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What is perioperative harm and how can we reduce it?

Mr Ian Civil
Clinical Lead
Perioperative Harm Advisory Group
Health Quality & Safety Commission

Health Quality & Safety Commission New Zealand
Kupu Taurangi Hauora o Aotearoa

National Patient Safety Campaign

What is perioperative harm?

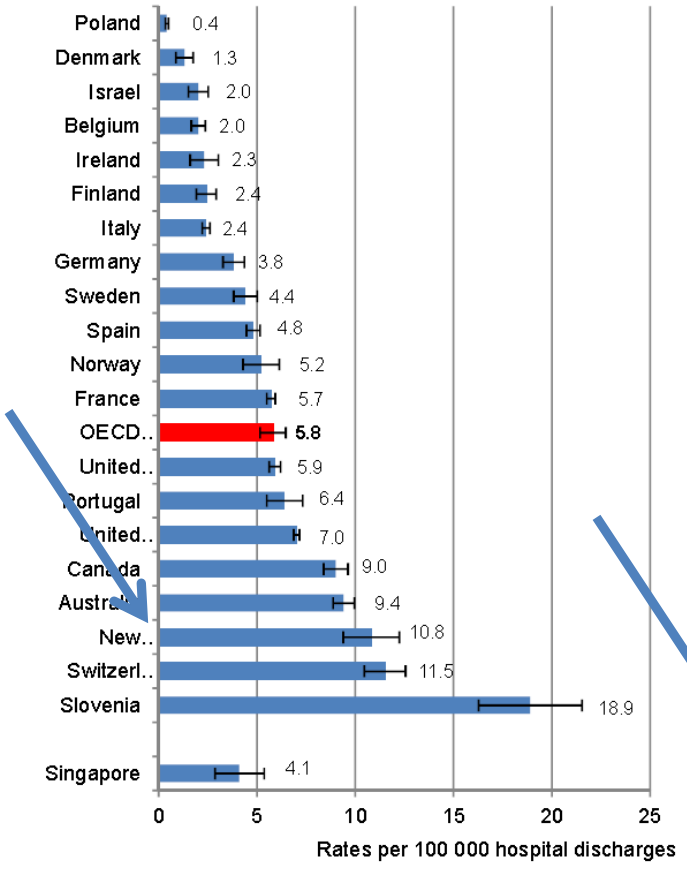
- An undesirable outcome (harm) associated with any aspect of an operation (intervention)
  - Preoperative
  - Intraoperative
  - Postoperative
- Slips, lapses (omissions), mistakes and violations leading to harm

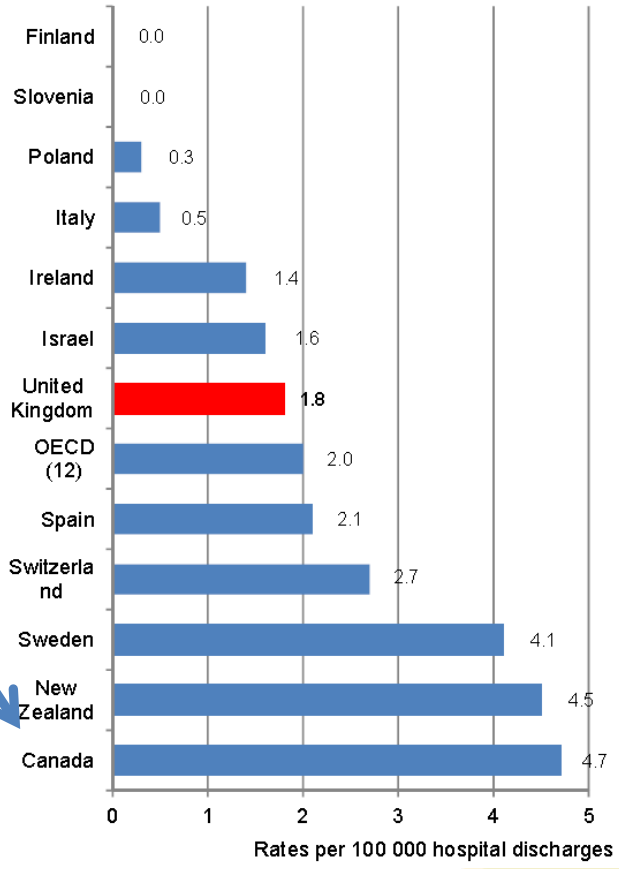
Perioperative harm includes:

- DVT/PE
- Wound infection
- Medication error
- Wrong side/site surgery
- Retained objects
- Falls
- Any other complication

Foreign body results

Figure 2. Foreign body left in during procedure (crude rate per 100 000 discharges)





Adults 15-99 years old

Children 0-14 years old

And there are worse things that could happen....

- C, a 14 year old, had unfortunately been diagnosed with osteosarcoma of his left tibia.
- He had previously been well, but now required chemotherapy, radiotherapy, and a left below-knee amputation.

And there are worse things that could happen....

- C's medical notes contained an error from an earlier hospital admission when a doctor accidentally wrote that his cancer was affecting the right lower limb. This mistake was transposed into the discharge summary for that admission, which was not subsequently corrected.

And there are worse things that could happen....

- When C was seen by the orthopaedic consultant about his surgery, the consultant correctly realised that the amputation was to be performed on the left side. But when the house surgeon saw him for the pre-surgical assessment, she reviewed the most recent discharge summary with the error. The mistake was then copied over onto the pre-surgical documentation and, later, onto the theatre list.

And there are worse things that could happen....

- On the day of his surgery C was unable to be reviewed by the surgical staff, so his leg was not marked before he was brought into theatre. In addition, the consultant who had seen C previously was unwell, so the senior registrar was covering the operating list.

And there are worse things that could happen....

- In the operating theatre the staff went through their usual pre-surgical checklist but due to time pressure the notes were not reviewed in detail, so they failed to catch the mistake. The surgeon made incisions in the lateral, medial and anterior aspects of the right leg. At that point, a medical student who had read the notes in detail and was present in theatre raised concerns about the discrepancy in the notes.

And there are worse things that could happen....

- The surgeon immediately ceased the procedure while the staff conferred about the correct side.
- The incisions in the right leg were closed, and the procedure was carried out on the correct leg. An adverse event form was filled out and a treatment injury claim was lodged.

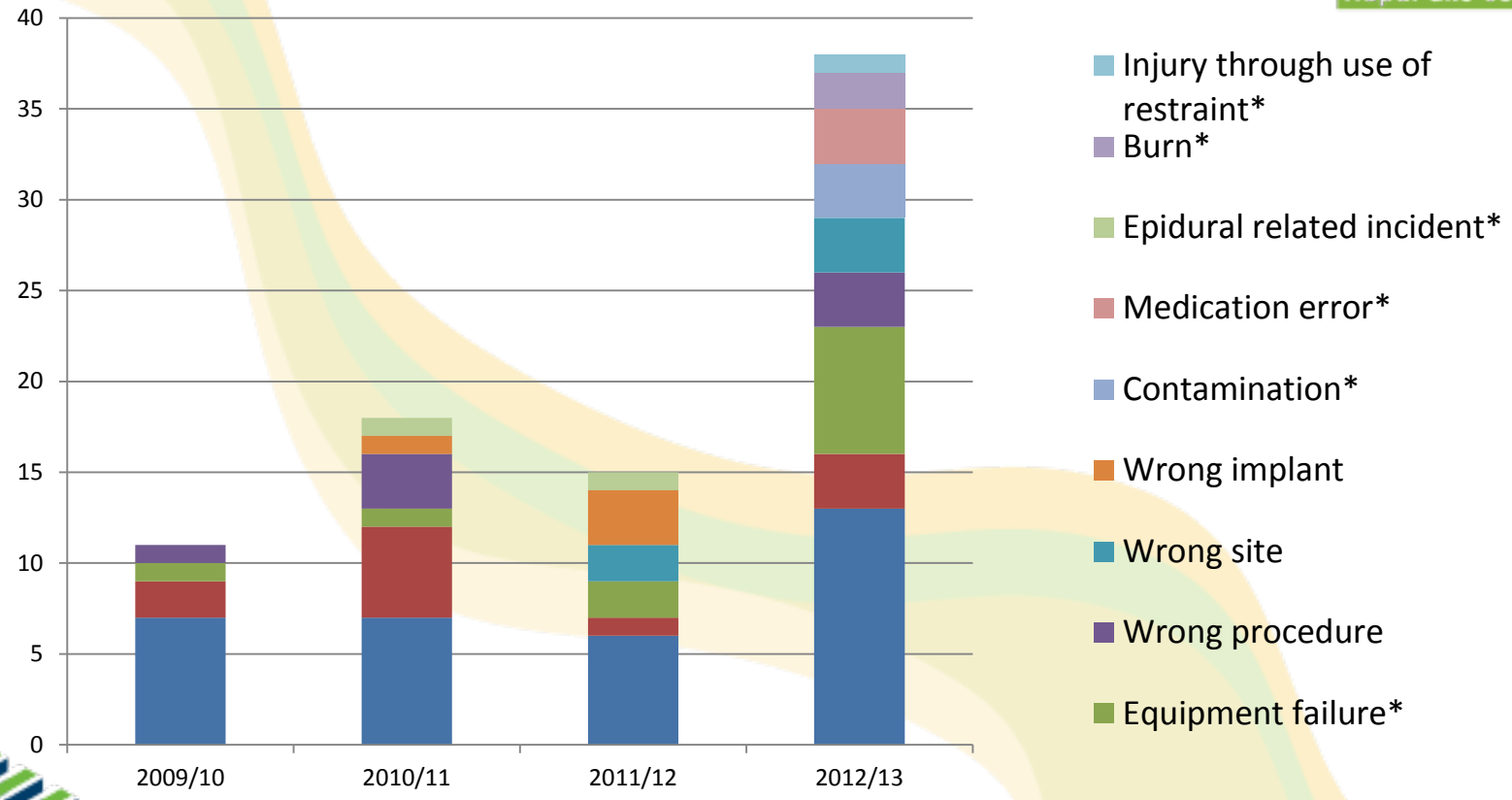
And there are worse things that could happen....

- ACC was able to accept the inadvertent skin incisions to the right leg as treatment injuries. C went on to make a good recovery from his cancer, with a positive long-term prognosis.

A few 2012/13 serious adverse events

- Bilateral brachial plexus injury as a result of positioning during surgery
- Burn from chlorhexidine igniting
- Air in bypass system resulting in cerebellar infarct
- Wrong patient had cardiac procedure
- Infected pacemaker sites (x3) due to inadequate skin-prep

Perioperative – reported serious adverse events



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Health care requires a team approach

- Analyses of adverse events: communication and teamwork failures common contributory factors
- 25% of OR communications fail: inappropriate timing, inaccurate or missing content, failure to resolve issues
- >35% have visible effects: tension in the team, inefficiency, waste of resources, delay or procedural error – (Lingard et al. 2004)

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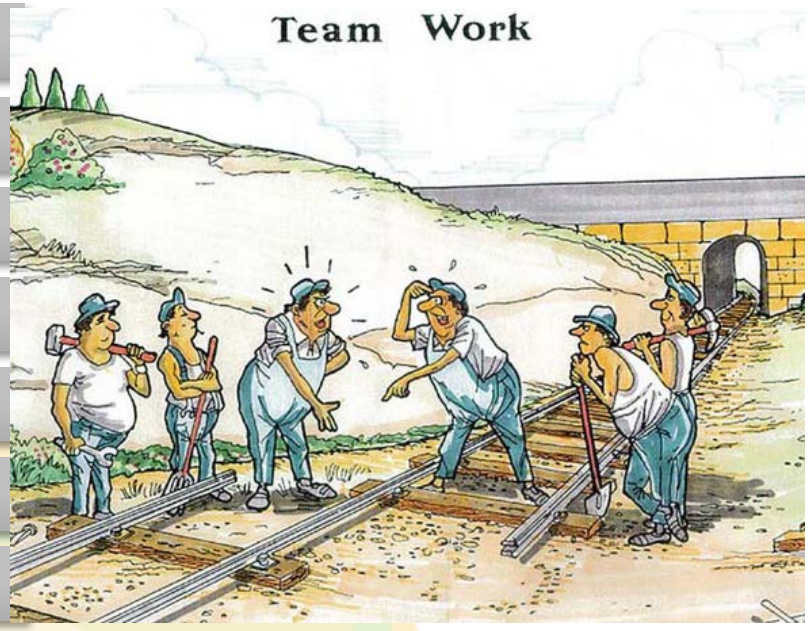
Leadership and communication

1	Teamwork impossible without good communication
2	Requires everyone to have a similar vision
3	Done poorly it commonly leads to errors and omissions
4	Needs training and practice
5	Needs everyone engaged in a common task
6	Needs to be present throughout the duration of the task
7	Good teamwork requires effective leadership



Aviation leadership

- The pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft

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Teamwork in surgery

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Aren't doctors and nurses all team players already?

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Hospitals stop ignoring bad behavior by doctors and start assigning anger management

March 5, 2013 5:52 am by Kaiser Health News - Stories (Full text) | 2 Comments

NOT ALWAYS

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At a critical point in a complex abdominal operation, a surgeon was handed a device that didn't work because it had been loaded incorrectly by a surgical technician. Furious that she couldn't use it, the surgeon slammed it down, accidentally breaking the technician's finger. "I felt pushed beyond my limits," recalled the surgeon, who was suspended for two weeks and told to attend an anger management course for doctors.

What are the features associated with good teamwork in the OR?

Is there a "Big Five" in Teamwork?
Eduardo Salas, Dana E. Sims and C. Shawn Burke
Small Group Research 2005 36: 555
DOI: 10.1177/1046496405277134

- Team leadership
- Mutual performance monitoring
- Backup behaviour
- Adaptability
- Team orientation

What are the features associated with good teamwork in the OR?

- Team leadership
  - Able to direct and coordinate the activities of other team members, assess team performance, assign tasks, motivate team members and establish a positive environment

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What are the features associated with good teamwork in the OR?

- Mutual performance monitoring
  - Apply appropriate strategies to monitor teammate performance

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What are the features associated with good teamwork in the OR?

- Backup behaviour
  - Ability to anticipate other team members needs and the ability to shift workload among members to achieve balance

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What are the features associated with good teamwork in the OR?

- Adaptability
  - Ability to adjust strategies based on information gathered in the environment

What are the features associated with good teamwork in the OR?

- Team orientation
  - Belief in the importance of the team goals over other individual members goals

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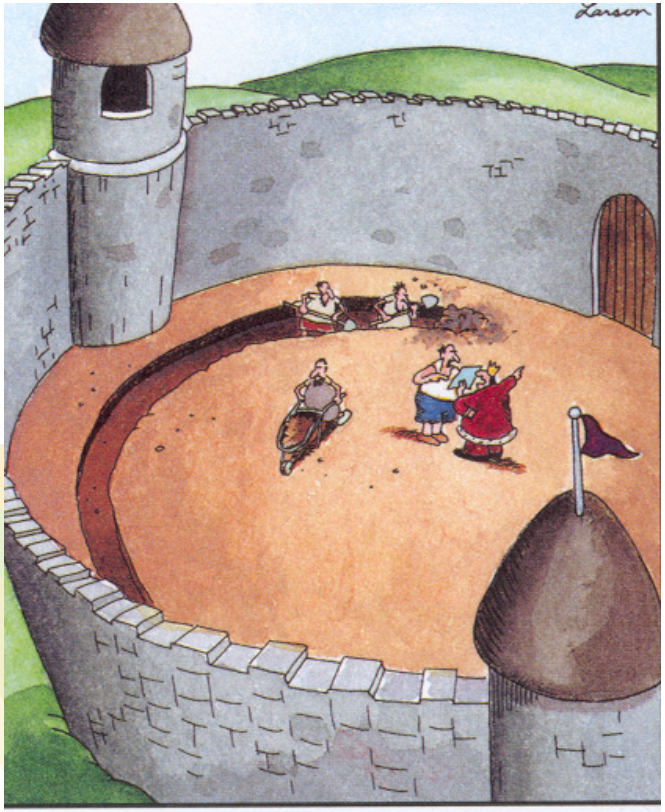
Shared mental models

- An organising knowledge structure of the relationships between the task the team is engaged in and how the team members will interact
  - Anticipating and predicting each others needs
  - Indentifying changes in the team or task and implicitly adjusting strategies as needed



Suddenly, a heated exchange took place between the king and the moat contractor.

Mutual trust

- The shared belief that team members will perform their roles and protect the interests of their teammates
  - Information sharing
  - Willingness to admit mistakes and accept feedback

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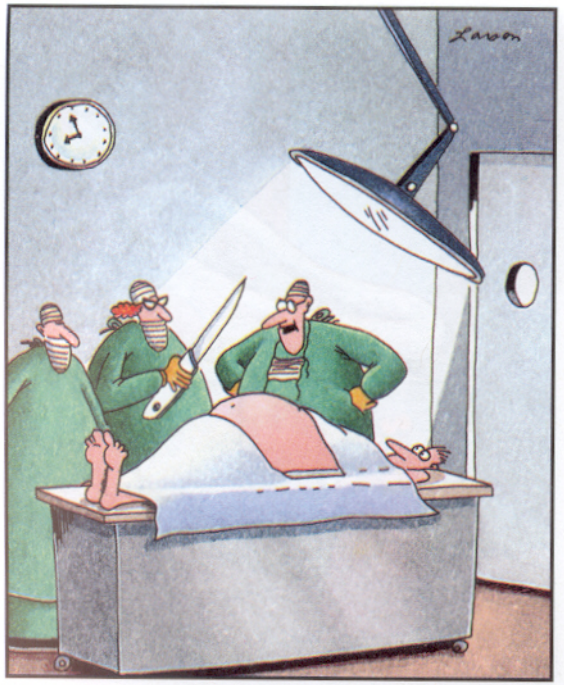
Closed-loop communication

- The exchange of information between the sender and the receiver irrespective of the medium
  - Following up with team members to ensure message was received.
  - Acknowledging that a message was received.
  - Clarifying with the sender of the message that the message received is the same as the intended message.



"And what is *this*, Nurse Wilkens? I distinctly asked for the *big* scalpel! Big scalpel! Big scalpel!"

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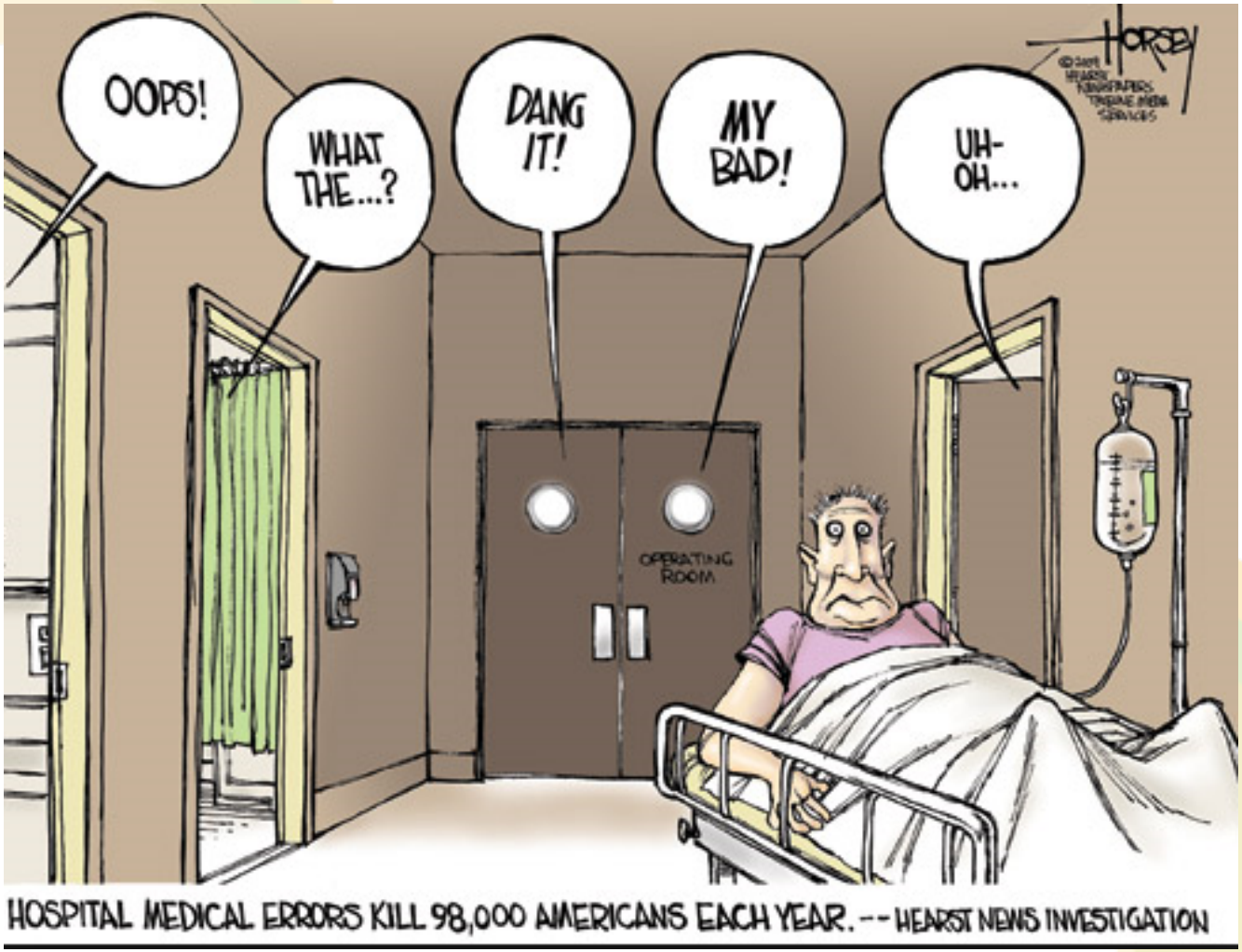
The angelic operating team?

The reality?


OOPS!
WHAT THE...?
DANG IT!
MY BAD!
UH-OH...
OPERATING ROOM
HORSEY
HOSPITAL MEDICAL ERRORS KILL 98,000 AMERICANS EACH YEAR. -- HEARST NEWS INVESTIGATION

ACC treatment injury

	Total 2005/6 – 2010/11
Equipment lost / separated	19
Equipment retained	74
Unnecessary surgery	50
Wrong site surgery	48
Wrong Surgery	14
Total	**205**

Reducing perioperative harm

Effective interventions

- Perioperative harm can be reduced by:
    - *Effective team work and communication strategies* such as briefings and debriefings
    - *Effective* use of the World Health Organization Surgical Safety Checklist

The NEW ENGLAND JOURNAL of MEDICINE

SPECIAL ARTICLE

A Surgical Safety Checklist to Reduce Morbidity and Mortality in a Global Population

Alex B. Haynes, M.D., M.P.H., Thomas G. Weiser, M.D., M.P.H., William R. Berry, M.D., M.P.H., Stuart R. Lipsitz, Sc.D., Abdel-Hadi S. Breizat, M.D., Ph.D., E. Patchen Dellinger, M.D., Teodoro Herbosa, M.D., Sudhir Joseph, M.S., Pascience L. Kibatala, M.D., Marie Carmela M. Lapitan, M.D., Alan F. Merry, M.B., Ch.B., F.A.N.Z.C.A., F.R.C.A., Krishna Moorthy, M.D., F.R.C.S., Richard K. Reznick, M.D., M.Ed., Bryce Taylor, M.D., and Atul A. Gawande, M.D., M.P.H., for the Safe Surgery Saves Lives Study Group*

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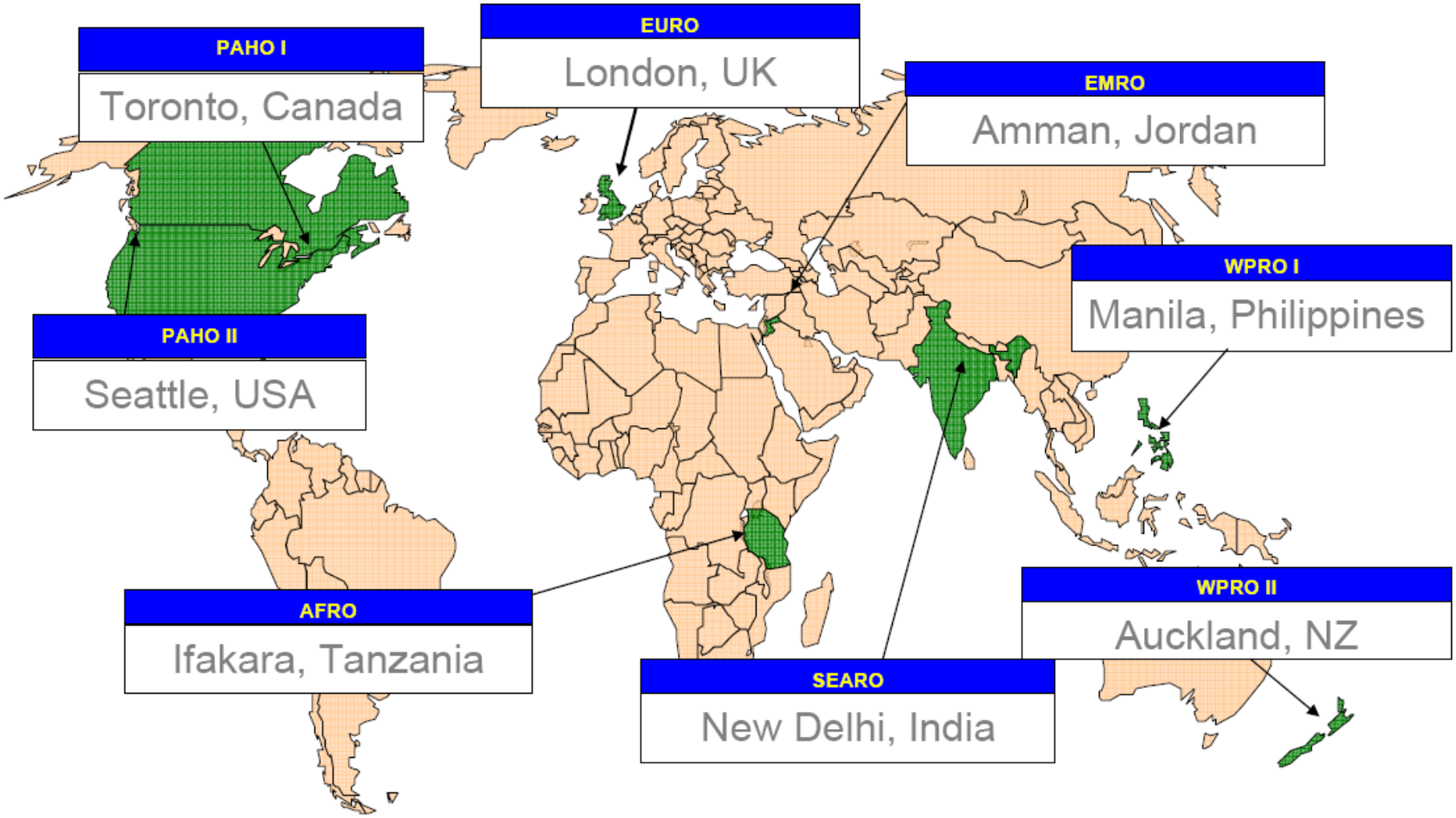
Kupu Taurangi Hauora o Aotearoa

World Health Organization

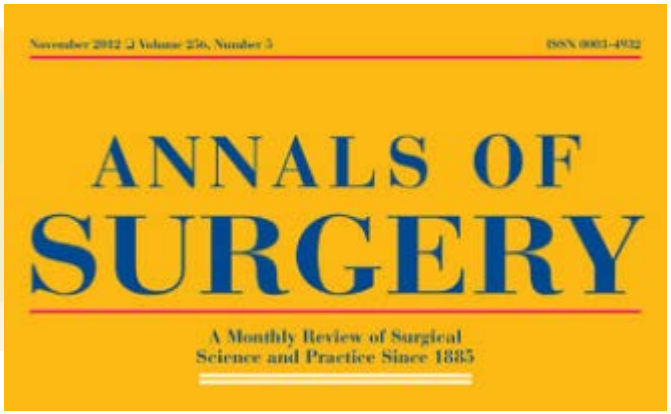
Safe Surgery Saves Lives
Checklist Pilot Sites



Results – all sites

	Baseline	Checklist	P value
Cases	3733	3955	-
Death	1.5%	0.8%	0.003
Any Complication	11.0%	7.0%	<0.001
SSI	6.2%	3.4%	<0.001
Unplanned Reoperation	2.4%	1.8%	0.047

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



ORIGINAL ARTICLE

Effects of the Introduction of the WHO "Surgical Safety Checklist" on In-Hospital Mortality

A Cohort Study

W. A. van Klei, MD, PhD, R. G. Hoff, MD, PhD,* E. E. H. L. van Aarnhem, MD,†*
R. K. J. Simmermacher, MD, PhD,‡ L. P. E. Regli, MD, PhD,§ T. H. Kappen, MD, L. van Wolfswinkel, MD, PhD,**
C. J. Kalkman, MD, PhD, W. F. Buhre, MD, PhD,* and L. M. Peelen, PhD*¶*

From the *Division of Perioperative Care and Emergency Medicine; †Division of Heart and Lungs; ‡Division of Surgical Specialties; §Division of Neurosciences; ¶Division Julius Centre for Health Sciences and Primary Care, University Medical Centre Utrecht, Utrecht, NL.

Annals of Surgery • Volume 255, Number 1, January 2012

Effects of introduction of SSCL in Utrecht

- Methods
  - All adult patients being admitted for a procedure from 2007-2010
  - Checklist introduced April, 2009
  - Outcome – 30 day mortality
- Results
  - 25,513 patients, 43% after checklist introduction
  - Mortality dropped from 3.13%-2.85% (OR 0.91)

Effects of introduction of SSCL in Utrecht

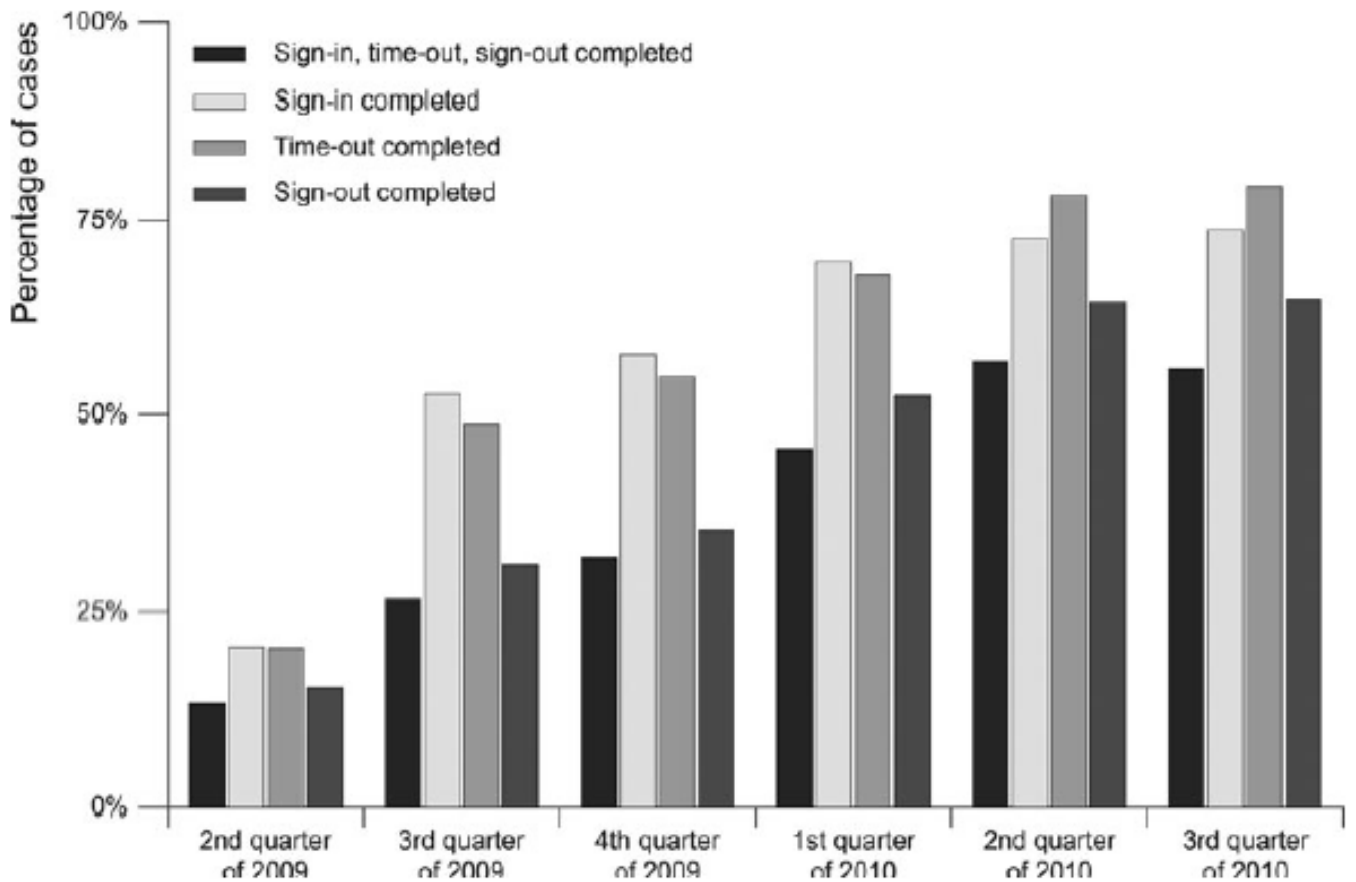


FIGURE 1. Checklist compliance per trimester after April 1, 2009.

Effects of introduction of SSCL in Utrecht

TABLE 3. Association Between WHO's Checklist Compliance and 30-Day In-Hospital Mortality, Adjusted for Confounding Factors

	Beta*	Odds Ratio (95% CI)
Checklist compliance		
Before implementation, not completed	Reference	
After implementation, fully completed	–0.81	0.44 (0.28–0.70)
After implementation, partly completed	0.09	1.09 (0.78–1.52)
After implementation, not completed	0.15	1.16 (0.86–1.56)

Conclusions

- Mortality decreased after introduction of the checklist
- Mortality strongly associated with checklist compliance
- Checklist compliance more important than the actual checklist

The NEW ENGLAND JOURNAL of MEDICINE

The NEW ENGLAND JOURNAL of MEDICINE

SPECIAL ARTICLE

Introduction of Surgical Safety Checklists in Ontario, Canada

David R. Urbach, M.D., Anand Govindarajan, M.D., Refik Saskin, M.Sc., Andrew S. Wilton, M.Sc., and Nancy N. Baxter, M.D., Ph.D.

N Engl J Med 2014;370:1029-38.
DOI: 10.1056/NEJMsa1308261

Introduction of Surgical Safety Checklists in Ontario, Canada

David R. Urbach, M.D., Anand Govindarajan, M.D., Refik Saskin, M.Sc., Andrew S. Wilton, M.Sc., and Nancy N. Baxter, M.D., Ph.D.

Table 1. Characteristics of the Patients.*

Characteristic	Before Checklist Introduction (N = 109,341)	After Checklist Introduction (N = 106,370)
	number (percent)	
Procedure status		
Elective	97,040 (88.7)	93,699 (88.1)
Emergency	12,301 (11.3)	12,671 (11.9)
Admission category		
Ambulatory	66,660 (61.0)	64,718 (60.8)
Inpatient	42,681 (39.0)	41,652 (39.2)
Procedure type†		
Eye	21,578 (19.7)	21,471 (20.2)
Orocraniofacial	9,663 (8.8)	9,582 (9.0)
Digestive	12,867 (11.8)	13,206 (12.4)
Genitourinary	17,785 (16.3)	16,340 (15.4)
Musculoskeletal	31,381 (28.7)	30,554 (28.7)
Other	9,855 (9.0)	9,410 (8.8)

Introduction of Surgical Safety Checklists in Ontario, Canada

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Table 2. Surgical Outcomes before and after Introduction of a Surgical Safety Checklist.*

Outcome	Before Checklist Introduction	After Checklist Introduction	P Value†
Rate of death in the hospital or within 30 days after discharge — % (95% CI)			
Unadjusted	0.70 (0.65–0.75)	0.66 (0.61–0.71)	0.27
Adjusted	0.71 (0.66–0.76)	0.65 (0.60–0.70)	0.07
Length of hospital stay — days (95% CI)‡			
Unadjusted	5.07 (5.01–5.13)	5.11 (5.05–5.17)	0.02
Adjusted	5.11 (5.08–5.14)	5.07 (5.04–5.10)	0.003
Rate of emergency department visit within 30 days after discharge — % (95% CI)			
Unadjusted	10.28 (10.10–10.46)	10.71 (10.52–10.90)	0.001
Adjusted	10.44 (10.26–10.62)	10.55 (10.37–10.73)	0.37
Rate of readmission within 30 days after discharge — % (95% CI)			
Unadjusted	3.08 (3.00–3.18)	3.17 (3.07–3.28)	0.21
Adjusted	3.11 (3.01–3.22)	3.14 (3.03–3.24)	0.76
Rate of complications — % (95% CI)			
Unadjusted	3.80 (3.69–3.92)	3.87 (3.76–3.99)	0.41
Adjusted	3.86 (3.76–3.96)	3.82 (3.71–3.92)	0.53

Introduction of Surgical Safety Checklists in Ontario, Canada

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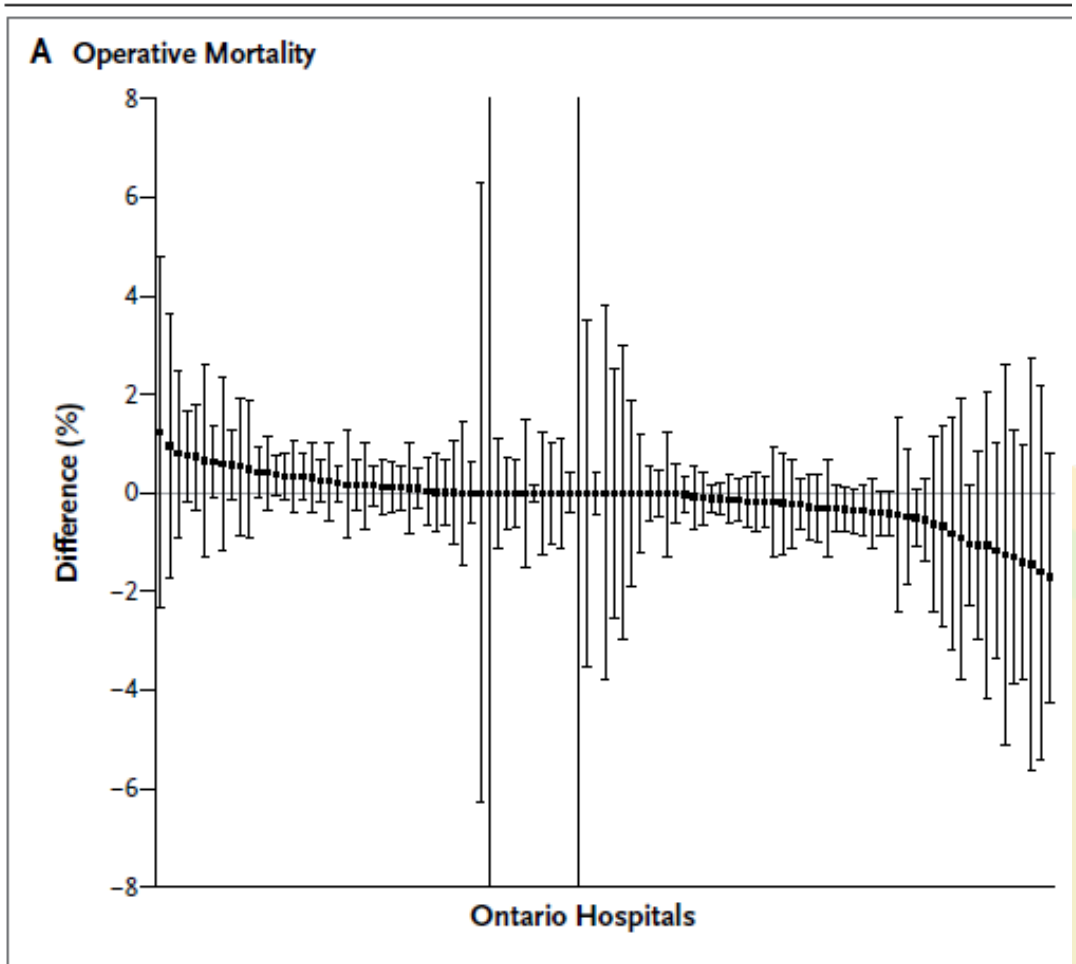

The Checklist Conundrum

Lucian L. Leape, M.D

- It is not act of ticking off a checklist that reduces complications – the checklist is merely a tool for ensuring that communication occurs
- Implementing a checklist is difficult
- Hospitals need help to implement a checklist
- Gaming is universal – in the absence of direct monitoring by observation true compliance is unknown
- Full implementation takes time

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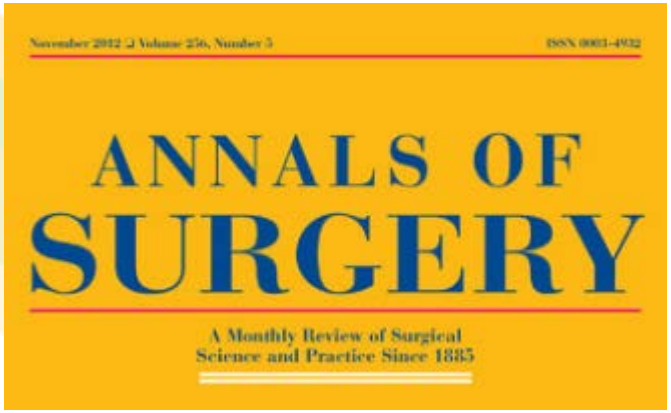
The Checklist Conundrum

Lucian L. Leape, M.D

- Likely reasons for failure of the checklist to work in Ontario were
  - Not actually used
  - Did not use locally modified checklist so engagement was probably poor
  - Underpowered
  - Unlikely effect would have been seen within three months



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ORIGINAL ARTICLE

OPEN

Effect of the World Health Organization Checklist on Patient Outcomes

A Stepped Wedge Cluster Randomized Controlled Trial

Arvid Steinar Haugen, MSc,† Eirik Søfteland, MD, PhD,* Stian K. Almeland, MD,‡ Nick Sevdalis, PhD,§ Barthold Vonen, MD, PhD,¶ Geir E. Eide, PhD,||** Monica W. Nortvedt, PhD,†† and Stig Harthug, MD, PhD‡‡†*

HEALTH QUALITY & SAFETY COMMISSION NEW ZEALAND
Kupu Taurangi Hauora o Aotearoa

Annals of Surgery Volume 00, Number 00, 2014

Effect of the World Health Organization Checklist on Patient Outcomes

A Stepped Wedge Cluster Randomized Controlled Trial

- Two hospitals in Norway
  - 1100 bed tertiary teaching hospital
  - 300 bed community hospital
- Five surgical specialties
  - Urology
  - GS
  - Orthopaedics
  - Neurosurgery
  - Cardiothoracic

- WHO SSCL adapted to Norwegian environment
- Specialty start determined at random by draw

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Effect of the World Health Organization Checklist on Patient Outcomes

A Stepped Wedge Cluster Randomized Controlled Trial

FIGURE 1. Design of the stepped wedge cluster randomized controlled SSC trial in 2 hospitals in western Norway in 2009–2010. Order of the SSC introduction to the clusters was randomized. White box indicates controls with care as usual; colored box, SSC intervention.

Effect of the World Health Organization Checklist on Patient Outcomes

A Stepped Wedge Cluster Randomized Controlled Trial

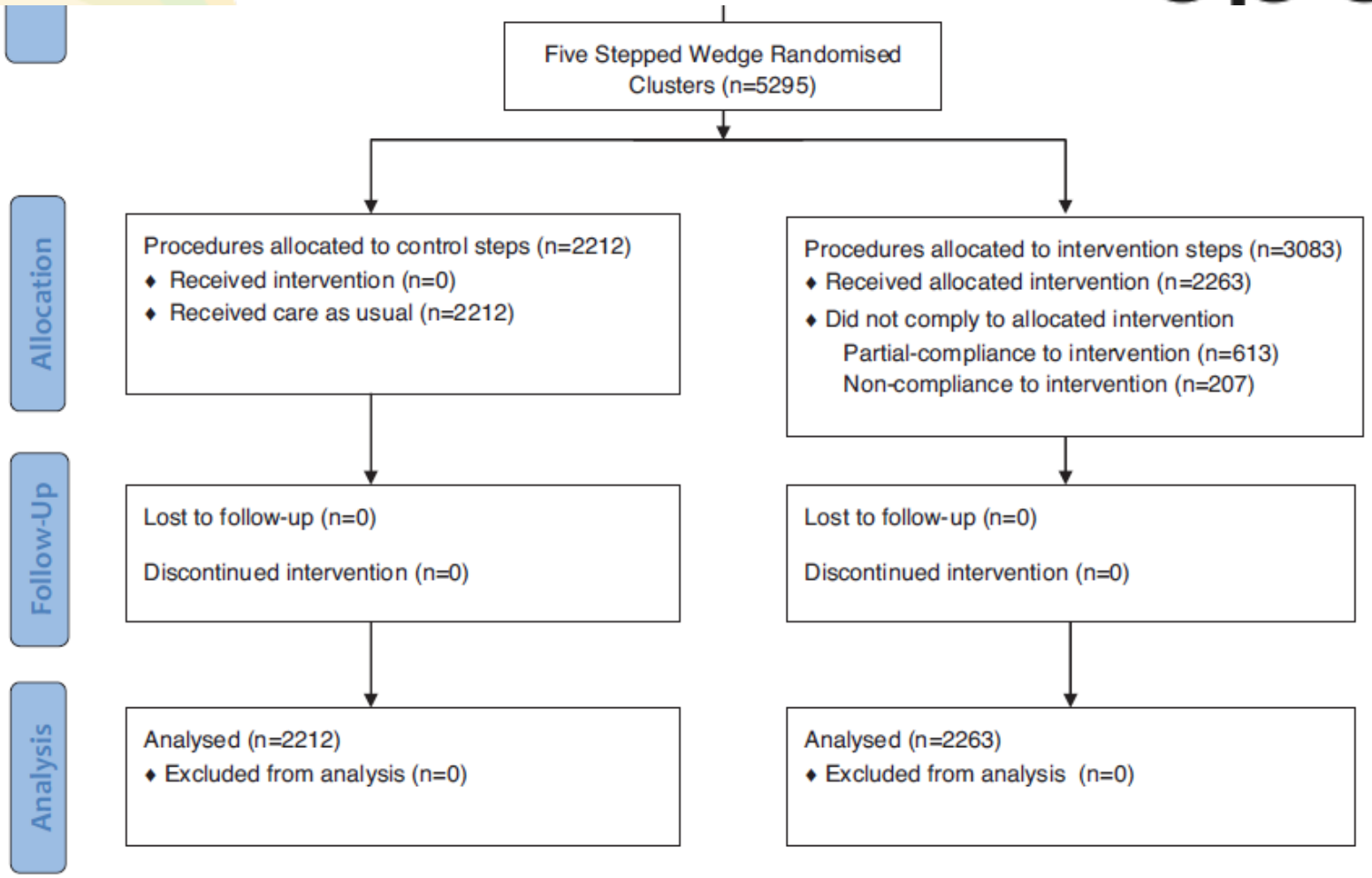

FIGURE 2. CONSORT 2010 flow diagram of the stepped wedge cluster randomized Surgical Safety Checklist intervention trial.

Effect of the World Health Organization Checklist on Patient Outcomes

A Stepped Wedge Cluster Randomized Controlled Trial

- 2212 controls vs 2263 SSCL cases
- Complications decreased from 19.6% to 11.5% ($p<0.001$)
- Absolute risk reduction 8.4 (95% CI 6.3-8.5)
- Reduction in complications stayed significant even when adjusting for confounding factors
- Mean LOS decreased by 0.8 days
- Overall reduction in mortality from 1.6%-1.0%

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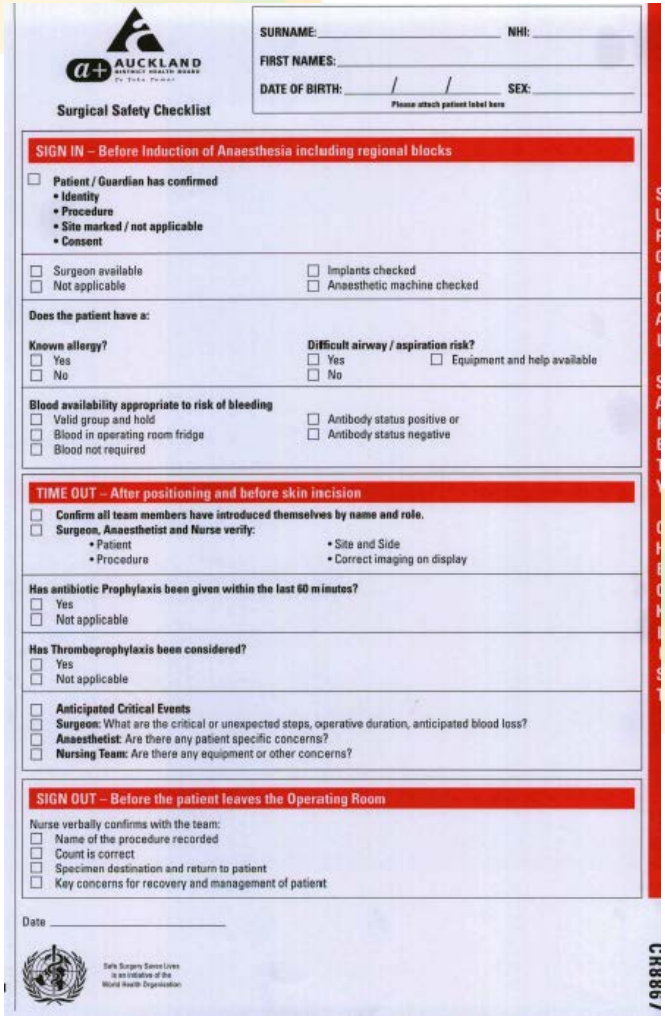
What about effective checklist usage?



AUCKLAND DISTRICT HEALTH BOARD

Surgical Safety Checklist

SURNAME: _____ NHI: _____

FIRST NAMES: _____

DATE OF BIRTH: ___/___/___ SEX: _____

Please attach patient label here

SIGN IN – Before Induction of Anaesthesia including regional blocks

☐ **Patient / Guardian has confirmed**
- **Identity**
- **Procedure**
- **Site marked / not applicable**
- **Consent**

☐ Surgeon available ☐ Implants checked
☐ Not applicable ☐ Anaesthetic machine checked

Does the patient have a:

Known allergy? ☐ Yes ☐ No

Difficult airway / aspiration risk? ☐ Yes ☐ Equipment and help available ☐ No

Blood availability appropriate to risk of bleeding
☐ Valid group and hold ☐ Antibody status positive or
☐ Blood in operating room fridge ☐ Antibody status negative
☐ Blood not required

TIME OUT – After positioning and before skin incision

☐ **Confirm all team members have introduced themselves by name and role.**
☐ **Surgeon, Anaesthetist and Nurse verify:**
- Patient
- Procedure
- Site and Side
- Correct imaging on display

Has antibiotic Prophylaxis been given within the last 60 minutes?
☐ Yes ☐ Not applicable

Has Thromboprophylaxis been considered?
☐ Yes ☐ Not applicable

☐ **Anticipated Critical Events**
☐ **Surgeon:** What are the critical or unexpected steps, operative duration, anticipated blood loss?
☐ **Anaesthetist:** Are there any patient specific concerns?
☐ **Nursing Team:** Are there any equipment or other concerns?

SIGN OUT – Before the patient leaves the Operating Room

Nurse verbally confirms with the team:
☐ Name of the procedure recorded
☐ Count is correct
☐ Specimen destination and return to patient
☐ Key concerns for recovery and management of patient

Date _____

Safe Surgery Saves Lives is an initiative of the World Health Organization

CR886/

- Is it about completing this form properly and ticking the boxes (and signing at the bottom)?
- Or is it about engaging appropriately in the process?

Time out – After positioning and before skin incision **Surgeon**

Surgeon, Anaesthetist and Nurse verify:

- Patient Name
- Procedure
- Site Marking + Side
- Positioning
- Correct imaging on display

Has antibiotic prophylaxis been given within the last 60 minutes?

Measures or plans for thromboprophylaxis during surgery considered?

Is blood availability status appropriate to risk of bleeding?

Concerns or potential critical events?

- Surgeon
- Anaesthetist
- Nursing Team

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

HEALTH QUALITY & SAFETY COMMISSION NEW ZEALAND
Kupu Taurangi Hauora o Aotearoa

WHO Surgical Safety Checklist
Quick Assess Tool V3.2
Time Out

Site: _____

Date: _____

Time Out

1. Was time out completed?

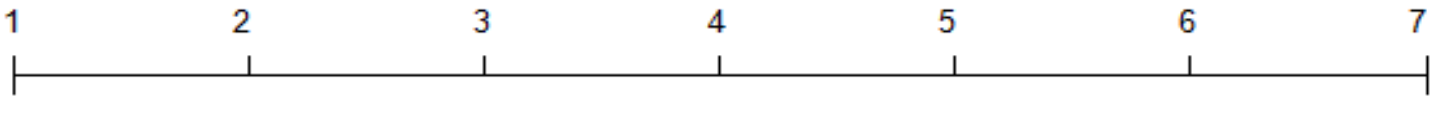
☐ Yes ☐ No

2. Was time out run by the surgeon?

☐ Yes ☐ No → If No, then by whom: _____

3. Team engagement—please rate team engagement at time out according to the following criteria:

All team members participate in the Checklist process in an engaged and attentive manner supportive of the process.



Assessment of checklist use

Poor

NOT SUPPORTIVE

- Someone says something like "This is a waste of time."

NOT ENGAGED

- Key members talk on the phone or to each other during time out.
- The surgeon says something like "Let's get on with the checklist," but then walks out of the room while it is being administered.
- Key members continue with preoperative tasks during the Checklist, attempting to multi-task.
- The registrar occupies self with other activities instead of paying attention.

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Kupu Taurangi Hauora o Aotearoa

Assessment of checklist use

Poor

NOT SUPPORTIVE

- Someone says something like "This is a waste of time."

NOT ENGAGED

- Key members talk on the phone or to each other during time out.
- The surgeon says something li checklist," but then walks out administered.
- Key members continue with p Checklist, attempting to multi-
- The registrar occupies self wit paying attention.

Excellent

SUPPORTIVE

- Surgeon or anaesthetist says something like "Thank you, Jane [to checklist reader]. Could everyone pay attention please? This is important."

ENGAGED

- All team members stop other activities and concentrate on the Checklist.
- Someone asks a question about something that he or she did not understand.
- Anaesthetist refers to patient chart to verify critical patient information as it is read out.

Sign out – Immediately following first surgical count **Nurse**

Nurse verbally confirms with the team:

- Count is correct
- Confirm the surgical procedure
- Specimen description, quantity and patient identification correct
- Concerns for recovery and postoperative management of patient
- Post operative plans for thromboprophylaxis considered

Perioperative harm

- Some (not all) is avoidable
- Checklists are designed to help error-free surgery
- Fatigue a feature of lack of engagement
- Good teamwork reduces perioperative harm
- Good teamwork associated with adaptability, backup behaviour, mutual performance monitoring and good team orientation

Leadership and communication in the perioperative setting

- Collective leadership a challenging concept
- Requires *excellent* communication and teamwork
- Helped by prompts and guidelines

Health Quality & Safety Commission New Zealand
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Hāpai ake te toiora

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National Patient Safety Campaign