CHECKING IN ON THE CHECKLIST

Uptake, Impact, and Opportunities for the Next Decade

lifebox

ARIADNE LABS

COVER PHOTO: AHMED JALLANZO

PREFACE

The very fact that surgery exists—that we can safely open people's bodies, remove and rearrange the parts, close the bodies back up again, and turn out to have made people better—is an astonishment.

Nonetheless, over the last century, the art that became a science has become a mass enterprise delivering more than 300 million operations a year worldwide. Surgery has become an essential part of enabling human beings to live long and healthy lives. It can address everything from obstetric emergencies (cesarean sections are the most common operation on the planet) and traumatic injuries to congenital conditions and cataracts. And that fact is a marvel of knowledge, training, logistics, and coordination in the face of enormous complexity.

In 2008 emerged one of the most significant innovations for making safe, reliable surgical care more possible at global scale. It wasn't a drug or device or new high-tech gadget. It was a checklist—the WHO (World Health Organization) Surgical Safety Checklist—a two-minute, single-page protocol with 19 items for reducing preventable human errors by improving communication and teamwork in the operating room. I was lucky enough to have directed the WHO program that developed the Checklist and oversaw the study in 8 hospitals around the world that found that its use could cut death rates nearly in half. But surgical teams and hospitals across the world were the ones who put it into action.

Reading the series of publications undertaken by Lifebox and Ariadne Labs after a decade since the introduction of the Checklist, I am stunned to see how rapidly and enthusiastically it has been adopted. A pooled analysis of international studies found that the Checklist is being used in 75% of operations globally. Multiple, large-scale evaluations have confirmed substantial reductions in surgical complications and deaths when implemented effectively. How? Leaders point to the way that use of the Checklist breaks down operating room hierarchies, improves communication and compliance with best safety practices, and ultimately helps surgical teams work together to provide safer care for their patients.

The report also highlights, however, how challenging adoption of the Checklist remains, especially in low- and middle-income countries, where uptake remains slow and sporadic. Buy-in, adaptation, and support for effective Checklist implementation by individuals and surgical teams, health facilities, and governments are proving to be key elements for reaping the benefits of the Checklist whether in South Carolina or southern India.

There is no single remedy to ensure safe surgery for all. This report amply testifies to the challenges still faced by surgical teams worldwide in ensuring the safety of the care they are providing to patients. The Checklist is only successful when the teams using it are committed to the teamwork, discipline, and humility that it requires. Over the coming decade, as access to surgical care is increasingly recognized as a vital component of health care, advancement and adoption of powerful, simple, and cost-effective tools like the Checklist will be essential for ensuring that every human being can count on getting the right care everywhere, every time.

–Atul Gawande

ACKNOWLEDGMENTS

Checking In On the Checklist was researched and written by Marine Buissonniere.

Editorial support was provided by Luca Koritsanszky, Kris Torgeson, Deborah O'Neil, Yves Sonnay, Tom Weiser, Alex Haynes, George Molina, and Evan Benjamin.

The report was designed by Courtney Staples.

Checking In On the Checklist is built on the work of many individuals from around the world and we thank them for their continued commitment to surgical and anesthesia safety. They include:

» The many members of the World Health Organization (WHO) Safe Surgery Program whose consultation yielded the first Surgical Safety Checklist (www.who.int/patientsafety/safesurgery/checklist/en);

» The principal investigators of the original pilot study that revealed the Checklist's efficacy across low-, middle-, and high-income settings (*Haynes et al., 2009*);

» Over 40 individuals interviewed who shared their firsthand experience with implementing the Checklist.

Checking In On the Checklist is part of a joint project of Lifebox and Ariadne Labs, both champions of the WHO Surgical Safety Checklist. It is a report written by and for front-line users of the Surgical Safety Checklist from around the world who are interested in sharing and learning from each other's implementation experiences. This is not a WHO report; rather, it reflects the learnings, insights, and experiences of frontline providers who have used a variety of strategies to implement this tool in their facilities.

Lifebox is a non-profit organization working to improve the safety of surgery and anesthesia in low- and middle-income countries. Lifebox was founded by the Association of Anaesthetists of Great Britain & Ireland, Brigham and Women's Hospital, the Harvard T.H. Chan School of Public Health, and the World Federation of Societies of Anaesthesiologists in 2011.

Ariadne Labs is a health systems innovation center at Brigham and Women's Hospital and the Harvard T.H. Chan School of Public Health. Founded in 2012, Ariadne Labs is home to the Safe Surgery Program.

Lifebox and Ariadne Labs acknowledge the important ongoing discussions about effective implementation of the Surgical Safety Checklist, and are committed to furthering Checklist research and effective implementation.

The following individuals were amongst those interviewed for this report, but are not responsible for its content or conclusions:

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EXECUTIVE SUMMARY

In 2009, a landmark article published in *The New England Journal of Medicine* introduced the World Health Organization's Surgical Safety Checklist and launched a new global movement in surgical safety.

The Checklist—a 19-item list of prompts divided into three critical pause points—was created to prevent "never-events" (mistakes that should never happen in surgery), to promote safe administration of anesthesia, reduce surgical site infections, and improve teamwork and communication in the operating room. A two-year study carried out by researchers from the WHO and Dr. Atul Gawande's group at the Harvard T.H. Chan School of Public Health examined patient outcomes before and after implementation of the Checklist at eight pilot hospitals in low-, middle-, and high-income countries. The Checklist was found to be associated with nearly 50% reduction in mortality and a 36% reduction in postoperative complications, as well as improved teamwork and communication among members of the surgical team.

A decade after its launch, facilities in 70% of the world's countries report using the Checklist, and the Checklist is documented as the national standard of health ministries in at least 20 countries, illustrating its widespread reach and appeal. In addition to reducing mortality and morbidity following surgery, the Checklist has had profound qualitative impact, from introducing a culture of safety and improved communication and efficiency in surgical teams, to increasing patient trust and empowering surgical clinicians, and improving job satisfaction.

Despite this impact, this report identifies critical barriers to increased uptake of the Surgical Safety Checklist, especially in low- and middle-income settings, where the Checklist work remains unfinished. Multiple barriers hinder universal adoption: inadequately supported introduction of the Checklist, failure to adapt the Checklist to local contexts, the perception that the Checklist requires too much time to complete, and concerns about impact on existing workflows.

RECOMMENDATIONS

In *Checking In On the Checklist*, we see that implementation of this seemingly simple tool is anything but a simple exercise. Rather, it's a complex multidimensional process based on understanding existing power structures and the motivations of those involved, fostering team learning and mutual understanding, and realigning routine practices with incentive structures. The Checklist requires that clinicians embrace a collective mindset, rather than one of individualism and competition.

Key recommendations for successful implementation and sustained use of the Checklist include:

BUY-IN

- Engagement of leadership, including local site leadership and national health officials, to ensure buy-in across all levels
- Engagement of all members of the multidisciplinary surgical team in the implementation process to address potential barriers to the uptake of the Checklist from the beginning

ADAPTATION

- Local adaptation of the Checklist, including modification of its items, language translation, and encouragement of greater participation by all surgical team members
- Tailored implementation of the Checklist based on local context by including all stakeholders in the implementation design and improving the implementation process through feedback from frontline implementers

ACCOUNTABILITY AND SUPPORT

- Building accountability structures by balancing top-down with bottom-up approaches to Checklist implementation, depending on the context

The WHO Surgical Safety Checklist is more than a single sheet of paper with 19 items. It is a vehicle that promotes patient safety, teamwork, effective communication, and empowerment of operating room staff who have traditionally been voiceless. These past ten years have demonstrated that effective implementation of the Checklist can lead to extraordinary improvements in patient outcomes following surgery. We have also learned that implementation of the Checklist can be difficult, and that the impact it stands to bring to the operating room depends on the quality of how the Checklist is implemented and reinforced. We have ample evidence that the WHO Surgical Safety Checklist works. The next challenge before us is how to promote and effectively implement this revolutionary tool throughout the world, especially in low- and middle-income settings.

Checking In On the Checklist is a report by and for people who use the Surgical Safety Checklist around the world, and those who are interested in learning from their experiences. We hope that it serves as a roadmap for the role of the Checklist in global surgical safety over the decade to come.

2007 WHO launches 2nd Global Patient Safety Challenge. Professor Lord Darzi draws up the first iteration of the Checklist at a meeting in London. A study begins to test the Checklist in eight hospitals in varying contexts.

2008 After rapid iterations on design and content, WHO issues the first edition of the Checklist. Professional societies worldwide begin to endorse use of the Checklist.

2009 The hospital trial results appear in *The New England Journal of Medicine* showing great impact. A second version of the Checklist is developed. Dr. Atul Gawande releases the book *The Checklist Manifesto: How to Get Things Right.*

2010 The Ontario Ministry of Health in Canada mandates public reporting of hospital adherence to the Checklist. The UK mandates that all hospitals of the National Health Service must implement the Checklist.

2011 Lifebox is founded to fill the gap in pulse oximetry in resource-limited settings.

2012 Ariadne Labs, home to the Safe Surgery Program, is founded. A study examines compliance with the Checklist at a university hospital in Thailand. A survey analyzes Checklist use in 15 African countries.

2013 Brazil's Ministry of Health mandates implementation of the Safe Surgery Protocol by health services.

2014 A stepped wedge cluster randomized controlled trial in Norway shows Checklist use was associated with a decrease in complication rate; in-hospital mortality decreased from 1.6% to 1.0%, but this was not statistically significant.

2015 A review of existing studies takes a deeper look at user-related barriers that hinder Checklist implementation.

2016 A survey assesses Checklist use at the main referral hospitals in East Africa. Safe Surgery 2015 Initiative in South Carolina reports that surgeon buy-in of the Checklist was associated with greater completion of the items on the Checklist.

2017 Safe Surgery 2015 Initiative reveals 22% decline in postoperative mortality in South Carolina hospitals using the Checklist.

2018 MercyShips describes successful Checklist implementation at scale in the low- and middle-income country setting. The WHO Surgical Safety Checklist turns ten years old.

2019 Scotland reveals a 36.6% reduction in postoperative mortality following a nationwide implementation.

CHAPTER 1
A SIMPLE, EVIDENCE-BASED TOOL

PHOTO: COURTNEY STAPLES

When the World Health Organization launched the Second Global Patient Safety Challenge in 2007, it set the bar high: improving the quality of surgery for everyone, everywhere.[1]

Although the objective was clear, how to reach this ambitious goal was not. The Second Challenge—entitled *Safe Surgery Saves Lives*—was initiated to find ways to improve surgical outcomes around the world by defining core safety standards that could be applied in all WHO member states. With a two-year horizon, Pauline Philip, the director of the WHO Patient Safety Program; Dr. Tim Evans, the director of the Information, Evidence, and Research Cluster; Dr. Atul Gawande, then program leader of the initiative; Dr. William Berry, the Boston project director for the Safe Surgery Saves Lives program; and their Harvard-based research team began chipping away at the task.

The WHO Patient Safety Program did not originally set out to develop a checklist. Rather, "we gave ourselves some guiding principles," recalls Dr. Thomas Weiser, a general and trauma surgeon who joined Dr. Gawande and Dr. Berry at the onset of the project.[2] These principles established that the solution needed to be **simple, widely applicable,** and **measurable**; that it needed to **reduce meaningful harm**; and that it should **not introduce new harm or excessive cost**.

This was a time when people were beginning to accumulate experience through surgical quality improvement efforts. To better understand the challenges and identify possible solutions, the team convened four working groups of experts from around the world and across multiple disciplines (surgery, anesthesia, obstetrics and gynecology, nursing, infection control, patient safety, patient representatives, biomedical engineering, and hospital management) that would focus on:[1]

- Preventing **surgical site infections**
- Promoting **safe anesthesia** to reduce complications
- Strengthening **surgical teamwork and communication**
- Increasing **measurement and data collection** of surgical services and outcomes

Out of this grew an extensive list of possible approaches that were presented, examined, debated, and carefully narrowed down. "What started to emerge was a short list of things that, maybe, were possible,"[3] said Dr. Berry. It became evident that multiple systems needed to function properly, reflecting the fact that there is no silver bullet, **no single remedy to improve surgical safety**. While "we initially had thought that we would do one or two interventions," recalls Dr. Weiser, "it became clear that it was not one thing, and that it was more of a bundle of things" that was needed. The four working groups defined Ten Essential Objectives for Safe Surgery that every surgical team should meet during surgical care in the WHO surgical safety guidelines.[1,4]

The next challenge was determining the best modality for putting these objectives into operation. The groups reviewed the scientific literature and protocols from a diverse range of high-performing hospitals from around the world. Steps were also taken to exclude ideas beyond the scope of perioperative care. As a result, the Checklist does not include items already championed by others, such as education of surgeons and improving water and sanitation across the Global South, which were beyond the realistic scope of the Checklist.

The teams looked at models that had worked in other fields, including, for instance, a Central Line Insertion Checklist pioneered by Dr. Peter Provonost and implemented across all intensive care units in the US state of Michigan.[5] They sought inspiration from other high-reliability organizations by engaging Dan Boorman, a safety engineer at Boeing. In a process similar

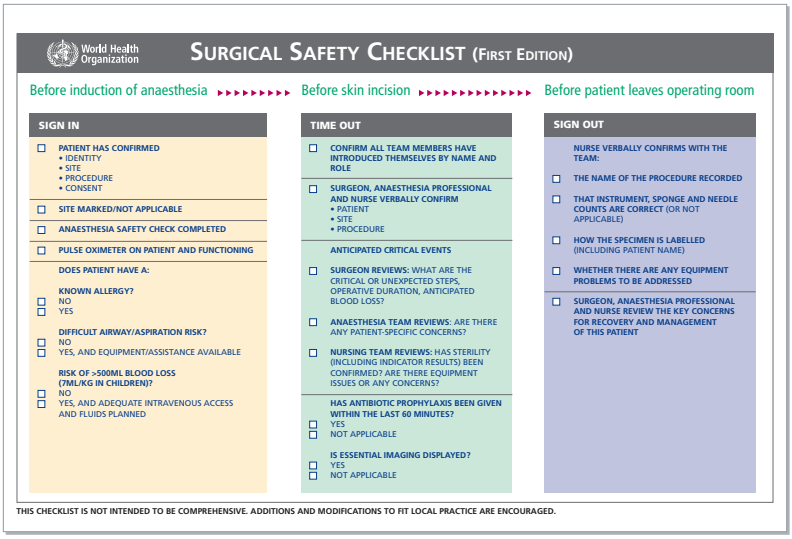
10 ESSENTIAL OBJECTIVES FOR SAFE SURGERY

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

to what is done in the aviation industry, the topics considered most relevant for operating rooms around the world were then converted into "**items that were amenable to verbal confirmation by an operating [room] team, and that allowed corrective action** if they were noted to have been overlooked."[6]

What crystallized was a one-page Checklist for use by healthcare workers to ensure that the Ten Essential Objectives for Safe Surgery were met. After rapid iterations on design and content—from being first drawn up on paper by Professor Lord (then Sir) Darzi at a meeting in London in early 2007—WHO launched the first edition of the Checklist in June 2008. A second version followed in 2009, and the idea of the WHO Surgical Safety Checklist, designed to improve consistency of care, was officially born.[7]

The expert groups spent time deliberating **how the chosen items should be physically organized**. This dual focus on both content (*what should be included*) and design (*what it should look like*) was driven by the determination to make a tool simple enough



World Health Organization

SURGICAL SAFETY CHECKLIST (FIRST EDITION)

Before induction of anaesthesia ▸▸▸▸▸▸▸▸▸ Before skin incision ▸▸▸▸▸▸▸▸▸▸▸▸▸ Before patient leaves operating room

SIGN IN

- ☐ PATIENT HAS CONFIRMED
  - IDENTITY
  - SITE
  - PROCEDURE
  - CONSENT
- ☐ SITE MARKED/NOT APPLICABLE
- ☐ ANAESTHESIA SAFETY CHECK COMPLETED
- ☐ PULSE OXIMETER ON PATIENT AND FUNCTIONING
- DOES PATIENT HAVE A:

KNOWN ALLERGY?
- ☐ NO
- ☐ YES

DIFFICULT AIRWAY/ASPIRATION RISK?
- ☐ NO
- ☐ YES, AND EQUIPMENT/ASSISTANCE AVAILABLE

RISK OF >500ML BLOOD LOSS (7ML/KG IN CHILDREN)?
- ☐ NO
- ☐ YES, AND ADEQUATE INTRAVENOUS ACCESS AND FLUIDS PLANNED

TIME OUT

- ☐ CONFIRM ALL TEAM MEMBERS HAVE INTRODUCED THEMSELVES BY NAME AND ROLE
- ☐ SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE VERBALLY CONFIRM
  - PATIENT
  - SITE
  - PROCEDURE

ANTICIPATED CRITICAL EVENTS

- ☐ SURGEON REVIEWS: WHAT ARE THE CRITICAL OR UNEXPECTED STEPS, OPERATIVE DURATION, ANTICIPATED BLOOD LOSS?
- ☐ ANAESTHESIA TEAM REVIEWS: ARE THERE ANY PATIENT-SPECIFIC CONCERNS?
- ☐ NURSING TEAM REVIEWS: HAS STERILITY (INCLUDING INDICATOR RESULTS) BEEN CONFIRMED? ARE THERE EQUIPMENT ISSUES OR ANY CONCERNS?

HAS ANTIBIOTIC PROPHYLAXIS BEEN GIVEN WITHIN THE LAST 60 MINUTES?
- ☐ YES
- ☐ NOT APPLICABLE

IS ESSENTIAL IMAGING DISPLAYED?
- ☐ YES
- ☐ NOT APPLICABLE

SIGN OUT

NURSE VERBALLY CONFIRMS WITH THE TEAM:

- ☐ THE NAME OF THE PROCEDURE RECORDED
- ☐ THAT INSTRUMENT, SPONGE AND NEEDLE COUNTS ARE CORRECT (OR NOT APPLICABLE)
- ☐ HOW THE SPECIMEN IS LABELLED (INCLUDING PATIENT NAME)
- ☐ WHETHER THERE ARE ANY EQUIPMENT PROBLEMS TO BE ADDRESSED
- ☐ SURGEON, ANAESTHESIA PROFESSIONAL AND NURSE REVIEW 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.

Surgical Safety Checklist

World Health Organization | Patient Safety
A World Alliance for Safer Health Care

Before induction of anaesthesia → **Before skin incision** → **Before patient leaves operating room**

(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

(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

(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.

Revised 1 / 2009

Sign in
> Before induction of anesthesia
> With at least nurse and anesthetist

Time out
> Before skin incision
> With nurse, anesthetist, and surgeon

Sign out
> Before patient leaves operating room
> With nurse, anesthetist, and surgeon

for people to just pick up and start using. The experts decided to divide the Checklist into three sections, each corresponding to a pause point in the perioperative period:

1. Sign In: before the induction of anesthesia;
2. Time Out: after the induction of anesthesia but before the skin incision;
3. Sign Out: as the procedure is being finalized, before the patient leaves the operating room.[9]

These three sections were physically represented on the landscape page, underlining the discrete tasks that need to be completed at each stage before proceeding, while specifying who needs to be involved at each stage.

The guiding principles of **simplicity** and **conciseness** also influenced the design of the Checklist. While there was pressure to have items arranged on multiple pages for completeness, the single-page model was ultimately retained. Experiences from other sectors using checklists, including aviation, had

impressed upon the designers that anything lengthier might become burdensome and discourage its use. The vision was that any surgeon should be able to take the Checklist to their operating room and use it with their team the following week. An implementation manual providing guidance on how to "run the Checklist" was designed by WHO for interested clinicians. It also contained recommendations for measuring outcomes. Although the manual touched upon hurdles that might be encountered, it offered limited guidance in terms of implementation and Checklist modification strategies. Early adopters would later experiment through trial and error to find the best ways to introduce the Checklist in their operating rooms, their hospitals, or in an ambulatory clinic, and sustain and expand its use.

Another guiding principle was that the effect of the Checklist needed to be **measurable**. Monitoring and evaluation of outcomes is an essential component of surgical care.

In addition to routine tracking of surgical results and post-operative complications, the WHO suggested that **process measures** also be incorporated into the evaluation system to help identify safety lapses and areas for improvement. Suggested process measures included tracking the frequencies of compliance with some of the Checklist items:

- percentage of operations where the operative site is marked by the surgeon;
- percentage of operations where pulse oximetry is used throughout the administration of anesthesia;
- percentage of operations preceded by a preoperative team briefing to discuss clinical concerns, operative plan, and other critical issues;
- percentage of operations followed by a postoperative team debriefing to discuss problems during the case and concerns for recovery and management of the patient.

The WHO was also committed to ensuring that the Checklist be **applicable in any setting**, high- and low-income countries alike. With surgeries performed in all regions and socioeconomic environments, the designers sought to set a minimum globally agreed-upon standard for surgical safety that the Checklist could help sites achieve, and which would gradually become internalized as the new norm, anywhere. Accordingly, most of the items on the Checklist did not hinge on the mobilization or injection of additional financial or physical resources. Three notable exceptions included

- the task of confirming a functional pulse oximeter ("Is the pulse oximeter on the patient and functioning?"), which presupposed the availability of a pulse oximeter;
- confirmation of antibiotic prophylaxis, which assumed the availability of prophylactic antibiotics; and
- confirmation of sterility, which calls for the use of a sterile indicator.

All three of these are often not readily obtainable in resource-constrained settings. The drive to include these tasks was in part a tactical move to establish that they should be the minimum level of care in operating rooms. The inclusion of the pulse oximeter, for example, paved the way for efforts to supply them around the world, and underpinned the initial mission of the nonprofit Lifebox Foundation, which was established in 2011 to fill this gap in pulse oximetry in resource-limited settings.

Finally, a seemingly small addition to the Checklist has unexpectedly played a key function in unleashing its full potential. The very bottom of the page reads: "***This Checklist is not intended to be comprehensive. Additions and modifications to fit local practice are encouraged***." This turned out to be a critical element in the Checklist's success. "Part of the magic is buried in that line," reflects Dr. Berry. "It said, 'Please modify me. Make me work for you.'" And indeed, this sentence crystallized the notion that one size was not going to fit all, and that the tool was meant to be adapted to address implementation issues and fit local contexts. In so doing, it paved the way for what became an essential implementation step: adaptation.

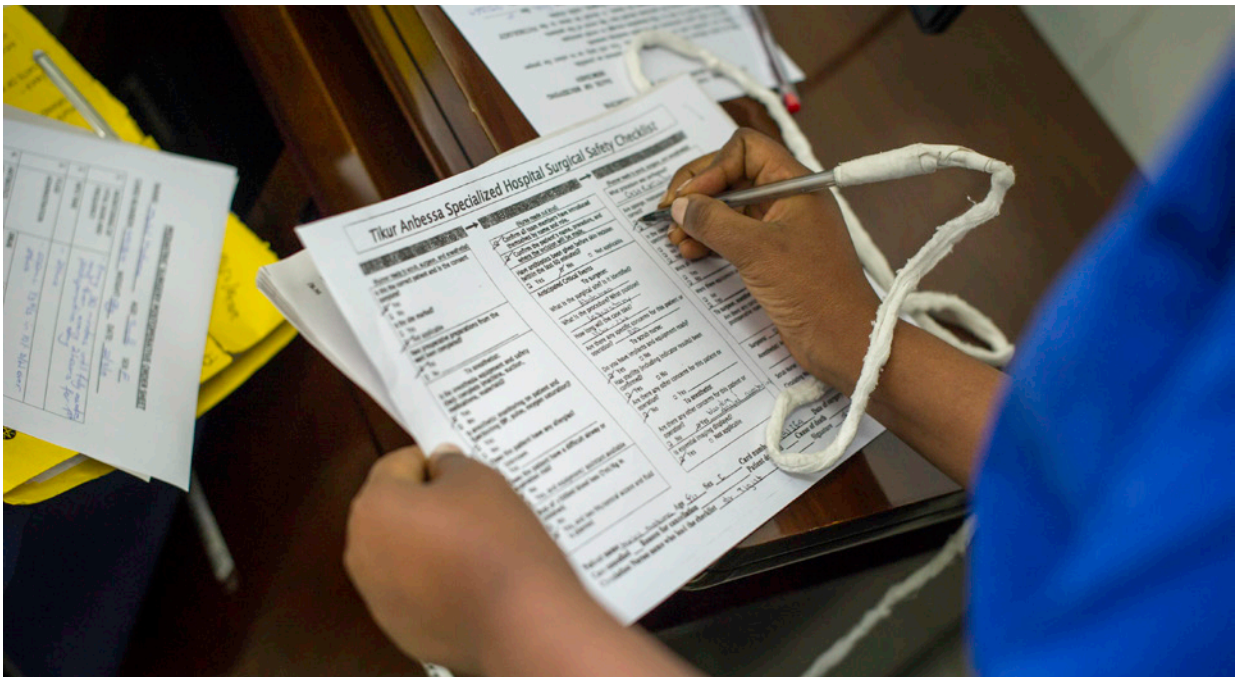
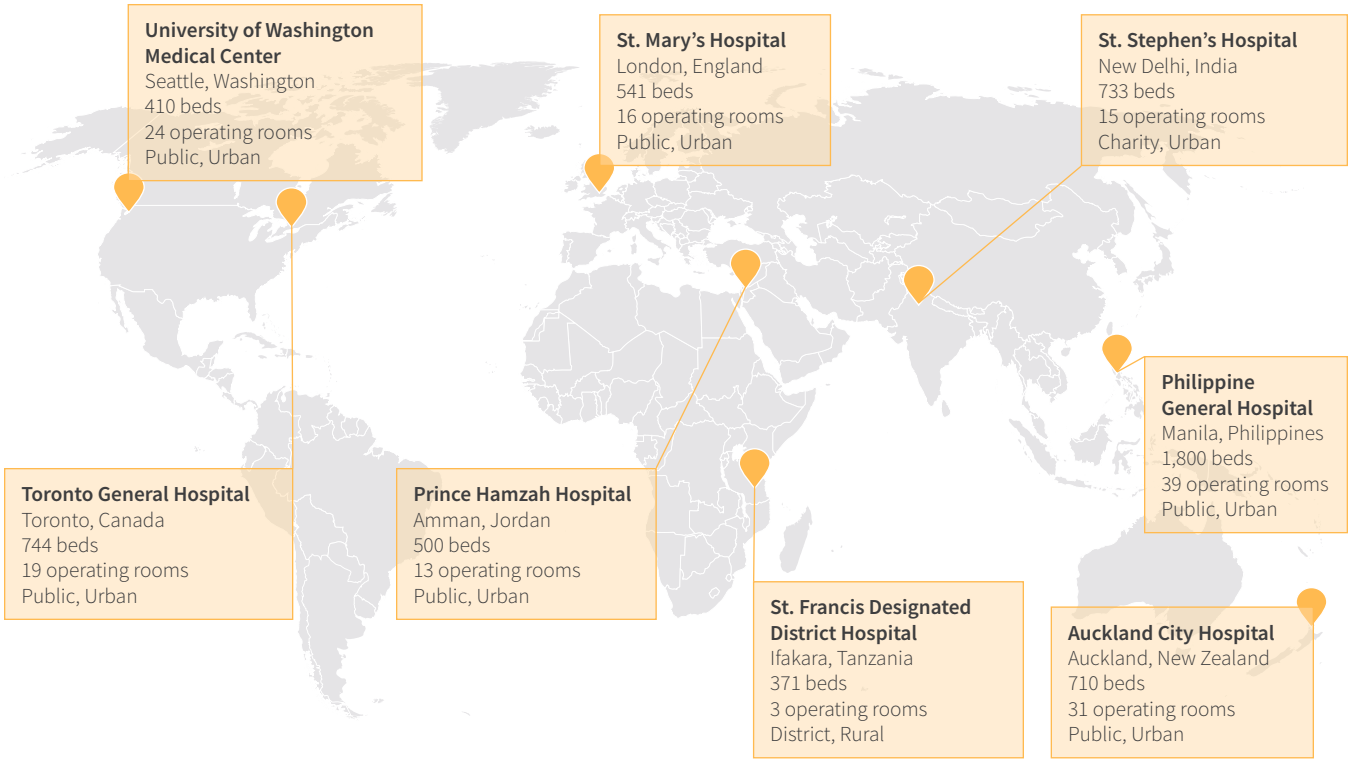


PHOTO: MICHAEL MCCASKEY

Characteristics of Participating Hospitals *(Haynes et al., 2008)*



TESTING THE CHECKLIST

The designers of the Surgical Safety Checklist had postulated that its "implementation and the associated cultural changes" it intended to spur, could reduce mortality rates and major complications after surgery in varied settings. To test whether it could indeed improve surgical outcomes, teams from the WHO and Dr. Gawande's research group at the Harvard T.H. Chan School of Public Health embarked on a landmark two-year pilot study.[10] After soliciting applications, eight pilot sites—representing all six WHO regions—were chosen to test the Checklist, identify implementation issues, and measure impact on surgical safety. Between October 2007 and September 2008, hospitals in varying contexts and with diverse patient populations participated in the study.

Before the Checklist was introduced, research teams prospectively collected data on clinical processes and outcomes from 3,733 consecutively enrolled surgical patients (non-cardiac operations). After the Checklist was introduced, the team once again collected data on 3,955 consecutively enrolled patients. The primary outcome was the rate of complications, including death, in the inpatient postoperative hospitalization, up to 30 days. The trial results, published in *The New England Journal of Medicine* in January 2009, showed in many ways an **even greater impact than the Checklist's architects had hoped to demonstrate**. The use of the Checklist not only reduced the length of hospital stay and contributed to improving teamwork and communication among surgical teams, it was associated with a **nearly 50% reduction in mortality across the eight study sites** (box 1).[7]

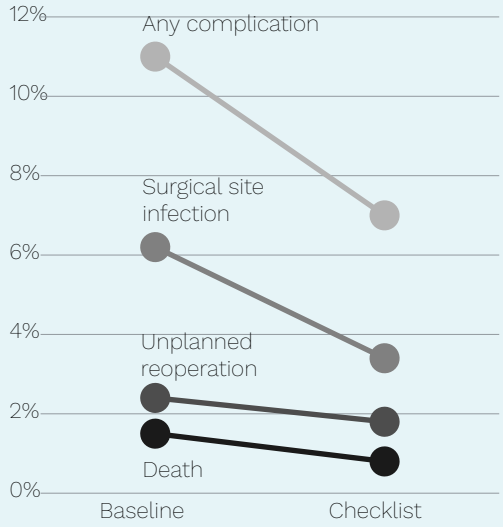
"This created the news," recalls Dr. Weiser, and the research had multiple positive ripple effects. First, practitioners involved in the trial

became the **first cohort of implementers**. The introduction of the Checklist at these eight sites was greatly eased by the research framing. "It was easy to sell as a research project, as people did not see it as something they would have to do over time," recalls Dr. Marie Carmela Lapitan at the National Institute of Health University of the Philippines, who served as the principal investigator of the site in the Philippines on the original pilot study. And once the positive impact on mortality rates became evident, as well as the realization that "greater involvement of OR nurses was a very good thing," there was no going back, Dr. Lapitan recalls. Second, upon realizing the Checklist's impact, practitioners involved with these original efforts, some of whom were skeptical at the outset, became Checklist ambassadors. Finally, the published results boosted the medical community's interest in the Checklist.

PHOTO: NICHOLE STARR

BOX 1. KEY FINDINGS FROM THE LANDMARK NEJM PILOT STUDY[15]

Outcomes before and after implementation of the Checklist, aggregate



- The rate of death was 1.5% before the Checklist was introduced and **declined to 0.8%** afterward.
- **In lower-income sites, the rate of death decreased by over 50%.**
- Postoperative **complication rates decreased by 36%** on average.
- The Checklist helped surgical team members **communicate with one another in a way that improved patient safety.**
- Team communication was key to **creating adherence to patient safety practices.**
- **Checklist programs improved the safety of surgical patients in diverse clinical and economic environments.**

	Baseline	Checklist	p-value
Cases	3733	3955	-
Any complication	11.0%	7.0% (~36%)	<0.001
Surgical site infection	6.2%	3.4% (~45%)	<0.001
Unplanned reoperation	2.4%	1.8% (~25%)	0.047
Death	1.5%	0.8% (~47%)	0.003

CHAPTER 2
THE ENTREPRENEURIAL PHASE

PHOTO: MICHAEL MCCASKEY

By 2009, the Surgical Safety Checklist was garnering the attention and curiosity of providers around the world.

The remarkable and unexpected results of the pilot study converged with widespread praise for Dr. Gawande's 2009 bestselling book, *The Checklist Manifesto: How to Get Things Right*.[12] This sowed the seeds for the subsequent organic adoption envisioned by the Checklist's developers. "One of the recommendations of WHO was just to try it. Go to your CEO, introduce the idea, and give it a go," recalls Dr. Isabeau Walker, a consultant pediatric anesthetist at Great Ormond Street Hospital in London.[13]

In the spirit envisioned by its architects, the initial implementations of the Checklist happened largely through **individual initiatives**. Practitioners, impressed by the results of the eight-site pilot study, thought that if the tool promised such impact, they ought to try it out. Surgeons who had read *The Checklist Manifesto* or the pilot study outcomes in *The New England Journal of Medicine* or heard Dr. Gawande speak about the power of the Checklist became determined to bring it to their instutitions. Professionals exposed to the Checklist in institutions where they had trained or practiced, often abroad, took it upon themselves to implement it in their next workplace or when returning home. A new surgical safety movement was born.

Yet, as pioneers and early adopters came to learn, "implementation of the Checklist is not as simple as passing it along to the surgeon or nurse in an operating theater and demanding its use," and enthusiastic **conviction did not automatically translate into broad adoption**.[14] In this early entrepreneurial rollout phase, many have recounted how they wholeheartedly launched into the process – and failed miserably. "I decided to try and implement the Checklist, which I had learned about when I was training. I worked at it for three months and completely failed. It was just me and it did not work," recalls Dr. Abebe Bekele, a general and cardiothoracic surgeon committed to implementing the Checklist in his hospital in Ethiopia upon his return from his subspecialty training in Seattle.[15] China-trained Dr. Capo-Chichi aimed to introduce the Checklist in her homeland of Benin, but her efforts did not initially lead to expected results.[16] She later reflected that they "probably had tried to do too much at once."

The challenges encountered by these entrepreneurial surgeons were similar to those of the participants in the pilot study. "When we started, we did not use the right approach; we had to stop completely after a week, and start again," recalls Professor Alan Merry, a renowned anesthetist and pain medicine physician, who piloted the introduction of the Checklist in New Zealand.[17] Dr. Lapitan echoes how in her hospital in the Philippines, "it did not go as planned, as we had not thought through who was going to implement the Checklist. We started out by saying that the anesthesiologist should implement it, but he was so busy. Then we thought the theater assistant could be asked to do the Checklist, but the assistant would not do it as formally as needed. If the surgeon or the nurse did not answer the question, the theater assistant did not press to get the answer." With limited guidance, these forerunners had to go through trials and errors before they could make headway.

In many ways, these early rollout experiences illuminated both the **individual and the systemic obstacles** that would need to be overcome for the Checklist to become widely adopted. Though the Checklist can seem innocuous in its simplicity, its effects and implications run deep. In the experience of these pioneers, utilization of the Checklist, including such aspects as mandated introductions or pauses for structured team exchanges, created tension within the hierarchical makeup and power structures in the operating room, as well as with long-established workflows. It generated nervousness and even resentment from some who interpreted it as

"When you prepare to do something difficult…you have your routine, your way to prepare yourself. If someone comes along and asks you to change that up, use a list, you may not be receptive."
– Dr. Iain Wilson

PHOTO: AHMED JALLANZO

a negative judgement both on the existing system and of their own competencies.[17] "When you come in with new methods," reflects anesthesiologist Dr. Ruth Tighe, who oversaw the introduction of the Checklist at a hospital in Tanzania, "you are implying that our current system does not work."[18]

Additionally, the Checklist demanded that professionals, whose education had been underpinned by a culture of competition and individualism, suddenly embrace a collective mindset. "You have to be better than others, to come out on top. And then suddenly, you join a team, and are expected to play as a team member. But we were trained to be individual competitors; this stays with you," explains Dr. Merry. Yet others, with very internalized ways of preparing for and approaching surgery, experienced the introduction of the Checklist as a destabilizing interference, as would athletes or warriors used to carefully crafted mental preparation ahead of incredibly difficult tasks.

The adjustments called for teams to move from very hierarchical to more fluid and participatory exchanges in the operating room, which would require transforming entrenched ways. For as simplistic as it may have looked, the Checklist had struck deep chords. And unsurprisingly, as a result, its implementation, though widely successful, was bound not to be a linear process.

LESSONS LEARNED FROM EARLY ADOPTERS

These initial efforts revealed that although the initiative to introduce the Checklist is often linked to the determination of a single committed practitioner, its **successful adoption hinges on a range of factors, including fostering supportive environments, ensuring site readiness, and designing a process of buy-in from key stakeholders.** "The importance of having the right design is understated, seeing how I first failed," reflects Dr. Abebe.

Learning from these early practitioners' experiences highlights key factors for successful Checklist implementation:

- » leadership buy-in;
- » multi-stakeholder engagement;
- » socialization through adaptation;
- » accountability; and
- » follow-up support.

SECURING LEADERSHIP BUY-IN

The **buy-in of decision makers and those clinicians in power** was repeatedly mentioned as being critical for a successful rollout. "Strong and dedicated clinical lead, from those who have the power to drive change" is essential, explained Dr. Weiser. Dr. Capo-Chichi observed firsthand the importance of surgeons' unequivocal support, "so that he/she gives the authorization to the team to be fully involved." "If you have a nurse who is young, new, and eager, under an unsupportive surgeon, she will not be able to run the Checklist properly," noted Dr. Lapitan.[11]

Dr. Ruslan, a surgeon at a training hospital in Moldova, similarly reflected that without a signal from leadership, open communication is unlikely to materialize: "We respect our seniors; if they say something, even if it is wrong, it is correct. So we need our seniors to say we have the right to speak up, that we should not stay silent." In a professional sector defined by a deeply entrenched hierarchy, the surgeons need to be onboard for success: "Changing surgical minds is the most important bit. Anesthesiologists can be helpful, but there is a hierarchy across the world, and it is the surgeon who gets to decide," stated Dr. Wilson, an anesthesiologist.[19]

ENGAGING STAKEHOLDERS

Another factor, apparent to those who tried to single-handedly introduce the Checklist, is the **importance of multi-stakeholder engagement.** "Having multiple leads helped," recalls Dr. Weiser, echoed by Dr. Abebe, "It was just me. You cannot implement the Checklist like this. I started reading related literature and I realized you needed teamwork for the Checklist to work." In its second attempt, Dr. Abebe ensured that he engaged "everybody from day one, including by bringing everybody to a single room, to discuss and write down the Checklist." Dr. Sujarit Giri, an anesthesiologist, also indicated that the key to success in his Indian hospital was to get "everybody on board.[20] We had to train people across the board – surgeon, consultants, nurses." Such experiences echo the results of studies that show how multidisciplinary training in hospital settings can lead to better results than teaching individual anesthesiologists or surgeons alone.[21]

SOCIALIZING THE CHECKLIST

Together with engaging the right people, adapting the Checklist appears to be an essential step to **increase its perceived relevance, create a shared experience among implementing teams, and nurture a sense of ownership**. In Dr. Capo-Chichi's own experience: "When the Checklist was just handed over, and people did not adapt it to their needs and contexts, this is when it failed. Adaptation is the key word." And indeed, implementers who modified the Checklist were able to rapidly socialize the tool by tailoring it to local contexts and realities. The more practitioners felt that the tool made sense for them and addressed their issues, and that they had contributed to its relevance, the greater the chances they would try it – and stick to it.

Adaptation in practice seems to have taken at least three different forms:

1. translation into local languages;
2. addition, elimination, or modification of items on the Checklist; and
3. redistribution of responsibilities for the different sections.

All three elements appeared to have played a role in the Checklist's power to deliver. Dr. Lapitan in the Philippines recalls how the initial use of the Checklist in English felt artificial to all, and it was only when it was translated into a blend of Tagalog and English, routinely used in hospital settings, that it gained traction. "We did a lot of changing the language. This was really important. It was about communication," she recalls. In Ethiopia, Dr. Abebe worked with collaborators to review and revise the Checklist, and translate it into Amharic, the local language. In Benin, Dr. Capo-Chichi and her colleagues decided to add to the Checklist "the crucial question of the generator. Electricity is unstable. Of utmost importance for us was to check that the generator was in working condition before starting a surgery." In Guatemala, Dr. Sandra Izquierdo, an anesthesiologist, and her collaborators decided to add questions pertaining to pain, as well as heparin for thrombosis.[22] Dr. Divatia, an anesthesiologist at the Tata Memorial Hospital in Mumbai, worked with colleagues to add a few components and divide up the responsibilities for the various sections of the Checklist between the surgeon, nurse, and anesthesiologist: "We adapted responsibilities to reflect how we are structured. In the operating theater, for each section of the Checklist, a different person is in charge – this works better."[23]

While Checklist adaptation seems to have increased relevance and adherence, it should be noted that there has been limited guidance on how to modify it. Some of the Checklist's existing elements have been instrumental to its impact and as such, their removal might curtail desired effect.[24] For instance, some have reported feeling uncomfortable with introductions and exchanges, and dropped them altogether, possibly affecting the benefits associated with improved team dynamics. Adding too many items also introduces the risk of making the Checklist too comprehensive and difficult to implement. Often, modified checklists end up longer and more complex than the original WHO template, making them more cumbersome to use.[21]

BUILDING ACCOUNTABILITY

While many self-driven practitioners have made the Checklist their own without external oversight, pressure, or requirement, **accountability has played a significant role in mainstreaming the routine use of and compliance with the checklist**. In Ethiopia, as part of governmental requirements, hospitals have to report on the rate of Checklist use every year, and medical institutions must also provide data on infection-related mortality and morbidity.[2] In India, the government has a voluntary accreditation system for hospitals, which includes the routine use of the Checklist.[23] In Moldova, national insurance requirements tie hospital surgery reimbursements to the completion of the Checklist, which has proven to be a powerful incentive for its use.[25] In the Philippines, the College of Surgeons has endorsed the use of the Checklist, as has the Department of Health, in conjunction with the national health insurance body. "That they made it a requirement has been useful," reflects Dr. Lapitan. In other countries, the endorsement of professional societies—starting in 2008—has played a key role in mainstreaming the use of the Checklist.

As the debate continues on the usefulness of mandating the Checklist, numerous practitioners have highlighted the value of having third parties (e.g., Ministry of Health, insurance, regulators) integrate the Checklist into their own processes to elevate the issue of patient safety as a common goal. In those cases, contextually relevant reinforcement mechanisms have helped create some accountability and laid the ground for greater adoption and sustainability at scale.

BREAKING ISOLATION

Behavior change in medicine is seldom an easy or linear process. It can be all the more challenging in low-resource settings, where practitioners can **be isolated and lack access to support**, including continuing professional education. Practitioners "have the desire to improve, but too often they are let down by the system,"[26] finding themselves left to their own devices in facing the logistical, medical, and political challenges that confront them daily. Implementing the Checklist in such contexts can be an exercise in frustration. Individual Checklist implementers can find themselves isolated, working in environments not conducive to success, and struggling on their own with strategy questions and rollout challenges.

To address such situations, Checklist implementers in Benin have set up their own peer support network, using a professional WhatsApp group for "people to share problems, encourage each other." This channel has proved instrumental in creating an easily accessible, supportive community of practice and a network of like-minded practitioners.[27] Implementers have also repeatedly highlighted the value of exchanging experiences with peers in their regions and beyond, including through informal networks, strategy workshops, and participation in regional conferences. International implementers, who are either working to bring the Checklist to new contexts (e.g. Mercy Ships), or to build a global community of implementers (e.g., Lifebox), have also observed the importance of sustained exchanges and engagement.

Explains Dr. Tighe: "The local champion cannot do it all. There needs to be someone with him/her in it for the long run, who helps make it happen." This echoes Dr. Capo-Chichi's observation that "the more you show up, the more it is likely to stick. This is the key to implementation." Whether from foreign or national/regional peers, **mechanisms by which strategic ideas can be exchanged, support provided, and connections weaved** with broader communities of practice, all appear to be essential components to solidify individual practitioners' achievements and advance the broader vision for surgical safety.

"We tried it in the operating room for a couple of weeks. We had set up a working group to get feedback, see how it worked. And initially, everyone rejected it!"
– Dr. Isabeau Walker

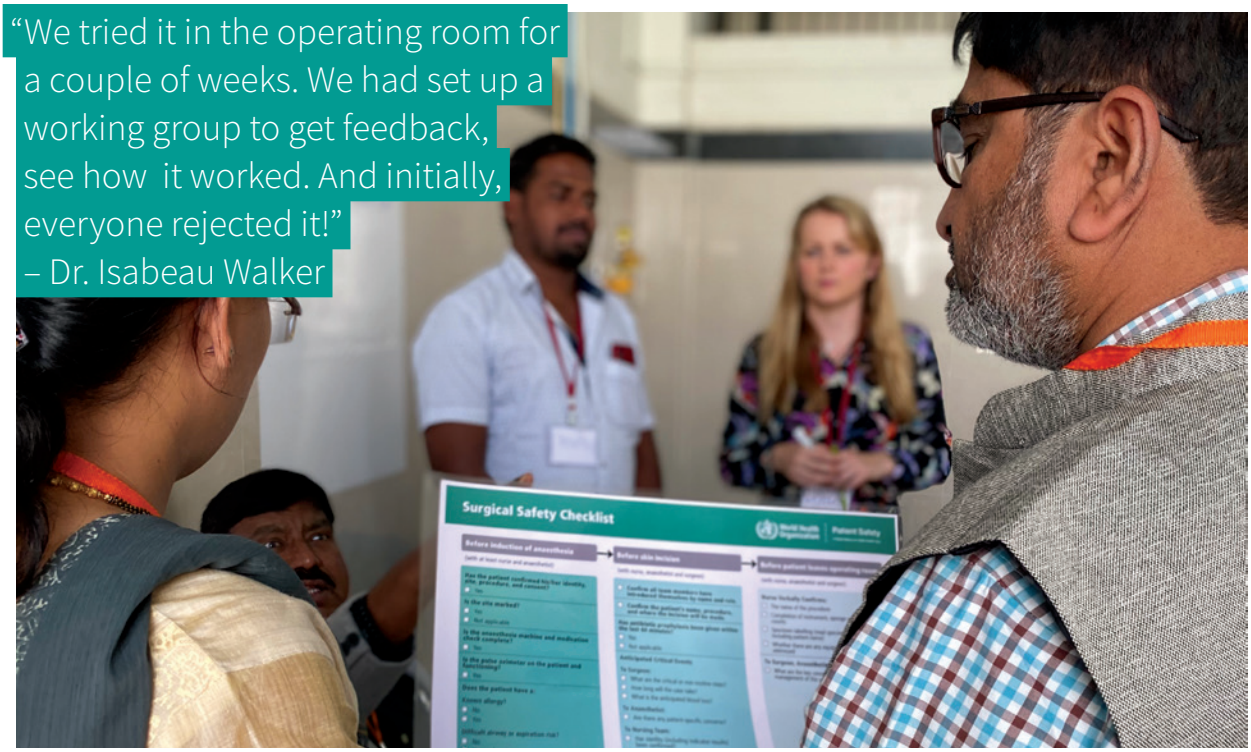
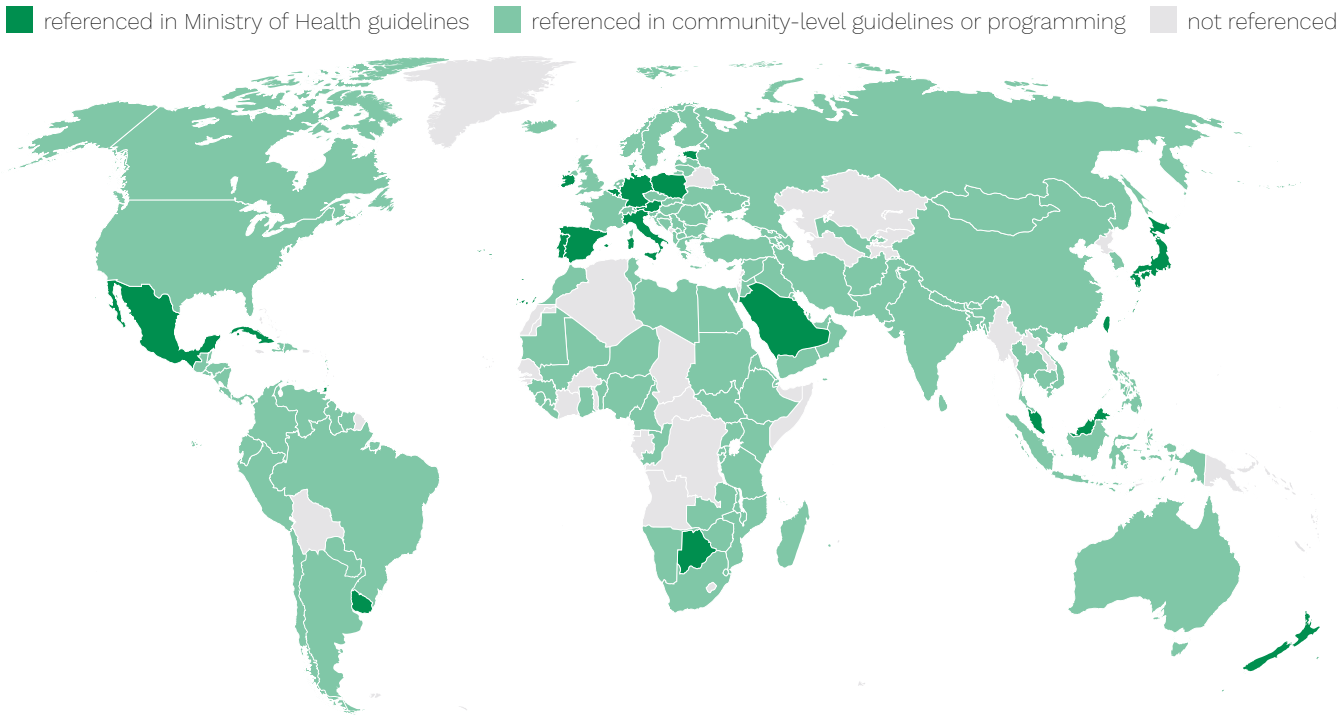


PHOTO: CHLOE RICH

CHAPTER 3
THE CHECKLIST FOOTPRINT AT TEN YEARS

PHOTO: COURTNEY STAPLES

Surgical Safety Checklist References as of 2019



The use of the surgical Checklist has become so standardized in some areas that a number of interviewees for this report were surprised to realize it's only ten years old.

Trials and errors notwithstanding, the organic, crowdsourced, bottom-up approach envisaged by the Checklist's architects resulted in its **rapid and far-reaching diffusion across the globe**. In the span of a few short years, the checklist has not only become known in surgical circles and among the medical profession writ large, but also among the wider public – possibly a first for a WHO technical document of this nature. Use of the Checklist has been recorded on the five continents, at all levels of economic development. Reflecting widely different approaches, implementation references to the Checklist can be found in at least 139 countries (70% of the world) a decade after its launch, illustrating the extent of its reach and universal appeal.

As remarkable as the map of Checklist countries can be, the picture deserves a closer look. In a small number of countries, the Checklist has been adopted at the national level and mandated to be used in all institutions. As early as 2009, Dr. Alex Haynes and team reported that five countries (Ecuador, Ireland, Jordan, Philippines, and the UK) had committed to using the Surgical Safety Checklist as a national standard.[28] Among the first adopters was the UK, with the National Patient Safety Agency making it mandatory for hospitals of the National Health Service in England to implement the Checklist by February 2010.[29] France followed shortly after, with the Haute Autorité de la Santé issuing a directive in January 2010 to mandate the national adoption of the Checklist for every patient undergoing a surgical procedure.[30] In 2013, Brazil's Ministry of Health issued Ordinance No. 1377 mandating that the Safe Surgery Protocol be implemented by health services as part of the National Patient Safety Program.[31] Today, references to the Checklist as a national standard can be found in at least 20 countries.

In many countries, however, the Checklist has only been tried in one or a handful of selected hospitals, or in a couple of operating rooms within those hospitals. Even in hospital settings where it has been adopted, it may only be used for certain types of surgeries, with additional variations pertaining to elective versus emergency surgeries. This is the case particularly in low- and middle-income countries (LMICs), where both interviewees and existing literature have pointed to slow, limited, and sporadic adoption.[32]

In a 2020 study to understand the global uptake of the Checklist, Delisle et al. found that 1,464 facilities in 94 countries used the Checklistt in 75.4% of surgical interventions, confirming that use of the Checklist was generally high. However, they also reported significant variations between countries with high or very high human development index (HDI), where the Checklist was used for almost 90% of patients, and countries with lower HDI, where the Checklist was used for only about one-third of patients. It further highlighted gaps in Checklist use for patients undergoing obstetric and gynecologic operations, as well as less-complex operations. They also found the Checklist was less likely to be used in emergency surgeries (versus elective) in low- and medium-HDI countries. Such findings point to the **incomplete picture of Checklist implementation**, and the task at hand is to improve its systematic use to make surgery safer for every patient around the world.

UNFINISHED BUSINESS: IMPLEMENTATION IN LMICs

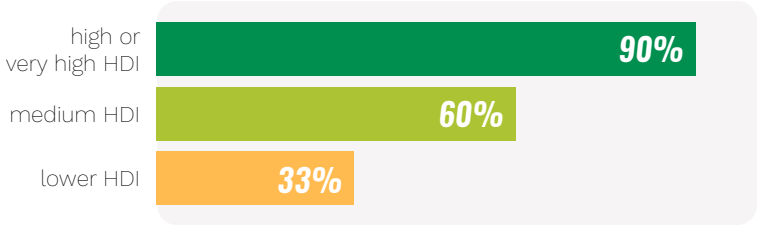
Aside from four of the first eight pilot sites, which were located in resource-constrained settings, some of the earliest published records of implementation outside of high-income countries were in university hospitals in Thailand and Moldova.[33,34] The 2012 Thai study was conducted to examine compliance with the Checklist at a university hospital. It concluded that the Checklist could be successfully implemented in a developing country, though compliance with some items was low, suggesting it could be improved through additional education and programmatic support. In Moldova, the team embarked on efforts to introduce the Checklist in every operating room of a university-affiliated hospital in Chisinau, Moldova and measure its impact in a lower-income setting. Data from 2,145 pre- and 2,212 post-intervention cases were collected. The adherence to all safety processes reached 66.9%, and the overall complication rate decreased from 21.5% to 8.8%. The study concluded that successful hospital-wide Checklist implementation was achievable in a resource-limited setting and could significantly reduce surgical complications.

A few studies have tried to take a systematic look at regional adoption across LMICs but have produced disappointing results. A survey was conducted in 2012 with the aim of analyzing the use of the Checklist in 15 African

Global Uptake of the Checklist (Delisle et al)

Of 1,464 facilities in 94 countries, ***facilities used the checklist in 75.4% of surgical interventions.***

Checklist use with patients varied across countries depending on their human development index (HDI):



countries, which had participated in a WHO-led orientation workshop held in Harare, Zimbabwe in 2011.[35] Of the 15 participating hospitals, ten (67%) had successfully implemented the checklist by October 2012. Only four out of ten hospitals (40%) had adapted the Checklist to suit their local contexts, and none of the implementing hospitals had completed implementation in all of their operating rooms. The mean Checklist compliance rate was 48.5%.[35] In a 2015 survey by Epui et al. to assess the utilization of the WHO Surgical Safety Checklist at the main referral hospitals in East Africa (Uganda, Kenya, Tanzania, Rwanda, Burundi), anesthetists were interviewed on their knowledge and attitudes toward use of the Checklist.[36] Of the 85 anesthetists interviewed, only 25% regularly used the checklist. None of those in Uganda or Burundi used the Checklist, primarily because it was not available. In the three other countries, 19% to 65% of the interviewees reported using the Checklist.

Overall, **efforts to implement the Checklist in resource-constrained settings have been limited and sporadic to date**, with few documented attempts to roll it out in a systematic fashion and at scale. Mercy Ships, a nonprofit organization that operates the world's largest civilian hospital ship, stands out for its incremental development of models to **rapidly deliver quality implementation at scale**. Mercy Ships and the health ministries of Madagascar, Benin, and Guinea have been partnering to roll out country-wide sustainable models of Checklist implementation. Research in Madagascar and Benin (box 2) has shown that nationwide Checklist implementation is feasible and can result in high-fidelity use. Lessons learned include:

- the need for partnerships with both local leadership (hospital directors and surgeons) and Ministries of Health;
- combining bottom-up and top-down approaches; the importance of co-designing programs with host countries;
- the need to continually adapt teaching materials to local culture and context;
- the value of a short three- to four-day course to improve indices of surgical safety; and
- the importance of proper follow-up, in person if possible or by phone, to discuss ongoing implementation challenges and prevent initial trainings fading from memory.[37]

As the picture of implementation in LMICs remains incomplete and uneven, Mercy Ships' successful, intensive country engagement prompts the question of the role of external actors in backing local champions and helping them catalyze sustainable change for safe surgery.[3]

BOX 2. BENIN AND MERCY SHIPS PARTNERSHIP

Mercy Ships, the Ministry of Health of Benin, and King's College London embarked on a study to design and evaluate a nationwide Checklist implementation effort in Benin.

- Thirty-six hospitals that represent the majority of government surgical hospitals participated in a three-day multidisciplinary training and in a four-month follow-up.
- The implementation strategy included a multidisciplinary learning environment that incorporated workshop-style teaching, simulation, adaptation, built-in feedback loops, and ongoing peer support.
- Seventeen hospitals were sampled for evaluation at 12-18 months. Eighty-six percent of participants reported Checklist use after the training, compared to 31% before the training.
- High-fidelity use and significant improvement in hospital safety culture were also reported.
- The study demonstrated it was possible to successfully sustain nationwide Checklist implementation using a particular implementation framework.

Source: White C et al. Implementation and evaluation of nationwide scale-up of the Surgical Safety Checklist. Br J Surg 2019;106(2):e91-102.

CHAPTER 4
IMPACT OF THE CHECKLIST

PHOTO: COURTNEY STAPLES

By 2009, the Checklist pilot study had established that reductions in the rates of death and complications among patients were attainable.[10]

Since that landmark study, other studies have shown similar benefit across a wide range of settings. Three systematic reviews have concluded that the available evidence strongly suggests a reduction in postoperative complications and mortality following implementation of the Checklist.[38,39,40]

In 2019, a study from Scotland, which was the first study showing country-level impact, demonstrated a 36.6% reduction in post-surgical deaths since the introduction of the Checklist in 2008.[41] The results were based on an analysis of 6.8 million operations performed between 2000 and 2014. Other large-scale implementation results include:

- United States: A statewide, voluntary, Surgical Safety Checklist program was found to be associated with a 22% relative reduction in postoperative 30-day mortality in hospitals that completed the program compared to hospitals that did not (breakout box "South Carolina").[42]
- Norway: A 2014 stepped wedge cluster randomized controlled trial found complication rates decreased significantly from 19.9% to 11.5% with Checklist utilization. Although the in-hospital mortality decreased from 1.6% to 1.0%, this was not statistically significant.[43]
- Liberia: Introduction of the Checklist was associated with significant improvements in overall surgical processes and outcomes.[44]
- Iran: In a 374-bed referral educational hospital in Shiraz, Iran, surgical complications decreased from 22.9% to 10% (57% reduction) after the Checklist was used.[45]

SOUTH CAROLINA, UNITED STATES: 22% RELATIVE REDUCTION IN POSTOPERATIVE MORTALITY AFTER IMPLEMENTATION OF A SURGICAL SAFETY CHECKLIST PROGRAM

The Safe Surgery 2015 program was a statewide hospital collaborative in South Carolina that encouraged and assisted with voluntary implementation of a surgical safety program that included a Surgical Safety Checklist. The program was launched in the fall of 2010.

By the conclusion of the program, 14 out of 58 hospitals that performed operations on adults in the state of South Carolina completed the program.

The 14 hospitals that completed the program cared for 22,514 patients before implementation of the program, and 18,112 patients after implementation. The remaining 44 hospitals that did not complete the program cared for 38,876 patients before and 30,218 patients after implementation of the Surgical Safety Checklist program.

After implementation of the Surgical Safety Checklist program, there was a 22% relative reduction in the postoperative 30-day mortality in hospitals that completed the program compared to hospitals that did not complete the program.

However, not all large-scale implementation efforts have yielded positive results:

- Canada: A pre- and post-implementation analysis that included 101 hospitals in Ontario, Canada, found that implementation of a Surgical Safety Checklist was not associated with significant reductions in postoperative mortality or surgical complications. Of note, of the 92 hospitals that provided their Checklists for review, 79 used the Canadian Patient Safety Institute version, four used the WHO version, and nine customized the Checklist for their setting.[46]
- Uganda: A prospective study across five referral hospitals in Uganda yielded an overall compliance rate of 41.7%, and no impact on length of hospital stay, adverse events, or mortality.[47]

"The Checklist completely changed the operating room; it changed it beyond recognition. It introduced communication within teams and a culture of safety…People know each other by name; they take into account each other's requirements." – Dr. Isabeau Walker

PHOTO: MICHAEL MCCASKEY

BEYOND MORTALITY AND MORBIDITY

As implementers universally attest to, the benefits of the Checklist extend beyond mortality and morbidity. Beyond clinical outcomes, interviewees across contexts have highlighted the profound qualitative effects of the Checklist on fostering a culture of safety, improving communication, strengthening efficiency and professionalism, increasing patient trust, and empowering practitioners. These effects are increasingly being documented.

Improvement in culture and attitude toward safety have been reported by many practitioners in institutions that have adopted the Checklist. Openness to reporting errors, ability to resolve disputes, and supportive teamwork all have been highlighted as byproducts of using the Checklist, and have helped spur a culture of safety.[48,49] Many publications have reported vastly improved communication between surgical team members after introduction of the Checklist, including acknowledgment of other team members' roles, and improved likelihood of staff feeling empowered to speak up when a problem arose.[50,51,52,53]

The implementation of the Checklist has also been associated with greater staff satisfaction, and increased efficiency (including reduction in staff turnover, reduction of delays, better management of cancellations, and prevention of complications).[50,32,54,55]

The selected quotes further highlight some of these highly valuable benefits that clinicians have derived from the introduction of the Checklist. They speak directly or indirectly to how the Checklist has put patients back at the center of the medical staff's attention and empowered practitioners.

SAFETY & CULTURE

"There is a much stronger safety culture, and the language of safety has become commonplace. If something goes wrong, there is a culture of talking it through. This has completely changed the safety culture in the theater." – Dr. Walker

"In those places that have adopted the Checklist, there is now a way to speak about safety that was never there before. They count instruments. They count swabs. We wanted people to start thinking of safety, and they have." – Dr. Capo-Chichi

"When the Checklist became part of patients' records, it introduced an accountability loop, a way of ensuring that basic safety measures were adhered to." – Dr. Kabongo,[56] Namibia

COMMUNICATION & TEAMWORK

"This has improved communication within teams. This brief stop at the beginning of the surgery, to share what is important, what people might have on their mind, is key. There was no culture of exchanging information, with the anesthesiologist focusing on their piece, the surgeon on his. Now there is communication and it is not about the anesthesiologist or the surgeon; it is all about the patient." – Dr. Divatia

"One of the main achievements of the Checklist was to modify the usual lines of communications and perceived responsibility. The nurses can ask a question to the doctor, and they can voice their views. The nurses are now more freely engaged, which is something very significant." – Dr. Kabongo, Namibia

EFFICIENCY & PROFESSIONALISM

"The clear benefits were in terms of more efficient running of the operation theater." – Dr. Wilson

"We had been having a lot of disorganization with our lists. I had written to our lead surgeon to say, 'surely we can do this better,' so the Checklist resonated. After six months, we could see the difference. Nurses liked it; things were more organized and professional." – Dr. Walker

"I found that the Checklist was appealing not only to the clinical side, but most importantly to the management side. You can show that the system is so inefficient at the moment, that cases are penciled on the day, but we are systematically late. If we did better, we could fit in two cases more per day. You can convince a manager, and have him/her mandate the Checklist, using efficiency arguments." – Dr. Tighe

INCREASED PATIENT TRUST

"Some places have reported that after they started using the Checklist, more patients came to the hospital. The Checklist increased trust in the doctors; patients felt more relaxed, more at ease to ask questions. Patients began feeling involved, which was new as most were used to feeling like objects. The Checklist helped break that barrier." – Dr. Capo-Chichi

"At the beginning, some patients were a bit anxious. 'Why are you asking me my name and what I am meant to get surgery for? Aren't you supposed to know?' But actually, when patients were meant to have mastectomy or amputation, they felt more confident if they know you are marking the site, if they see you taking the steps to get it right." – Dr. Divatia

EMPOWERMENT & JOB SATISFACTION

"There is a growing appreciation for the Checklist. Places where the Checklist is used are nicer environments to work in, more pleasant." – Dr. Berry, USA

"The idea that right here, right now, you can improve patient outcomes, that the power to change is in your hands, this is a big driver. People feel empowered. Interestingly, we looked at whether the use of the Checklist improves job satisfaction and the answer is yes, it does." – Dr. White

CHAPTER 5
OPPORTUNITIES IN THE SECOND DECADE

PHOTO: MICHAEL MCCASKEY

Despite substantial evidence demonstrating the usefulness of the WHO Surgical Safety Checklist to reduce perioperative infection rates and morbidity, many barriers have stood in the way of universal adoption, systematic compliance, and sustained use.

Each represents an opportunity for the next decade of safe surgery. Some of the common challenges identified by interviewees find echoes in the existing literature. By 2012, Fourcade et al. had already documented some of the most common issues, which interviewees also referenced[57]:

- **Entrenched hierarchy:** The hierarchy in the operating room can act as a major challenge to successfully implementing the Checklist. The support from surgeons is essential to create the appropriate backdrop for the Checklist to be used to full effect.
- **Perceived delays or workflow disruption:** Operating room staff fear or resent the perceived delays before the start of surgery, and interruption to the usual workflow.
- **Impact on workload:** Staff working in the operating room may see the Checklist as an interruption of well-established routines, and as an extra burden.
- **Reluctance to use in emergencies:** Worries that the Checklist will have a negative impact on the timing and outcome of the surgery.
- **Patients' perspectives:** Concerns about the patient's response at hearing the Checklist protocol.
- **Sign-out time:** Misalignment of sign-out times between surgeon, anesthetists, and nurses.

Bergs et al. (2015) also reviewed existing studies to obtain a deeper understanding of the user-related barriers against implementation of the Surgical Safety Checklist.[38] They found that the factors impeding or advancing Checklist adoption concentrated around the perception of the Checklist itself, the implementation process (and related workflow questions), and the local context.

In 2019, Brazilian researchers worked with nurses in a hospital surgical center to identify barriers to implementation of the Checklist.[55] They congruently found that lack of support from the administration or the heads of surgery, absence of a patient safety team, abrupt introduction of the Checklist without previous planning, and absence of education were all significant obstacles to successful implementation.

Some of the identified challenges can and have been addressed by interventions targeting potential Checklist implementers, including:

- robust presentation of the evidence base;
- identification of people's motivations (box 3);
- emphasis on adaptation of the Checklist to local contexts;
- testing of interactive, multidisciplinary training programs;
- involvement of the entire health care team; and
- tailored approaches to adjust workflows.[58]

Other challenges, however, require a broader and more systemic approach (e.g., government buy-in, overall health system functioning, workforce development, material resources).

Overall, research findings and interviewees highlight that implementing the Checklist is a complex, multidimensional process, in which success hinges on understanding existing power structures, knowing the motivations of all those involved, fostering team learning and mutual understanding, and realigning routine practices. Beyond issues pertaining

BARRIERS TO CHECKLIST ADOPTION

PERCEPTION

- Concerns about time consumption/efficiency
- Concerns about patient perception
- Varied perception of Checklist importance
- Skepticism regarding Checklist components
- Skepticism regarding evidence base

IMPLEMENTATION PROCESS

- Poor/inadequate education and training methods
- Unclear guidelines
- Failure to adapt to context
- Lack of follow-up
- Senior clinician resistance
- Poor buy-in/ psychological ownership

WORKFLOW

- Tensions with individual workflow
- Tensions with team workflow/necessary adjustments
- Tensions with other existing processes

LOCAL CONTEXT

- National leadership
- Medical structure leadership
- Organizational culture
- Communication/ team dynamics
- Material conditions (supplies, functioning equipment)
- Number of personnel
- Compensation

Adapted from Bergs et al, 2015

to the Checklist itself, the **context in which the implementation happens** (including pre-existing beliefs and practices, existing norms and workflows, training levels, material conditions, etc.), and the **ways in which the Checklist is introduced**, are essential elements underpinning a successful rollout.

At the onset of this second decade of the Checklist, and with its impact already robustly documented, implementation contexts and strategies to achieve scale and sustainability, in particular in resource-constrained settings, deserve further attention.

CONTEXT AS AN INESCAPABLE DETERMINANT

The Checklist's creators put a lot of effort into crafting a tool that would be applicable in any setting, regardless of resource levels.[2] And indeed, whether the patient has confirmed his or her identity, whether the surgical site has been marked, or whether team members have introduced themselves by names and roles – these are examples of key steps that transcend socioeconomic boundaries. A case in point: The teamwork and communication concepts introduced by the Checklist have been found to have very similar effects, regardless of context.

Yet the issue of different levels of resources and environments, which the Checklist authors had so assiduously tried to minimize, continues to affect Checklist implementation. "You can raise the Checklist all you want, but the lack of resources stands in the way," explains Dr. Wilson. "In East Africa, the Checklist has been quite difficult to implement. The systems in place that provide basic safety in the OR are weak. We make assumptions of what things are in place but often they are not. Human factors, communication, teamwork: These things are the same everywhere. But for other aspects of the Checklist, it is difficult if the basics are not in place."

And at times, nothing seems to be in place, as Dr. Capo-Chichi experienced: "Some [hospitals] are very broken, so much so that they could not implement the Checklist even if they wanted to. Surely, the worst was not knowing what to do in [a] hospital where nothing worked. Some of the setbacks are beyond the Checklist; they are

BOX 3. "WHY WE ADOPTED THE CHECKLIST"

"Even in the Western world with all the equipment there is, things are not perfect and people make mistakes. We tell stories about how it has often not much to do with the lack of equipment, but that it is about human error. And it could happen anywhere and to anyone." – Dr. Capo-Chichi

"The search for a missing gauze can be an important trigger. In such circumstances, the Checklist is a means to find a solution to the problem, and an instrument by which we can prevent it." – Dr. Divatia

"In the US, individuals are doing it; they want to avoid complications, with an eye to legal aspects." – Dr. Weiser

"For the surgeon, I appeal to the power of the last part of the Checklist, the one that asks for a debrief. This is the biggest pain for surgeons: When things don't work, they complain, but nothing changes. But if you register the issue as part of the debrief, and the institution commits to addressing issues that emerge from the debrief, then progress can be made." – Dr. Berry

"For nurses, the Checklist offers a way to raise their concerns, so they were not difficult to convince about trying it." – Dr. Wilson

"Health interventions tend to be expensive. The Checklist, which is not, can lead to important clinical outcomes as well as improve safety, patient care, and staff morale. There is no downside to introducing it – only demonstrated gains. This is an easy win." – Dr. Abebe

"There are a lot of interventions which require equipment and money. Research is done, but eventually, the benefits are not available to those who tried it out. But when looking at how the Checklist was created, I realized that they were very sensitive to how it could be run, even in low-income settings. This is something we could really do." – Dr. Lapitan

related to how health workers feel about their work. For example, people are not paid well, and you want to train them on something the government is pushing. 'Why should I learn something that I will not be paid to do?' they might ask."

These practitioners have experienced firsthand that some minimum requirements are needed to create a surgical environment conducive to Checklist implementation. Or as Dr. White, an anesthesiologist who leads Checklist implementation efforts for Mercy Ships, puts it: "The issues facing LMICs pose problems of a fundamental nature at the systems level" in terms of what "safety and quality interventions the system can support, absorb, and sustain."[27]

When the political, socioeconomic, and technical foundations are in place, the Checklist primarily acts as a safety net, a reminder for surgical teams to do the things they are routinely doing but at times can overlook. The Checklist provides a prompt for those moments when something may be forgotten or missed. By contrast, when the underpinnings are weak, the Checklist acts as a dye, which reveals things that ought to be done to ensure safe surgery but are not or cannot be routinely done. For instance, the Checklist item about sterility highlights the need for and presupposes the existence of sterilization practices. Yet those may or may not be in place in a given setting, due to lack of training or resources. In such places, a negative answer to the question, "Has sterility (including indicator results) been confirmed?" will not, in and of itself, bring about a solution to a pre-existing sterilization problem. The question forcefully brings to light the issue but does not "tell people: Here is the way to move toward sterility."[2]

The Checklist thus can act as a diagnostic tool, which reveals where problems are, but does not propose a pathway to solving issues. The Checklist can be a useful basis to craft advocacy requests and engage decision makers – but not always the safety net it was originally intended to be. It "is helpful to identify gaps, but we need a way to address those," reflects Dr. Tito, who underscores how the gaps in infrastructure have, in her experience, constrained practitioners' uptake of the Checklist.

The seminal vision of the Checklist authors was that anyone could take the Checklist and introduce it in their operating room the following week. What real-life experiences have shown is that the intractable issues of resources and technical capabilities continue to stand in the way of progress. Two questions bookend the use of the checklist: the upstream question of "How do we make sites ready that are not ready?"[2] and the follow-up question, "How do we fill the 'do-next-week' gap?" Answers hold important insights to support the unfinished work of Checklist implementation across all contexts.

STRATEGIES TO GET TO SCALE AND SUSTAINED USE

As the experience of the past decade demonstrates, the Checklist is a powerful tool to improve surgical safety and has universal appeal. Yet its systemic implementation at scale is a complex endeavor.

Based on their own applied experience, champions of the Checklist have tended to fall on a spectrum, with diverging views when it comes to implementation approaches that would support scaled-up, sustained use of the Checklist. On one end of the spectrum, some practitioners advocate for continued reliance on individually committed physicians to champion the Checklist. With a growing number of staff exposed and trained to use the Checklist, those practitioners believe that the combined demonstration and snowball effects will lead to a new status quo where Checklist use becomes the norm. These tend to be practitioners who have experienced first-hand the limits and serious drawbacks of top-down, compulsory approaches, including the risk of turning the Checklist into an administrative "ticking box exercise," devoid of meaning and desired effects. Imposing a rigid particular format takes away the discretion and local autonomy that have proved key to successful implementation.[59] "The Checklist was always intended to be flexible, but the moment you make it mandatory, you rigidify it," reflects Dr. Wilson. As Dr. Berry sums up: "When you make it mandatory, unless it is very well supported already and you allow some degree of autonomy, it will not get used very well. People will say they use it, but they really don't, or not well."

"It takes time. One-by-one facility implementation is not the answer either. It will take a combination approach, which includes policy and institution-by-institution introduction. But in a generation of surgeons, it can become routine." – Dr. Thomas Weiser

PHOTO: COURTNEY STAPLES

On the other end of the spectrum, some call for the Checklist to be enforced through binding policies or practices. They are often early and isolated adopters, yearning for an institutional framework that would back their efforts. They also include practitioners who may feel powerless to expand good practices beyond their limited direct sphere of influence. Dr. Capo-Chichi sums up these aspirations: "If we could make it a national program, if we could make it be the rule, part of the protocols, and part of the trainings, then we could hope for sustainability. This is the only way to sustain the Checklist over a generation. And that can only happen at the Ministry of Health level."

Dr. Izquierdo concurs that "the Ministry of Health needs to enforce the Checklist by creating a law that makes its use forceful in every hospital." Dr. Abebe, who aspires to see the Checklist institutionalized and mandated in Ethiopia, takes this idea one step further: "The notion that you should not operate unless the Checklist is filled, period, is the next frontier. Our wish to see the checklist used should be compounded by legislation."

"The approach you take depends on where you are. Neither of the views are wrong," reflects Dr. Berry. Experience shows that both engaged clinicians and public commitments are necessary for the Checklist to be implemented at scale and in a sustainable fashion. "There is no point of a policy if no one is trained," reflects Dr. Michelle White, "but the policy can help. Sometimes people lack the support to follow things through. They can't make copies of the Checklist; they face tensions within their structures. A policy can create the necessary hooks. In places where things are very hierarchical, then a very hierarchical approach works."

Dr. Wilson, reflecting on the UK experience of mandating the Checklist, shares similar insights: "I think it is both a top-down and bottom-up approach. In the UK, if it had not been mandated, there would not have been buy-in from the CEOs, the medical director would not have taken the surgeon aside to talk to him about expectations, etc. On the other hand, if it had been mandated but no one would have been leading on the ground, this would not have worked either."

This enduring tension highlights both the value of the Checklist's plasticity, which has made it successful in its first decade (e.g. crowdsourced rollout efforts, adaptability to local contexts, non-binding guidance), and the challenges of achieving scale and sustainability without robustly tested strategies to do so. Neither a champion alone, nor a policy alone, is likely to be sufficient to achieve desired change. And indeed, lasting change tends to be driven by a combination of factors, which in the case of the Checklist and based on implementer insights, are likely to include:

- Accumulating experience and power at the level of individual implementers and institutions;
- Challenging established norms and entrenched beliefs that "nothing can be done";
- Tapping into varied motivations for adoption;
- Identifying and supporting visionary and committed leaders (including by building communities of practice);
- Stimulating demand for the Checklist, including from patients (most people will require surgery at some point in their lives and would benefit from reduced adverse outcomes);
- Modifying trainings and professional education curricula to engage the next generation;
- Building reinforcement mechanisms and adjusting incentive structures; and
- Creating enabling environments and publicly elevating successes.

Models that include these multiple dimensions and account for implementing and embedding new interventions in complex settings are key to driving wider adoption and sustained use of the Checklist in the coming decade.

PHOTO: MICHAEL MCCASKEY

TOOLS FOR CHECKLIST IMPLEMENTATION AND USE

WITHIN A SINGLE FACILITY

Ariadne Labs Implementation Manual

Ariadne Labs' implementation manual provides an intensive four-phase framework for Checklist implementation at a surgical facility. Following the provided steps, facilities are guided through building a multidisciplinary implementation team; assessing their current surgical culture and practices; engaging key leadership and stakeholders; building a facility-specific Checklist and testing it via small-scale, rapid-cycle testing; promoting the Checklist facility-wide; training staff and spreading the Checklist; and supporting its continued use through coaching.

Clean Cut Implementation Playbook

Clean Cut is a Checklist-based intervention developed by Lifebox, designed to guide facilities through the steps of improving perioperative infection prevention processes to reduce the incidence of surgical site infections. The perioperative processes that Clean Cut focuses on were selected for their importance to infection prevention, but also because they are embedded within the Surgical Safety Checklist. Therefore, the playbook provides tools and a process for introducing and using the Checklist as a mechanism for surgical site infection prevention.

PHOTO: SCOTT STREBLE

ACROSS MULTIPLE SURGICAL TEAMS

Lifebox Checklist Strategies Workshop

Lifebox's Checklist Strategies Workshop is aimed at providers who are using or are familiar with the Checklist but would benefit from methods to improve their practice. Over the course of three days, the workshop provides tools and strategies for improving Checklist use through a series of practical exercises. By pulling together surgical teams from various facilities and settings, the workshop also creates an environment where teams from similar contexts can learn from and support each other to overcome barriers to proper Checklist use.

Safer Anaesthesia from Education (SAFE) Courses

Developed jointly by the Association of Anaesthetists of Great Britain & Ireland (AAGBI) and the World Federation of Societies of Anaesthesiologists (WFSA), SAFE courses aim to help providers reach a level whereby they can deliver vigilant, competent, and safer surgical care. SAFE OR is a three-day workshop focused on the pre-, intra-, and post-operative surgical environment through lectures, small-group work, and practical scenarios.

IMPLEMENTATION AT SCALE

Mercy Ships Checklist Implementation Program

Mercy Ships is a nonprofit organization that brings volunteer medical teams and sterile operating rooms directly to people who would otherwise go without care, by deploying the *Africa Mercy*, the largest civilian hospital ship in the world. Mercy Ships has supported countrywide implementation of the checklist via a three-day workshop coupled with in-person or phone follow-ups at three months. This program employs a unique combination of both top-down and bottom-up approaches to involve individuals from all levels of government and hospital leadership to build strong support and ongoing partnerships for effective implementation.

SUPPORTING THE SURGICAL ENVIRONMENT

Sterile Processing Education Charitable Trust (SPECT)

SPECT focuses education and training on an often-neglected population: sterile processing professionals. Understanding that sterile instruments are a critical component of safe surgical systems, SPECT provides a week-long training on instrument cleaning, inspection and assembly, aseptic packaging techniques, sterilization, and storage, and supports sterile processing teams to implement systemic changes within their facilities through targeted long-term mentorship.

CONCLUSION
GETTING TO SCALE, SUSTAINING SAFER SURGICAL PRACTICES

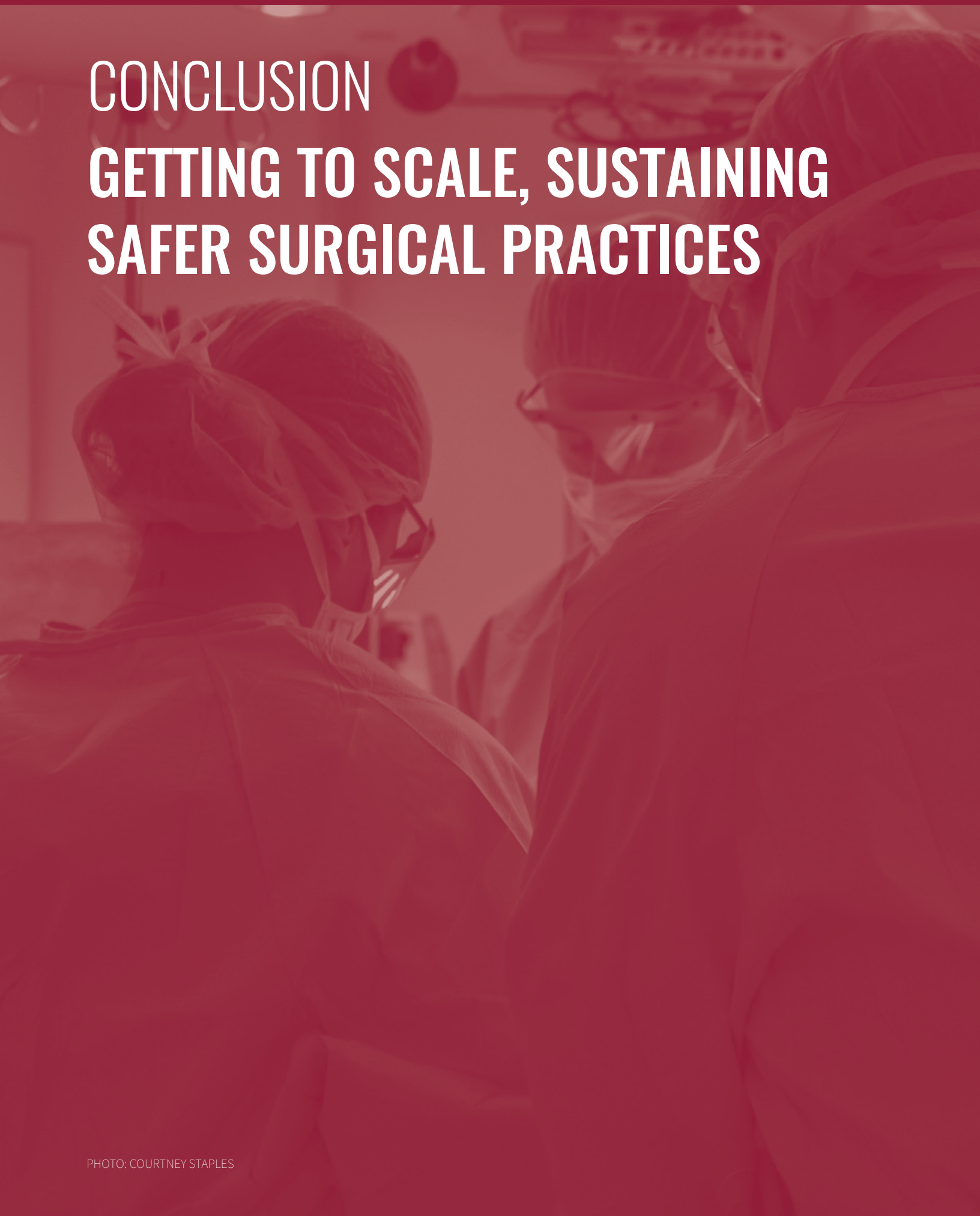


PHOTO: COURTNEY STAPLES

The uptake of the Surgical Safety Checklist around the world in a decade has been nothing short of astonishing.

From Manila to Addis Ababa, Guatemala City to Oslo, the Checklist has found its ways to operating rooms, inspiring profound changes in surgical culture and practice, and progress toward greater safety for patients around the world.

But many questions remain. How will the Checklist scale from being used in one operating room to all operating rooms in any given hospital? What is the best way to promote consistent use for all types of surgeries? At the national level, what are the pathways to expand from one institution to all institutions in a country? What are the best practices to incentivize compliance and sustained use over time? "We know that there is a tool that works, but it is not routinely used around the world," reflects Dr. Wilson, laying out the main challenges facing the Checklist as it enters its second decade: scale, compliance, and sustainability.

Positive change requires power combined with contextual awareness and concerted action. The Surgical Safety Checklist has demonstrated its potential to empower practitioners to improve patient safety. Today, greater collective efforts to **make surgical environments more conducive to Checklist implementation**, combined with **advanced implementation models** for scale and sustainability could bring the Checklist's benefits to surgery patients around the world. And if the determination of the Checklist's pioneers is an indication, the power of younger surgeons entering the workforce, more attuned to safety norms and patients' rights compared with their predecessors, may prove the missing ingredient to achieve universal and irreversible change.

As the global surgical community looks to move the needle on surgical safety, this report proposes recommendations for promoting the uptake of the surgical safety checklist (box 4).

BOX 4. RECOMMENDATIONS FOR PROMOTING UPTAKE OF THE SURGICAL SAFETY CHECKLIST

BUY-IN

Engage all relevant practitioners and partners—surgeons, anesthetists, nurses, support staff, hospital administrators, health officials—and secure senior leadership's buy-in. Partnerships between local leadership (hospital directors, surgeons) and health officials (health ministries) are often needed.

It is essential to engage surgeons early and to receive their support of this work. Staff concerns of perceived delays, workflow disruption, or workload burden caused by the Checklist must be acknowledged and addressed.

ADAPTATION

Tailor and adapt the Checklist to local realities and contexts, including addition, removal, or modification of items; redistribution of responsibilities and tasks per staff practices; and language translation. As the Checklist is not meant to be "one size fits all, " modification to local practice is encouraged.

Co-designing implementation programs with host countries and adapting teaching materials to the local culture and context are vital steps.

ACCOUNTABILITY AND SUPPORT

Balance top-down mandates with bottom-up facility-by-facility approaches to Checklist implementation, depending on the context. Neither a mandated policy alone nor a lone individual champion is likely to be sufficient to guarantee sustained Checklist use; lasting change will likely be driven by a combination of such factors. Also, proper follow-up support is critical for sustained use, including trainings and check-ins.

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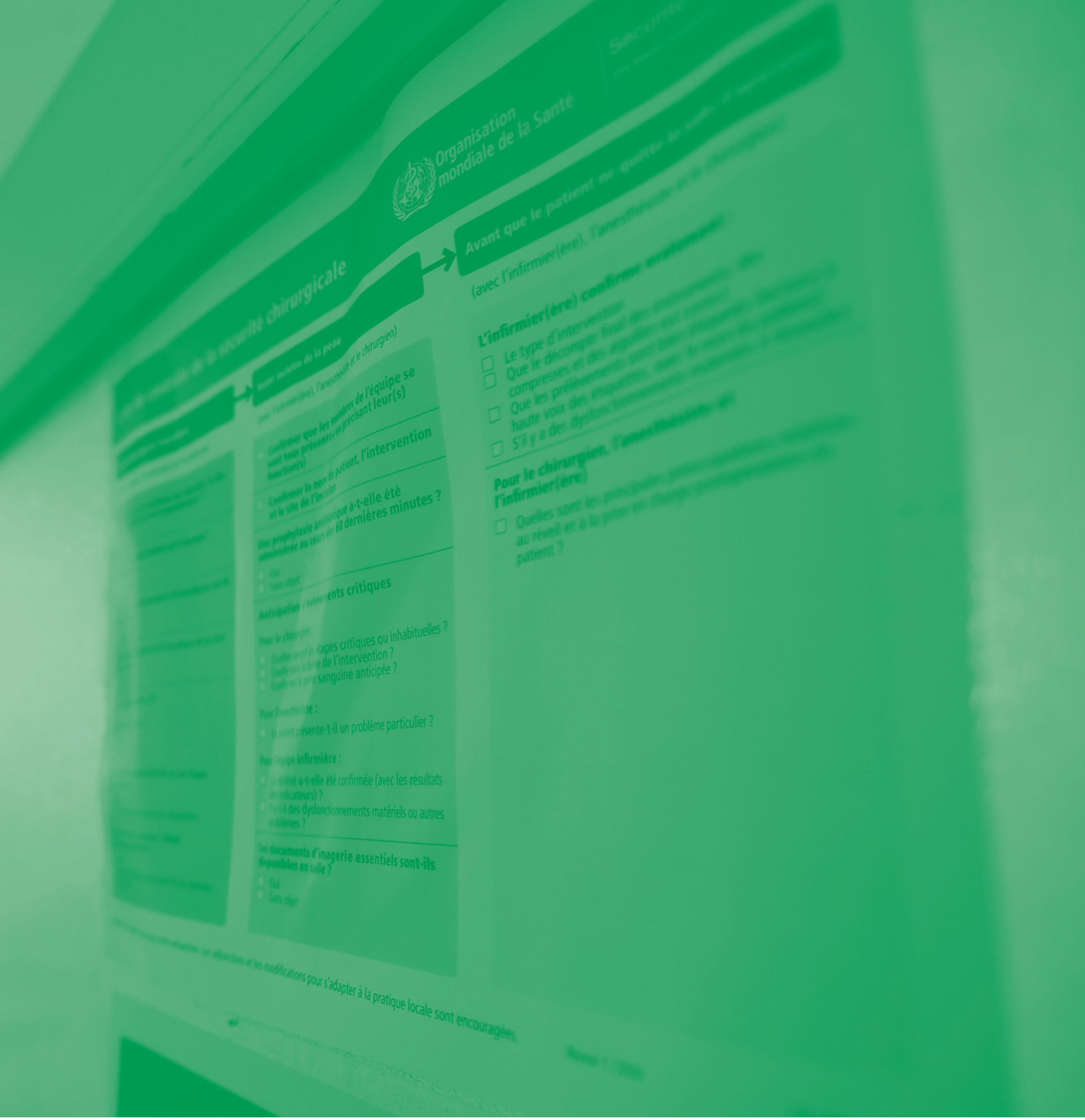

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