Environmental cleaning: The cost-effectiveness of the CLEEN study, latest trials and the unknowns

IPC TOUR 2025

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www.cleenstudy.com

Avondale UNIVERSITY

NSW GOVERNMENT Health Central Coast Local Health District

HMRI Hunter Medical Research Institute

Declarations

CLEEN study

- Nationally competitive government grant, NHMRC Emerging Leadership Investigator grant (Prof Brett Mitchell), (GNT2008392), administered by Avondale University
  - In kind support from Hunter Medical Research Institute and GAMA Healthcare Australia
  - No role in design, data collection, analysis

IPC tour

- Travel costs have been arranged and paid for
- Do not and have not received fees or payment for this or other talks.

Overview of talk

- CLEEN study (very brief)
- Discuss cost-effectiveness and use CLEEN study as a case example
- Latest evidence
- The unknowns

The CLEANING AND ENHANCED DISINFECTION study

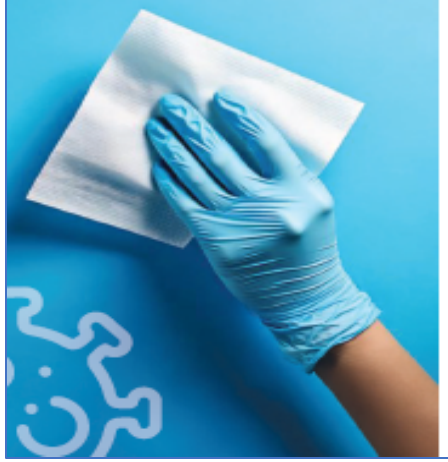
First RCT to examine the impact of improved cleaning of shared medical equipment on HAIs

Extra cleaning of shared equipment

CLEEN STUDY

STUDY WEBSITE
cleenstudy.com

MAIN PAPER



Does improved cleaning and disinfection of shared equipment reduce healthcare associated infections?

Summary of the study, key results and implications

The problem

Pathogens can be transferred through the environment, including shared equipment, to patients in hospital

Cleaning of shared equipment is often **not done** in hospitals

The importance of clean shared equipment has **not been quantified in an RCT**

What we did

A **world first** randomised control trial in one Australian hospital

Quantified **14 healthcare associated infections** over 36 weeks using a point prevalence survey

Three hours of extra dedicated cleaning for shared equipment, supported with training

Cleaning involved the use of a **2 in 1 detergent disinfectant wipe**

Audits of cleaning thoroughness with feedback of results in refresher training to help improve cleaning

What we found

5002 **in-patient participants** were included in the study

The intervention was associated with a **reduction** of **-34.5%** in healthcare associated infections

Findings emphasise the **need for dedicated approaches** for cleaning shared equipment.

Implications

Improving the cleaning and disinfection of shared equipment **significantly reduces** healthcare associated infections

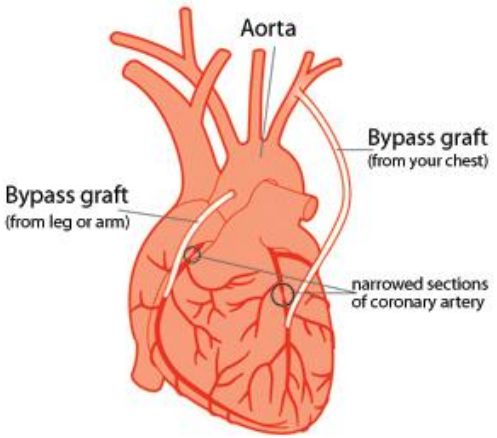
Cost-effectiveness

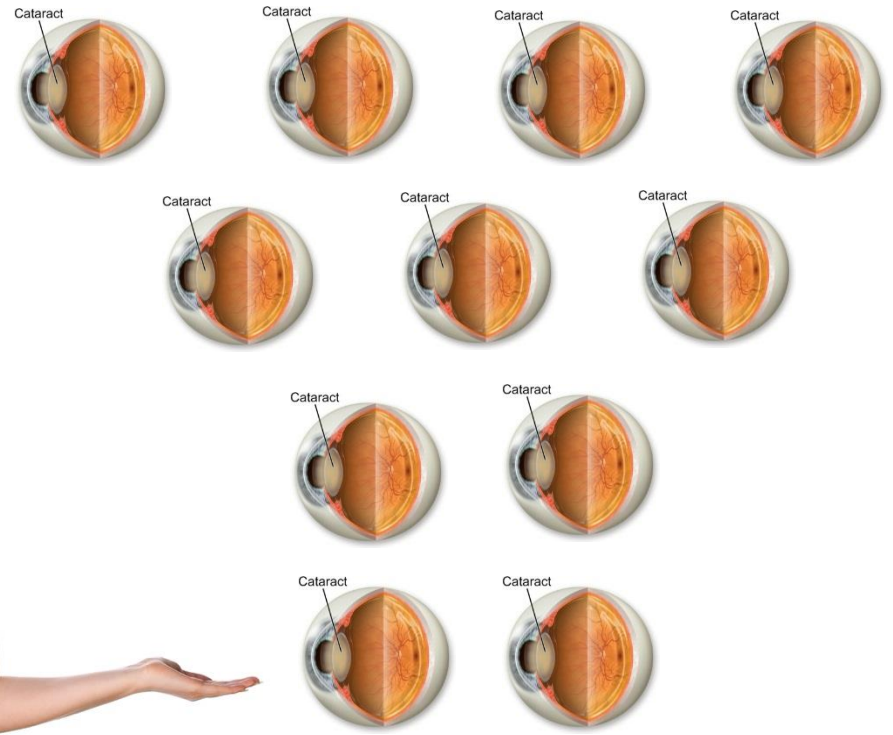
Health Economics

- Increasing popularity
- Clinician upskilling required
- Hard to get funding within the health system without an economic argument
- High level of importance with decision-makers

Economics in Healthcare

- Every decision to do something, means something else is not done





Economics in IPC

More time hand hygiene

More time educating

More time on surveillance

Less time on sinks

Less time HAP prevention

Less time on procurement

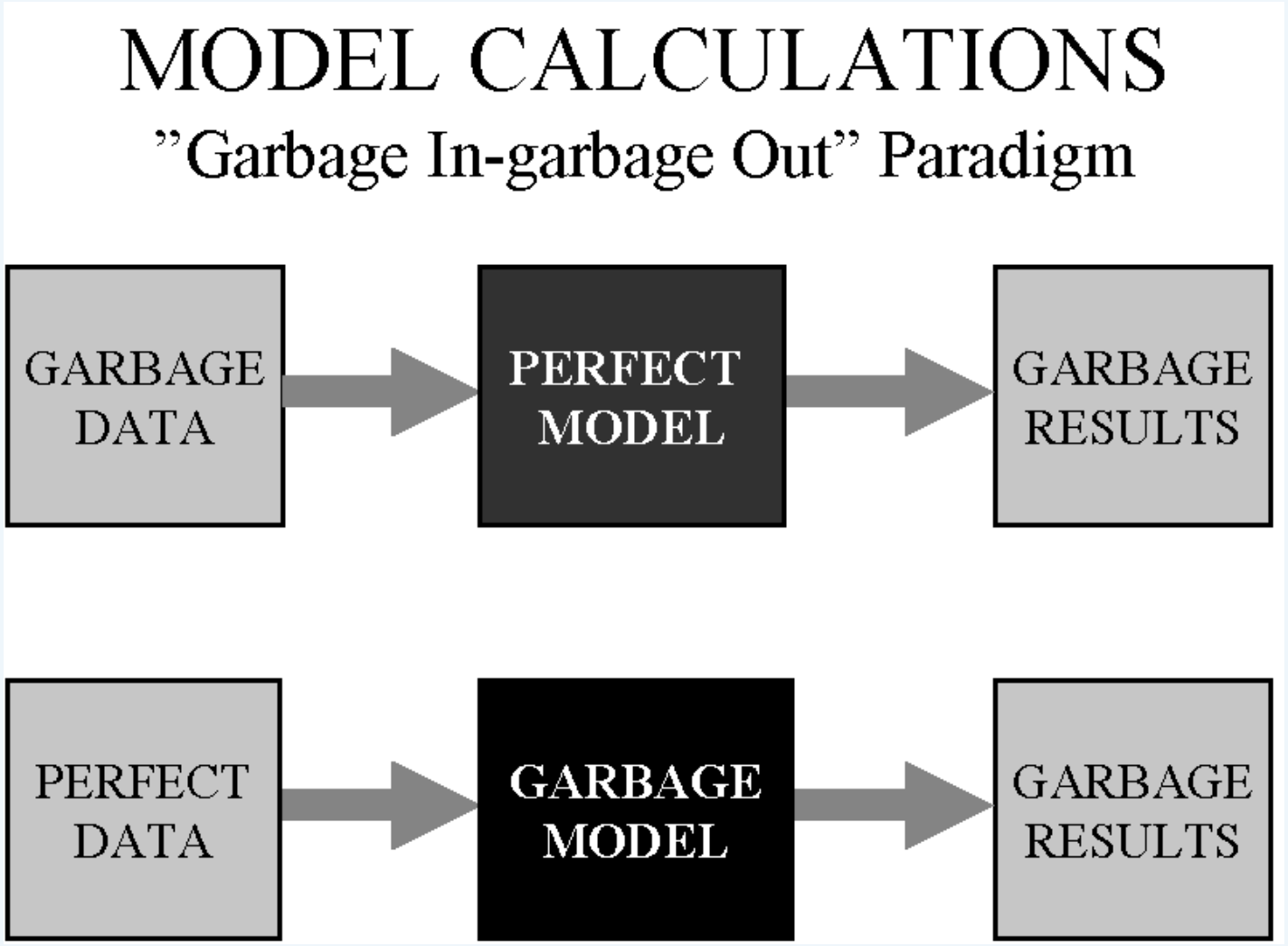
Scarcity

- Demand for IPC rise
  - Accreditation and standards
  - Challenge of MROs
  - De-escalation of IPC measures
  - New builds
  - New evidence to implement
  - New technologies

Types of Economic Evaluation

- Cost-minimisation
- Cost-effectiveness
- Cost-utility
- Cost-benefit

Choosing data to include in a model



Effectiveness example: CLEEN study

- How much do infections change with the intervention?
- Use real data, from the trial
- Could use data from literature if available

Costs example: CLEEN study

- Time to train staff (people)
- Extra product costs (things)
- Auditing time (people)
- Time for feedback (people)
- Refresher training (people)

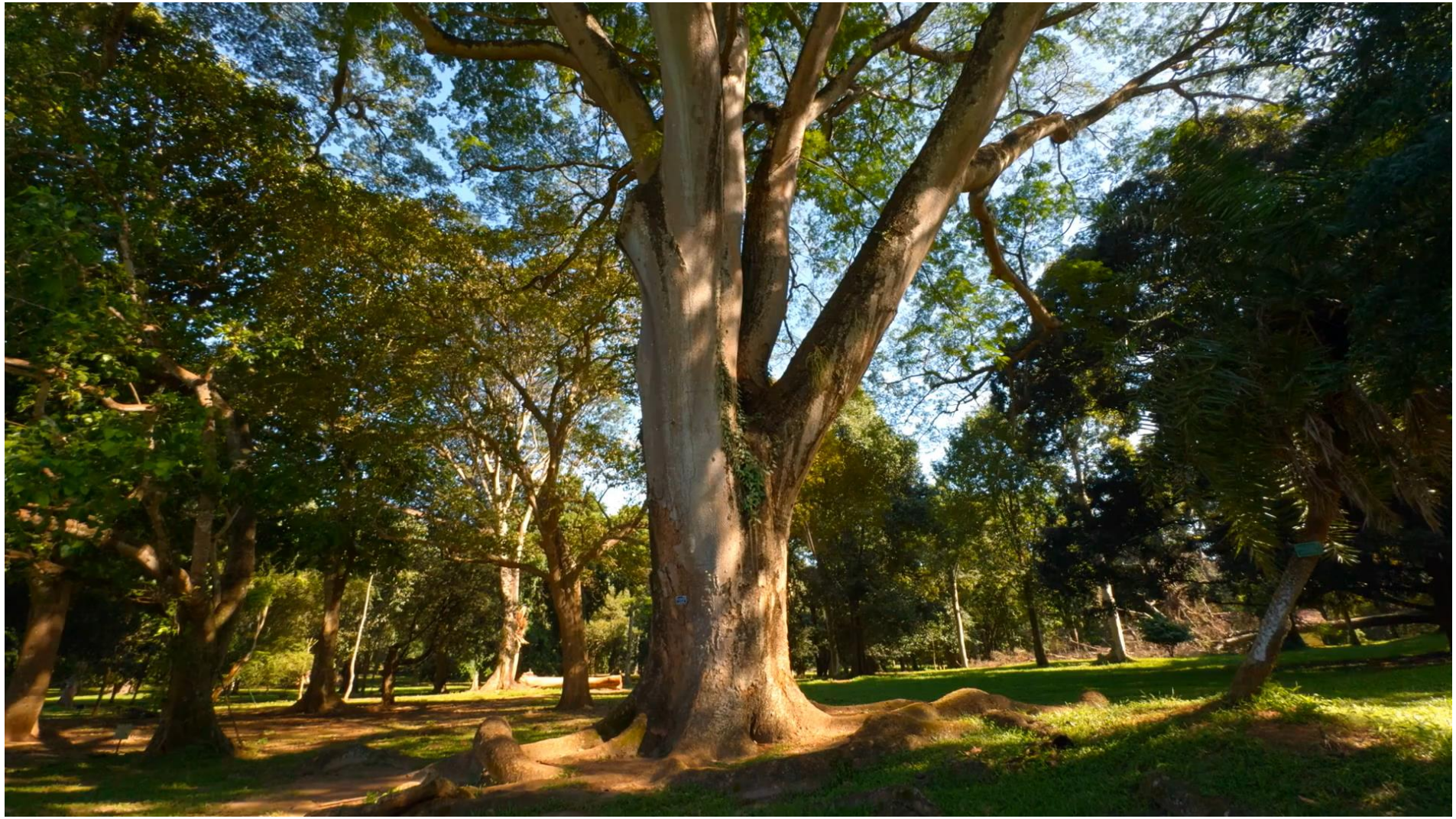
If you prevent infection, what do you gain?

- Reduction in length of stay in hospital / reduction healthcare costs
  - Saves money as each day in hospital costs money
- Increased life expectancy
  - Survival = contribution to society e.g. pay more taxes

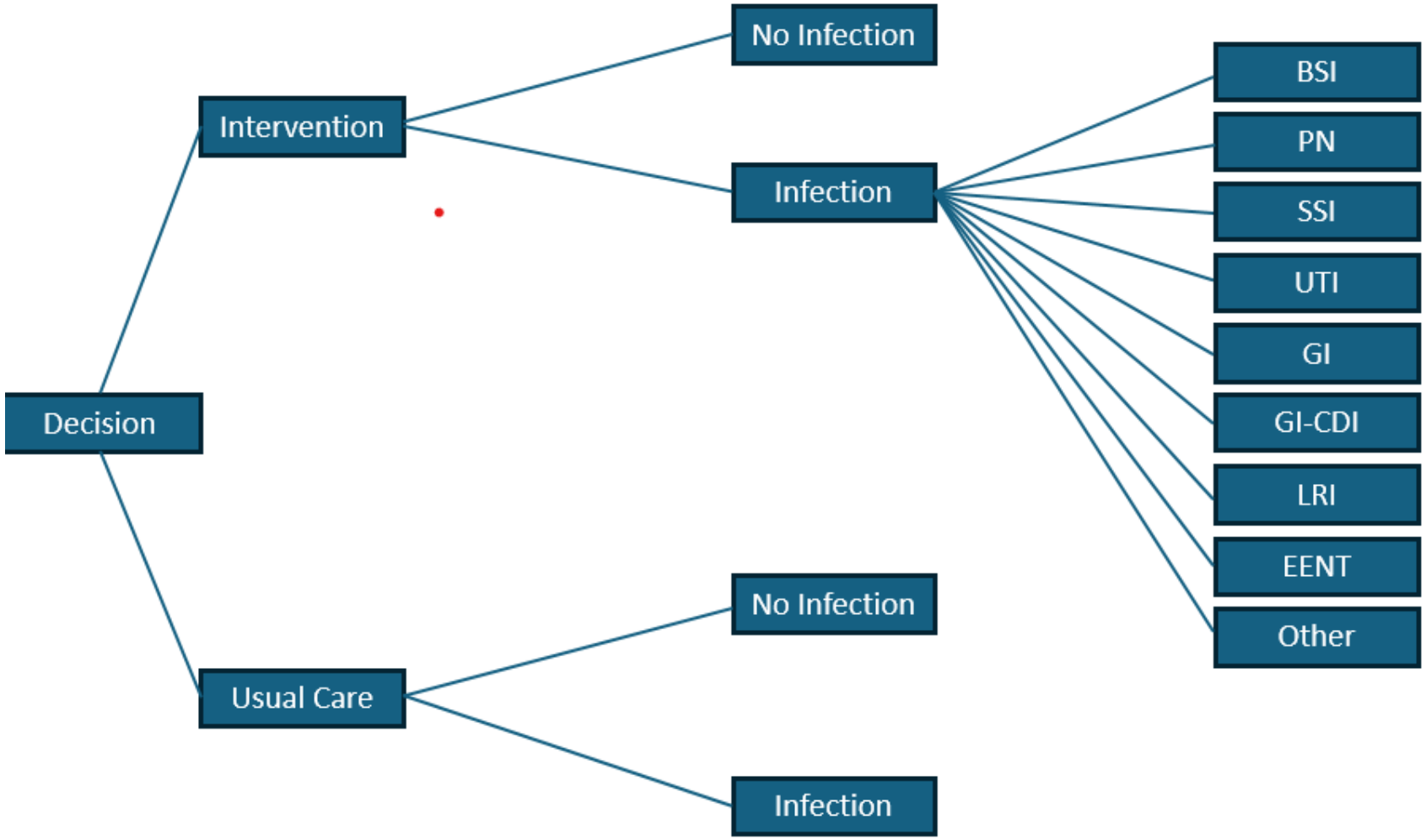
CLEEN study: costs and saving

Variable	Parameter	Source
Intervention (in-trial) costs		
Audit & Feedback	$3,537	Trial data
Staff training	$2,358	Trial data
Trainer time	$472	Trial data
Staffing	$106,110	Trial data
Sporicidal wipes	$1,134	Trial data
Universal wipes	$9,737	Trial data
Indicator tags	$1,318	Trial data
UV torch & markers	$116	Trial data
LOS (daily)	$2,151	IHACPA

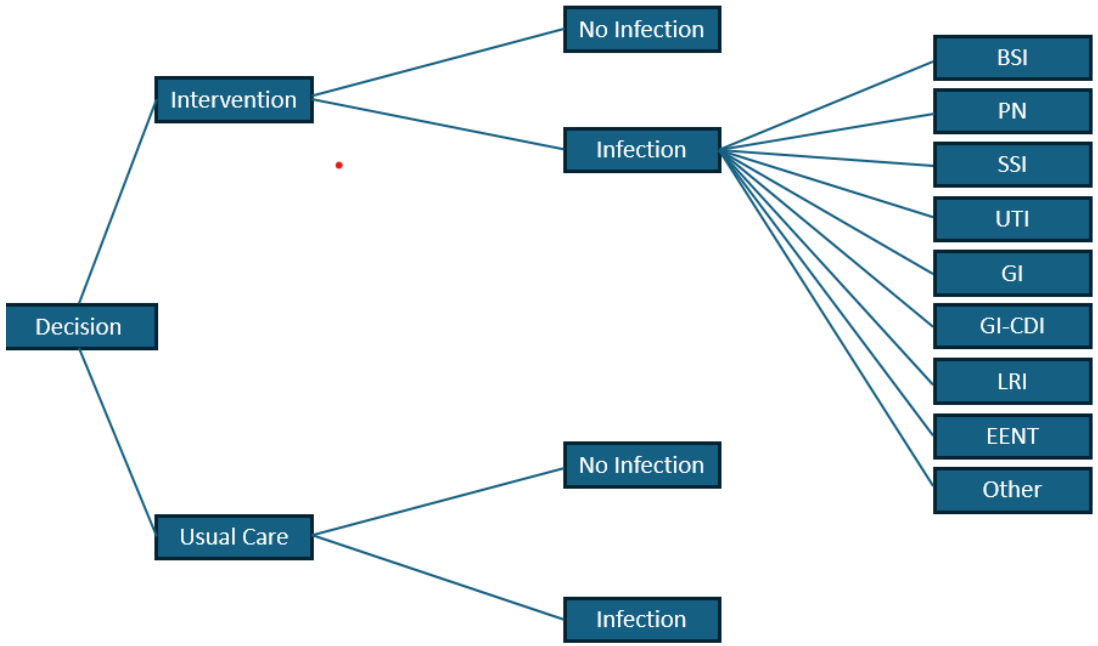
Decision tree



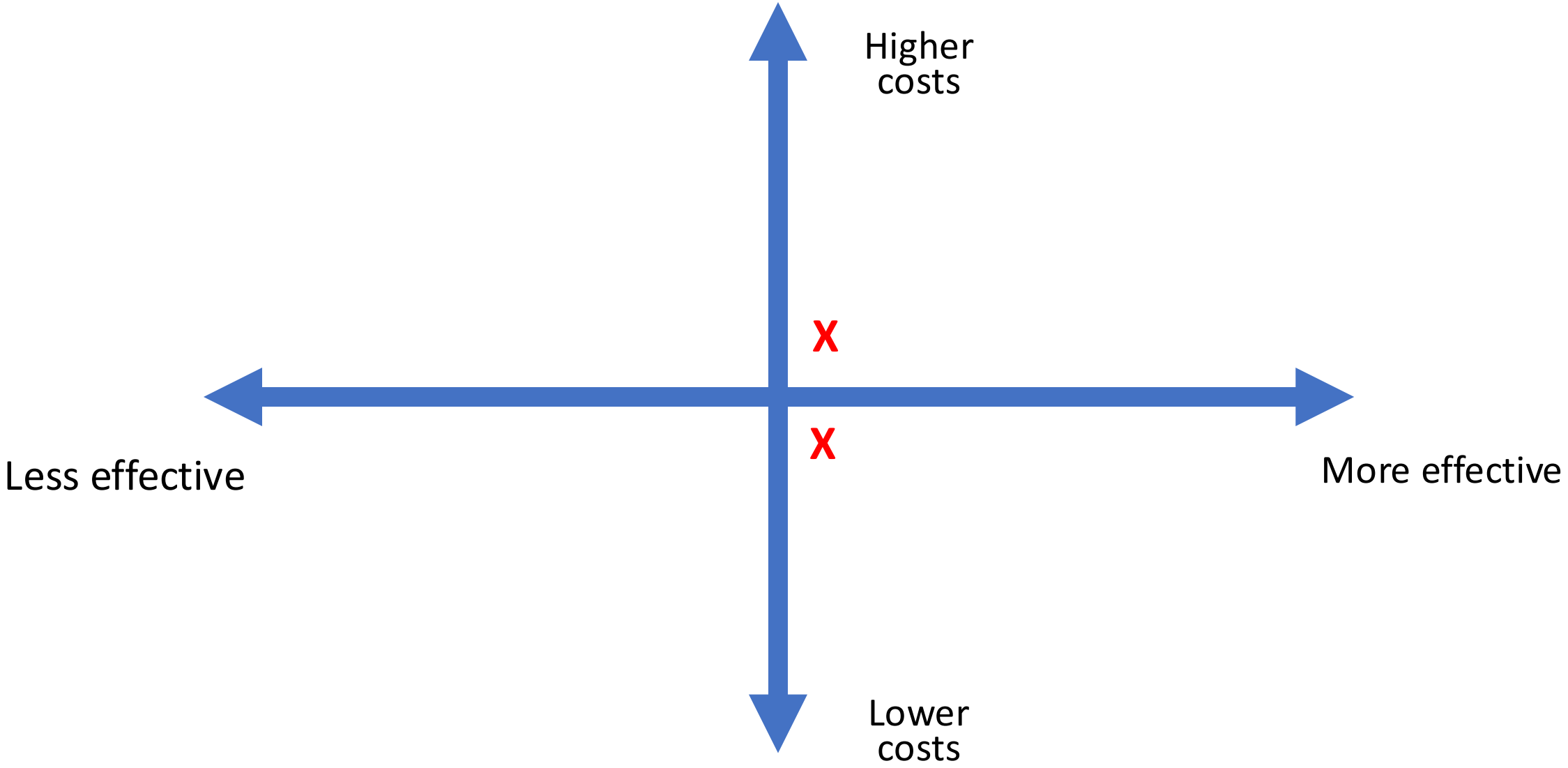
Effectiveness example: CLEEN study



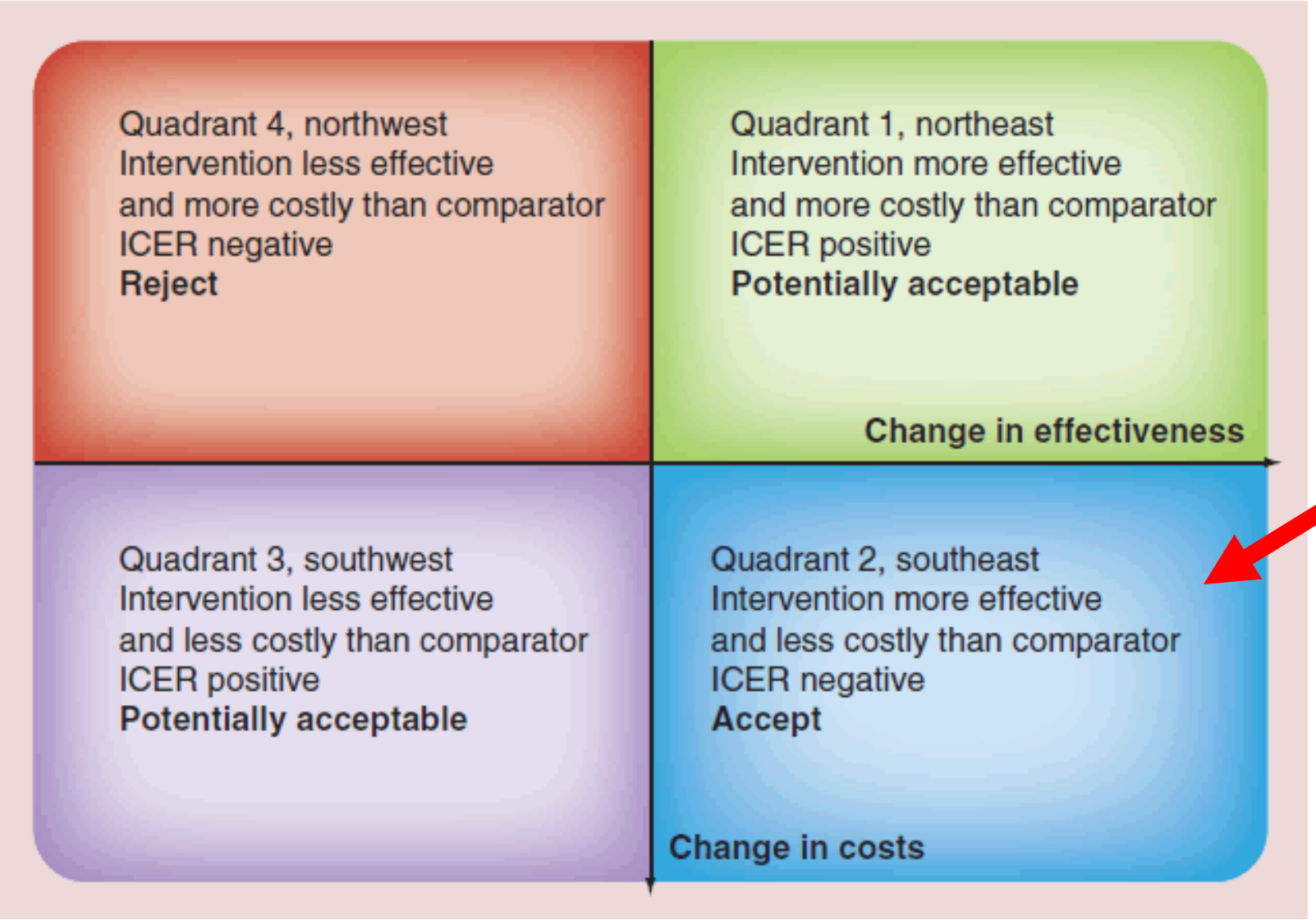
Uncertainty



Cost-effectiveness plane



Cost-effectiveness plane

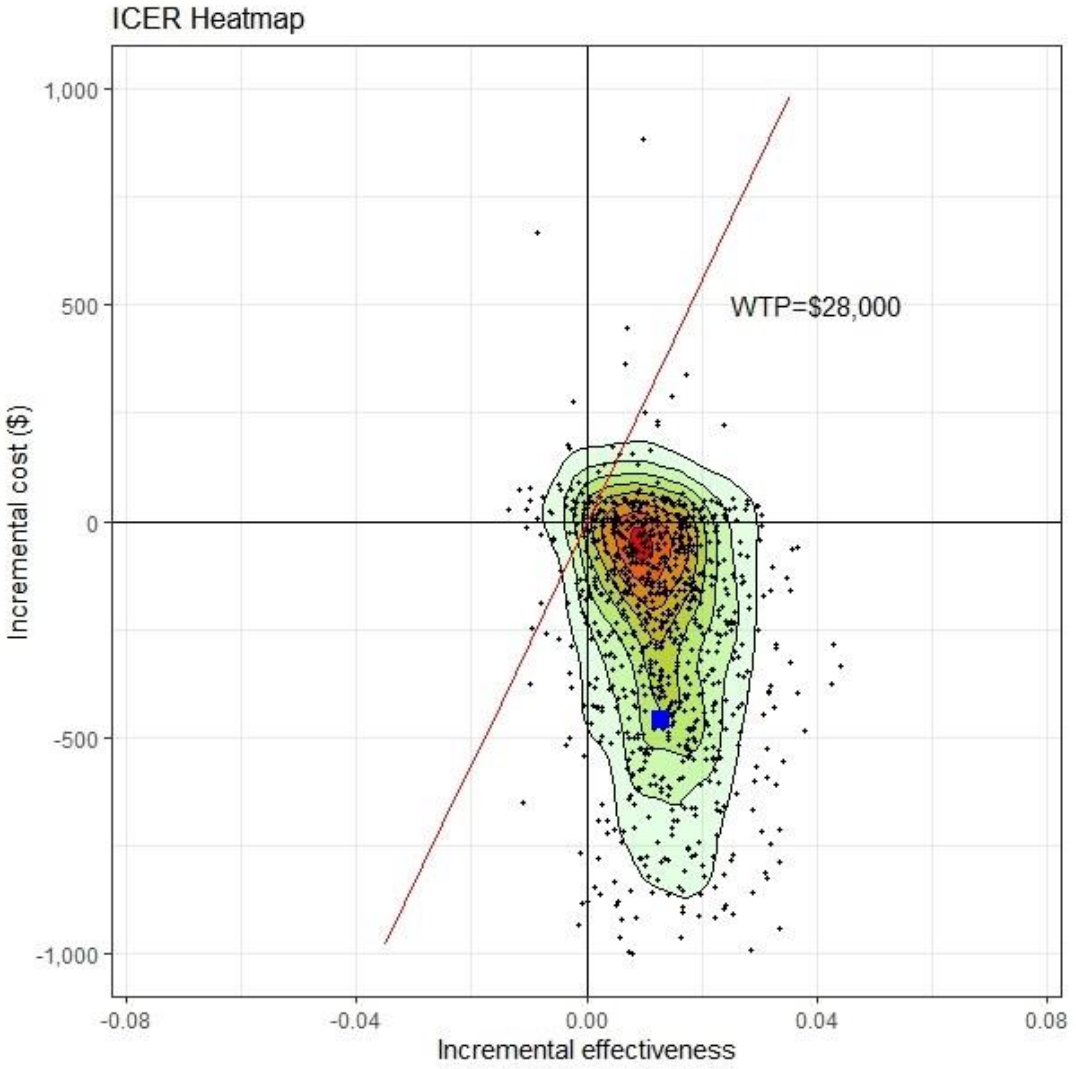


Results

- For a cohort of 1,000 patients, estimated total costs:
  - Usual care: $2,155,310
  - Intervention: $1,513,000

- **For every 1000 patients this trial is implemented for, a hospital could:**
  - **Prevent 30 infections**
  - **Save $642,010**

- On average, each infection prevented saves $21,400



But wait, my organisation is different…

- **Halving the effectiveness per 1000 patients**
  - Prevents 13 HAIs
  - Saves ~ $460,000

- **A biodegradable wipe (more expensive)**
  - Prevent 25 HAIs
  - Saves ~ $637,000

Numbers are people

Team

Avondale University

AlfredHealth

MONASH University

NSW GOVERNMENT Health Central Coast Local Health District

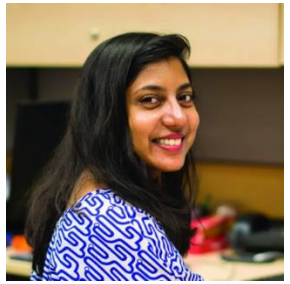
HMRI Hunter Medical Research Institute

QUT Queensland University of Technology





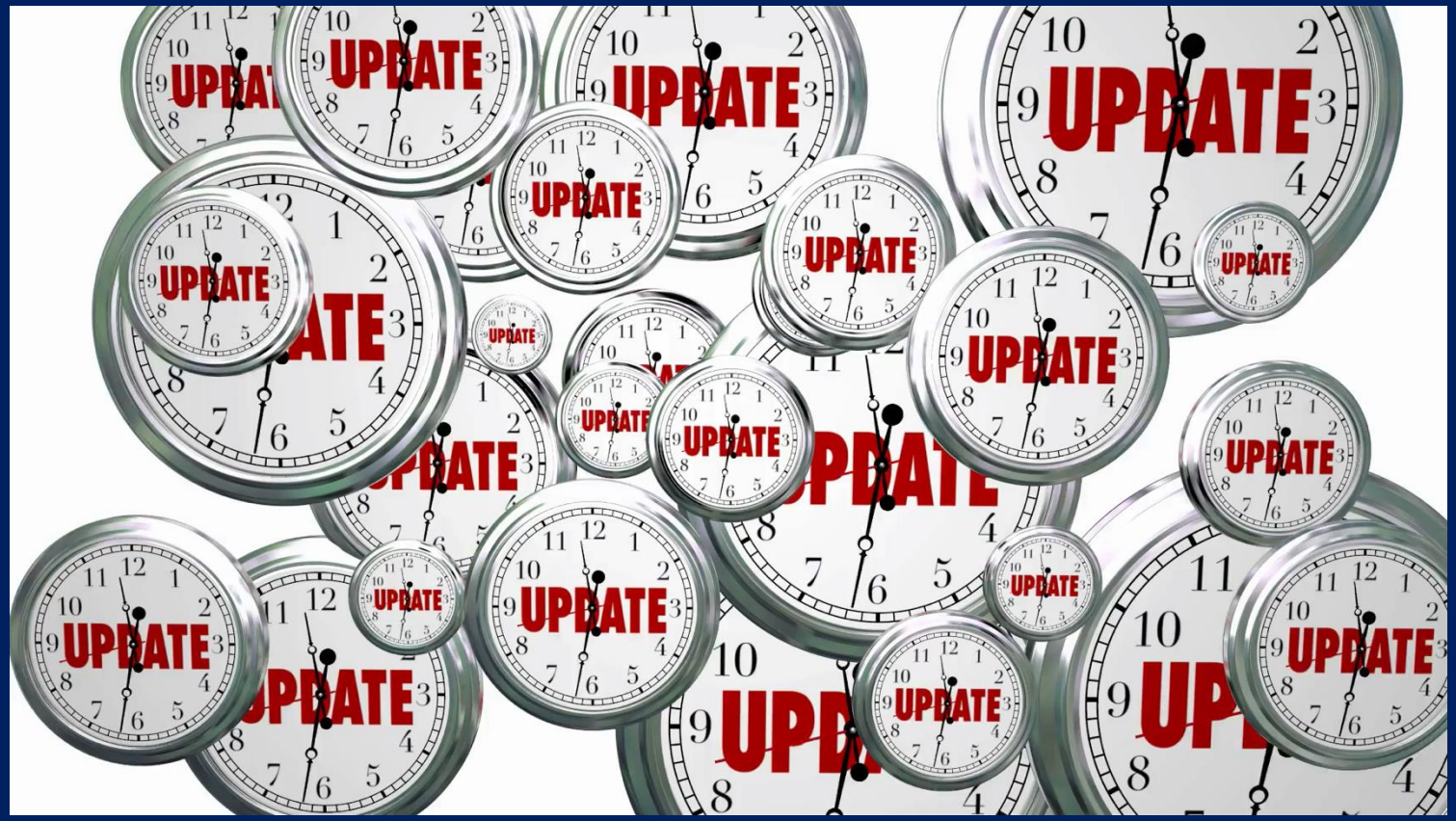





Final thoughts about CLEEN

The CLEEN intervention is a cost-saving initiative and a decision-maker who chooses not to invest in it forgoes an opportunity to maximise health gain from a scarce budget.

Latest high-quality IPC evidence around cleaning



Background: RCTs up to 2021

First author	Year	Primary intervention	Primary outcome
Salgado	2013	Antimicrobial surfaces • Copper alloy	• MRSA/VRE colonisation
Boyce	2017	Enhanced cleaning patient rooms • H_2O_2 & QAC	• Colony counts • Colonisation/ infection (MRSA,CDI,VRE)
Ray	2017	Bleach wipe	• CDI incidence
Anderson	2017	Terminal room disinfection • QAC, UV, bleach	• HAI rates
Mitchell	2019	Enhanced cleaning patient rooms	• CDI, VRE, SAB

Peters et al, ARIC, 2022

Since 2021, 5 RCTs

RCT 1

Investigating the effect of enhanced cleaning and disinfection of shared medical equipment on health-care-associated infections in Australia (CLEEN): a stepped-wedge, cluster randomised, controlled trial

Katrina Browne, Nicole M White, Philip L Russo, Allen C Cheng, Andrew J Stewardson, Georgia Matterson, Peta E Tehan, Kirsty Graham, Maham Amin, Maria Northcote, Martin Kiernan, Jennie King, David Brain, Brett G Mitchell

Summary

Background There is a paucity of high-quality evidence based on clinical endpoints for routine cleaning of shared medical equipment. We assessed the effect of enhanced cleaning and disinfection of shared medical equipment on health-care-associated infections (HAIs) in hospitalised patients.

Lancet Infect Dis 2024

Published Online
August 13, 2024
https://doi.org/10.1016/
S1473-3099(24)00399-2

RCT 2

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin

The effect of copper-oxide-treated soft and hard surfaces on the incidence of healthcare-associated infections: a two-phase study

P.E. Marik [a,*], S. Shankaran [b,c], L. King [d]

Population →	One 8 bed ICU
Intervention →	Copper-oxide-impregnated linens
Comparator →	Standard linen
Outcomes →	HAIs^
Findings →	No significant difference between groups
Limitations →	^ HAIs appear to be CLABSI, CDI, CAUTIs; 8 bed ICU, not powered for RCT (phase 2 was before/after); small sample; no blinding and potential conflict of interest

RCT 3

Available online at www.sciencedirect.com

Journal of Hospital Infection

journal homepage: www.elsevier.com/locate/jhin

The impact of bedside wipes in multi-patient rooms: a prospective, crossover trial evaluating infections and survival

M. Dadon [a,b,†], K. Chedid [c,†], E.T. Martin [c], I. Shaul [a], O. Greiver [a], I. Katz [a], H. Saadon [b], M. Alfaro [a], L. Hod [a], A. Shorbaje [a], A. Braslavsky-Siag [a], S. Moscovici [a], K.S. Kaye [d], D. Marchaim [a,b,*]

Population	4 medicine depts
Intervention	Cleaning either single-use QAC wipe (high touch)
Comparator	Reusable cloths and buckets with bleach
Outcomes	Device-related HAIs (CLABSI, CAUTI)
Findings	No significant difference between groups MRO environmental contamination decreased
Limitations	Small number of clusters; background trends in HAIs; no blinding

RCT 4

Environmental cleaning to prevent hospital-acquired infections on non-intensive care units: a pragmatic, single-centre, cluster randomized controlled, crossover trial comparing soap-based, disinfection and probiotic cleaning

Rasmus Leistner,[a,b,*] Britta Kohlmorgen,[a] Annika Brodzinski,[a] Frank Schwab,[a] Elke Lemke,[a] Gregor Zakonsky,[c] and Petra Gastmeier[a]

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[c]Charité CFM Facility Management GmbH, Berlin, Germany

eClinicalMedicine
2023;59: 101958

Summary

Background The impact of environmental hygiene on the occurrence of hospital-acquired infections (HAIs) remains a

Population	→	18 wards
Intervention	→	Routine cleaning with disinfectant or probiotic
Comparator	→	Soap-based cleaning (reference),
Outcomes	→	Incidence of HAI? (likely proportion)
Findings	→	“Disinfection proved not superior to soap-based or probiotic cleaning”. Absence of evidence
Limitations	→	Insufficient power; discrepancies in the statistical analysis plan; conclusions don’t match study design; substrate of wipes not compatible.

RCT 5

Clinical Infectious Diseases
MAJOR ARTICLE

Lowering the Acquisition of Multidrug-Resistant Organisms (MDROs) With Pulsed-xenon (LAMP) Study: A Cluster-Randomized, Controlled, Double-Blinded, Interventional Crossover Trial

Sorabh Dhar,[1,2] Chetan Jinadatha,[3,4] Paul E. Kilgore,[5] Oryan Henig,[6] George W. Divine,[7] Erika N. Todter,[8] John D. Coppin,[9] Marissa J. Carter,[10] Teena Chopra,[1] Steve Egbert,[11] Philip C. Carling,[12] and Keith S. Kaye[13]

Population →	Cluster double blind RCT, crossover, 15 wards, 2 hospitals
Intervention →	Pulsed Xenon (light disinfection) + standard terminal clean
Comparator →	Sham UV
Outcomes →	Composition MRO/C.difficile (~3 years)
Findings →	No significant differences between UV and non UV (note this is not UV-C)
Limitations →	Only evaluated the use of UV light for terminal cleaning. Difficulty in using pulsed – trained technicians were used.

The unknowns

The unknowns (personal)

Gon et al.
Antimicrobial Resistance & Infection Control (2024) 13:112
https://doi.org/10.1186/s13756-024-01463-9

Antimicrobial Resistance and Infection Control

COMMENT Open Access

Research priorities to strengthen environmental cleaning in healthcare facilities: the CLEAN Group Consensus

Giorgia Gon[1*], Angela Dramowski[2], Emilio Hornsey[3], Wendy Graham[1], Nasser Fardousi[1], Alexander Aiken[1],

- whether to use disinfectants or detergents for routine cleaning
- which disinfectant is most appropriate in any given scenario;
- a universal standard of surface cleanliness;
- the cost-effectiveness of cleaning interventions;
- the roles of surface biofilms in transmission and removal of pathogens;
- the optimal frequency of routine cleaning;
- and the role of air in contaminating surfaces and subsequent risk

Conclusion

- Maturing and growing evidence demonstrating the importance of cleaning in infection prevention

- Many ‘simple’ interventions are cost-effective or cost-saving

- Still many unknowns

- Investment in cleaning is a ‘no brainer’.

Assistance

Quick questions about the CLEEN study

Less than 1 min to complete

https://www.surveymonkey.com/r/S6VH7N8

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Survey link

CLEEN study website

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