****

**Safer surgery journal articles
(short version)**

Update August 2021

Contents

[Introduction 3](#_Toc79066223)

[Summary of the evidence presented below 3](#_Toc79066224)

[The World Health Organization Surgical Safety Checklist and safer surgery 4](#_Toc79066225)

[Team training and safer surgery 6](#_Toc79066226)

[Briefing/debriefing and safer surgery 7](#_Toc79066227)

[Team communication and safer surgery 8](#_Toc79066228)

[Simulation team training and safer surgery 9](#_Toc79066229)

Published in August 2021 by the Health Quality & Safety Commission New Zealand,
PO Box 25496, Wellington, New Zealand.

Published under Creative Commons licence CC BY-NC 4.0, which means you are free to:
• share ‒ copy and redistribute the material in any medium or format
• adapt ‒ remix, transform, and build upon the material
under the terms outlined at: <https://creativecommons.org/licenses/by-nc/4.0/>

This document is available on the Health Quality & Safety Commission’s website:
[www.hqsc.govt.nz](http://www.hqsc.govt.nz)

Purpose of this document

This document includes the short version of the Health Quality & Safety Commission New Zealand’s repository of selected research papers on safer surgery.

The long version is available on the Commission website:

<https://www.hqsc.govt.nz/our-programmes/safe-surgery-nz/publications-and-resources/publication/4343/>

Introduction

The World Health Organization Surgical Safety Checklist (SSC) was introduced to operating rooms (ORs) in the late 2000s as an important patient safety measure. More recent evidence highlights the mutually reinforcing roles of checklist use along with enhanced multidisciplinary teamwork, briefing and debriefing practices, effective communication techniques, and multidisciplinary simulation training. Teamwork has many efficiency and safety benefits other than just preventing sentinel errors: it is the antithesis of bullying and harassment.

This document provides the evidence base for using these practices as well as evidence-based approaches to implementation.

Summary of the evidence presented below

The WHO SSC has been evaluated in longitudinal studies using pre- and post-implementation comparisons, in studies of between-hospital comparisons and in a stepped-wedge cluster randomised controlled trial (RCT). Safety benefits have been reported across surgical specialties and in acute and elective care. Systematic reviews of safety checklist use in the OR reveal substantial benefits in terms of improving patient outcomes.

Research evidence, including systematic reviews, indicates a connection between surgical multidisciplinary team training and improved knowledge, team processes and outcomes. Team training was found to improve OR processes, including: reduced incorrect surgical counts; more timely antibiotic administration, deep vein thrombosis (DVT) prophylaxis, and beta-blockade; reduced technical and procedural errors and increased compliance with briefings, checklists and time out. Team training has also been shown to enhance OR efficiency, including turnover time, cases starting on time and reduced delays. Evidence suggests that teamwork training can also: improve teamwork processes in the OR and staff attitudes towards safety; reduce communication errors and improve scores for communication between team members. However, not all studies demonstrated the effectiveness of team training. It appears that high-quality comprehensive programmes are important.

There is good evidence to support the use of surgical briefings and debriefings to reduce patient harm. Staff should foster effective briefings and handovers at every opportunity. Briefings and debriefings can reduce unexpected delays and improve communication and teamwork (see *Checklists, Briefings and Debriefings: An evidence summary*, [Health Quality and Safety Commission 2016](https://www.hqsc.govt.nz/our-programmes/safe-surgery-nz/publications-and-resources/publication/2209/)).

Systematic reviews have found that briefings:

* improve team attitudes towards safety
* decrease unexpected delays
* reduce communication failures between team members by two-thirds
* reduce the rate of non-routine surgical events by 25 percent
* effectively surface potential surgical safety hazards
* enhance the timely administration of prophylactic antibiotics and preoperative venous thromboembolism (VTE) prophylaxis
* increase efficiency
* reduce staff perception of risk and increase their sense of team collaboration
* reduce disruptions to surgery.

The Veterans Health Administration (VHA) medical team training programme showed that compliance with briefings related directly to patient mortality.

Failures in information transfer and communication adversely affect patient care, and evidence reviews underscore the importance of effective communication strategies. There are a number of tools available to improve communication in the surgical suite. Following the Commission’s [Proof of Concept project](https://www.hqsc.govt.nz/our-programmes/safe-surgery-nz/projects/surgical-teamwork-and-communication/proof-of-concept-project/), the following communication tools were identified to be rolled out to district health boards (DHBs): call-outs, closed-loop communication, the two-challenge rule and ISBAR (identify, situation, background, assessment, recommendation).

Closed-loop communication has been shown to enhance the speed of critical actions. Checklist- or proforma-based interventions can help in surgical handoffs or handovers. ISBAR is included in the guidelines of some professional organisations. Barriers and enablers to speaking up are largely modifiable, and this may include training senior staff to ‘hear’ concerns more clearly.

Systematic reviews of multidisciplinary team simulations identify them as an opportunity for system-level improvement and to help address issues like hierarchy. Simulation training helps improve crisis resource management skills, including attitudes, teamwork and communication, with possible transfer to the clinical setting and indications of improved patient outcomes. In New Zealand, a comprehensive simulation course has been associated with improved teamwork scores in the ORs at two large hospitals.

The World Health Organization Surgical Safety Checklist and safer surgery (in reverse chronological order)

Healey A, Søfteland E, Harthug S, et al. 2020. A health economic evaluation of the World Health Organization Surgical Safety Checklist: A single center assessment. *Ann Surg*. Online first. DOI: 10.1097/sla.0000000000004300 (accessed 16 June 2021).

Haugen AS, Wæhle HV, Almeland SK, et al. 2019. Causal analysis of World Health Organization's Surgical Safety Checklist implementation quality and impact on care processes and patient outcomes: Secondary analysis from a large stepped wedge cluster randomized controlled trial in Norway. *Ann Surg* 269(2): 283–90. DOI: 10.1097/sla.0000000000002584 (accessed 16 June 2021).

Abbott TEF, Ahmad T, Phull MK, et al. 2018. The surgical safety checklist and patient outcomes after surgery: A prospective observational cohort study, systematic review and meta-analysis. *Br J Anaesth* 120(1): 146–55. DOI: 10.1016/j.bja.2017.08.002 (accessed 16 June 2021).

Martis WR, Hannam JA, Lee T, et al. 2016. Improved compliance with the World Health Organization Surgical Safety Checklist is associated with reduced surgical specimen labelling errors. *NZ Med J* 129(1441): 63–67.

Mayer EK, Sevdalis N, Rout S, et al. 2016. Surgical Checklist Implementation Project: The impact of variable WHO checklist compliance on risk-adjusted clinical outcomes after national implementation: A longitudinal study. *Ann Surg* 263(1): 58–63. DOI: 10.1097/sla.0000000000001185 (accessed 16 June 2021).

Perry W, Civil I, Mitchell S, et al. 2015. Reducing perioperative harm in New Zealand: The WHO Surgical Safety Checklist, briefings and debriefings, and venous thromboembolism prophylaxis. *NZ Med J* 128(1424): 54–67.

Haugen AS, Søfteland E, Almeland SK, et al. 2015. Effect of the World Health Organization checklist on patient outcomes: A stepped wedge cluster randomized controlled trial. *Ann Surg* 261(5): 821–28. DOI: 10.1097/sla.0000000000000716 (accessed 16 June 2021).

Bergs J, Hellings J, Cleemput I, et al. 2014. Systematic review and meta-analysis of the effect of the World Health Organization surgical safety checklist on postoperative complications. *Br J Surg* 101(3): 150–58. DOI: 10.1002/bjs.9381 (accessed 16 June 2021).

Lyons VE, Popejoy LL. 2014. Meta-analysis of surgical safety checklist effects on teamwork, communication, morbidity, mortality, and safety. *West J Nurs Res* 36(2): 245–61. DOI: 10.1177/0193945913505782 (accessed 16 June 2021).

Russ S, Rout S, Sevdalis N, et al. 2013. Do safety checklists improve teamwork and communication in the operating room? A systematic review. *Ann Surg* 258(6): 856–71. DOI: 10.1097/sla.0000000000000206 (accessed 16 June 2021).

van Klei WA, Hoff RG, van Aarnhem EE, et al. 2012. Effects of the introduction of the WHO “Surgical Safety Checklist” on in-hospital mortality: A cohort study. *Ann Surg* 255(1): 44–49. DOI: 10.1097/SLA.0b013e31823779ae (accessed 16 June 2021).

de Vries EN, Prins HA, Crolla RM, et al. 2010. Effect of a comprehensive surgical safety system on patient outcomes. *N Engl J Med* 363(20): 1,928–37. DOI: 10.1056/NEJMsa0911535 (accessed 16 June 2021).

Haynes AB, Weiser TG, Berry WR, et al. 2009. A surgical safety checklist to reduce morbidity and mortality in a global population. *N Engl J Med* 360(5): 491–99. DOI: 10.1056/NEJMsa0810119 (accessed 16 June 2021).

Lingard L, Regehr G, Orser B, et al. 2008. Evaluation of a preoperative checklist and team briefing among surgeons, nurses, and anesthesiologists to reduce failures in communication. *Arch Surg* 143(1): 12–17; discussion 18. DOI: 10.1001/archsurg.2007.21 (accessed 16 June 2021).

Westman M, Takala R, Rahi M, et al. 2020. The need for surgical safety checklists in neurosurgery now and in the future: A systematic review. *World Neurosurg* 134: 614–28. e613. DOI: 10.1016/j.wneu.2019.09.140 (accessed 16 June 2021).

Patel J, Ahmed K, Guru KA, et al. 2014. An overview of the use and implementation of checklists in surgical specialities: A systematic review. *Int J Surg* 12(12): 1,317–23. DOI: 10.1016/j.ijsu.2014.10.031 (accessed 16 June 2021).

Weiser TG, Haynes AB, Dziekan G, et al. 2010. Effect of a 19-item surgical safety checklist during urgent operations in a global patient population. *Ann Surg* 251(5): 976–80. DOI: 10.1097/SLA.0b013e3181d970e3 (accessed 16 June 2021).

Weinger MB. 2021. Time out! Rethinking surgical safety: More than just a checklist. *BMJ Qual Saf*. Online first, March 23. DOI: 10.1136/bmjqs-2020-012600 (accessed 17 June 2021).

de Jager E, McKenna C, Bartlett L, et al. 2016. Postoperative adverse events inconsistently improved by the World Health Organization Surgical Safety Checklist: A systematic literature review of 25 studies. *World J Surg* 40(8): 1,842–58. DOI: 10.1007/s00268-016-3519-9 (accessed 17 June 2021).

Haugen AS, Søfteland E, Sevdalis N, et al. 2020. Impact of the Norwegian National Patient Safety Program on implementation of the WHO Surgical Safety Checklist and on perioperative safety culture. *BMJ Open Qual* 9(3). Online first. DOI: 10.1136/bmjoq-2020-000966 (accessed 17 June 2021).

Taplin C, Romano L, Tacey M, et al. 2020. Everyone has their role to play during the World Health Organization Surgical Safety Checklist in Australia: A prospective observational study. *World J Surg* 44(6): 1,755–61. DOI: 10.1007/s00268-020-05397-2 (accessed 17 June 2021).

Weller JM, Jowsey T, Skilton C, et al. 2018. Improving the quality of administration of the Surgical Safety Checklist: A mixed methods study in New Zealand hospitals. *BMJ Open* 8(12): e022882. DOI: 10.1136/bmjopen-2018-022882 (accessed 17 June 2021).

Ong AP, Devcich DA, Hannam J, et al. 2016. A ‘paperless’ wall-mounted surgical safety checklist with migrated leadership can improve compliance and team engagement. *BMJ Qual Saf* 25(12): 971–76. DOI: 10.1136/bmjqs-2015-004545 (accessed 17 June 2021).

Bergs J, Lambrechts F, Simons P, et al. 2015. Barriers and facilitators related to the implementation of surgical safety checklists: A systematic review of the qualitative evidence. *BMJ Qual Saf* 24(12): 776–86. DOI: 10.1136/bmjqs-2015-004021 (accessed 17 June 2021).

Russ SJ, Sevdalis N, Moorthy K, et al. 2015. A qualitative evaluation of the barriers and facilitators toward implementation of the WHO surgical safety checklist across hospitals in England: Lessons from the “Surgical Checklist Implementation Project”. *Ann Surg* 261(1): 81–91. DOI: 10.1097/sla.0000000000000793 (accessed 17 June 2021).

Sendlhofer G, Mosbacher N, Karina L, et al. 2015. Implementation of a surgical safety checklist: Interventions to optimize the process and hints to increase compliance. *PLoS One* 10(2): e0116926. DOI: 10.1371/journal.pone.0116926 (accessed 17 June 2021).

Hannam JA, Glass L, Kwon J, et al. 2013. A prospective, observational study of the effects of implementation strategy on compliance with a surgical safety checklist. *BMJ Qual Saf* 22(11): 940–47. DOI: 10.1136/bmjqs-2012-001749 (accessed 17 June 2021).

Team training and safer surgery

Babic B, Volpe AA, Merola S, et al. 2018. Sustained culture and surgical outcome improvement. *Am J Surg* 216(5): 841–45. DOI: 10.1016/j.amjsurg.2018.02.016. Epub 2018 Feb 16.

Hughes AM, Gregory ME, Joseph DL, et al. 2016. Saving lives: A meta-analysis of team training in healthcare. *J Appl Psychol* 101(9): 1,266–304. DOI: 10.1037/apl0000120 (**full text not freely available**).

Sacks GD, Shannon EM, Dawes AJ, et al. 2015. Teamwork, communication and safety climate: A systematic review of interventions to improve surgical culture. *BMJ Qual Saf* 24(7): 458–67. DOI: 10.1136/bmjqs-2014-003764 (accessed 17 June 2021).

Weller J, Boyd M. 2014. Making a difference through improving teamwork in the operating room: A systematic review of the evidence on what works. *Current Anesthesiology Reports* 4(2): 77–83. DOI: 10.1007/s40140-014-0050-0 (accessed 17 June 2021).

Young-Xu Y, Neily J, Mills PD, et al. 2011. Association between implementation of a medical team training program and surgical morbidity. *Arch Surg* 146(12): 1,368–73. DOI: 10.1001/archsurg.2011.762 (accessed 17 June 2021).

Neily J, Mills PD, Young-Xu Y, et al. 2010. Association between implementation of a medical team training program and surgical mortality. *JAMA* 304(15): 1,693–700. DOI: 10.1001/jama.2010.1506 (accessed 17 June 2021).

Leuschner S, Leuschner M, Kropf S, et al. 2019. Non-technical skills training in the operating theatre: A meta-analysis of patient outcomes. *Surgeon* 17(4): 233–43. DOI: 10.1016/j.surge.2018.07.001 (accessed 17 June 2021).

Sun R, Marshall DC, Sykes MC, et al. 2018. The impact of improving teamwork on patient outcomes in surgery: A systematic review. *Int J Surg* 53: 171–77. DOI: 10.1016/j.ijsu.2018.03.044 (accessed 17 June 2021).

Buljac-Samardzic M, Doekhie KD, van Wijngaarden JDH. 2020. Interventions to improve team effectiveness within health care: A systematic review of the past decade. *Hum Resour Health* 18(1): 2. DOI: 10.1186/s12960-019-0411-3 (accessed 17 June 2021).

Hill NM, Fisher DM. 2019. Reinforcing collaboration and teamwork: The role of team communication and training. *ANZ J Surg* 89(7–8): 957–61. DOI: 10.1111/ans.15272 (accessed 17 June 2021).

McCulloch P, Morgan L, New S, et al. 2017. Combining systems and teamwork approaches to enhance the effectiveness of safety improvement interventions in surgery: The Safer Delivery of Surgical Services (S3) Program. *Ann Surg* 265(1): 90–96. DOI: 10.1097/sla.0000000000001589 (accessed 17 June 2021).

Weller J, Boyd M, Cumin D. 2014. Teams, tribes and patient safety: Overcoming barriers to effective teamwork in healthcare. *Postgrad Med J* 90(1061): 149–54. DOI: 10.1136/postgradmedj-2012-131168 (accessed 17 June 2021).

Salas E, Almeida SA, Salisbury M, et al. 2009. What are the critical success factors for team training in health care? *Jt Comm J Qual Patient Saf* 35(8): 398–405. DOI: 10.1016/s1553-7250(09)35056-4 (accessed 17 June 2021).

Briefing/debriefing and safer surgery

Leong K, Hanskamp-Sebregts M, van der Wal RA, et al. 2017. Effects of perioperative briefing and debriefing on patient safety: A prospective intervention study. *BMJ Open* 7(12): e018367. DOI: 10.1136/bmjopen-2017-018367 (accessed 17 June 2021).

Civil I, Shuker C. 2015. Briefings and debriefings in one surgeon's practice. *ANZ J Surg* 85(5): 321–23. DOI: 10.1111/ans.13017 (**full text not freely available**).

Glymph DC, Olenick M, Barbera S, et al. 2015. Healthcare Utilizing Deliberate Discussion Linking Events (HUDDLE): A systematic review. *AANA J* 83(3): 183–88.

Jain AL, Jones KC, Simon J, et al. 2015. The impact of a daily pre-operative surgical huddle on interruptions, delays, and surgeon satisfaction in an orthopedic operating room: A prospective study. *Patient Saf Surg* 9: 8. DOI: 10.1186/s13037-015-0057-6 (accessed 17 June 2021).

McDowell DS, McComb SA. 2014. Safety checklist briefings: A systematic review of the literature. *AORN J* 99(1): 125–37. e113. DOI: 10.1016/j.aorn.2013.11.015 (accessed 17 June 2021).

Hill N. 2021. Perceptions of value: A qualitative study of the barriers to the routine use of preoperative briefing in New Zealand. *ANZ Journal of Surgery: Abstract Journal Safety in Surgical Practice* (8 May): QA003. DOI: 10.1111/ans.16825?af=R (accessed 17 June 2021).

Fruhen L, Carpini JA, Parker SK, et al. 2020. Perceived barriers to multiprofessional team briefings in operating theatres: A qualitative study. *BMJ Open* 10(2): e032351. DOI: 10.1136/bmjopen-2019-032351 (accessed 17 June 2021).

Robinson LD, Paull DE, Mazzia LM, et al. 2010. The role of the operating room nurse manager in the successful implementation of preoperative briefings and postoperative debriefings in the VHA Medical Team Training Program. *J Perianesth Nurs* 25(5): 302–06. DOI: 10.1016/j.jopan.2010.07.003 (accessed 17 June 2021).

Paull DE, Mazzia LM, Izu B, et al. 2009. Predictors of successful implementation of preoperative briefings and postoperative debriefings after medical team training. *Am J Surg* 198(5): 675–78. DOI: 10.1016/j.amjsurg.2009.07.008 (accessed 17 June 2021).

Team communication and safer surgery

Etherington N, Wu M, Cheng-Boivin O, et al. 2019. Interprofessional communication in the operating room: A narrative review to advance research and practice. *Can J Anaesth* 66(10): 1,251–60. DOI: 10.1007/s12630-019-01413-9 (accessed 17 June 2021).

Pattni N, Arzola C, Malavade A, et al. 2019. Challenging authority and speaking up in the operating room environment: A narrative synthesis. *Br J Anaesth* 122(2): 233–44. DOI: 10.1016/j.bja.2018.10.056 (accessed 17 June 2021).

Weller JM, Long JA. 2019. Creating a climate for speaking up. *Br J Anaesth* 122(6): 710–13. DOI: 10.1016/j.bja.2019.03.003 (accessed 17 June 2021).

El-Shafy IA, Delgado J, Akerman M, et al. 2018. Closed-loop communication improves task completion in pediatric trauma resuscitation. *J Surg Educ* 75(1): 58–64. DOI: 10.1016/j.jsurg.2017.06.025 (accessed 17 June 2021).

von Dossow V, Zwissler B. 2016. Recommendations of the German Association of Anesthesiology and Intensive Care Medicine (DGAI) on structured patient handover in the perioperative setting: The SBAR concept. *Anaesthesist* 65(Suppl 1): 1–4. DOI: 10.1007/s00101-016-0237-5 (accessed 17 June 2021).

Pucher PH, Johnston MJ, Aggarwal R, et al. 2015. Effectiveness of interventions to improve patient handover in surgery: A systematic review. *Surgery* 158(1): 85–95. DOI: 10.1016/j.surg.2015.02.017 (accessed 17 June 2021).

Gillespie BM, Chaboyer W, Murray P. 2010. Enhancing communication in surgery through team training interventions: A systematic literature review. *AORN J* 92(6): 642–57. DOI: 10.1016/j.aorn.2010.02.015 (accessed 17 June 2021).

Nagpal K, Vats A, Lamb B, et al. 2010. Information transfer and communication in surgery: A systematic review. *Ann Surg* 252(2): 225-239. DOI: 10.1097/SLA.0b013e3181e495c2 (accessed 17 June 2021).

Simulation team training and safer surgery

Armenia S, Thangamathesvaran L, Caine AD, et al. 2018. The role of high-fidelity team-based simulation in acute care settings: A systematic review. *Surg J (N Y)* 4(3): e136–e151. DOI: 10.1055/s-0038-1667315 (accessed 17 June 2021).

Weller JM, Cumin D, Civil ID, et al. 2016. Improved scores for observed teamwork in the clinical environment following a multidisciplinary operating room simulation intervention. *NZ Med J* 129(1439): 59–67.

Weller J, Civil I, Torrie J, et al. 2016. Can team training make surgery safer? Lessons for national implementation of a simulation-based programme. *NZ Med J* 129(1,443): 9–17.

Fung L, Boet S, Bould MD, et al. 2015. Impact of crisis resource management simulation-based training for interprofessional and interdisciplinary teams: A systematic review. *J Interprof Care* 29(5): 433–44. DOI: 10.3109/13561820.2015.1017555 (accessed 17 June 2021).

Boet S, Bould MD, Fung L, et al. 2014. Transfer of learning and patient outcome in simulated crisis resource management: A systematic review. *Can J Anaesth* 61(6): 571–82. DOI: 10.1007/s12630-014-0143-8 (accessed 17 June 2021).

Paull DE, Deleeuw LD, Wolk S, et al. 2013. The effect of simulation-based crew resource management training on measurable teamwork and communication among interprofessional teams caring for postoperative patients. *J Contin Educ Nurs* 44(11): 516–24. DOI: 10.3928/00220124-20130903-38 (accessed 17 June 2021).

Weller J, Long JA, Beaver P, et al. (2020). Evaluation of the effect of multidisciplinary simulation-based team training on patients, staff and organisations: Protocol for a stepped-wedge cluster-mixed methods study of a national, insurer-funded initiative for surgical teams in New Zealand public hospitals. *BMJ Open* 10(2): e032997. DOI: 10.1136/bmjopen-2019-032997 (accessed 17 June 2021).

Long JA, Jowsey T, Henderson KM, et al. 2020. Sustaining multidisciplinary team training in New Zealand hospitals: A qualitative study of a national simulation-based initiative. *NZ Med J* 133(1516): 10–21.

Arriaga AF, Gawande AA, Raemer DB, et al. 2014. Pilot testing of a model for insurer-driven, large-scale multicenter simulation training for operating room teams. *Ann Surg* 259(3): 403–10. DOI: 10.1097/sla.0000000000000342. (accessed 17 June 2021).