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Thank you, Dr Benton:* Rationale for using a surgical checklist in British Columbia

Health professionals risk committing errors every day when caring for surgical patients—risks that can be reduced with the help of a checklist from the Safe Surgery Saves Lives campaign launched by the World Health Organization and supported by the Canadian Patient Safety Institute.

ABSTRACT: Next to hospital-acquired infections, complications from surgical procedures are the most frequent cause of preventable adverse events in health care. One simple way to prevent mishaps is to use checklists to aid memory and communication. Checklists help by structuring the interactions of team members and leveling social hierarchies in operating suites. By placing all members of the operative team on the same level, operational efficiency and team satisfaction are enhanced. Surgery is now following the lead of anesthesia and intensive care medicine by using checklists. The World Health Organization, the Canadian Patient Safety Institute, the Royal College of Physicians and Surgeons of Canada, the Society of Obstetricians and Gynecologists, and the Canadian Medical Association, among others, have all endorsed the use of a checklist to minimize the risk of human error.

Consider the following case: *It is 07:30 on Tuesday. The operating team for OR1 has been delayed by a lengthy handover and planning meeting at shift change—a delay compounded by last-minute changes in the slate and an illness call from one of the nursing staff. The scrub nurse, Mary, and the circulator, Trevor, begin the operative setup while the anesthesia technician checks the gas machine and the volatile anesthetics, and calibrates the arterial transducer and monitor. At 07:40, the surgeon, Doug, and the anesthesiologist, Paul, join the nursing and technical staff and begin the surgical safety checklist briefing. Because Trevor is new to the surgical service, team members introduce themselves. Paul describes the final slate of patients for OR1 and confirms the completion of the anesthetic equipment check and the suitability of planned monitoring. Doug describes the reasons for the day's slated operations and the unique needs of the patients.*

The first operation of the day is a cranial remodeling for a craniosynostosis on Jonathan, a 3-month-old infant. Trevor describes the positioning, the plan for instruments and sutures, and confirms with Doug the in-room availability of the supplies. Doug reviews Jonathan's images and allergy status, pre-op blood work, and transfusion requirements with Paul. Packed RBS is confirmed to be "in the fridge," special drugs and equipment have been made available, and preoperative antibiotics have been given.

Trevor and Paul meet Jonathan and his parents in the pre-op area—Doug has marked and initialed the surgical site in the presence of the family earlier in the morning. Jonathan is carried by his mother to the OR at 07:50. The team introduces themselves to Jonathan and his mother and confirms the operation and the site. Then, with his usual skill, Paul induces Jonathan without causing fear or anxiety in mother or infant. Trevor escorts Jonathan's mother from the OR. The final confirmation of the patient's identity, consent, operation, and plan is led by Doug.

In total, the pre-op briefing and the "huddle" with the patient in the room have taken only 7 minutes of the

* A character in the television series *ER*.

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team's time. The operation proceeds without surprises or delay, with all the equipment and sutures needed readily available.

Before the team departs the OR, while Jonathan is waking, Mary makes a suggestion for better draping and Trevor suggests a way to improve sharps handling. Both suggestions involve small changes that Doug agrees to test during the next operation.

Worldwide, approximately 11% of illness is due to surgically treatable disease,[1] resulting in the performance of an estimated 234 million surgical procedures annually.[2] The increased frequency of cardiovascular disease, cancer, and traumatic injuries, coupled with longer life expectancy, means significant increases in the surgical burden are likely in coming years. Studies in industrialized countries show that the perioperative death rate for inpatient surgery is in the order of 0.4% to 0.8% and the rate of major complications varies from 3% to 17%.[3,4] Of these cases, at least 50% could be prevented by minimizing the risk of surgical site infection and complications of anesthesia. Conservative estimates forecast 11 million disabling complications and 1 million deaths worldwide each year due to, or associated with, surgical illness.

In British Columbia, surgical complications account for a significant portion of our health burden. During the 2007–2008 fiscal year, 119 926 inpatient surgical procedures were performed. Applying the Baker and Norton findings[3] to surgical care in BC, and assuming a 7.5% adverse event rate, 8995 surgical inpatient cases with at least one adverse event would have occurred. Of these 8995 surgical inpatient cases with an adverse event, 3319 inpatient surgical cases (36.9%) would have had at least one preventable adverse event; 589 to 920 cases would have resulted in preventable deaths. As each preventable adverse event results in an increased length of hospital stay—6 days on average—mitigating the preventable adverse events would result in making an additional 19 914 patient days available to address health system needs. Despite public outcries and efforts to avoid medical-legal culpability and meet accreditation standards, excessive rates of wound infection continue to occur in elective and clean surgeries, in part because of inconsistent timing of appropriate prophylactic antibiotics, and wrong-patient or wrong-site operations persist.

The World Health Organization (WHO) has recognized the impact of unsafe health care practices globally and launched campaigns that challenge practitioners to implement improvements. Clean Care Is Safer Care challenges practitioners to keep hand hygiene on the national and international health agenda (www.who.int/gpsc/en/); Safe Surgery Saves Lives challenges practitioners to improve surgical care around the world by ensuring adherence to proven standards, including the use of surgical safety checklists (www.who.int/patientsafety/safesurgery/en/); and Tackling Antimicrobial Resistance challenges practitioners to address the growing threat to control of infectious diseases posed by antibiotic resistance in those diseases that have long been endemic—malaria, tuberculosis, and sexually transmitted infections, as well as seasonally occurring infections and pandemics (www.who.int/patientsafety/amr/en/).

In formulating the Safe Surgery Saves Lives campaign, WHO identified 10 objectives for safe surgery (**Table**). Each objective has been incorporated into the surgical safety checklist to ensure correct patient, correct procedure, correct site, safe anesthesia, appropriate prophylactic antibiotic timing, and availability of fluids or blood for resuscitation.

Table. WHO Safe Surgery

1. The team will use methods known to prevent harm from administration of *anesthetics,* while protecting the patient from pain.
2. The team will recognize and effectively prepare for life-threatening loss of *airway* or respiratory function.
3. The team will recognize and effectively prepare for risk of *high blood loss.*
4. The team will avoid inducing an *allergic or adverse drug reaction* for which the patient is known to be at significant risk.
5. The team will operate on the *correct patient at the correct site.*
6. The team will consistently use methods known to minimize the risk for surgical site infection.
7. The team will prevent inadvertent retention of instruments or sponges in surgical wounds.
8. The team will secure and accurately identify all surgical specimens.
9. The team will effectively communicate and exchange critical information for the safe conduct of the operation.
10. Hospitals and public health systems will establish routine surveillance of surgical capacity, volume, and results.

The value of checklists

Checklists provide guidance and allow tracking of completed tasks. In the context of surgery, they aid memory and foster process standardization while providing a framework for valuation.[5] The use of a checklist in a team setting facilitates communication so that all team members share explicit goals.[6] Checklist use also significantly reduces the occurrence of mistakes, slips, and lapses.[7]

A checklist is typically a list of action items or criteria arranged in a systematic manner that allows the user to record or verbally confirm the presence or absence of individual conditions or items to ensure that all are

considered and completed. Checklists differ from other cognitive aids and lie somewhere between a string-around-the-finger reminder and a protocol.[8]

The OR is a complex environment that involves consistent time-critical decision making and is thus a place susceptible to adverse events.[9] Human error is implicated in 70% to 80% of surgical and anesthetic incidents and accidents. Stress, fatigue, time pressures, and team dynamics affect perceptions and decision making, resulting in errors of judgment, deviations from standard procedures, and decreased proficiency.[10] It is accepted that during almost all procedures an unanticipated event will occur and require the surgical team to respond to a changed condition.[11] Although unexpected problems are typically not critical, the combination and frequency of these small incidents can affect the outcome and success of the surgery.

Improving communication

Ineffective or insufficient communication among team members contributes to error in the surgical theater.[12] This is often the result of team members' uncommunicated perceptions of their roles, responsibilities, and motivations. In addition, critical information is often transferred in an ad hoc manner and typically when tension levels are high.[13]

One way to address the weaknesses of team communication is to use a checklist. By structuring team communication, a checklist assists in ensuring that all team members possess accurate and explicit information regarding the patient and the procedural plan. This approach gives team members the same context for decision making and risk awareness[6] by prompting attention to critical items, and ensures that communication and discussion occurs between team members.[9,14]

Increasing efficiency

Checklists can also affect operational efficiency. Nundy and colleagues undertook an evaluation of preoperative briefings on surgical delays.[15] Their preoperative briefings, which each took less than 2 minutes, were designed to formulate and share the operative plan, to promote teamwork, to mitigate hazards to patients, to reduce preventable harm, and to ensure all required equipment was available. Following implementation of the briefing protocol, surgeons reported that unexpected delays decreased from 38% to 7% and that communication breakdowns resulting in case start delays were also reduced. Briefings were shown to save time and reduce frustration while improving quality and operative efficiency.[15] They were also shown to identify problems and allow critical knowledge gaps to be addressed.[6]

Reducing complications

The use of a checklist can not only improve team communication and increase operational efficiency, it can also reduce postsurgical complication rates. Haynes and colleagues undertook a critical analysis of the efficacy of the WHO checklist (**Figure 1**) in high- and low-income health care settings, and in all adult noncardiac surgical disciplines with respect to complications and in-hospital mortality.[4] The study examined complication rates in 3700 patients prior to the implementation of the checklist and 3900 following implementation in several sites: Toronto, Canada; New Delhi, India; Amman, Jordan; Auckland, New Zealand; Manila, Philippines; Ifakara, Tanzania; London, England; and Seattle, USA. Overall complication rates dropped from 11% to 7% after the introduction of the checklist—in both high- and low-income sites—and the in-hospital rate of death dropped from 1.5% to 0.8%. Surgical site infections and mortality rates also declined significantly.[4]

Given the obvious benefits found in this and other studies, the Canadian Patient Safety Institute (CPSI) is supporting the WHO Safe Surgery Saves Lives campaign in Canada in collaboration with Accreditation Canada, the Canadian Anesthesiologists Society, the Canadian Association of Paediatric Health Centres, the Canadian Medical Association, the Canadian Nurses Association, GreenDot Global, the Nova Scotia Department of Health, the Ottawa Heart Institute, the Operating Room Nurses Association of Canada, Patients for Patient Safety Canada, the Regina Qu'Appelle Health Region, the Royal College of Physicians and Surgeons of Canada, the Society of Obstetricians and Gynecologists, Suresurgery, and the University of Calgary. Examples of the Safe Surgery Saves Lives checklist are available on the CPSI Safe Surgery Saves Lives web site (www.patientsafetyinstitute.ca/english/toolsresources/sssl/pages/default.aspx) along with a variety of other tools, including videos on how checklists can be used effectively in operating rooms. Implementation manuals and other tools have also been made available. Similar resources are available at Safesurg.org (www.safesurg.org/) and from WHO (www.who.int/patientsafety/safesurgery/en/).

The checklist in use at Vancouver Coastal Health is based on both the WHO and CPSI versions, and has been modified to meet the needs of the surgical teams involved. The checklist in use at BC Children's Hospital is also based on the WHO and CPSI versions, and has been modified to account for the unique needs and risks associated with the surgery of children (**Figure 2**).

Surgical Safety Checklist

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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

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?

This checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged.

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Figure 1. Checklist developed by WHO.

cpsi Canadian Patient Safety Institute

SURGICAL SAFETY CHECKLIST

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BC CHILDREN'S HOSPITAL An agency of the Provincial Health Services Authority

Sign In – Before induction of anesthesia

Hand-off from Day care, ER, Nursing Unit or ICU

- ❒ Team Assembled
- ❒ Anesthesia equipment safety check completed
- ❒ Patient information confirmed
  - Identity (2 identifiers)
  - Consent(s)
  - Site and procedure and Anaesthetic Technique
  - Site, side and level marked
  - Necessary Clinical documentation
- ❒ Body weight (kg) _____
- ❒ Allergies _____
- ❒ Difficult Airway / Aspiration Risk
  - Confirm equipment and assistance available
- ❒ Monitoring
  - Pulse oximetry
- ❒ Confirm essential imaging displayed

After Induction

- ❒ Review final test results
- ❒ Medications
  - Antibiotic prophylaxis: Next dose?
  - Anticonvulsants

Time Out – After induction (*continued*)

- ❒ All team members introduce themselves by name and role if not done already

Team review

- ❒ Patient positioning and support / Warming devices / Pressure protection
- ❒ Special Instruments, implants
- ❒ Confirmation of Specimen requirements
- ❒ Postoperative destination

Before Skin incision

- ❒ Surgeon, Anesthesiologist, and Nurse verbally confirm
  - Patient
  - Site, side, and level
  - Procedure
  - Antibiotic prophylaxis: repeat dose?
- ❒ "Does anyone have any other questions or concerns before proceeding?"

Sign Out – Before patient leaves the OR

- ❒ Team reviews
  - Instrument/sponge/needle count
  - Procedure
  - Specimen documentation complete specimens labelled
  - Important intra-operative events
  - Fluid balance / management
  - Recovery plans, pain management, position
- ❒ Written Operative Note Completed and signed
- ❒ Instructions for transfer and expectations of planned care to PACU, Nursing Unit or ICU are complete?

Could this event have been improved?

❒ Yes ❒ No

- ❒ Handover to PACU, Nursing Unit or ICU

Adapted from the WHO Surgical Safety Checklist, © World Health Organization, 2008/revised working party BCCH 15/04/09/reviewed Feb2010

Figure 2. Checklist developed for use at BC Children's Hospital.

Conclusions

The use of a simple checklist is efficient and cost-effective. Checklists reduce frustration for members of the surgical team, reduce morbidity in health systems identical to ours, and save patients' lives. Using a checklist contributes to operational efficiency, patient safety, and teamwork. In 2009, a worldwide audience watching the final episodes of *ER* saw this confirmed (see box). In future, you can expect your patients to ask that the checklist be used for their operations. It is your duty and responsibility to do so.

Competing interests

None declared.

What Dr Benton taught us

Why should you take notice of the Safe Surgery Saves Lives campaign? Because your patients already have.

Dr Benton was a character on the popular NBC television series *ER* when the final episodes aired in 2009. In the penultimate episode, viewers saw Dr Benton use a surgical safety checklist to protect the life of a patient and colleague, Dr Carter.

When Dr Carter was rushed to the operating room to receive a donor kidney, Dr Benton prevented an impatient surgeon from performing the transplant immediately by asking the team to run through a checklist and establish that everyone knew each other and understood their roles and the operation to be undertaken. At this briefing, a nurse pointed out that there was no reperfusion fluid in the operating room—a deficiency that was corrected. During the procedure, having the solution available saved Dr Carter's renal graft from needless ischemia and confirmed the value of the surgical safety checklist.

Not only have national professional bodies now endorsed the use of the WHO checklist, ministries of health are now requiring that a surgical checklist be used and the public be informed of this practice. Accreditation Canada has made the use of the surgical checklist a required organizational practice starting in the 2011 accreditation year.

With awareness of this support for checklists and the example set by Dr Benton, your patients will be asking if you use a surgical safety checklist to keep them safe—there can be only one answer!

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