

**IMPLEMENTATION MANUAL
FOR THE
WORLD HEALTH ORGANIZATION
SURGICAL SAFETY CHECKLIST
(FIRST EDITION)**

INTRODUCTION:

The *Safe Surgery Saves Lives* programme was established by the World Alliance for Patient Safety as part of the World Health Organization's efforts to reduce the number of surgical deaths across the globe. The aim of the programme is to harness political commitment and clinical will to address important safety issues, including inadequate anaesthetic safety practices, avoidable surgical infection and poor communication among team members. These have proved to be common, deadly and preventable problems in all countries and settings.

To assist operative teams in reducing the number of these events, the Alliance—in consultation with surgeons, anaesthesiologists, nurses, patient safety experts and patients around the world—has identified a set of safety checks that could be performed in any operating room. The aim of the resulting draft WHO Surgical Safety Checklist (available at www.who.int/patientsafety/challenge/safe.surgery/en/index.html) is to reinforce accepted safety practices and foster better communication and teamwork between clinical disciplines. The checklist is not a regulatory device or a component of official policy; it is intended as a tool for use by clinicians interested in improving the safety of their operations and reducing unnecessary surgical deaths and complications.

HOW TO USE THIS MANUAL:

In this manual, the “operative team” is understood to comprise the surgeons, anaesthesia professionals, nurses, technicians and other operating room personnel involved in surgery. Much as an airplane pilot must rely on the ground crew, flight personnel and air traffic controllers for a safe and successful flight, a surgeon is an essential but not solitary member of a team responsible for patient care. The operative team referred to in this manual is therefore composed of all persons involved, each of whom plays a role in ensuring the safety and success of an operation.

This manual provides suggestions for implementing the checklist, understanding that different practice settings will adapt it to their own circumstances. Each safety check has been included based on clinical evidence or expert opinion that its inclusion will reduce the likelihood of serious, avoidable surgical harm and that adherence to it is unlikely to introduce injury or unmanageable cost. The checklist was also designed for simplicity and brevity. Many of the individual steps are already accepted as routine practice in facilities around the world, though they are rarely followed in their entirety. Each surgical department must practice with the checklist

and examine how to sensibly integrate these essential safety steps into their normal operative workflow.

The ultimate goal of the surgical safety checklist—and of this manual—is to help ensure that teams consistently follow a few critical safety steps and thereby minimize the most common and avoidable risks endangering the lives and well-being of surgical patients.

HOW TO RUN THE CHECKLIST (IN BRIEF):

In order to implement the checklist during surgery, a single person must be made responsible for checking the boxes on the list. This designated checklist coordinator will often be a circulating nurse, but it can be any clinician participating in the operation.

The checklist divides the operation into three phases, each corresponding to a specific time period in the normal flow of a procedure—the period before induction of anaesthesia (the Sign In), the period after induction and before surgical incision (the Time Out), and the period during or immediately after wound closure but before removing the patient from the operating room (the Sign Out). In each phase, the checklist coordinator must be permitted to confirm that the team has completed its tasks before it proceeds onward. As operative teams become familiar with the steps of the checklist, they can integrate the checks into their familiar work patterns and verbalize their completion of each step without the explicit intervention of the checklist coordinator. Each team should seek to incorporate use of the checklist into its work with maximum efficiency and minimum disruption while aiming to accomplish the steps effectively.

Nearly all the steps will be checked verbally with the appropriate personnel to ensure that the key actions have been performed. Therefore, during the Sign In before induction of anaesthesia, the person coordinating the checklist will verbally review with the patient (when possible) that his or her identity has been confirmed, that the procedure and site are correct and that consent for surgery has been given. The coordinator will visually confirm that the operative site has been marked (if appropriate) and will verbally review with the anaesthesia professional the patient's risk of blood loss,

airway difficulty and allergic reaction and whether a full anaesthesia safety check has been completed. Ideally the surgeon will be present for the Sign In, as the surgeon may have a clearer idea of anticipated blood loss, allergies, or other complicating patient factors. However, the surgeon's presence is not essential for completing this part of the checklist.

For the Time Out, each team member will introduce him or herself by name and role. If already partway through the operative day together, the team can simply confirm that everyone in the room is known to each other. The team will pause immediately prior to the skin incision to confirm out loud that they are performing the correct operation on the correct patient and site and then verbally review with one another, in turn, the critical elements of their plans for the operation, using the checklist questions for guidance. They will also confirm that prophylactic antibiotics have been administered within the previous 60 minutes and that essential imaging is displayed, as appropriate.

For the Sign Out, the team will review together the operation that was performed, completion of sponge and instrument counts and the labelling of any surgical specimens obtained. It will also review any equipment malfunctions or issues that need to be addressed. Finally, the team will review key plans and concerns regarding postoperative management and recovery before moving the patient from the operating room.

Having a single person lead the checklist process is essential for its success. In the complex setting of an operating room, any of the steps may be overlooked during the fast-paced preoperative, intraoperative, or postoperative preparations. Designating a single person to confirm completion of each step of the checklist can ensure that safety steps are not omitted in the rush to move forward with the next phase of the operation. Until team members are familiar with the steps involved, the checklist coordinator will likely have to guide the team through this checklist process.

A possible disadvantage of having a single person lead the checklist is that an antagonistic relationship might be established with other operative team members. The checklist coordinator can and should prevent the team from progressing to the next phase of the operation until each step is satisfactorily addressed, but in doing so may alienate or irritate other team

members. Therefore, hospitals must carefully consider which staff member is most suitable for this role. As mentioned, for many institutions this will be a circulating nurse, but any clinician can coordinate the checklist process.

HOW TO RUN THE CHECKLIST (THE DETAILS):

SIGN IN:

The **Sign In** is to be completed before induction of anaesthesia in order to confirm the safety of proceeding. It requires the presence of the anaesthesia professional and nursing personnel at the very least. The checklist coordinator may complete this section all at once or sequentially, depending on the flow of preparation for anaesthesia. The details for each of the boxes in the Sign In are as follows:

PATIENT HAS CONFIRMED IDENTITY, SITE, PROCEDURE AND CONSENT

The coordinator verbally confirms with the patient his or her identity, the type of procedure planned, the site of surgery and that consent for surgery has been given. While it may seem repetitive, this step is essential for ensuring that the team does not operate on the wrong patient or site or perform the wrong procedure. When confirmation by the patient is impossible, such as in the case of children or incapacitated patients, a guardian or family member can assume this role. If a guardian or family member is not available and this step is skipped, such as in an emergency, the box should be left unchecked.

SITE MARKED/NOT APPLICABLE

The checklist coordinator should confirm that the surgeon performing the operation has marked the site of surgery (usually with a permanent felt-tip marker) in cases involving laterality (a left or right distinction) or multiple structures or levels (e.g. a particular finger, toe, skin lesion, vertebra). Site-marking for midline structures (e.g. thyroid) or single structures (e.g. spleen) will follow local practice. Some hospitals do not require site marking because of the extreme rarity of wrong-site surgery in these instances. Consistent site marking in all cases does, however, provide a backup check confirming the correct site and procedure.

ANAESTHESIA SAFETY CHECK COMPLETED

The coordinator completes this next step by asking the anaesthesia professional to verify completion of an anaesthesia safety check, understood to be a formal inspection of the anaesthetic equipment, medications and patient's anaesthetic risk before each case. A helpful mnemonic is that, in addition to confirming that the patient is fit for surgery, the anaesthesia team should complete the ABCDEs – an examination of the Airway equipment, Breathing system (including oxygen and inhalational agents), suction, Drugs and Develops and Emergency medications, equipment and assistance to confirm their availability and functioning.

PULSE OXIMETER ON PATIENT AND FUNCTIONING

The checklist coordinator confirms that a pulse oximeter has been placed on the patient and is functioning correctly before induction of anaesthesia. Ideally the pulse oximetry reading should be visible to the operative team. An audible system should be used when possible to alert the team to the patient's pulse rate and oxygen saturation. Pulse oximetry has been highly recommended as a necessary component of safe anaesthesia care by WHO. If no functioning pulse oximeter is available, the surgeon and anaesthesia professional must evaluate the acuity of the patient's condition and consider postponing surgery until appropriate steps are taken to secure one. In urgent circumstances to save life or limb this requirement may be waived, but in such circumstances the box should be left unchecked.

DOES THE PATIENT HAVE A KNOWN ALLERGY?

The checklist coordinator should direct this and the next two questions to the anaesthesia professional. First, the coordinator should ask whether the patient has a known allergy and, if so, what it is. This should be done even if he or she knows the answer in order to confirm that the anaesthesia professional is aware of any allergies that pose a risk to the patient. The appropriate box is then filled in. If the coordinator knows of an allergy that the anaesthesia professional is not aware of, this information should be communicated.

DOES THE PATIENT HAVE A DIFFICULT AIRWAY/ASPIRATION RISK?

The coordinator should verbally confirm that the anaesthesia team has objectively assessed whether the patient has a difficult airway. There are a number of ways to grade the airway (such as the Mallampati score,

thyromental distance, and Bellhouse-Doré score). An objective evaluation of the airway using a valid method is more important than the choice of method itself. Death from airway loss during anaesthesia is still a common disaster globally but is preventable with appropriate planning. If the airway evaluation indicates a high risk for a difficult airway (such as a Mallampati score of 3 or 4), the anaesthesia team must prepare against an airway disaster. This will include, at a minimum, adjusting the approach to anaesthesia (for example, using a regional anaesthetic, if possible) and having emergency equipment accessible. A capable assistant—whether a second anaesthesia professional, the surgeon, or a nursing team member—should be physically present to help with induction of anaesthesia.

The risk of aspiration should also be evaluated as part of the airway assessment. If the patient has symptomatic active reflux or a full stomach, the anaesthesia professional must prepare for the possibility of aspiration. The risk can be reduced by modifying the anaesthesia plan, for example using rapid induction techniques and enlisting the help of an assistant to provide cricoid pressure during induction. For a patient recognized as having a difficult airway or being at risk for aspiration, the box should only be marked (and induction of anaesthesia begun) only when the anaesthesia professional confirms that he or she has adequate equipment and assistance present at the bedside.

DOES THE PATIENT HAVE A RISK OF >500 ML BLOOD LOSS (7 ML/KG IN CHILDREN)?

In this safety step, the coordinator asks the anaesthesia team whether the patient risks losing more than half a litre of blood during surgery in order to ensure recognition of and preparation for this critical event. Large volume blood loss is among the most common and important dangers for surgical patients, with risk of hypovolaemic shock escalating when blood loss exceeds 500 ml (7 ml/kg in children). Adequate preparation and resuscitation can mitigate the consequences considerably.

Surgeons may not consistently communicate the risk of blood loss to anaesthesia and nursing staff. Therefore, if the anaesthesia professional does not know what the risk of major blood loss is for the case, he or she should stop to discuss the risk with the surgeon before induction of anaesthesia. If there is a significant risk of a greater than 500 ml blood loss, it is highly recommended that at least two large bore intravenous lines or a central venous catheter be placed prior to skin incision. In addition, the team should confirm the availability of fluids or blood for resuscitation. (Note that the

expected blood loss will be reviewed again by the surgeon during the Time Out. This will provide a second safety check for the anaesthesia professional and nursing staff.)

At this point the Sign In is completed and the team may proceed with anaesthetic induction.

Time Out:

The **Time Out** is a momentary pause taken by the team just before skin incision in order to confirm that several essential safety checks are undertaken and involves everyone on the team.

CONFIRM ALL TEAM MEMBERS HAVE INTRODUCED THEMSELVES BY NAME AND ROLE

Operative team members may change frequently. Effective management of high risk situations requires that all team members understand who each member is and their roles and capabilities. A simple introduction will achieve this. The coordinator will ask each person in the room to introduce him or herself by name and role. Teams already familiar with each other can confirm that everyone has been introduced, but new members or staff that have rotated into the operating room since the last operation should introduce themselves, including students or other personnel.

SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE VERBALLY CONFIRM PATIENT, SITE AND PROCEDURE

This step is the standard “time out” or “surgical pause” and meets the standards of many national and international regulatory agencies. Just before the surgeon makes the skin incision, the person coordinating the checklist or another team member will ask everyone in the operating room to stop and verbally confirm the name of the patient, the surgery to be performed, the site of surgery and, where appropriate, the positioning of the patient in order to avoid operating on the wrong patient or the wrong site. For example, the circulating nurse might announce, “Let’s take our Time Out,” and then continue, “Does everyone agree that this is patient X, undergoing a right inguinal hernia repair?” This box should not be checked until the anaesthesia professional, surgeon and circulating nurse explicitly and individually confirm agreement. If the patient is not sedated, it is helpful for him or her to confirm the same as well.

ANTICIPATED CRITICAL EVENTS

Effective team communication is a critical component of safe surgery, efficient teamwork and the prevention of major complications. To ensure communication of critical patient issues, during the Time Out the checklist coordinator leads a swift discussion among the surgeon, anaesthesia staff and nursing staff of critical dangers and operative plans. This can be done by simply asking each team member the specified question out loud. The order of discussion does not matter, but each box should be checked only after each clinical discipline has provided its information. During routine procedures or those with which the entire team is familiar, the surgeon can simply state, “This is a routine case of X duration” and then ask the anaesthesia professional and nurse if they have any special concerns.

SURGEON REVIEWS: WHAT ARE THE CRITICAL OR UNEXPECTED STEPS, OPERATIVE DURATION, ANTICIPATED BLOOD LOSS?

A discussion of “critical or unexpected steps” is intended, at a minimum, to inform all team members of any steps that put the patient at risk for rapid blood loss, injury or other major morbidity. This is also a chance to review steps that might require special equipment, implants or preparations.

ANAESTHESIA TEAM REVIEWS: ARE THERE ANY PATIENT-SPECIFIC CONCERNS?

In patients at risk for major blood loss, haemodynamic instability or other major morbidity due to the procedure, a member of the anaesthesia team should review out loud the specific plans and concerns for resuscitation—in particular, the intention to use blood products and any complicating patient characteristics or comorbidities (such as cardiac or pulmonary disease, arrhythmias, blood disorders, etc). It is understood that many operations do not entail particularly critical risks or concerns that must be shared with the team. In such cases, the anaesthesia professional can simply say, “I have no special concern regarding this case.”

NURSING TEAM REVIEWS: HAS STERILITY (INCLUDING INDICATOR RESULTS) BEEN CONFIRMED? ARE THERE EQUIPMENT ISSUES OR ANY CONCERNS?

The scrub nurse or technologist who sets out the equipment for the case should verbally confirm that sterilization was performed and that, for heat-sterilized instruments, a sterility indicator has verified successful sterilization. Any discrepancy between the expected and the actual sterility indicator results should be reported to all team members and addressed before incision. This is also an opportunity to discuss any problems with

equipment and other preparations for surgery or any safety concerns the scrub or circulating nurse may have, particularly ones not addressed by the surgeon and anaesthesia team. If there are no particular concerns, however, the scrub nurse or technologist can simply say, “Sterility was verified. I have no special concerns.”

HAS ANTIBIOTIC PROPHYLAXIS BEEN GIVEN IN THE LAST 60 MINUTES?

Despite strong evidence and wide consensus that antibiotic prophylaxis against wound infections is most effective if serum and/or tissue levels of antibiotic are achieved, surgical teams are inconsistent about administering antibiotics within one hour prior to incision. To reduce surgical infection risk, the coordinator will ask out loud during the Time Out whether prophylactic antibiotics were given during the previous 60 minutes. The team member responsible for administering antibiotics (usually the anaesthesia professional) should provide verbal confirmation. If prophylactic antibiotics have not been administered, they should be administered now, prior to incision. If prophylactic antibiotics have been administered longer than 60 minutes before, the team should consider redosing the patient; the box should be left blank if no additional dose is given. If prophylactic antibiotics are not considered appropriate (e.g. cases without a skin incision, contaminated cases in which antibiotics are given for treatment), the “not applicable” box may be checked once the team verbally confirms this.

IS ESSENTIAL IMAGING DISPLAYED?

Imaging is critical to ensure proper planning and conduct of many operations, including orthopaedic, spinal and thoracic procedures and many tumour resections. During the Time Out, the coordinator should ask the surgeon if imaging is needed for the case. If so, the coordinator should verbally confirm that the essential imaging is in the room and prominently displayed for use during the operation. Only then should the box be checked. If imaging is needed but not available, it should be obtained. The surgeon will decide whether to proceed without the imaging if it is necessary but unavailable. In such a circumstances, however, the box should be left unchecked. If imaging is not necessary, the “not applicable” box should be checked.

At this point the Time Out is completed and the team may proceed with the operation.

Sign Out:

The **Sign Out** should be completed before removing the patient from the operating room. The aim is to facilitate the transfer of important information to the care teams responsible for the care of the patient after surgery. The Sign Out can be initiated by the circulating nurse, surgeon or anaesthesia professional and should be accomplished before the surgeon has left the room. It can coincide, for example, with wound closure. Again, each box should be checked only after the coordinator has confirmed that each item has been addressed by the team.

NURSE VERBALLY CONFIRMS WITH THE TEAM: THE NAME OF THE PROCEDURE RECORDED

Since the procedure may have changed or expanded during the course of an operation, the checklist coordinator should confirm with the surgeon and the team exactly what procedure was done. This can be done as a question, “What procedure was performed?” or as a confirmation, “We performed X procedure, correct?”

THAT INSTRUMENT, SPONGE AND NEEDLE COUNTS ARE CORRECT (OR NOT APPLICABLE)?

Retained instruments, sponges and needles are uncommon but persistent and potentially calamitous errors. The scrub or circulating nurse should therefore verbally confirm the completeness of final sponge and needle counts. In cases with an open cavity, instrument counts should also be confirmed to be complete. If counts are not appropriately reconciled, the team should be alerted so that appropriate steps can be taken (such as examining the drapes, garbage and wound or, if need be, obtaining radiographic images).

HOW THE SPECIMEN IS LABELLED (INCLUDING PATIENT NAME)?

Incorrect labelling of pathological specimens is potentially disastrous for a patient and has been shown to be a frequent source of laboratory error. The circulator should confirm the correct labelling of any pathological specimen obtained during the procedure by reading out loud the patient’s name, the specimen description and any orienting marks.

ARE THERE ANY EQUIPMENT MALFUNCTIONS OR ISSUES TO BE ADDRESSED?

Equipment problems are universal in operating rooms. Accurately identifying the sources of failure and instruments or equipment that have malfunctioned is important in preventing devices from being recycled back into the room before the problem has been addressed. The coordinator

should ensure that equipment problems arising during a case are identified by the team.

SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE REVIEW THE KEY CONCERNS FOR RECOVERY AND MANAGEMENT OF THIS PATIENT

The surgeon, anaesthesia professional and nurse should review the post-operative recovery and management plan, focusing in particular on intraoperative or anaesthetic issues that might affect the patient. Events that present a specific risk to the patient during recovery and that may not be evident to all involved are especially pertinent. The aim of this step is the efficient and appropriate transfer of critical information to the entire team.

With this final step, the safety checklist is completed. If desired, the checklist can be placed in the patient record or retained for quality assurance review.

ADDITIONAL NOTES — PROMOTING A SAFETY CULTURE:

MODIFYING THE CHECKLIST

The checklist can be modified to account for differences among facilities with respect to their processes, the culture of their operating rooms and the degree of familiarity each team member has with each other. For example, if pulse oximetry is used so routinely that its inclusion risks making the checklist appear irrelevant, the check can be removed. However, removing safety steps because they cannot be accomplished in the existing environment or circumstances is strongly discouraged. The safety steps should inspire effective change that will bring an operative team to comply with each and every element of the checklist.

In order to ensure brevity, the surgical safety checklist was not intended to be comprehensive. Facilities may wish to add safety steps to the checklist. Teams should consider adding other safety checks for specific procedures, particularly if they are part of a routine process established in the facility. Each phase should be used as an opportunity to verify that critical safety steps are consistently completed. Additional steps might include confirmation of venous thromboembolism prophylaxis by mechanical means (such as sequential compression boots and stockings) and/or medical means (such as heparin or warfarin) when indicated, the availability of essential implants (such as mesh or a prosthetic), other equipment needs or critical

preoperative biopsy results, laboratory results or blood type. Each locale is encouraged to reformat, reorder or revise the checklist to accommodate local practice while ensuring completion of the critical safety steps in an efficient manner. Facilities and individuals are cautioned, however, against making the checklist unmanageably complex.

INTRODUCING THE CHECKLIST INTO THE OPERATING ROOM

It will take some practice for teams to learn to use the checklist effectively. Some individuals will consider it an imposition or even a waste of time. The goal is not rote recitation or to frustrate workflow. The checklist is intended to give teams a simple, efficient set of priority checks for improving effective teamwork and communication and to encourage active consideration of the safety of patients in every operation performed. Many of the steps on the checklist are already followed in operating rooms around the world; few, however, follow all of them reliably. The checklist has two purposes: ensuring consistency in patient safety and introducing (or maintaining) a culture that values achieving it.

Successful implementation requires adapting the checklist to local routines and expectations. This will not be possible without sincere commitment by hospital leaders. For the checklist to succeed, the chiefs of surgery, anaesthesia and nursing departments must publicly embrace the belief that safety is a priority and that use of the surgical safety checklist can help make it a reality. To demonstrate this, they should use the checklist in their own cases and regularly ask others how implementation is proceeding. If there is no demonstrable leadership, instituting a checklist of this sort may breed discontent and antagonism.

Checklists have been useful in many different environments, including patient care settings. This surgical safety checklist has been used successfully in a diverse range of healthcare facilities with a range of resource constraints. Experience shows that with education, practice and leadership, barriers to implementation can be overcome. With proper planning and commitment, the checklist steps are easily accomplished and can make a profound difference in the safety of surgical care.