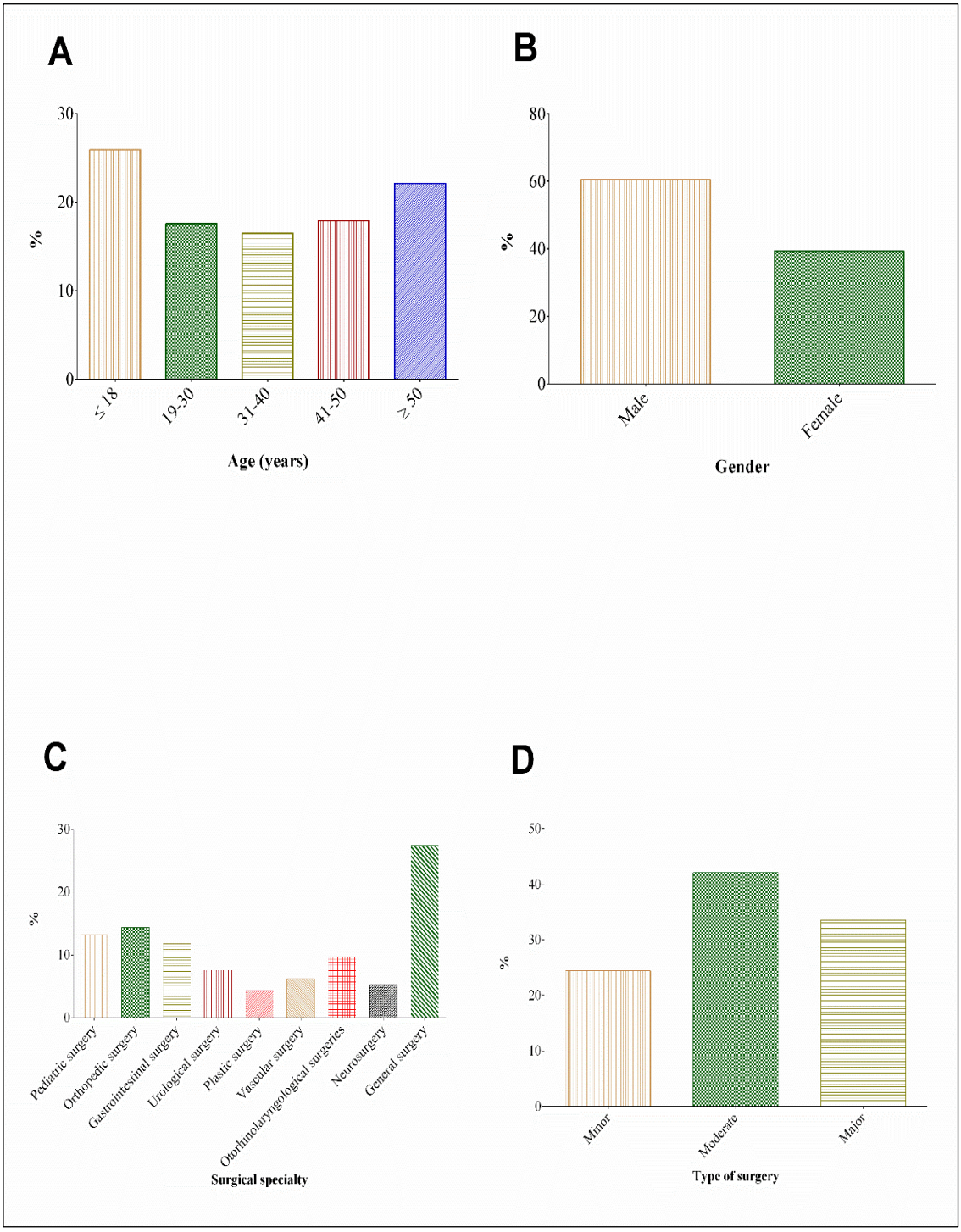
| Variable | β | S.E. | Wald | p-value | OR | 95% C.I. for OR | |
|---|---|---|---|---|---|---|---|
| | | | | | | Lower | Upper |
| Gender | | | | | | | |
| Male | 3.15 | 1.25 | 6.36 | 0.012 | 23.44 | 2.02 | 272.31 |
| Female | Reference | | | | | | |
| Age (years) | | | | | | | |
| ≤ 30 | Reference | | | | | | |
| 31-40 | -1.33 | 1.20 | 1.21 | 0.271 | 0.27 | 0.03 | 2.81 |
| 41-50 | -0.85 | 1.75 | 0.24 | 0.626 | 0.43 | 0.01 | 13.14 |
| ≥ 50 | 3.44 | 2.07 | 2.78 | 0.096 | 31.33 | 0.55 | 1798.28 |
| Profession | | | | | | | |
| Surgeon | 0.05 | 1.52 | 0.00 | 0.975 | 1.05 | 0.05 | 20.79 |
| Anesthetist | -1.17 | 1.76 | 0.44 | 0.506 | 0.31 | 0.01 | 9.78 |
| Operation theater nurse | Reference | | | | | | |
| Length of practical experience (years) | | | | | | | |
| ≤ 5 | 3.20 | 1.47 | 4.70 | 0.030 | 24.44 | 1.36 | 439.83 |
| 5-10 | 1.10 | 1.62 | 0.46 | 0.498 | 2.99 | 0.13 | 71.47 |
| ≥ 10 | Reference | | | | | | |
| Academic qualification | | | | | | | |
| Diploma | -0.70 | 2.18 | 0.10 | 0.747 | 0.50 | 0.01 | 35.43 |
| BSc | -0.22 | 1.40 | 0.03 | 0.873 | 0.80 | 0.05 | 12.44 |
| Postgraduate | Reference | | | | | | |
| Place of employment | | | | | | | |
| Nongovernmental hospital | Reference | | | | | | |
| Governmental hospital | 3.84 | 1.03 | 14.04 | < 0.001 | 46.69 | 6.25 | 348.65 |

### 3.5 Characteristics of the patients who were included in the study

In this study, 340 patients were operated on at a governmental hospital (*n = 170*) and a nongovernmental hospital (*n = 170*). Of all patients, 206 (60.6%) were male, and 192 (56.5%) were older than 30 years. Of all patients, 93 (27.4%) were operated on for general surgeries, 49 (14.4%) were operated for orthopedic surgeries, and 45 (13.2%) were operated for pediatric surgeries. The rest of the patients were operated for gastrointestinal, urological, plastic, vascular, otorhinolaryngological, and neurosurgeries. 114 (33.5%) of these surgeries were classified as major surgeries. The detailed variables of the patients included in this study are shown in Figure 4 and Supplementary Table 15.

**Figure 4**

*Detailed variables of the patients who were included in this study (n = 340)*



### 3.6 Differences in the characteristics of the patients included in this study

The characteristics of the patients were those included from the nongovernmental hospital and those from the governmental hospital were compared using Pearson's chi-square. As shown in Supplementary Table 16, significantly more male and older patients (patients in the ≥ 50 years group) were included from the nongovernmental hospital.

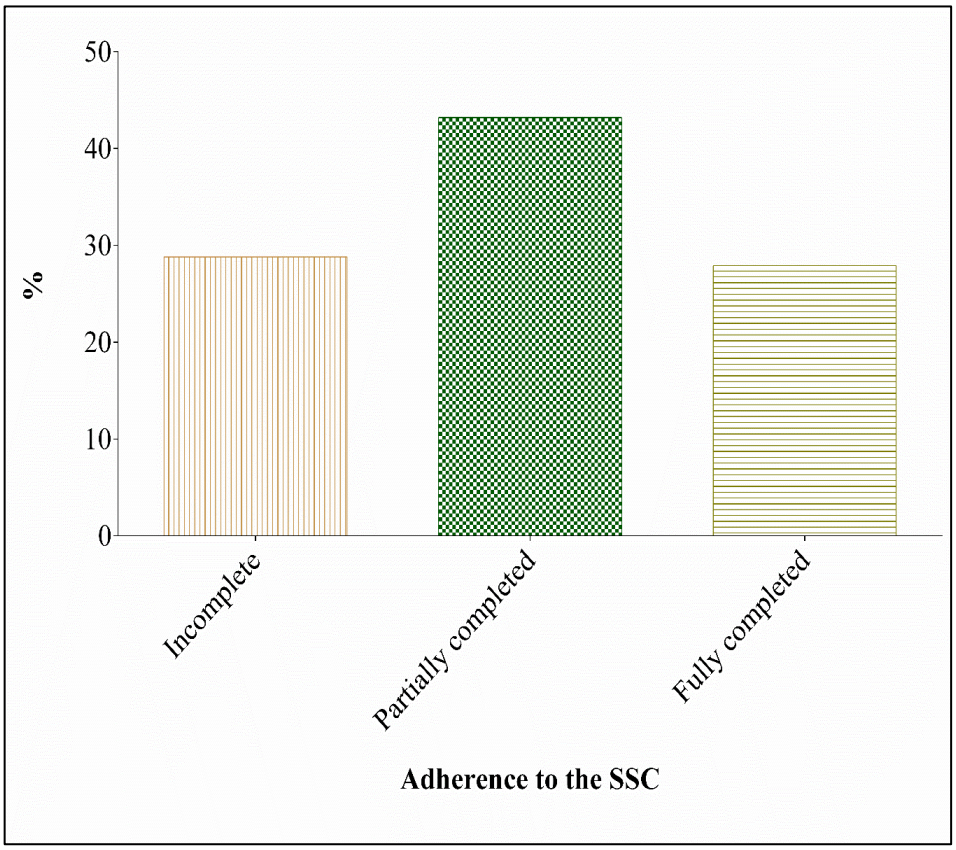
On the other hand, more patients who had general and orthopedic surgeries were included from the governmental hospital. More patients who had major surgeries were included from the nongovernmental hospital. A detailed comparison between the characteristics of the patients who were included from both hospitals is shown in Table 16.

### 3.7 Adherence to the SSC

In this study, the SSC was fully completed (completely filled out) for 95 (27.9%) patients. However, for 98 (28.8%) patients, the SSC was left blank (incomplete). For the rest of the patients, the SSC was partially completed. Details of the adherence to the SSC are shown in Figure 5 and Supplementary Table 17.

**Figure 5**

*Details of the adherence to the SSC*



When adherence to the SSC was compared between the nongovernmental hospital and the governmental hospital, the SSC was left blank (complete) for 0 (0.0%) patients who were included from the nongovernmental hospital. On the other hand, the SSC was fully completed for 0 (0.0%) patients who were included from the governmental hospital. A detailed comparison between adherence to the SSC in both hospitals is shown in Supplementary Table 18.

### 3.8 Association between variables of the patients and adherence to the SSC

Adherence to the SSC was significantly associated with gender, surgical specialty (type of surgery), classification of surgery, and hospital. Detailed associations between variables of the patients and adherence to the SSC are shown in Supplementary Table 19.

The multivariate logistic regression model showed that the patients who were older than 18 years old, had pediatric, gastrointestinal, urological, vascular, or neurosurgery, and had major surgeries were 2.20-fold (95% CI: 1.18 to 4.09), 1.95-fold (95% CI: 1.18 to 3.21), and 1.88-fold (95% CI: 1.07 to 3.28) higher risk for an incomplete adherence to the SSC compared to patients who were 18 years and younger, had orthopedic, plastic, otorhinolaryngological, or general surgeries, and had minor or moderate surgeries as shown in Supplementary Table 20.

# Chapter Four
# Discussions and Conclusions

Worldwide, improving patient safety while receiving healthcare services has been the top priority in different healthcare systems worldwide (Alahmadi, 2010; Albsoul et al., 2022; Haugen et al., 2019; Lark, Kirkpatrick, & Chung, 2018; Siddiqi et al., 2012). The number of surgical operations worldwide has increased significantly over the past few decades. Therefore, there is a pressing need to minimize surgical complications and improve patient safety. In the last few decades, initiatives were launched to improve nontechnical skills like accountability, communication, congruence in service provision, and teamwork. These initiatives led to the development of different SSCs (Lark et al., 2018). These SSCs might serve as tools to prevent/minimize the occurrence of these complications. In this study, the attitudes of operating room team members toward implementing the SSC in Palestinian hospitals were assessed for the first time. Additionally, surgical records from governmental and nongovernmental hospitals were audited for adherence to the SSC. The findings of this study might be informative to the top management of Palestinian hospitals and decision-makers in health authorities to improve patient safety and prevent/minimize the occurrence of surgical complications.

## 4.1 Discussion and Interpretation of the Main Results

### 4.1.1 Attitudes of the operating room team members toward implementing the WHO's SSC

In this study, about one-third of the operating room team members reported few differences between the SSCs used in their hospitals and the WHO's SSC. The findings reported in this study were consistent with those reported in among operating theatre staff in Ireland (O'Connor et al., 2013). However, previous studies have reported that the SSCs used by different hospitals and sometimes with the same hospital differ significantly (Delisle et al., 2020; Dharampal, Cameron, Dixon, Ghali, & Quan, 2016; Hammond Mobilio, Paradis, & Moulton, 2022; Rodella et al., 2018; Russ et al., 2015; Siddiqi et al., 2012). Differences were also reported in the implementation of the SSCs regarding briefings, time-outs, and debriefings (Hammond Mobilio et al., 2022). In this study, 63.8% of the operating room team members in this study agreed that the SSC used in their hospital was used for every procedure and 61.3% of the operating room team members

reported that the SSC was used in every procedure they were involved in. The percentage reported in this study was higher than that reported by the operating theatre staff in Ireland (O'Connor et al., 2013). In a previous qualitative study, operating room team members in hospitals based in high- and low-income countries recognized the value of using SSCs (Aveling, McCulloch, & Dixon-Woods, 2013). Similarly, gynecologists, anesthesiologists, and operating room nurses saw that the SSC was useful (Gong et al., 2021). Despite this recognition, the use of SSCs varied significantly within and between different hospitals (Russ et al., 2015). A large recent study that collected data from 1464 healthcare facilities in 94 different countries reported that SSCs were used in about three-fourths of surgical operations (Delisle et al., 2020). The study reported lower use of the SSCs in low Human Development Index countries compared to high Human Development Index countries, emergency surgical operations compared to elective surgical operations, and obstetrical and gynecological operations compared to abdominal surgeries (Delisle et al., 2020).

In this study, the majority of the operating room team members considered that the SSC can reduce the likelihood of human error, improve patient safety, teamwork in the operating room, and that the SSC should be mandatory for every case. Additionally, the operating room team members reported that the use of the SSC was supported by the surgical, anesthetic, nursing, senior, junior, and management personnel. The findings reported in this study were consistent with those reported in previous studies in which the operating room team members recognized the importance and impact of implementing the SSCs (Gong et al., 2021; O'Connor et al., 2013; Russ et al., 2015) (Aveling et al., 2013; Delisle et al., 2020; Dharampal et al., 2016; Hammond Mobilio et al., 2022; Rodella et al., 2018; Russ et al., 2015). In this study, more than half of the operating room team members who responded to the questionnaire reported that they had initiated the use of the SSC in the past and 80.0% reported that they intend to use the SSC in the future. Taken together, these findings indicate that the operating room team members had positive attitudes toward the SSC and believed in the power of such a list to prevent/minimize errors and improve patient safety.

More than half of the operating room team members who participated in this study reported that lack of time, training, staff assertiveness, and electronic versions of the SSC hindered the wide implementation of the SSC in every surgical operation. These findings

were consistent with previous studies' findings (Aveling et al., 2013; Delisle et al., 2020; Dharampal et al., 2016; Gong et al., 2021; Hammond Mobilio et al., 2022; O'Connor et al., 2013; Rodella et al., 2018; Russ et al., 2015). Together, these findings might be informative to the top management of the hospitals and decision-makers in health authorities who might be interested in increasing the use of SSC and improving patient safety.

In this study, operating room team members who the nongovernmental hospital employed were more likely to score ≥ 80% in the norm, support, and initiate domains. Probably, operating room team members had more positive attitudes towards the SSC and its impact on reducing human errors and improving patient safety. Differences in implementing and recognizing the importance of the SSCs between operating room team members in different hospitals were reported before (Aveling et al., 2013; Delisle et al., 2020; Dharampal et al., 2016; Hammond Mobilio et al., 2022). These findings might indicate the top management in governmental hospitals and decision-makers in health authorities need to increase awareness and correct attitudes of the operating room team members toward the SSC and its impact on reducing human errors and improving patient safety. On the other hand, the operating room team members with more experience were more likely to score higher in the teamwork and safety domain. Probably, the top management in governmental hospitals and decision-makers in health authorities might need to increase the junior staff's awareness of the SSC's importance in facilitating teamwork, reducing human error, and improving patient safety. In this study, operating room team members who were male, had less experience, and those who the governmental hospital employed were more likely to report barriers to implementing the SSC. Therefore, the top management in governmental hospitals and decision-makers in health authorities might need to provide training, employ more staff to reduce the workload, and design an electronic version of the SSC.

### 4.1.2 Adherence to filling out the SSC

Despite of lack of complete adherence to filling out the SSC, the findings reported in this study showed that 55.9% of the SSC were fully completed in the nongovernmental hospital. On the other hand, none of the SSC was fully completed in the governmental hospital. Moreover, none of the SSC was left blank in the nongovernmental hospital. These findings indicated that implementation of the SSC was suboptimal in both

hospitals. Therefore, the top management and decision-makers need to find ways to increase adherence to filling out the SSC in both hospitals, notably the governmental hospital. Previous studies have reported variable uptake and use of the SSC in different hospitals worldwide (Aveling et al., 2013; Delisle et al., 2020). Additionally, variations in implementing and practice of filling out and using the SSC were also reported (Hammond Mobilio et al., 2022). Therefore, the results reported in this study probably add to the pressing need for wider implementation of the SSC, reducing surgical complications, preventing/minimizing human errors, and improving patient safety.

The findings of this study showed that the SSC was less likely to be filled out when the patient was operated in the governmental hospital, was older than 18 years, had major surgery, and was operated for pediatric, gastrointestinal, urological, vascular, or neurosurgery. These findings indicate the top management and decision-makers need to design measures to improve adherence to filling out the SSC, especially in governmental hospitals in certain surgical practices.

## 4.2 Appraisal of the Strengths of the Study

The findings of this study might be interpreted after considering the following strengths:

1. This study was of two parts. In the first part, the attitudes of the operating room team members toward the implementation of the WHO's SSC in the Palestinian hospitals. In the second part, surgical records were reviewed from a governmental and a nongovernmental hospital to determine adherence to filling out the SSC in these hospitals. To the best of our knowledge, this is the first study of its type in the Palestinian surgical practice.

2. The study was conducted in two main hospitals in the West Bank of Palestine. The governmental hospital was one of the major surgical hospitals in the West Bank where a considerable number of surgical operations are performed on a yearly basis. On the other hand, the nongovernmental hospital was one of the main referral hospitals where the Ministry of Health requested surgical services when governmental hospitals do not provide these services. Therefore, the two selected hospitals probably represent the governmental and nongovernmental hospitals in which surgical operations are performed in Palestine.

3. In the attitudes part, operating room team members, including surgeons, anesthetists, and theater nurses, were invited and recruited. This should have ensured the representation of the different healthcare professionals that compose the operating room team.

4. In this study, a comprehensive sampling procedure was used to invite and recruit the participants for the attitudes part. This sampling procedure is one of the best when the study population is small.

5. This study recruited the same number of participants from governmental and nongovernmental hospitals. This should have reduced the risk of the dominance of the opinions and views of the operating room team members in any governmental and nongovernmental hospitals.

6. The study participants were diversified in terms of demographic and professional variables. This should have ensured the representation of team members from both genders, age groups, healthcare professionals, length of practical experience, and academic degree.

7. For the adherence part, records were randomly selected from both hospitals. This random selection should have reduced the risk of sampling bias.

8. The records were also selected from each month of the year. Again, this should have reduced the selection bias.

9. The records of patients who underwent general surgeries, pediatric surgeries, orthopedic surgeries, gastrointestinal surgeries, urological surgeries, plastic surgeries, vascular surgeries, otorhinolaryngological surgeries, and neurosurgeries were included. Again, this should have reduced the selection bias and ensured the representation of the different surgical procedures performed in both hospitals.

10. The patients whose records were audited were of different age groups, both genders, and received different surgical operations. This should have ensured the representation of the different patients.

## 4.3 Appraisal of the Limitations of the Study

This study is not without limitations. Therefore, when interpreting the findings reported in the study, the following limitations should be considered:

1. The sample size used in the attitudes part was relatively small. However, it is noteworthy that all operating room team members in both hospitals were invited to participate in this study as a comprehensive sampling approach was used.
2. The participants were recruited from two (a governmental and a nongovernmental) hospitals. Including more hospitals should have improved the external validity and permitted the generalization of the findings to the rest of the governmental and nongovernmental hospitals in Palestine.
3. The attitude part was merely the opinions and views of the participants. Therefore, the results could be associated with desirability bias.
4. Similarly, the number of records selected from both hospitals was relatively small. Including more records could have improved the external validity of the findings.
5. This study showed differences in age, gender, surgical specialties, and type of surgeries between both types of hospitals. Therefore, the selection of matching records from both hospitals could have produced more reliable findings.

## 4.4 Conclusion

In conclusion, the operating room team members had positive attitudes toward implementing the WHO'S SSC in Palestinian governmental and nongovernmental hospitals. The operating room team members who the nongovernmental hospital employed had a more positive attitude toward the SSC. The operating room team members who employed the governmental hospital reported more barriers that hindered SSC implementation. Adherence to filling out the SSC in both hospitals was suboptimal. None of the SSC was fully completed in the governmental hospital and none of the SSC was left blank in the nongovernmental hospital. The SSC was less likely to be filled out when the patient was operated in a governmental hospital, was older than 18 years, had major surgery, and was operated for pediatric, gastrointestinal, urological, vascular, or neurosurgery.

## 4.5 Recommendations

The following recommendations can be made based on the results reported in this study:

1. The top management of the Palestinian hospitals and decision-makers in health authorities should design interventions to increase awareness of the operating room team members about the importance of the SSC in preventing/minimizing human errors and improving patient safety.
2. The top management of the Palestinian hospitals and decision-makers in health authorities should train, employ more staff to reduce the workload, and design an electronic version of the SSC to improve adherence to filling the SSC by the operating room team members.

## 4.6 Future work

Based on the findings obtained in this study, the following studies might be conducted to:

1. Impose a wide implementation of the WHO's SSC and measure adherence to filling out the SSC in Palestinian hospitals.
2. Measure the impact of the SSC in preventing/minimizing human errors, surgical complications, and improving patient safety.

# List of Abbreviations

| Abbreviation | Meaning |
|---|---|
| IQR | Interquartile range |
| IRB | Institutional Review Board |
| JCI | Joint Commission International |
| OR | Odds ratio |
| Q1 | First quartile |
| Q3 | Third quartile |
| SSC | Surgical safety checklist |
| SURPASS | Surgical Patient Safety System |
| WHA | World Health Assembly |
| WHO | World Health Organization |

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# Appendices

## Appendix A

## *Supplementary Tables*

**Supplementary Table 1** *Characteristics of the operating room team members (n = 80)*

| Variable | n | % |
|---|---|---|
| Gender | | |
| Male | 72 | 90.0 |
| Female | 8 | 10.0 |
| Age (years) | | |
| ≤ 30 | 13 | 16.3 |
| 31-40 | 37 | 46.3 |
| 41-50 | 22 | 27.5 |
| ≥ 50 | 8 | 10.0 |
| Profession | | |
| Surgeon | 33 | 41.3 |
| Anesthetist | 15 | 18.8 |
| Operation theater nurse | 32 | 40.0 |
| Length of practical experience (years) | | |
| ≤ 5 | 12 | 15.0 |
| 5-10 | 29 | 36.3 |
| ≥ 10 | 39 | 48.8 |
| Academic qualification | | |
| Diploma | 6 | 7.5 |
| BSc | 24 | 30.0 |
| Postgraduate | 50 | 62.5 |
| Place of employment | | |
| Nongovernmental hospital | 40 | 50.0 |
| Governmental hospital | 40 | 50.0 |

*Note.* BSc: Bachelor of Science

**Supplementary Table 2** *Attitudes of the operating room team members towards the SSC*

| | | | Strongly disagree | | Disagree | | Neutral | | Agree | | Strongly agree | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Domain | # | Statement | n | % | n | % | n | % | n | % | n | % |
| Norms | 1 | 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 |
| | 2 | 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 |
| | 3 | 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 |
| | 4 | 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 |
| | 5 | Sometimes sections of the checklist are not completed. | 6 | 7.5 | 28 | 35.0 | 11 | 13.8 | 29 | 36.3 | 6 | 7.5 |
| | 6 | 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 | 1 | 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 |
| | 2 | 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 |
| | 3 | I believe using the checklist improves patient safety. | 0 | 0.0 | 2 | 2.5 | 3 | 3.8 | 31 | 38.8 | 44 | 55.0 |
| | 4 | I believe using the checklist improves teamwork in theatre. | 0 | 0.0 | 6 | 7.5 | 6 | 7.5 | 38 | 47.5 | 30 | 37.5 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 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 | 1 | Surgical personnel support the use of the checklist. | 0 | 0.0 | 4 | 5.0 | 8 | 10.0 | 52 | 65.0 | 16 | 20.0 |
| | 2 | Anesthetic personnel support the use of the checklist. | 0 | 0.0 | 9 | 11.3 | 5 | 6.3 | 52 | 65.0 | 14 | 17.5 |
| | 3 | Nursing staff support the use of the checklist. | 0 | 0.0 | 4 | 5.0 | 1 | 1.3 | 51 | 63.8 | 24 | 30.0 |
| | 4 | Senior theatre personnel support the use of the Checklist. | 0 | 0.0 | 3 | 3.8 | 3 | 3.8 | 51 | 63.8 | 23 | 28.8 |
| | 5 | Junior theatre personnel support the use of the checklist. | 0 | 0.0 | 3 | 3.8 | 7 | 8.8 | 51 | 63.8 | 19 | 23.8 |
| | 6 | Management supports the use of the checklist. | 1 | 1.3 | 2 | 2.5 | 21 | 26.3 | 36 | 45.0 | 20 | 25.0 |
| Initiate | 1 | I have initiated the use of the checklist in the past. | 0 | 0.0 | 21 | 26.3 | 14 | 17.5 | 29 | 36.3 | 16 | 20.0 |
| | 2 | 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 |
| Barriers | 1 | The requirement for signatures. | 0 | 0.0 | 20 | 25.0 | 22 | 27.5 | 32 | 40.0 | 6 | 7.5 |
| | 2 | Lack of assertiveness of staff. | 1 | 1.3 | 16 | 20.0 | 19 | 23.8 | 38 | 47.5 | 6 | 7.5 |
| | 3 | Lack of time. | 2 | 2.5 | 24 | 30.0 | 9 | 11.3 | 27 | 33.8 | 18 | 22.5 |
| | 4 | Lack of training. | 5 | 6.3 | 17 | 21.3 | 15 | 18.8 | 29 | 36.3 | 14 | 17.5 |
| | 5 | The lack of an electronic version of the checklist that could be completed on the theatre computer system. | 2 | 2.5 | 13 | 16.3 | 23 | 28.8 | 29 | 36.3 | 13 | 16.3 |

*Note.* WHO: World Health Organization

**Supplementary Table 3** *Scores of the operating room team members in the different domains*

| | Score | | |
|---|---|---|---|
| Domain | Q1 | Median | Q3 |
| Norms raw score | 16.3 | 21.0 | 24.0 |
| Norms percentage score | 54.2 | 70.0 | 80.0 |
| Impact on teamwork and safety raw score | 18.0 | 20.0 | 22.0 |
| Impact on teamwork and safety percentage score | 72.0 | 80.0 | 88.0 |
| Support raw score | 23.0 | 24.0 | 26.0 |
| Support percentage score | 76.7 | 80.0 | 86.7 |
| Initiate raw score | 6.0 | 8.0 | 9.0 |
| Initiate percentage score | 60.0 | 80.0 | 90.0 |
| Barriers raw score | 13.0 | 17.0 | 20.0 |
| Barriers percentage score | 52.0 | 68.0 | 80.0 |

*Note.* Q1: First quartile, Q3: Third quartile

**Supplementary Table 4** *Number of the operating room team members who scored ≥ 80% in the different domains*

| Domain | n | % |
|---|---|---|
| Norms percentage score | | |
| < 80% | 55 | 68.8 |
| ≥ 80% | 25 | 31.3 |
| Impact on teamwork and safety percentage score | | |
| < 80% | 31 | 38.8 |
| ≥ 80% | 49 | 61.3 |
| Support percentage score | | |
| < 80% | 25 | 31.3 |
| ≥ 80% | 55 | 68.8 |
| Initiate percentage score | | |
| < 80% | 34 | 42.5 |
| ≥ 80% | 46 | 57.5 |
| Barriers percentage score | | |
| < 80% | 51 | 63.8 |
| ≥ 80% | 29 | 36.3 |

**Supplementary Table 5** *Association between the demographic and professional characteristics of the operating room team members with their attitude scores in the norm domain*

| | | | Norm scores | | | |
|---|---|---|---|---|---|---|
| Variable | n | % | Q1 | Median | Q3 | p-value |
| Gender | | | | | | |
| Male | 72 | 90.0 | 16.0 | 21.0 | 24.0 | 0.546 |
| Female | 8 | 10.0 | 17.8 | 20.0 | 22.5 | |
| Age (years) | | | | | | |
| ≤ 30 | 13 | 16.3 | 17.5 | 20.0 | 24.0 | |
| 31-40 | 37 | 46.3 | 16.5 | 22.0 | 24.5 | 0.522 |
| 41-50 | 22 | 27.5 | 14.8 | 19.5 | 22.3 | |
| ≥ 50 | 8 | 10.0 | 15.5 | 20.5 | 24.3 | |
| Profession | | | | | | |
| Surgeon | 33 | 41.3 | 15.5 | 21.0 | 24.5 | |
| Anesthetist | 15 | 18.8 | 17.0 | 22.0 | 26.0 | 0.790 |
| Operation theater nurse | 32 | 40.0 | 17.3 | 20.5 | 24.0 | |
| Length of practical experience (years) | | | | | | |
| ≤ 5 | 12 | 15.0 | 15.5 | 18.5 | 23.8 | |
| 5-10 | 29 | 36.3 | 21.0 | 23.0 | 24.0 | 0.039 |
| ≥ 10 | 39 | 48.8 | 16.0 | 20.0 | 23.0 | |
| Academic qualification | | | | | | |
| Diploma | 6 | 7.5 | 14.3 | 19.5 | 22.5 | |
| BSc | 24 | 30.0 | 18.3 | 20.5 | 24.0 | 0.672 |
| Postgraduate | 50 | 62.5 | 15.8 | 21.0 | 25.0 | |
| Place of employment | | | | | | |
| Nongovernmental hospital | 40 | 50.0 | 22.0 | 24.0 | 26.0 | < 0.001 |
| Governmental hospital | 40 | 50.0 | 14.0 | 17.0 | 20.0 | |

*Note.* BSc: Bachelor of Science, Q1: First quartile, Q3: Third quartile

**Supplementary Table 6** *Association between the demographic and professional characteristics of the operating room team members and scoring ≥ 80% in the norm domain*

| | Norm scores | | | | | |
|---|---|---|---|---|---|---|
| | < 80% | | ≥ 80% | | | |
| Variable | n | % | n | % | Pearson Chi-Square/Fisher's exact test | p-value |
| Gender | | | | | | |
| Male | 48 | 60.0 | 24 | 30.0 | 1.44 | 0.424 |
| Female | 7 | 8.8 | 1 | 1.3 | | |
| Age (years) | | | | | | |
| ≤ 30 | 9 | 11.3 | 4 | 5.0 | 3.30 | 0.356 |
| 31-40 | 22 | 27.5 | 15 | 18.8 | | |
| 41-50 | 18 | 22.5 | 4 | 5.0 | | |
| ≥ 50 | 6 | 7.5 | 2 | 2.5 | | |
| Profession | | | | | | |
| Surgeon | 23 | 28.8 | 10 | 12.5 | 0.67 | 0.773 |
| Anesthetist | 9 | 11.3 | 6 | 7.5 | | |
| Operation theater nurse | 23 | 28.8 | 9 | 11.3 | | |
| Length of practical experience (years) | | | | | | |
| ≤ 5 | 9 | 11.3 | 3 | 3.8 | 6.13 | 0.056 |
| 5-10 | 15 | 18.8 | 14 | 17.5 | | |
| ≥ 10 | 31 | 38.8 | 8 | 10.0 | | |
| Academic qualification | | | | | | |
| Diploma | 5 | 6.3 | 1 | 1.3 | 0.73 | 0.802 |
| BSc | 17 | 21.3 | 7 | 8.8 | | |
| Postgraduate | 33 | 41.3 | 17 | 21.3 | | |
| Place of employment | | | | | | |
| Nongovernmental hospital | 16 | 20.0 | 24 | 30.0 | 30.78 | < 0.001 |
| Governmental hospital | 39 | 48.8 | 1 | 1.3 | | |

**Supplementary Table 7** *Association between the demographic and professional characteristics of the operating room team members with their attitude scores in the impact on teamwork and safety domain*

| | Impact on teamwork and safety | | | |
|---|---|---|---|---|
| Variable | Q1 | Median | Q3 | p-value |
| Gender | | | | |
| Male | 18.0 | 20.0 | 22.8 | 0.173 |
| Female | 16.5 | 18.5 | 20.8 | |
| Age (years) | | | | |
| ≤ 30 | 17.5 | 19.0 | 21.5 | |
| 31-40 | 18.0 | 21.0 | 23.0 | 0.240 |
| 41-50 | 18.0 | 20.0 | 22.0 | |
| ≥ 50 | 18.5 | 23.0 | 25.0 | |
| Profession | | | | |
| Surgeon | 18.5 | 20.0 | 23.5 | |
| Anesthetist | 20.0 | 20.0 | 24.0 | 0.055 |
| Operation theater nurse | 18.0 | 19.0 | 22.0 | |
| Length of practical experience (years) | | | | |
| ≤ 5 | 16.5 | 18.5 | 20.0 | |
| 5-10 | 19.0 | 22.0 | 23.0 | 0.058 |
| ≥ 10 | 18.0 | 20.0 | 22.0 | |
| Academic qualification | | | | |
| Diploma | 15.0 | 17.5 | 19.0 | |
| BSc | 18.0 | 19.0 | 21.0 | 0.002 |
| Postgraduate | 19.0 | 21.0 | 24.0 | |
| Place of employment | | | | |
| Nongovernmental hospital | 19.0 | 22.0 | 23.8 | 0.014 |
| Governmental hospital | 18.0 | 20.0 | 21.0 | |

**Supplementary Table 8** *Association between the demographic and professional characteristics of the operating room team members and scoring ≥ 80% in the impact on teamwork and safety domain*

| Variable | Impact on teamwork and safety | | | | | |
|---|---|---|---|---|---|---|
| | < 80% | | ≥ 80% | | Pearson Chi-Square/Fisher's exact test | p-value |
| | n | % | n | % | | |
| Gender | | | | | | |
| Male | 26 | 32.5 | 46 | 57.5 | 2.05 | 0.250 |
| Female | 5 | 6.3 | 3 | 3.8 | | |
| Age (years) | | | | | | |
| ≤ 30 | 7 | 8.8 | 6 | 7.5 | 2.29 | 0.525 |
| 31-40 | 15 | 18.8 | 22 | 27.5 | | |
| 41-50 | 7 | 8.8 | 15 | 18.8 | | |
| ≥ 50 | 2 | 2.5 | 6 | 7.5 | | |
| Profession | | | | | | |
| Surgeon | 12 | 15.0 | 21 | 26.3 | 6.95 | 0.030 |
| Anesthetist | 2 | 2.5 | 13 | 16.3 | | |
| Operation theater nurse | 17 | 21.3 | 15 | 18.8 | | |
| Length of practical experience (years) | | | | | | |
| ≤ 5 | 8 | 10.0 | 4 | 5.0 | 4.58 | 0.100 |
| 5-10 | 9 | 11.3 | 20 | 25.0 | | |
| ≥ 10 | 14 | 17.5 | 25 | 31.3 | | |
| Academic qualification | | | | | | |
| Diploma | 5 | 6.3 | 1 | 1.3 | 10.50 | 0.004 |
| BSc | 13 | 16.3 | 11 | 13.8 | | |
| Postgraduate | 13 | 16.3 | 37 | 46.3 | | |
| Place of employment | | | | | | |
| Nongovernmental hospital | 12 | 15.0 | 28 | 35.0 | 2.58 | 0.168 |
| Governmental hospital | 19 | 23.8 | 21 | 26.3 | | |

**Supplementary Table 9** *Association between the demographic and professional characteristics of the operating room team members with their attitude scores in the support domain*

| | Support | | | |
|---|---|---|---|---|
| Variable | Q1 | Median | Q3 | p-value |
| Gender | | | | |
| Male | 23.0 | 24.0 | 26.8 | 0.226 |
| Female | 20.3 | 23.5 | 25.5 | |
| Age (years) | | | | |
| ≤ 30 | 21.5 | 24.0 | 26.5 | |
| 31-40 | 23.5 | 25.0 | 28.0 | 0.028 |
| 41-50 | 23.0 | 24.0 | 24.0 | |
| ≥ 50 | 23.3 | 24.5 | 29.5 | |
| Profession | | | | |
| Surgeon | 23.0 | 24.0 | 26.5 | |
| Anesthetist | 24.0 | 24.0 | 28.0 | 0.459 |
| Operation theater nurse | 23.0 | 24.0 | 26.0 | |
| Length of practical experience (years) | | | | |
| ≤ 5 | 22.0 | 24.0 | 25.8 | |
| 5-10 | 24.0 | 25.0 | 28.0 | 0.037 |
| ≥ 10 | 23.0 | 24.0 | 24.0 | |
| Academic qualification | | | | |
| Diploma | 18.8 | 22.0 | 25.0 | |
| BSc | 23.0 | 24.0 | 25.0 | 0.047 |
| Postgraduate | 24.0 | 24.0 | 28.0 | |
| Place of employment | | | | |
| Nongovernmental hospital | 24.0 | 25.0 | 28.0 | 0.007 |
| Governmental hospital | 23.0 | 24.0 | 24.0 | |

**Supplementary Table 10** *Association between the demographic and professional characteristics of the operating room team members and scoring ≥ 80% in support domain*

| Variable | Support | | | | | |
|---|---|---|---|---|---|---|
| | < 80% | | ≥ 80% | | Pearson Chi-Square/Fisher's exact test | p-value |
| | n | % | n | % | | |
| Gender | | | | | | |
| Male | 21 | 26.3 | 51 | 63.8 | 1.36 | 0.424 |
| Female | 4 | 5.0 | 4 | 5.0 | | |
| Age (years) | | | | | | |
| ≤ 30 | 6 | 7.5 | 7 | 8.8 | 2.54 | 0.484 |
| 31-40 | 9 | 11.3 | 28 | 35.0 | | |
| 41-50 | 8 | 10.0 | 14 | 17.5 | | |
| ≥ 50 | 2 | 2.5 | 6 | 7.5 | | |
| Profession | | | | | | |
| Surgeon | 10 | 12.5 | 23 | 28.8 | 3.47 | 0.170 |
| Anesthetist | 2 | 2.5 | 13 | 16.3 | | |
| Operation theater nurse | 13 | 16.3 | 19 | 23.8 | | |
| Length of practical experience (years) | | | | | | |
| ≤ 5 | 5 | 6.3 | 7 | 8.8 | 4.34 | 0.118 |
| 5-10 | 5 | 6.3 | 24 | 30.0 | | |
| ≥ 10 | 15 | 18.8 | 24 | 30.0 | | |
| Academic qualification | | | | | | |
| Diploma | 4 | 5.0 | 2 | 2.5 | 6.50 | 0.032 |
| BSc | 10 | 12.5 | 14 | 17.5 | | |
| Postgraduate | 11 | 13.8 | 39 | 48.8 | | |
| Place of employment | | | | | | |
| Nongovernmental hospital | 8 | 10.0 | 32 | 40.0 | 4.65 | 0.053 |
| Governmental hospital | 17 | 21.3 | 23 | 28.8 | | |

**Supplementary Table 11** *Association between the demographic and professional characteristics of the operating room team members with their attitude scores in the initiate domain*

| | Initiate | | | |
|---|---|---|---|---|
| Variable | Q1 | Median | Q3 | p-value |
| Gender | | | | |
| Male | 6.0 | 8.0 | 9.0 | 0.397 |
| Female | 6.0 | 7.0 | 8.0 | |
| Age (years) | | | | |
| ≤ 30 | 6.0 | 6.0 | 8.5 | |
| 31-40 | 6.0 | 8.0 | 9.5 | 0.312 |
| 41-50 | 7.0 | 8.0 | 8.0 | |
| ≥ 50 | 6.5 | 8.5 | 9.0 | |
| Profession | | | | |
| Surgeon | 6.0 | 8.0 | 9.0 | |
| Anesthetist | 7.0 | 8.0 | 8.0 | 0.337 |
| Operation theater nurse | 6.0 | 7.0 | 9.0 | |
| Length of practical experience (years) | | | | |
| ≤ 5 | 5.3 | 6.0 | 7.8 | |
| 5-10 | 6.0 | 8.0 | 10.0 | 0.002 |
| ≥ 10 | 6.0 | 8.0 | 8.0 | |
| Academic qualification | | | | |
| Diploma | 4.0 | 5.5 | 8.3 | |
| BSc | 6.0 | 6.5 | 8.8 | 0.048 |
| Postgraduate | 7.0 | 8.0 | 9.0 | |
| Place of employment | | | | |
| Nongovernmental hospital | 7.0 | 8.0 | 9.0 | 0.013 |
| Governmental hospital | 6.0 | 7.0 | 8.0 | |

**Supplementary Table 12** *Association between the demographic and professional characteristics of the operating room team members and scoring ≥ 80% in initiate domain*

| Variable | Initiate | | | | | |
|---|---|---|---|---|---|---|
| | < 80% | | ≥ 80% | | Pearson Chi-Square/Fisher's exact test | p-value |
| | n | % | n | % | | |
| Gender | | | | | | |
| Male | 30 | 37.5 | 42 | 52.5 | 0.20 | 0.717 |
| Female | 4 | 5.0 | 4 | 5.0 | | |
| Age (years) | | | | | | |
| ≤ 30 | 8 | 10.0 | 5 | 6.3 | 3.14 | 0.383 |
| 31-40 | 16 | 20.0 | 21 | 26.3 | | |
| 41-50 | 8 | 10.0 | 14 | 17.5 | | |
| ≥ 50 | 2 | 2.5 | 6 | 7.5 | | |
| Profession | | | | | | |
| Surgeon | 11 | 13.8 | 22 | 27.5 | 4.13 | 0.141 |
| Anesthetist | 5 | 6.3 | 10 | 12.5 | | |
| Operation theater nurse | 18 | 22.5 | 14 | 17.5 | | |
| Length of practical experience (years) | | | | | | |
| ≤ 5 | 9 | 11.3 | 3 | 3.8 | 7.85 | 0.017 |
| 5-10 | 8 | 10.0 | 21 | 26.3 | | |
| ≥ 10 | 17 | 21.3 | 22 | 27.5 | | |
| Academic qualification | | | | | | |
| Diploma | 4 | 5.0 | 2 | 2.5 | 6.08 | 0.041 |
| BSc | 14 | 17.5 | 10 | 12.5 | | |
| Postgraduate | 16 | 20.0 | 34 | 42.5 | | |
| Place of employment | | | | | | |
| Nongovernmental hospital | 12 | 15.0 | 28 | 35.0 | 5.12 | 0.041 |
| Governmental hospital | 22 | 27.5 | 18 | 22.5 | | |

**Supplementary Table 13** *Association between the demographic and professional characteristics of the operating room team members with their attitude scores in the barrier domain*

| | Barriers | | | |
|---|---|---|---|---|
| Variable | Q1 | Median | Q3 | p-value |
| Gender | | | | |
| Male | 13.0 | 16.0 | 20.0 | 0.067 |
| Female | 17.0 | 20.0 | 20.0 | |
| Age (years) | | | | |
| ≤ 30 | 12.5 | 17.0 | 20.0 | |
| 31-40 | 14.0 | 16.0 | 20.0 | 0.528 |
| 41-50 | 13.0 | 16.5 | 20.0 | |
| ≥ 50 | 14.0 | 20.0 | 21.5 | |
| Profession | | | | |
| Surgeon | 13.5 | 17.0 | 21.0 | |
| Anesthetist | 14.0 | 16.0 | 20.0 | 0.709 |
| Operation theater nurse | 13.0 | 17.5 | 20.0 | |
| Length of practical experience (years) | | | | |
| ≤ 5 | 12.3 | 15.5 | 19.5 | |
| 5-10 | 13.5 | 18.0 | 20.0 | 0.343 |
| ≥ 10 | 13.0 | 17.0 | 20.0 | |
| Academic qualification | | | | |
| Diploma | 11.5 | 14.0 | 20.0 | |
| BSc | 13.3 | 19.0 | 20.0 | 0.439 |
| Postgraduate | 13.8 | 16.0 | 20.0 | |
| Place of employment | | | | |
| Nongovernmental hospital | 12.0 | 15.0 | 16.8 | 0.000 |
| Governmental hospital | 17.3 | 20.0 | 21.0 | |

**Supplementary Table 14** *Association between the demographic and professional characteristics of the operating room team members and scoring ≥ 80% in barrier domain*

| Variable | Barriers | | | | Pearson Chi-Square/Fisher's exact test | p-value |
|---|---|---|---|---|---|---|
| | < 80% | | ≥ 80% | | | |
| | n | % | n | % | | |
| Gender | | | | | | |
| Male | 49 | 61.3 | 23 | 28.8 | 5.70 | 0.024 |
| Female | 2 | 2.5 | 6 | 7.5 | | |
| Age (years) | | | | | | |
| ≤ 30 | 8 | 10.0 | 5 | 6.3 | 5.72 | 0.127 |
| 31-40 | 26 | 32.5 | 11 | 13.8 | | |
| 41-50 | 15 | 18.8 | 7 | 8.8 | | |
| ≥ 50 | 2 | 2.5 | 6 | 7.5 | | |
| Profession | | | | | | |
| Surgeon | 20 | 25.0 | 13 | 16.3 | 0.76 | 0.751 |
| Anesthetist | 11 | 13.8 | 4 | 5.0 | | |
| Operation theater nurse | 20 | 25.0 | 12 | 15.0 | | |
| Length of practical experience (years) | | | | | | |
| ≤ 5 | 9 | 11.3 | 3 | 3.8 | 0.73 | 0.736 |
| 5-10 | 18 | 22.5 | 11 | 13.8 | | |
| ≥ 10 | 24 | 30.0 | 15 | 18.8 | | |
| Academic qualification | | | | | | |
| Diploma | 4 | 5.0 | 2 | 2.5 | 0.54 | 0.868 |
| BSc | 14 | 17.5 | 10 | 12.5 | | |
| Postgraduate | 33 | 41.3 | 17 | 21.3 | | |
| Place of employment | | | | | | |
| Nongovernmental hospital | 34 | 42.5 | 6 | 7.5 | 15.63 | 0.000 |
| Governmental hospital | 17 | 21.3 | 23 | 28.8 | | |

**Supplementary Table 15** *Detailed variables of the patients who were included in this study (n = 340)*

| Variable | n | % |
|---|---|---|
| Age (years) | | |
| ≤ 18 | 88 | 25.9 |
| 19-30 | 60 | 17.6 |
| 31-40 | 56 | 16.5 |
| 41-50 | 61 | 17.9 |
| ≥ 50 | 75 | 22.1 |
| Gender | | |
| Male | 206 | 60.6 |
| Female | 134 | 39.4 |
| Surgical specialty | | |
| Pediatric surgery | 45 | 13.2 |
| Orthopedic surgery | 49 | 14.4 |
| Gastrointestinal surgery | 40 | 11.8 |
| Urological surgery | 26 | 7.6 |
| Plastic surgery | 15 | 4.4 |
| Vascular surgery | 21 | 6.2 |
| Otorhinolaryngological surgeries | 33 | 9.7 |
| Neurosurgery | 18 | 5.3 |
| General surgery | 93 | 27.4 |
| Type of surgery | | |
| Minor | 83 | 24.4 |
| Moderate | 143 | 42.1 |
| Major | 114 | 33.5 |

**Supplementary Table 16** *Comparison between the characteristics of the patients who were included from the nongovernmental hospital and governmental hospital*

| | Nongovernmental hospital | | Governmental hospital | | | |
|---|---|---|---|---|---|---|
| Variable | n | % | n | % | Pearson Chi-Square | p-value |
| Age (years) | | | | | | |
| ≤ 18 | 33 | 19.4 | 55 | 32.4 | | |
| 19-30 | 34 | 20.0 | 26 | 15.3 | | |
| 31-40 | 20 | 11.8 | 36 | 21.2 | 27.88 | < 0.001 |
| 41-50 | 28 | 16.5 | 33 | 19.4 | | |
| ≥ 50 | 55 | 32.4 | 20 | 11.8 | | |
| Gender | | | | | | |
| Male | 113 | 66.5 | 93 | 54.7 | 4.93 | 0.035 |
| Female | 57 | 33.5 | 77 | 45.3 | | |
| Surgical specialty | | | | | | |
| Pediatric surgery | 30 | 17.6 | 15 | 8.8 | | |
| Orthopedic surgery | 14 | 8.2 | 35 | 20.6 | | |
| Gastrointestinal surgery | 31 | 18.2 | 9 | 5.3 | | |
| Urological surgery | 15 | 8.8 | 11 | 6.5 | | |
| Plastic surgery | 5 | 2.9 | 10 | 5.9 | 41.08 | < 0.001 |
| Vascular surgery | 16 | 9.4 | 5 | 2.9 | | |
| Otorhinolaryngological surgeries | 10 | 5.9 | 23 | 13.5 | | |
| Neurosurgery | 9 | 5.3 | 9 | 5.3 | | |
| General surgery | 40 | 23.5 | 53 | 31.2 | | |
| Type of surgery | | | | | | |
| Minor | 54 | 31.8 | 29 | 17.1 | | |
| Moderate | 51 | 30.0 | 92 | 54.1 | 21.53 | < 0.001 |
| Major | 65 | 38.2 | 49 | 28.8 | | |

**Supplementary Table 17** *Adherence to the SSC*

| Variable | n | % |
|---|---|---|
| Adherence to the SSC | | |
| Incomplete | 98 | 28.8 |
| Partially completed | 147 | 43.2 |
| Fully completed | 95 | 27.9 |

*Note.* SSC: Surgical Safety Checklist

**Supplementary Table 18** *Comparison between adherence to the SSC in both hospitals*

| | Nongovernmental hospital | | Governmental hospital | | | |
|---|---|---|---|---|---|---|
| Variable | n | % | n | % | Pearson Chi-Square | p-value |
| Adherence to the SSC | | | | | | |
| Incomplete | 0 | 0.0 | 98 | 57.6 | | |
| Partially completed | 75 | 44.1 | 72 | 42.4 | 193.06 | < 0.001 |
| Fully completed | 95 | 55.9 | 0 | 0.0 | | |

*Note.* SSC: Surgical Safety Checklist

**Supplementary Table 19** *Associations between variables of the patients and adherence to the SSC*

| Variable | Adherence to the SSC | | | | Pearson Chi-Square | p-value |
|---|---|---|---|---|---|---|
| | Incomplete | | Completed | | | |
| | n | % | n | % | | |
| Age (years) | | | | | | |
| ≤ 18 | 70 | 20.6 | 18 | 5.3 | 3.31 | 0.074 |
| > 18 | 175 | 51.5 | 77 | 22.6 | | |
| Gender | | | | | | |
| Male | 140 | 41.2 | 66 | 19.4 | 4.36 | 0.048 |
| Female | 105 | 30.9 | 29 | 8.5 | | |
| Surgical specialty | | | | | | |
| Pediatric/gastrointestinal/urological/vascular/neurosurgery | 99 | 29.1 | 51 | 15.0 | 4.89 | 0.029 |
| Orthopedic/plastic/otorhinolaryngological/general surgery | 146 | 42.9 | 44 | 12.9 | | |
| Classification of surgery | | | | | | |
| Minor/moderate | 53 | 15.6 | 30 | 8.8 | 3.67 | 0.067 |
| Major | 192 | 56.5 | 65 | 19.1 | | |
| Hospital | | | | | | |
| Nongovernmental hospital | 75 | 22.1 | 95 | 27.9 | 131.84 | < 0.001 |
| Governmental hospital | 170 | 50.0 | 0 | 0.0 | | |

*Note.* SSC: Surgical Safety Checklist

**Supplementary Table 20** *The multivariate logistic regression model of the adherence to the SSC*

| | | | | | | 95% C.I. for OR | |
|---|---|---|---|---|---|---|---|
| Variable | β | S.E. | Wald | p-value | OR | Lower | Upper |
| Age | 0.79 | 0.32 | 6.19 | 0.013 | 2.20 | 1.18 | 4.09 |
| Gender | 0.45 | 0.26 | 2.94 | 0.086 | 1.57 | 0.94 | 2.64 |
| Surgical specialty | 0.67 | 0.26 | 6.78 | 0.009 | 1.95 | 1.18 | 3.21 |
| Classification of surgery | 0.63 | 0.28 | 4.89 | 0.027 | 1.88 | 1.07 | 3.28 |

# Appendix B

## The questionnaire

**An-Najah National University**

Dear participant,

We hope that you well

I would like to thank you for your collaboration and participation to fill out our questionnaire about the **Attitude of Operating Surgical Room Teams towards the Implementation of the WHO Surgical Safety Checklist and Evaluation of the Compliance of Filling out the Checklist in Hospitals of Palestine** for the scientific research purposes

Your participation is highly appreciated

Thanks

Sana Yaseen

## Operating surgical team members' attitude to Surgical Safety Checklist

- **Part one: General Information**

  Please kindly fill out the attached survey by ticking **(√ )** in the box ...

**1- Gender:**

☐ Male ☐ Female

**2- Age:**

☐ 22–30-year ☐ 31–40-year ☐ 41-50 year ☐ More than 50 years

**3- Job do you perform in theatre**

☐ Surgeon ☐ Anaesthetist ☐ Theater Nurse

**4- Surgical specialty:**

☐ General Surgeries ☐ Pediatric ☐ Urology ☐ Vascular ☐ Neurosurgery

☐ Plastics ☐ Otorhinolaryngology (ENT)

☐ Orthopaedics ☐ Gastrointestinal ☐ None.

**5- Experience:**

☐ Less than 5 years ☐ From 5 to 10 years ☐ More than 10 years

**6- Qualification**

☐ Intermediate Diploma ☐ Bachelor ☐ Postgraduate

**7- Hospital's type:**

☐ Governmental ☐ Private

- **<u>Part two: Attitudes to Surgical Checklist Questionnaire</u>**

  Please kindly fill out the attached survey by ticking **(√ )** in the box ...

| Dimensions | Attitudinal items | Disagree Strongly (1) | Disagree (2) | Neutral (3) | Agree (4) | Agree Strongly (5) |
|---|---|---|---|---|---|---|
| Norms | There is little difference between the surgical checklist in NNUH / RGH and the WHO surgical safety checklist. | | | | | |
| | The complete checklist is used for every procedure in every operation in NNUH / RGH | | | | | |
| | The complete checklist is used for every procedure in which I am involved in theatre | | | | | |
| | When the checklist is being carried out, everyone in the theatre stops what they are doing and listens until it is completed | | | | | |
| | Sometimes sections of the checklist are not completed. | | | | | |
| | The individual who signs the checklist personally ensures that the relevant steps have been completed. | | | | | |
| Impact on Teamwork and safety | I believe that failing to use the checklist is poor professional practice. | | | | | |
| | I believe using the checklist reduces the likelihood of human error. | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | I believe using the checklist improves patient safety. | | | | | |
| | I believe using the checklist improves teamwork in theatre. | | | | | |
| | The use of the checklist should be mandatory for every case. | | | | | |
| **Support** | Surgical personnel support the use of the checklist | | | | | |
| | Anaesthetic personnel support the use of the checklist. | | | | | |
| | Nursing staff support the use of the checklist. | | | | | |
| | Senior theatre personnel support the use of the Checklist. | | | | | |
| | Junior theatre personnel support the use of the checklist | | | | | |
| | Management supports the use of the checklist. | | | | | |
| **Initiate** | I have initiated the use of the checklist in the past. | | | | | |
| | I intend to initiate the use of the checklist in the future. | | | | | |
| **Barriers** | The requirement for signatures. | | | | | |
| | Lack of assertiveness of staff. | | | | | |
| | Lack of time. | | | | | |
| | Lack of training | | | | | |
| | The lack of an electronic version of the checklist that could be completed on the theatre computer system | | | | | |

***NNUH – Najah National Unviersity Hospital** *** World Health Organization**

***RGH – Rafedia Governmental Hospital.**

# Appendix C

# IRB approval


An-Najah
National University

Faculty of Graduate Studies
Dean's Office

جامعة
النجـــاح الوطنية
كلية الدراسات العليا
مكتب العميد


التاريخ: 2021/10/10

حضرة الدكتورة مريم الطل المحترمة
منسقة برنامجي ماجستير ادارة الصحة العامة والصحة العامة

تحية طيبة وبعد،

***الموضوع : الموافقة على عنوان الاطروحة وتحديد المشرف***

قرر مجلس كلية الدراسات العليا في جلسته رقم (410) المنعقدة بتاريخ 2021/10/7، الموافقة على مشروع الأطروحة المقدم من الطالب/ة سناء جبر علي ياسين، رقم التسجيل 11850998، تخصص ماجستير ادارة الصحة العامة، عنوان الأطروحة:

**موقف فرق غرف العمليات الجراحية من تنفيذ قائمة مراجعة السلامة الجراحية لمنظمة الصحة العالمية وتقييم الامتثال لملء قائمة المراجعة في مستشفيات فلسطين**

**Attitude of Operating Surgical Rooms Teams towards the Implementation of WHO Surgical Safety Checklist and Evaluation of the Compliance of Filling out the Checklist in Hospitals of Palestine**

**باشراف: 1)** د. سائد زيود  2) د. عبد السلام الخياط

***ملاحظة: لاعتماد الأطروحة وتسجيلها على الفصل الاول 2022/2021.***

***يرجى اعلام المشرف والطالب بضرورة تسجيل الاطروحة خلال اسبوعين من تاريخ اصدار الكتاب. وفي حال عدم تسجيل الطالب/ة للاطروحة في الفترة المحددة له/ا ستقوم كلية الدراسات العليا بالغاء اعتماد العنوان والمشرف***

وتفضلوا بقبول وافر الاحترام ،،،

**عميد كلية الدراسات العليا**

**أ.د. وليد صويلح**

نسخة : د. رئيس قسم الدراسات العليا للعلوم الطبية والصحية المحترم
: عميد القبول والتسجيل المحترم
: مشرف الطالب
: ملف الطالب

**جامعة النجاح الوطنية من أفضل 500 جامعة على مستوى العالم في تصنيف التايمز البريطاني 2022**


فلسطين، نابلس، ص.ب 707، 7 هاتف: 2345115، 2345114، 2345113 (09)(972)* فاكسميل: 2342907(09)(972)
Nablus, P. O. Box (7) *Tel. 972 9 2345113, 2345114, 2345115 هاتف داخلي (5) 3200
* Facsimile 972 92342907 *www.najah.edu - email fgs@najah.edu

# Appendix D

# Study approval

State of Palestine
Ministry of Health
Education in Health and Scientific
Research Unit

دولة فلسطين
وزارة الصحة
وحدة التعليم الصحي
والبحث العلمي

Ref.: .....
Date:.....

الرقم: ع.ص/٦٣٤/٢٠٢٠
التاريخ: ٢٠٢٠/٨/١٣

**مدير عام الادارة العامة للمستشفيات المحترم،،،**

**تحية واحترام،،**

**الموضـــوع: تسهيل مهمة بحث**

يرجى التكرم بتسهيل مهمة الطالبة: **سناء جبر علي ياسين**- ماجستير ادارة الصحة العامة- **جامعة النجاح**، لعمل بحث بعنوان:

**Attitude of Operating Surgical Room Teams towards the Implementation of " WHO Surgical Safety Checklist and Evaluation of the Compliance of filling 'out the Checklist in Hospitals of Palestine**

حيث ستقوم الطالبة بجمع معلومات عن طريق تعبئة استبانة من قبل فريق الجراحة، ومراجعة ملفات مرضى، وذلك في:

- **مستشفى رفيديا**

مع العلم أن مشرف الدراسة: د. سائد الزبود ود. عبد السلام الخياط.

على ان يتم الالتزام بالمحافظة على اخلاقيات البحث العلمي وسرية المعلومات.
على ان يتم الالتزام بجميع تعليمات واجراءات الوقاية والسلامة الصادرة عن وزارة الصحة بخصوص جائحة كورونا، وتحت طائلة المسؤولية. وابراز شهادة التطعيم قبل دخول مرافق وزارة الصحة.
على ان يتم تزويد الوزارة بنسخة PDF من نتائج البحث، التعهد بعدم النشر لحين الحصول على موافقة وزارة الصحة.

**مع الاحترام،،**

د. عبد الله القواسمي
رئيس وحدة التعليم الصحي والبحث العلمي

نسخة: عميد كلية الدراسات العليا المحترم/ جامعة النجاح

Telfax.:09-2333901 scientificresearch.dep@gmail.com تلفاكس: 09-2333901

جـامعـــة النجاح الوطنية

كليـــة الدراســـات العليـــا

# موقف فرق غرف العمليات الجراحية من تنفيذ قائمة مراجعة السلامة الجراحية لمنظمة الصحة العالمية وتقييم الامتثال لملء قائمة المراجعة في مستشفيات فلسطين

إعداد

سناء جبر علي ياسين

إشراف

د سائد زيود

د عبد السلام الخياط

قدمت هذه الرسالة استكمالا لمتطلبات الحصول على درجة الماجستير في إدارة الصحة العامة، من كلية الدراسات العليا، في جامعة النجاح الوطنية، نابلس– فلسطين.

2023

# موقف فرق غرف العمليات الجراحية من تنفيذ قائمة مراجعة السلامة الجراحية لمنظمة الصحة العالمية وتقييم الامتثال لملء قائمة المراجعة في مستشفيات فلسطين

**إعداد**

**سناء جبر علي ياسين**

**إشراف**

**د سائد زيود**

**د عبد السلام الخياط**

## الملخص

**خلفية الدراسة:** قدمت منظمة الصحة العالمية قائمة مراجعة السلامة الجراحية التي تهدف إلى تعزيز سلامة المرضى في الجراحة. أجريت هذه الدراسة لتقييم اتجاهات أعضاء فريق غرفة العمليات نحو تطبيق قائمة فحص السلامة الجراحية في المستشفيات الحكومية وغير الحكومية في فلسطين. كان الهدف الآخر هو تحديد مدى الالتزام بملء قائمة فحص سلامة العمليات الجراحية المستخدمة حاليًا في المستشفيات الحكومية وغير الحكومية في فلسطين.

**منهجية الدراسة:** أجريت هذه الدراسة في جزئين. تم إجراء جزء الاتجاهات في دراسة مقطعية باستخدام استبيان تم اعتماده وتعديله من الدراسات السابقة. تم إجراء جزء الالتزام في باستخدام دراسة بأثر رجعي. تم تدقيق الملفات الجراحية للمرضى مقابل العناصر الموجودة في قائمة فحص السلامة الجراحية.

**نتائج الدراسة:** كان للمشاركين مواقف إيجابية تجاه قائمة فحص السلامة الجراحية. كان أعضاء فريق غرفة العمليات الذين عملوا في المستشفى غير الحكومي 76.23 ضعفًا (95٪ CI: 8.08 إلى 718.84) أكثر احتمالا لتسجيل 80٪ في المجال المعياري ، 4.15 ضعفًا (95٪ CI: 1.23 إلى 13.94) أكثر احتمالا لتسجيل ≤ 80٪ في مجال البدء ، و 3.96 ضعفًا (95٪ CI: 1.13 إلى 13.93) أكثر احتمالا لتسجيل ≤ 80٪ في مجال الدعم. كان لدى المشاركين الذين عملوا في المستشفيات الحكومية 46.69 ضعفًا (95٪

CI: 6.25 إلى 348.65) أكثر احتمالا لتسجيل 80٪ في مجال الحاجز. تم الانتهاء من قائمة فحص السلامة الجراحية بالكامل (تم ملؤها بالكامل) لـ 95 (27.9٪) مريضاً. تُركت قائمة فحص السلامة الجراحية فارغة لـ 0 (0.0٪) من المرضى الذين تم تضمينهم من المستشفى غير الحكومي. من ناحية أخرى ، تم استكمال قائمة فحص السلامة الجراحية بالكامل لـ 0 (0.0٪) من المرضى الذين شملهم المستشفى الحكومي.

**إستنتاجات الدراسة:** كان لأعضاء فريق غرفة العمليات الذين عملوا في المستشفى غير الحكومي مواقف أكثر إيجابية تجاه قائمة فحص سلامة العمليات الجراحية. كان الالتزام بملء قائمة فحص السلامة الجراحية في كلا المستشفيين دون المستوى الأمثل.

**الكلمات المفتاحية:** قائمة المراجعة الجراحية، الجراحة، سلامة المرضى.