

Implementation Manual WHO Surgical Safety Checklist 2009

Safe Surgery Saves Lives



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**World Health
Organization**

Patient Safety

A World Alliance for Safer Health Care

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Contents

Implementation Manual WHO Surgical Safety Checklist 2009

Introduction	4
How to use this manual	6
How to run the Checklist (in brief)	6
How to run the Checklist (in detail)	7
Before induction of anaesthesia	7
Before skin incision	9
Before patient leaves operating room	11
Additional notes — promoting a safety culture	13
Modifying the Checklist	13
Introducing the Checklist into the operating room	15
Evaluating surgical care	16

Introduction

The *Safe Surgery Saves Lives* programme was established by WHO 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 operating teams in reducing the number of these events, WHO Patient Safety—in consultation with surgeons, anaesthetists, nurses, patient safety experts and patients around the world—has identified ten essential objectives for safe surgery. These were compiled into the WHO Surgical Safety Checklist. The aim of this Checklist (available at www.who.int/safesurgery) is to reinforce accepted safety practices and foster better communication and teamwork between clinical disciplines. The Checklist is intended as a tool for use by clinicians interested in improving the safety of their operations and reducing unnecessary surgical deaths and complications. Its use has been demonstrably associated with significant reductions in complication and death rates in diverse hospitals and settings, and with improvements in compliance to basic standards of care¹.

Surgical Safety Checklist

Before induction of anaesthesia

(with at least nurse and anaesthetist)

Has the patient confirmed his/her identity, site, procedure, and consent?

Yes

Is the site marked?

Yes

Not applicable

Is the anaesthesia machine and medication check complete?

Yes

Is the pulse oximeter on the patient and functioning?

Yes

Does the patient have a:

Known allergy?

No

Yes

Difficult airway or aspiration risk?

No

Yes, and equipment/assistance available

Risk of >500ml blood loss (7ml/kg in children)?

No

Yes, and two IVs/central access and fluids planned

This checklist is not intended to be comprehensive.



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Before skin incision

(with nurse, anaesthetist and surgeon)

Confirm all team members have introduced themselves by name and role.

Confirm the patient's name, procedure, and where the incision will be made.

Has antibiotic prophylaxis been given within the last 60 minutes?

- Yes
 Not applicable

Anticipated Critical Events

To Surgeon:

- What are the critical or non-routine steps?
 How long will the case take?
 What is the anticipated blood loss?

To Anaesthetist:

- Are there any patient-specific concerns?

To Nursing Team:

- Has sterility (including indicator results) been confirmed?
 Are there equipment issues or any concerns?

Is essential imaging displayed?

- Yes
 Not applicable

Before patient leaves operating room

(with nurse, anaesthetist and surgeon)

Nurse Verbally Confirms:

- The name of the procedure
 Completion of instrument, sponge and needle counts
 Specimen labelling (read specimen labels aloud, including patient name)
 Whether there are any equipment problems to be addressed

To Surgeon, Anaesthetist and Nurse:

- What are the key concerns for recovery and management of this patient?

Additions and modifications to fit local practice are encouraged.

Revised 1 / 2009 – © WHO, 2009

How to use this manual

In this manual, the “operating team” is understood to comprise the surgeons, anaesthetists, 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. All members of the operating team play a role in ensuring the safety and success of an operation.

This manual provides guidance on using the checklist, suggestions for implementation, and recommendations for measuring surgical services and outcomes. Different practice settings should 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 WHO 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 wellbeing of surgical patients. The Checklist guides a verbal team-based interaction as a means of confirming that appropriate standards of care are ensured for every patient.

How to run the Checklist (in brief)

In order to implement the Checklist during surgery, a single person must be made responsible for performing the safety checks 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 period after induction and before surgical incision, and the period during or immediately after wound closure but before removing the patient from the operating room. In each phase, the Checklist coordinator must be permitted to confirm that the team has completed its tasks before it proceeds onward. As operating 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.

All steps should be checked verbally with the appropriate team member to ensure that the key actions have been performed. Therefore, before induction of anaesthesia, the person coordinating the Checklist will verbally review with the anaesthetist and patient (when possible) that patient

identity has been confirmed, that the procedure and site are correct and that consent for surgery has been given. The coordinator will visualize and verbally confirm that the operative site has been marked (if appropriate) and will review with the anaesthetist the patient’s risk of blood loss, airway difficulty and allergic reaction and whether an anaesthesia machine and medication safety check has been completed. Ideally the surgeon will be present during this phase 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.

Before skin incision, 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 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 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.

Before leaving the operating room, the team will review the operation that was performed, completion of sponge and instrument counts and the labelling of any surgical

1 Haynes AB, et al. A Surgical Safety Checklist to Reduce Morbidity and Mortality in a Global Population. *New England Journal of Medicine*, 2009; 360:491-9.

specimens obtained. It will also review any equipment malfunctions or issues that need to be addressed. Finally, the team will discuss 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 operating 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 (in detail)

Before induction of anaesthesia

These safety checks are to be completed before induction of anaesthesia in order to confirm the safety of proceeding. It requires the presence of the anaesthetist 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 safety steps are as follows:

Has the patient confirmed his/her identity, site, procedure and consent?

The Checklist coordinator verbally confirms the patient's 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 or if this step is skipped, such as in an emergency, the team should understand why and all be in agreement prior to proceeding.

Is the site marked?

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) should follow local practice. Consistent site marking in all cases, however, can provide a backup check confirming the correct site and procedure.

Is the anaesthesia machine and medication check complete?

The Checklist coordinator completes this next step by asking the anaesthetist to verify completion of an anaesthesia safety check, understood to be a formal inspection of the anaesthetic equipment, breathing circuit, 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 **A**irway equipment, **B**reathing system (including oxygen and inhalational agents), **s**u**C**tion, **D**rugs and **D**eveloped and **E**mergency medications, equipment and assistance to confirm their availability and functioning.

Is the pulse oximeter on the 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 operating team. An audible system should be used 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 anaesthetist 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 team should be in agreement about the necessity to proceed with the operation.

Does the patient have a known allergy?

The Checklist coordinator should direct this and the next two questions to the anaesthetist. First, the coordinator should ask whether the patient has a known allergy and,

if so, what it is. If the coordinator knows of an allergy that the anaesthetist is not aware of, this information should be communicated.

Does the patient have a difficult airway/aspiration risk?

The Checklist 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, or 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 anaesthetist, 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 anaesthetist 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, induction of anaesthesia should begin only when the anaesthetist 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 Checklist 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 may mitigate the consequences considerably.

Surgeons may not consistently communicate the risk of blood loss to anaesthesia and nursing staff. Therefore, if the anaesthetist does not know what the risk of major blood loss is for the case, he or she should discuss the

risk with the surgeon before the operation begins. 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 before skin incision. This will provide a second safety check for the anaesthetist and nursing staff.)

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

Before skin incision

Before making the first surgical incision, a momentary pause should be taken by the team in order to confirm that several

essential safety checks are undertaken. These checks involve all team members.

Confirm all team members have introduced themselves by name and role

Operating 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 can achieve this. The coordinator should 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.

Confirm the patient's name, procedure and where the incision will be made

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, *"Before we make the skin incision"*, and then continue, *"Does everyone agree that this is patient X, undergoing a right inguinal hernia repair?"* The anaesthetist, surgeon and circulating nurse should explicitly

and individually confirm agreement. If the patient is not sedated, it is helpful for him or her to confirm the same as well.

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 whether prophylactic antibiotics were given during the previous 60 minutes. The team member responsible for administering antibiotics – usually the anaesthetist – 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. 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.

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, 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 clinical discipline should provide information and communicate concerns. 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 anaesthetist and nurse if they have any special concerns.

To surgeon: what are the critical or non-routine steps ?

How long will the case take? What is the anticipated blood loss ?

A discussion of “critical or non-routine 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.

To anaesthetist: 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 co-morbidities (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 anaesthetist can simply say, *“I have no special concern regarding this case.”*

To nursing team: 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."*

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. Before skin incision, 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. 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.

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

Before patient leaves operating room

These safety checks 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 patient after surgery. The checks can

be initiated by the circulating nurse, surgeon or anaesthetist and should be accomplished before the surgeon has left the room. It can coincide, for example, with wound closure.

Nurse verbally confirms

The name of the procedure

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?"*

Completion of instrument, sponge and needle counts

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).

Specimen labelling (read specimen labels aloud, 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.

Whether there are any equipment problems 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, anaesthetist and nurse review the key concerns for recovery and management of this patient

The surgeon, anaesthetist 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 WHO 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 should 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. 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 operating team to comply with each and every element of the Checklist.

Modification of the Checklist should be undertaken with a critical eye. Surgeons, anaesthetists, and nurses should be involved in the modification process, and the resulting Checklist trialled in simulated and real-life situations in order to ensure its functionality. Additionally, many of the principles used in the development of the Checklist can also be applied to its modification.

Focused	The Checklist should strive to be concise, addressing those issues that are most critical and not adequately checked by other safety mechanisms. Five to nine items in each Checklist section are ideal.
Brief	The Checklist should take no more than a minute for each section to be completed. While it may be tempting to try to create a more exhaustive Checklist, the needs of fitting the Checklist into the flow of care must be balanced with this impulse.
Actionable	Every item on the Checklist must be linked to a specific, unambiguous action. Items without a directly associated action will result in confusion among team members regarding what they are expected to do.
Verbal	The function of the Checklist is to promote and guide a verbal interaction among team members. Performing this team Checklist is critical to its success—it will likely be far less effective if used solely as a written instrument.

Collaborative Any effort to modify the Checklist should be in collaboration with representatives from groups who might be involved in using it. Actively seeking input from nurses, anaesthetists, surgeons and others is important not only in helping to make appropriate modifications but also in creating the feeling of “ownership” that is central to adoption and permanent practice change.

Tested Prior to any rollout of a modified Checklist, it should be tested in a limited setting. The real-time feedback of clinicians is essential to successful development of a Checklist and its integration into the processes of care. Testing through a “simulation” as simple as running through the Checklist with team members sitting around a table is important. We also suggest using the Checklist for a single day by a single operating team and collecting feedback. Modify the Checklist or the way that it is incorporated into care accordingly and then try the Checklist again in a single operating room. Continue this process until you are comfortable that the Checklist you have created works in your environment. Then consider a wider implementation program.

Integrated

Many institutions already have strategies to insure the reliable performance of many of the processes that are part of the WHO Checklist. Integrating new safety checks into the processes is challenging but possible in nearly all settings. The major additions to existing routines involve the integration of team communication, briefings, and debriefings. These items are of critical importance and should not be removed from the Checklist.

In order to ensure brevity, the WHO Surgical Safety Checklist was not intended to be comprehensive. Teams may 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. As noted above facilities and individuals are cautioned against making the Checklist unmanageably complex.

Introducing the Checklist into the operating room

It will take 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 WHO 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.

Previous quality improvement work has provided a number of models for how to implement such a Checklist into the operating room. Experience with the pilot study confirmed the utility of many of these strategies. A number of suggested steps are outlined below for consideration as facilities begin implementation of the WHO Surgical Safety Checklist.

Build a team Commitment by all clinical team members involved in surgical procedures is essential. Start building support by involving clinicians who are likely to be most supportive. Include colleagues from as many clinical disciplines (surgery, anaesthesia, nursing) as possible. Identify a core group of people who are enthusiastic about the Checklist while trying to involve at least one member from each of the clinical disciplines. At this early stage, work with those who are interested rather than trying to convince the most resistant people. Also involve hospital leaders and administrators, if possible. Emphasize the benefits of lower complication rates and the potential for cost savings.

Start small, then expand

Start small, testing out the Checklist in one operating room with one team and moving forward after problems have been addressed and when enthusiasm builds. During the original evaluation by WHO, sites that tried to implement the Checklist in multiple operating rooms simultaneously or hospital-wide faced the most resistance and had the most trouble convincing staff to use the Checklist effectively. Once one team is comfortable using the Checklist, spread it to another operating room. Discuss these efforts with different surgical departments and surgeons. Make sure the team members who were originally involved in the process are using the Checklist in their own operating rooms. Customize the Checklist for each setting as necessary, but do not remove safety steps just because they cannot be accomplished. Address resistance as it arises. Clinicians who have used the Checklist and have good experiences with it make great champions for promoting it and defending its use and spread in the hospital.

Track changes and improvements

WHO Guidelines for Safe Surgery encourages the monitoring of surgical results and complications. Ideally hospitals and facilities should track process and outcome measures, for example the percent of operations having antibiotics administered at the correct time and the surgical site infection rate.

Evaluating surgical care

Monitoring and evaluation of outcomes is an essential component of surgical care. Many facilities and departments already engage in this process; additional data collection is neither recommended nor encouraged if such a system is already in place and proves useful to the clinicians and staff as a means of improving the quality of care. However, in hospitals where results of surgical care are not routinely tracked and postoperative complications are not recorded, or where surveillance mechanisms have not been sufficient to identify poor practices, WHO highly recommends that a monitoring system be established. In particular, as a means of surgical surveillance at hospital and practitioner levels, death on the day of surgery and postoperative in-hospital deaths should be collected systematically by facilities and clinicians. When combined with operative volume, such information provides departments of surgery with day-of-surgery and postoperative in-hospital mortality rates. Mortality rates can help surgeons identify safety shortfalls and provides guidance to clinicians for improvements in care. In addition, for those facilities with the capacity and ability to do so, surgical site infection rates and the Surgical Apgar Score are also important outcome measures.²

In addition to deaths and complications, process measures can also be incorporated into the evaluation system and may help identify safety lapses and areas for improvement. Improved compliance has been associated with better outcomes and may identify weaknesses in the system of care delivery. A few suggestions for measurement, even on an intermittent basis, are the frequencies of compliance with:

- Marking of the operative site by the surgeon
- Performance of an anaesthesia safety check of the machine and medications
- Use of pulse oximetry throughout administration of anaesthesia in all cases
- Objective evaluation of the airway
- Use of sterility indicators to ensure adequacy of sterility practices
- Administration of prophylactic antibiotics within one hour before skin incision
- Verbal confirmation of patient, site and procedure immediately before incision with all team members present
- Preoperative team briefing to discuss clinical concerns, operative plan, and other critical issues
- Post-operative team debriefing to discuss problems during the case and concerns for recovery and management of the patient

Use of the WHO Surgical Safety Checklist has demonstrably improved compliance with basic standards of surgical care in diverse hospitals around the world. While the relationship between adherence to standards and decreases in complication rates is likely multifactorial, improving the safety and reliability of surgical care can save lives and promote confidence in the health system.

² Gawande AA, et al. An Apgar score for surgery. *Journal of the American College of Surgeons*, 2007; **204**:201-8

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