gama healthcare | ACIPC Australasian College for Infection Prevention and Control

Welcome to the **IPC Tour 2024!**

Dr Jon Otter

Surface disinfectants in healthcare: when to use them and how to choose them and their contribution to AMR

Surface disinfectants in healthcare: when to use them, how to choose them, and their contribution to AMR

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Slides: www.jonotter.net

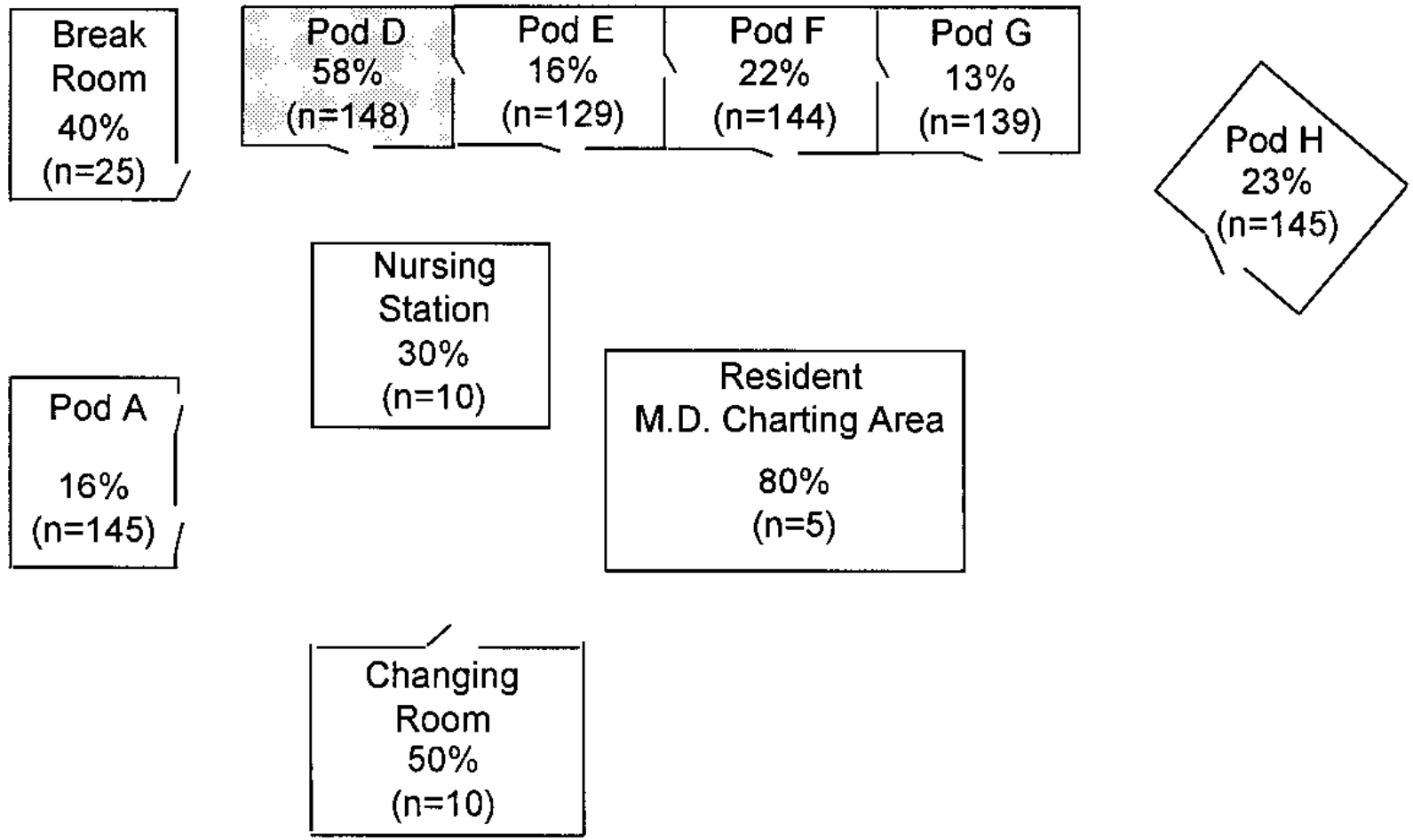

NHS
Guy's
Hospital
Main Entrance and Urgent Care Centre


St Thomas' Hospital
Guy's and St Thomas'
NHS
St Thomas' Hospital
KING'S HEALTH PARTNERS


Welcome to
Royal Brompton
Hospital

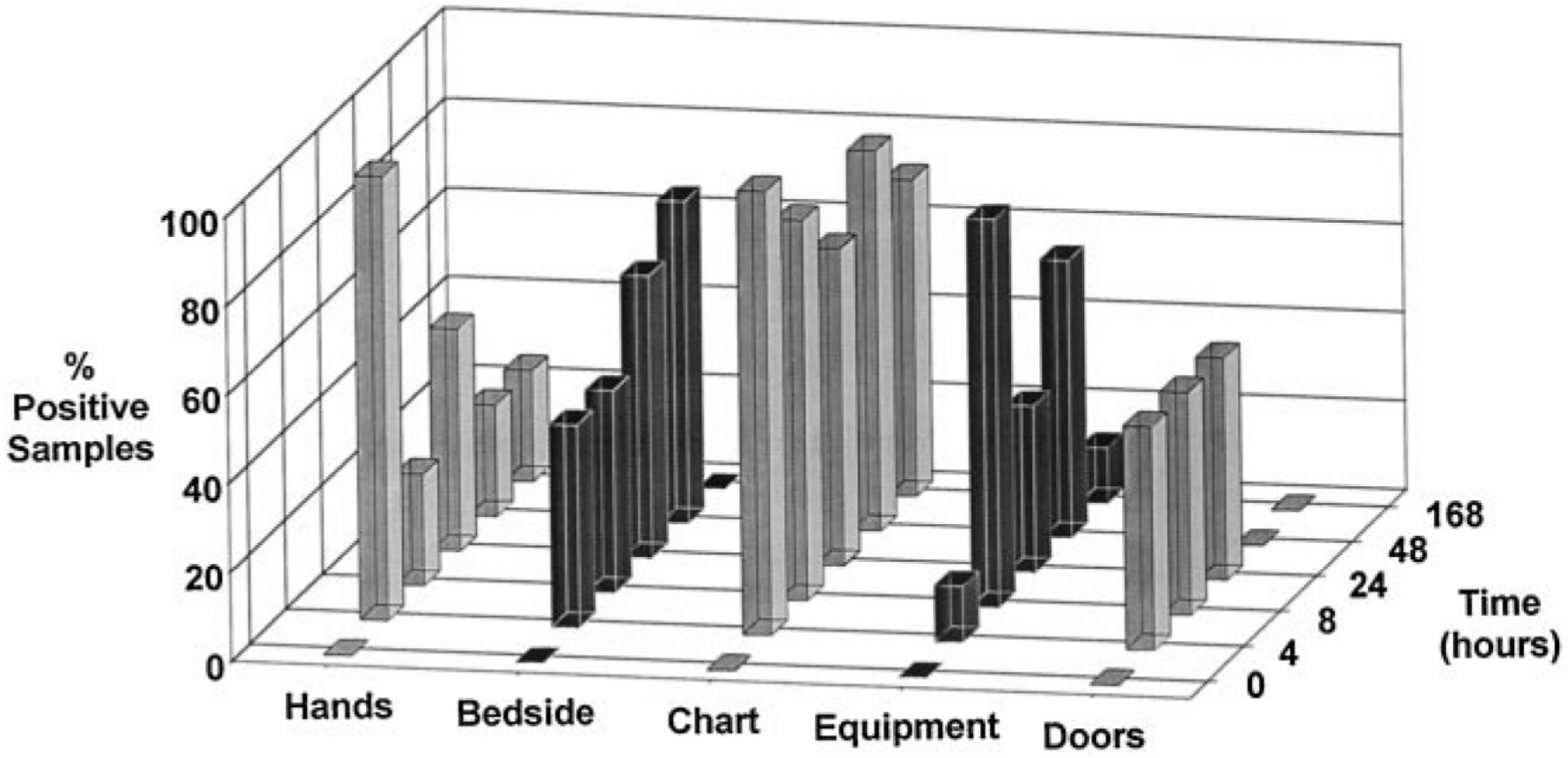

Harefield Hospital

Transfer of a surrogate marker in a NICU

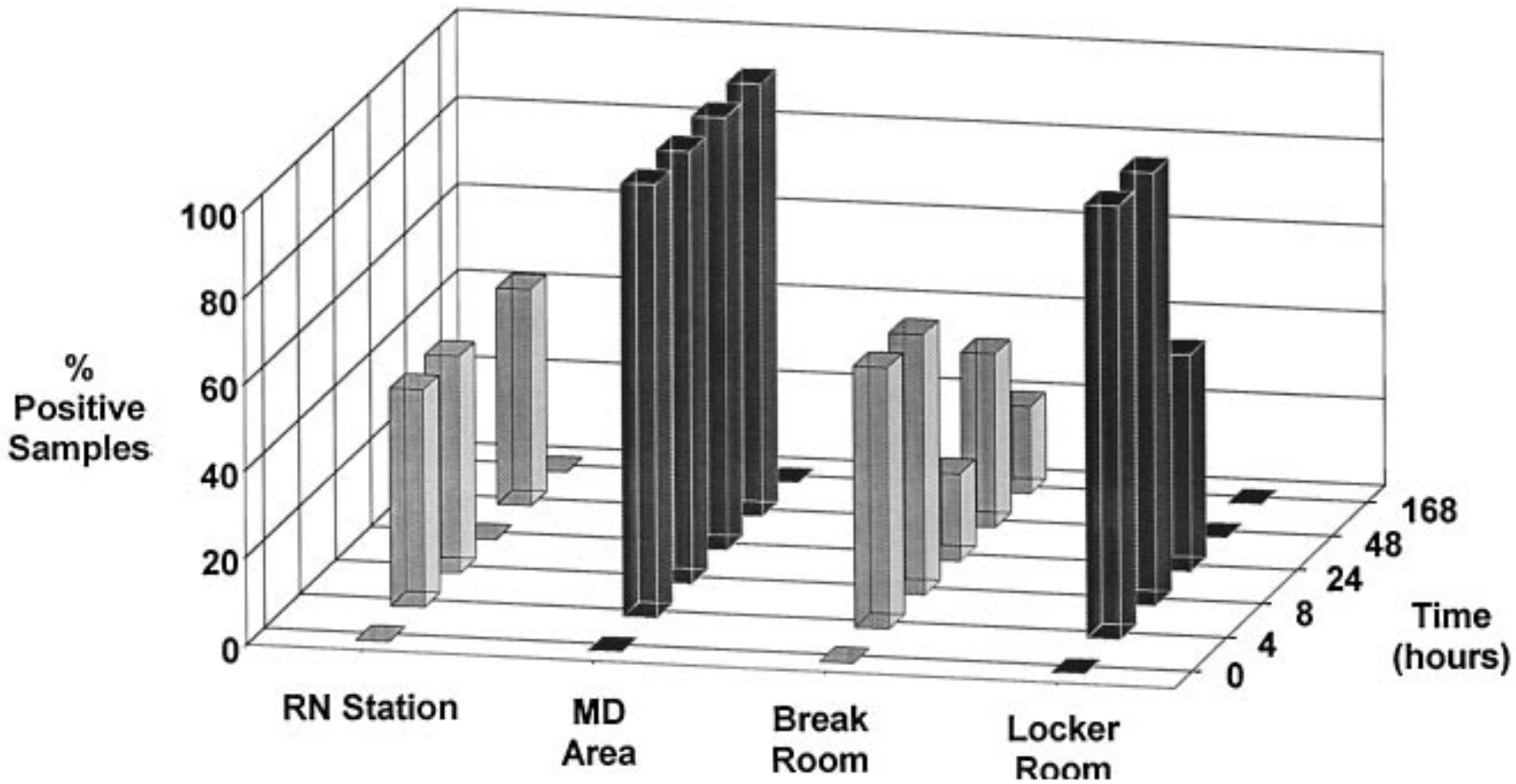


Oelberg *et al*. *Pediatrics* 2000;105:311-315.

Transfer over time: inoculated pod



Contamination over time by location



- Importance of surface contamination for HCAI and AMR
- Current approaches to cleaning and disinfection
- Surface disinfectant overview
- Possible contribution of surface disinfectants to AMR

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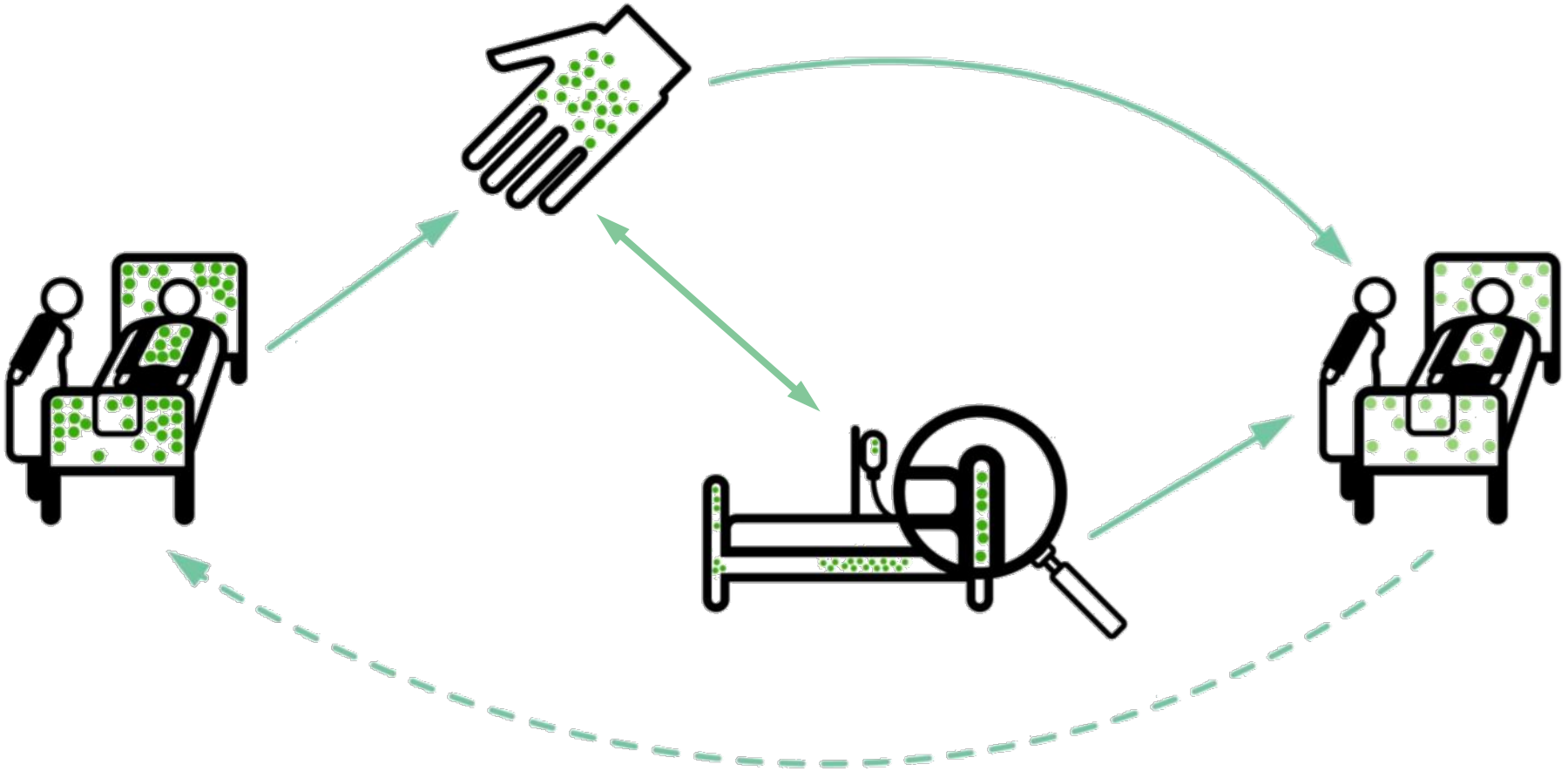
Transmission routes



Otter *et al. Infect Control Hosp Epidemiol* 2011;32:687-699.

French *et al. J Hosp Infect* 2004;57:31-37.

Surface <> Hand <> Patient

Pathogens can be transferred from surfaces to HCW hands without direct patient contact[1-2]

52% of 23 HCW acquired VRE on their hands[3]	Contact with patient **or** surface = ~10% risk of acquiring VRE[3]
45% of 50 HCW acquired MRSA on their hands[4]	**40%** of 50 HCW acquired MRSA on their hands[4]
50% of 30 HCW acquired *C. difficile* on their hands[5]	**50%** of 30 HCW acquired *C. difficile* on their hands[5]
Compliance with hand hygiene: **50%**[6]	Compliance with hand hygiene: **80%**[6]

1. Boyce *et al. Infect Control Hosp Epidemiol* 1997;18:622-627.
2. Bhalla *et al. Infect Cont Hosp Epidemiol* 2004;25:164-167.
3. Hayden *et al. Infect Control Hosp Epidemiol* 2008;29:149-154.
4. Stiefel *et al. Infect Control Hosp Epidemiol* 2011;32:185-187.
5. Guerrero *et al. Am J Infect Control* 2012;40:556-558.
6. Randle *et al. J Hosp Infect* 2010;76:252-255.

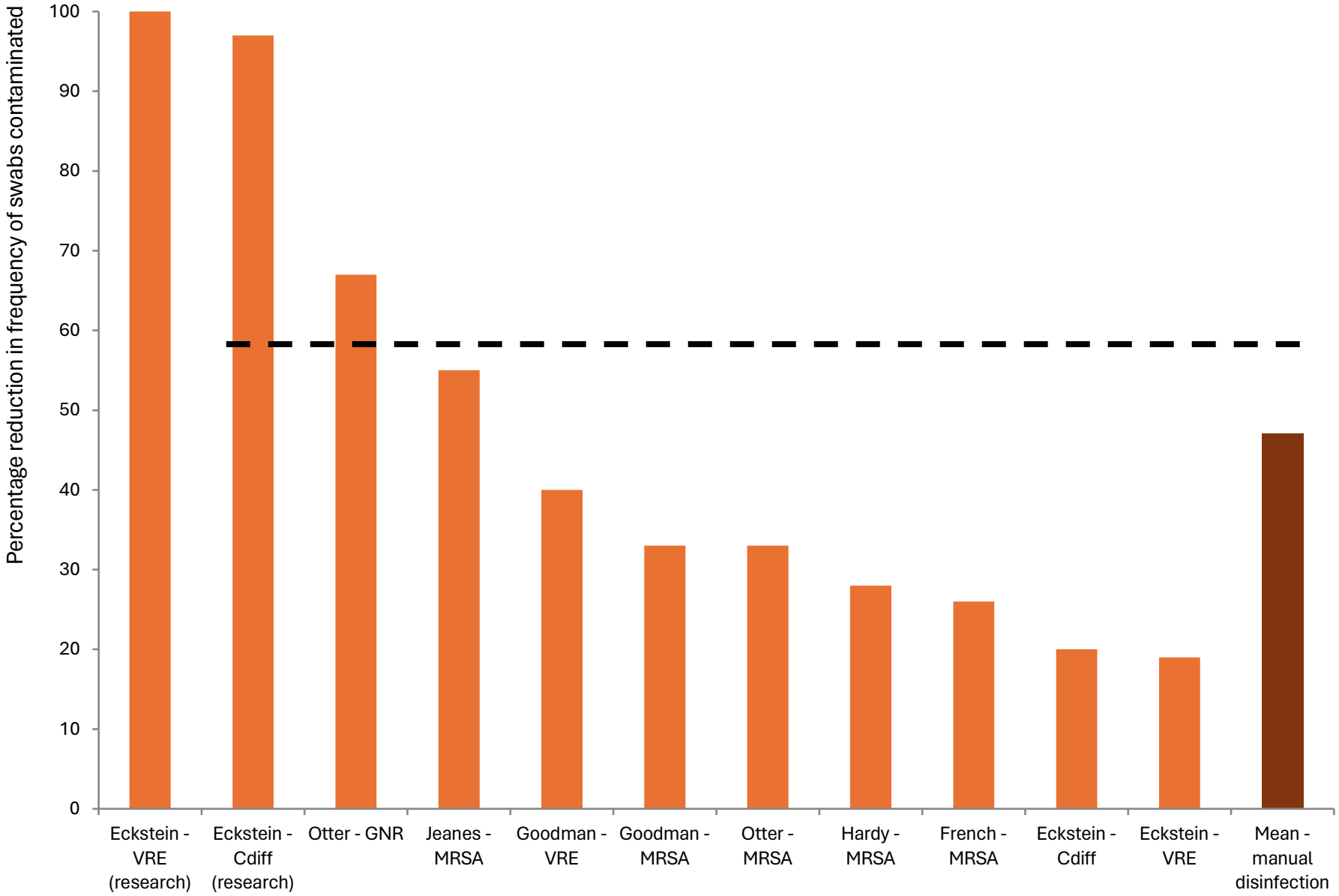
Surface survival

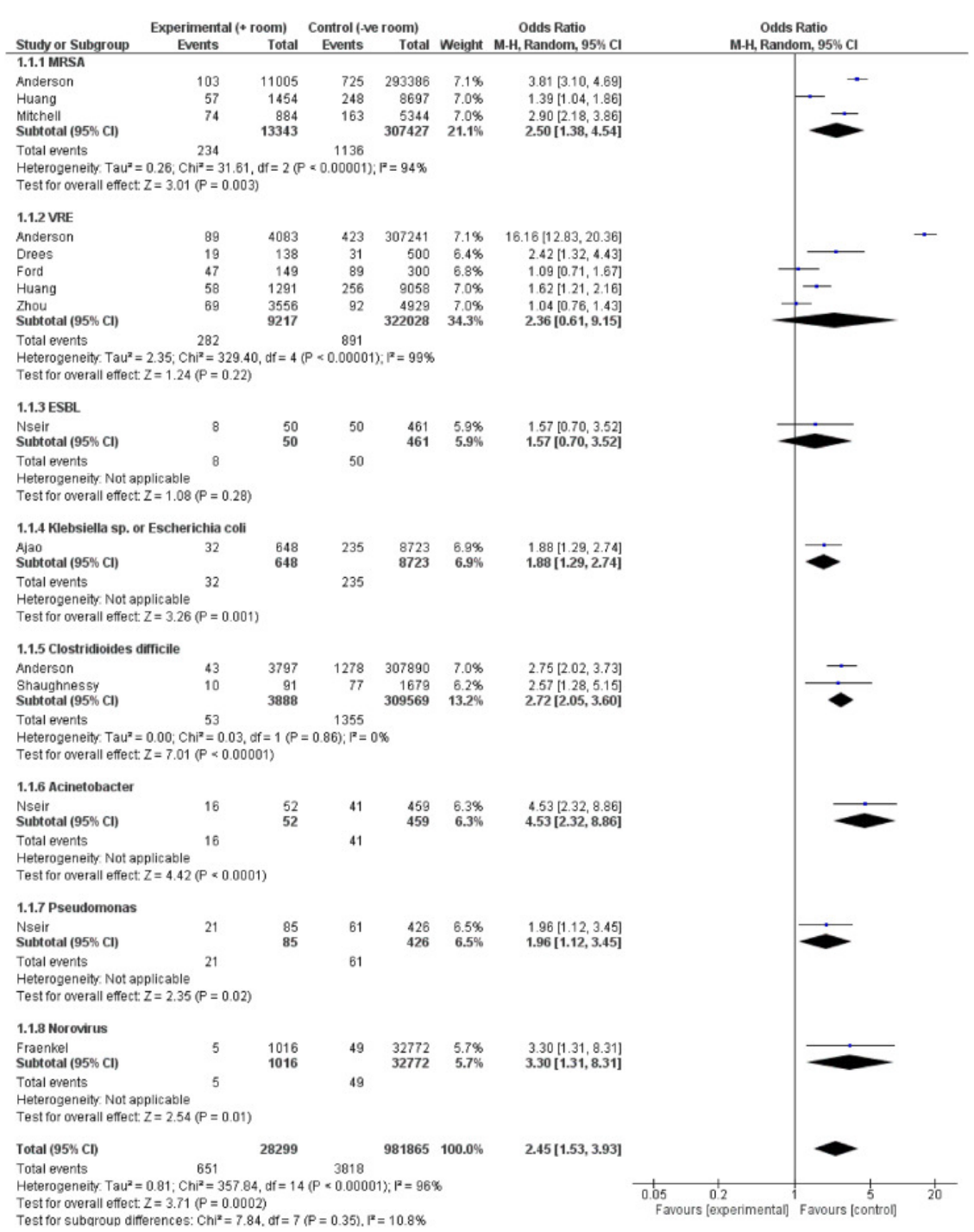
Organism	Survival time
Clostridium difficile (spores)	5 months
Acinetobacter spp.	3 days to 5 months
Enterococcus spp. including VRE	5 days – 4 years (!)[1]
Pseudomonas aeruginosa	6 hours – 16 months
Klebsiella spp.	2 hours to > 30 months
Staphylococcus aureus, inc. MRSA	7 days – 7 months
Norovirus (and feline calicivirus)	8 hours to > 2 weeks[2]
SARS Coronavirus	72 hours to >28 days[3]
Influenza	Hours to several days[4]

Adapted from Kramer *et al. BMC Infect Dis* 2006;6:130.

1. Wagenvoort et al. J Hosp Infect 2011;77:282-283.
2. Doultree *et al. J Hosp Infect* 1999;41:51-57.
3. Rabenau *et al. Med Microbiol Immunol* 2005;194:1-6.
4. Bean *et al. J Infect Dis* 1982;146:47-51.

Conventional terminal decontamination





The MDRO status of the prior room occupant influences acquisition risk

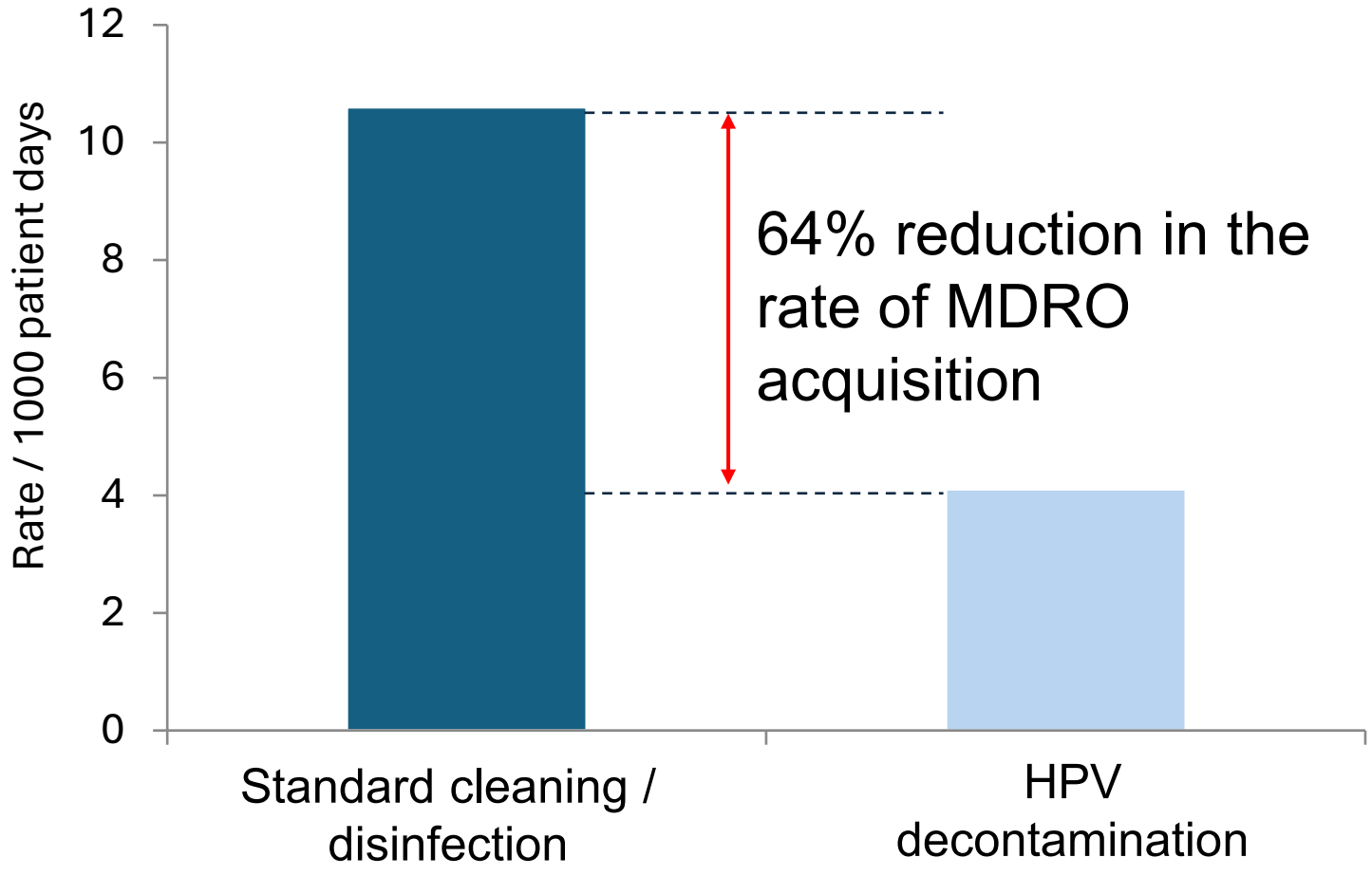
Meta-analysis of studies evaluating the risk of MDRO acquisition for the incoming occupant based on the status of the prior room occupant.

	OR	95% CI
Acinetobacter	4.5	2.3-8.9
Norovirus	3.3	1.3-8.3
C. difficile	2.7	2.0-3.6
MRSA	2.5	1.4-4.5
VRE	2.4	0.6-9.1
Pseudomonas	2.0	1.1-3.4
Klebsiella or *E. coli*	1.9	1.3-2.7
ESBL	1.6	0.7-3.5
Total	2.5	1.5-3.9

Mitchell et al. Infect Dis Health 2023.

Hydrogen peroxide vapour: clinical impact

30-month prospective cohort intervention study performed on 6 high-risk units (5 ICUs) including 8813 patients at Johns Hopkins Hospital.



Passaretti *et al. Clin Infect Dis* 2013;56:27-35.

Hospital cleaning and disinfection works

Key studies illustrating the impact of improved cleaning and disinfection

Author/year	Design	Result
Dancer et al. 2009	Cross-over study of extra ward cleaner	27% reduction in MRSA infection
Datta et al. 2011	Cohort intervention study of enhanced disinfection	Significant reduction in VRE acquisition from the prior room occupant
Anderson et al. 2017	Cluster RCT of UVC room disinfection	Significant reduction in MDRO acquisition from the prior room occupant
Mitchell et al. 2019	Cluster RCT of cleaning bundle	Improved rate of cleaning high touch items and reduced incidence of VRE
Dadon et al. 2023	Cross-over study of switching from chlorine “bucket” method to disinfectant wipes	Significant reduction in surface contamination, MDRO acquisition, and in-hospital mortality

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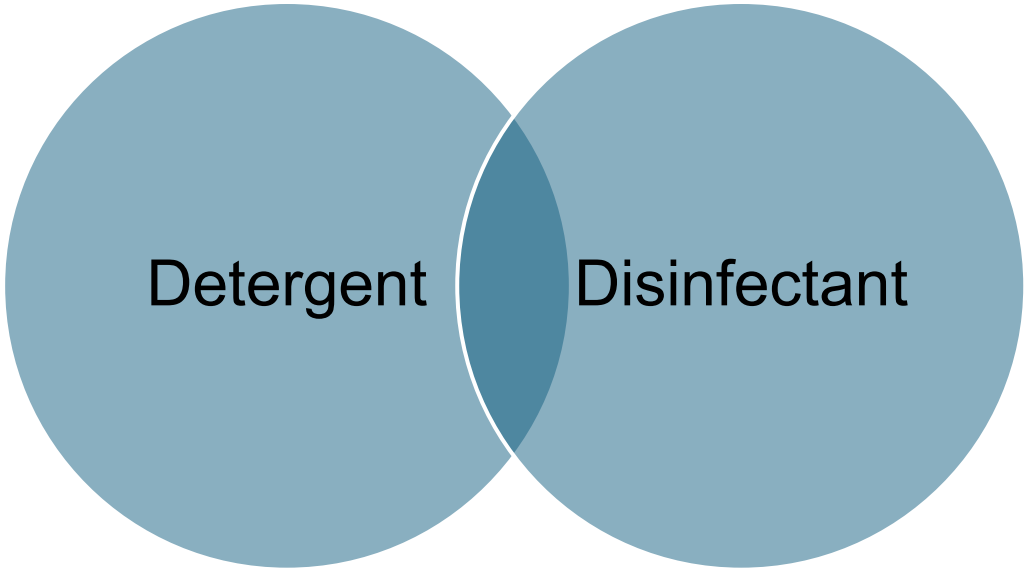
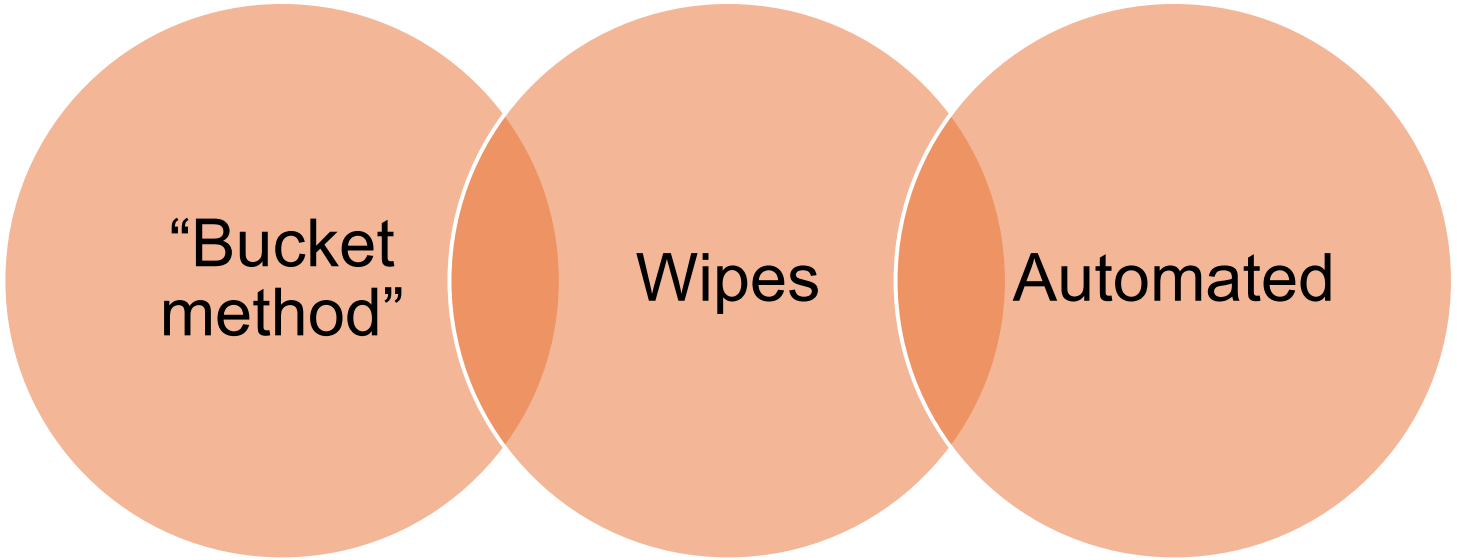
PRODUCT



PROCEDURE



What is the protocol for surface cleaning and disinfection in your hospital?

- Combined cleaner/disinfectant for all cleaning and disinfection
- Routine detergent cleaning; cleaner/disinfectant when known infection risks
- Detergent cleaning only

English cleaning / disinfection recommendations

- Under *Standard Infection Control Precautions*, routine disinfection of the environment is not routinely recommended in the manual, aside from routine disinfection of sanitary fittings using chlorine.
- Under *Transmission Based Precautions*, disinfection of hospital surfaces during the stay of the patient and at the time of their transfer or discharge is recommended.
  - The manual makes a specific recommendation that chlorine should be used for daily and discharge surface disinfection.

National Infection Control Policy Manual

Limitations of a “detergent only” approach

- Patients with unidentified infection risks
- Challenges of cleaning complex and intricate environment
- Dry surface biofilms
- Limited reduction in pre-post studies
- Evidence that they spread contamination around
- Emerging evidence of detergent-related surface damage
- Evidence that moving to routine disinfection reduces transmission risk

Kiernan et al. J Hosp Infect 2024 (accepted)

Limitations of a chlorine-based disinfectants

- Many are not sporicidal when tested correctly
- Inactivation when exposed to soiling
- Poor environmental profile
- Material compatibility
- Staff exposure
- Majority of patients on TBPs don’t require chlorine

Kiernan et al. J Hosp Infect 2024 (accepted)

Chlorine may not be as effective as you think..

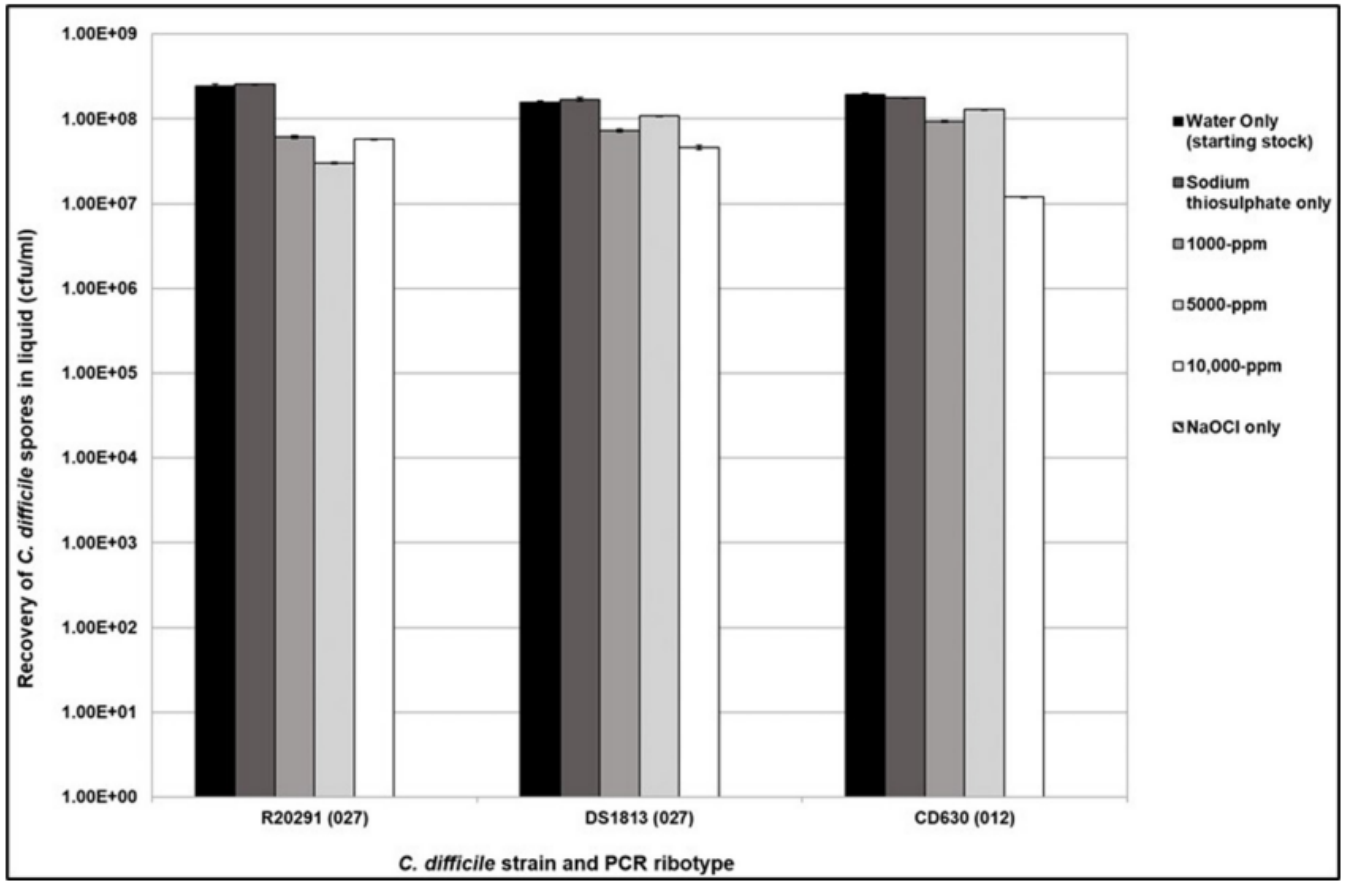
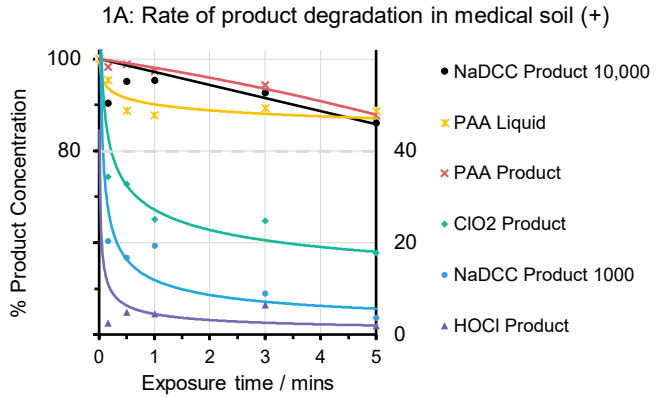
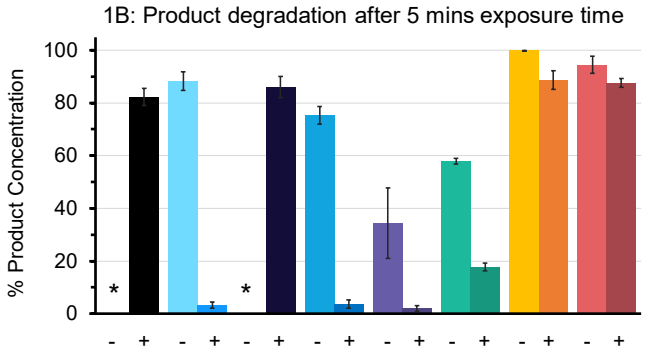


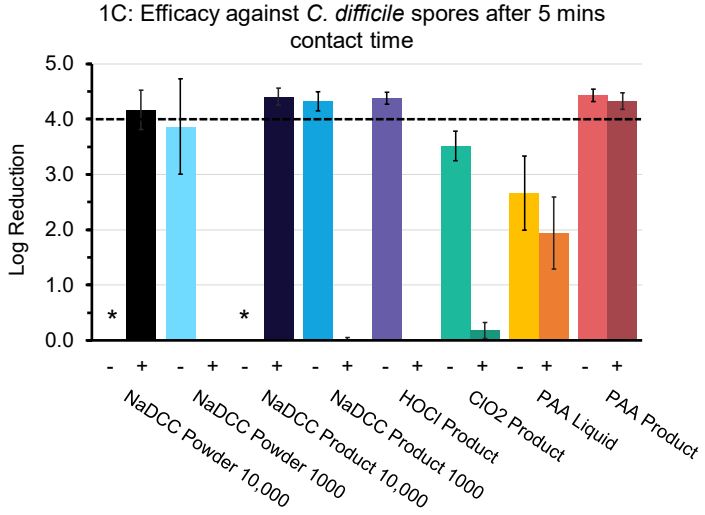
Fig. 1. Recovery of purified *C. difficile* spores following exposure to NaOCl at 1000, 5000 and 10 000 p.p.m. in liquid for 10 min. The spore inoculum was at 10^8 c.f.u. ml^{-1}. The inoculum was used as the positive control (water only) and was also suspended in sodium thiosulphate to ensure no cross-reactivity. Plots represent means±SEM (n=3).

Ahmed & Joshi. Microbiology 2023.

Impact of Soiling







Brown et al. J Hosp Infect 2024 (accepted)

* = not tested

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Types	Mechanism of action	Examples of chemistry	Application and areas of use
Highly reactive biocides — strong interactions through chemical or ionic binding			
Alkylating agents	Reacts with amino acids to form crosslinks and fix proteins	Glutaraldehyde, formaldehyde, ortho-phthalaldehyde	Disinfection of surfaces, materials, equipment Disinfection of materials and surfaces associated with the housing or transportation of animals
Oxidizing agents	Oxidation of macromolecules (proteins, lipids and nucleotides), while causing nonspecific damage to the cytoplasmic membrane	Sodium hypochlorite, peracetic acid, hydrogen peroxide, ethylene oxide	Disinfection of surfaces, materials, equipment Disinfection of materials and surfaces associated with the housing or transportation of animals Disinfection of drinking water
		Povidone–iodine	Disinfection of skin, scalps, surfaces, materials and equipment
Less-reactive biocides — weak physical interaction			
Cationics	Positively charged, hydrophilic region interacts with negatively charged cell surface. Hydrophobic region partitions into membrane, disrupting intermolecular bonds and leading to loss of intracellular contents	Quaternary ammonium compounds (for example, benzalkonium chloride)	Disinfection of skin and scalps Disinfection of surfaces, materials and equipment Incorporated in textiles, tissues, mask, producing treated articles with self-disinfecting properties
		Biguanides (for example, chlorhexidine, polyhexamethylene biguanide)	Antisepsis of skin and scalps Disinfection of surfaces, materials, equipment and swimming pools
		Diamines and amine oxides	Disinfection of surfaces, materials and equipment
Phenolics	Protonophore that targets the cytoplasmic membrane, causing loss of membrane potential. At low concentrations, triclosan inhibits fatty acid synthesis	Triclosan	Disinfection of surfaces, materials and equipment Incorporated in textiles, tissues, mask, producing treated articles with disinfecting properties
Alcohols	Permeabilization of the cytoplasmic membrane, denaturation of proteins and dehydration of exposed bacteria	Ethyl alcohol (ethanol) and isopropyl alcohol	Disinfection of skin and scalps Disinfection of surfaces, materials and equipment
Weak organic acids	Uncoupling of proton motive force; acidification of bacterial cytoplasm, leading to inhibition of enzyme activity and biosynthesis while exerting osmotic stress	Citric acid and benzoic acid	Disinfection of skin and scalps Disinfection of surfaces, materials and equipment
Metal ions	Redox active. Interacts with thiol groups and generates reactive oxygen species that damage macromolecules	Silver and copper	Antimicrobial surfaces, textiles and wound dressings
Antimicrobial dyes	Intercalation with DNA. Production of singlet oxygen (photosensitizers)	Methylene blue, toluidine blue and crystal violet	Wound dressings, photodynamic therapy (photosensitizers)

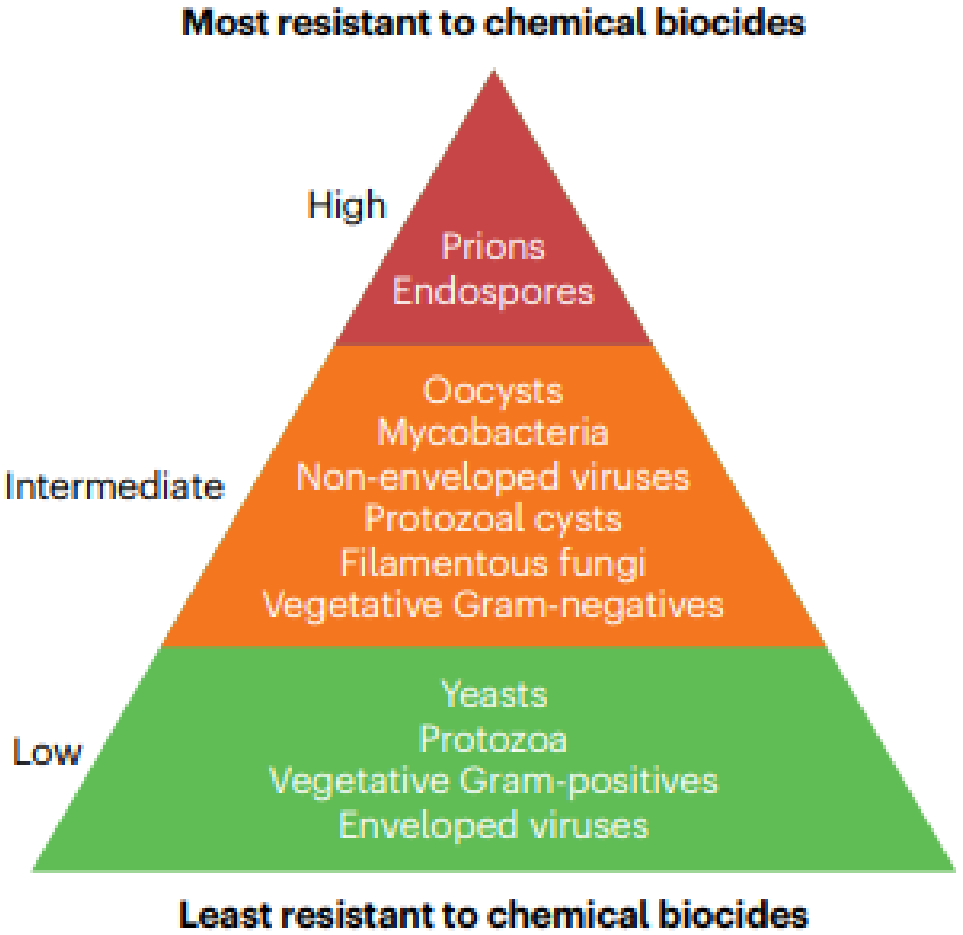
Maillard & Pascoe. Nature Rev Microbiol 2024.

Examples of bacteria

- *Bacillus subtilis* spores
- *Clostridioides difficile* spores
- *Mycobacterium chelonae* environmental isolates
- *Mycobacterium massiliense* environmental isolates

- *M. chelonae* standard culture collection
- *Pseudomonas aeruginosa*
- *Staphylococcus aureus* environmental isolates

- *B. subtilis* (vegetative)
- *S. aureus* standard culture collection



Examples of biocides

- Ethylene oxide (sterilant)
- Peracetic acid
- ClO_2
- Hydrogen peroxide
- Aldehydes
- Sodium hypochlorite

- Povidone–iodine
- Phenolics
- Complex QAC formulations
- Biguanides-based formulations

- 70% IPA/ethanol
- Simple QAC solutions
- Simple biguanide solutions
- Antimicrobial dyes

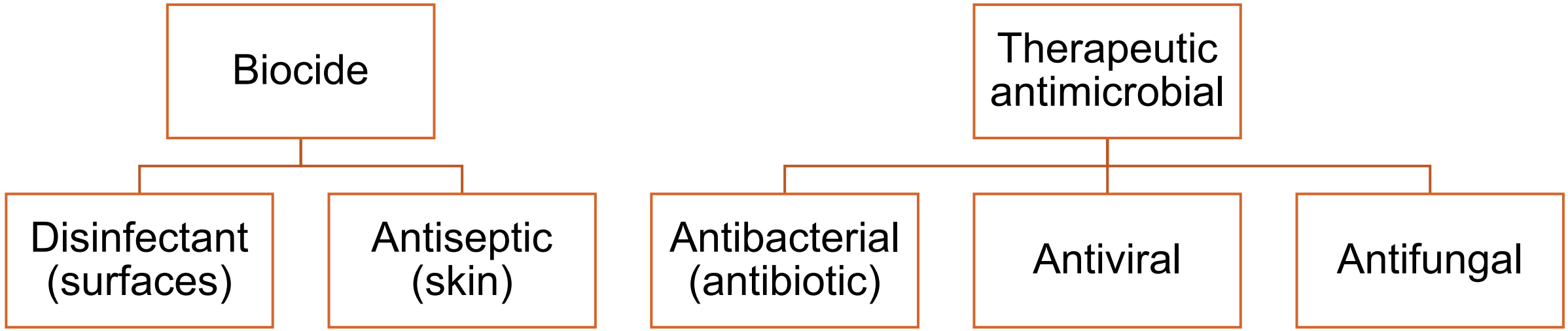
Maillard & Pascoe. Nature Rev Microbiol 2024.

Importance of surface contamination for HCAI and AMR

Current approaches to cleaning and disinfection

Surface disinfectant overview

Possible contribution of surface disinfectants to AMR


Biocide
Disinfectant (surfaces)
Antiseptic (skin)
Therapeutic antimicrobial
Antibacterial (antibiotic)
Antiviral
Antifungal

Biocides vs. therapeutic antimicrobials

Feature	Biocide	Therapeutic antimicrobial
Mechanism of action	Multiple cellular targets	Single process or structure
“Resistance”	Tolerance or reduced susceptibility	Resistance halts therapy
Measurement of “resistance”	No agreed methodology or breakpoints	Defined methodology and breakpoints
Mechanism of “resistance”	Intrinsic or acquired	Intrinsic or acquired

Factors affecting biocide effectiveness

Biocide

- Type / mechanism of action
- Concentration
- Formulation

Application

- Dilution
- Delivery method
- Contact time
- Soiling
- Surface type
- Interactions

Microbe

- Structure (e.g. spores)
- Reduced susceptibility
- Metabolic state (e.g. VNC)
- Community (e.g. biofilm)

Maillard & Pascoe. Nature Rev Microbiol 2024.

The importance of formulation

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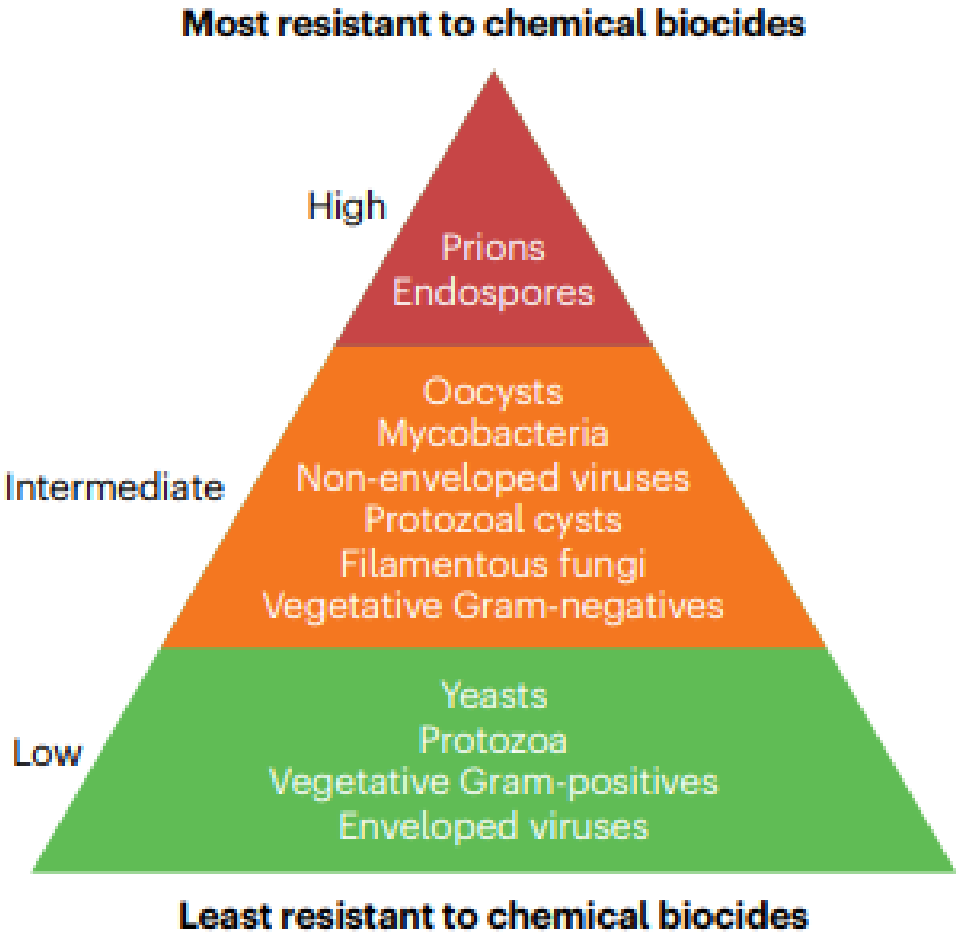

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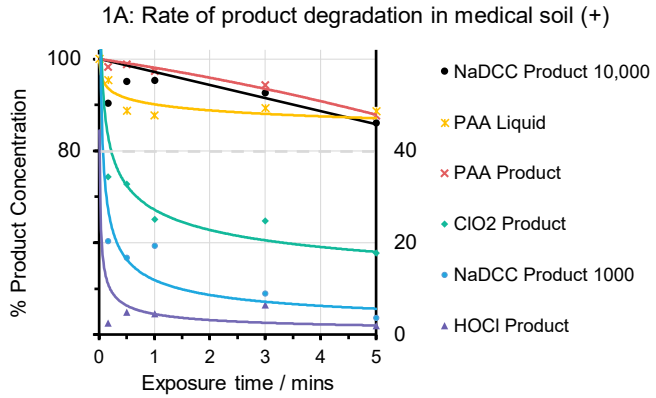
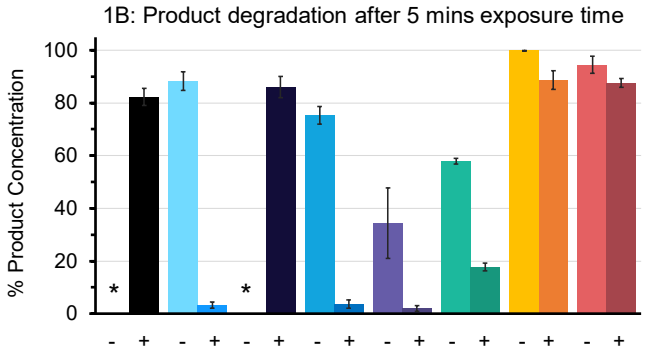
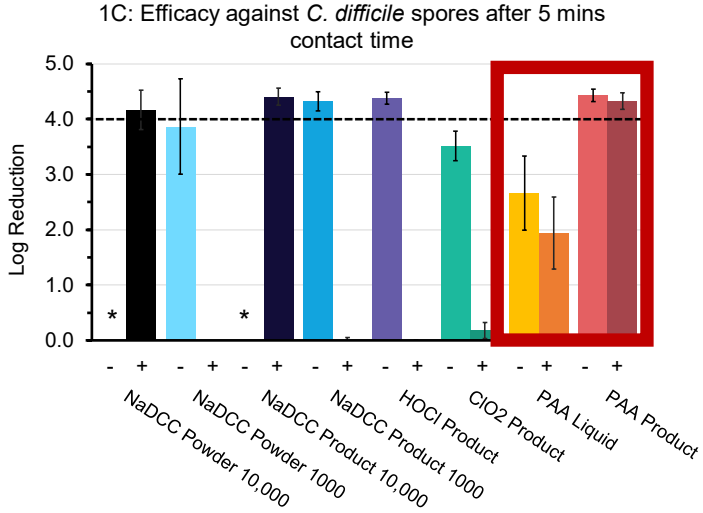
Maillard & Pascoe. Nature Rev Microbiol 2024.

Importance of formulation







Brown et al. J Hosp Infect 2024 (accepted)

* = not tested

Morning Tea

STAY A STEP AHEAD

of winter infections

gama healthcare | ACIPC Australasian College for Infection Prevention and Control

Scan the QR code to register for the IPC webinar **"Winter Preparedness & the Hidden Threats".**

23rd April 2024 at 7pm AEST

Prof Brett Mitchell (AM)

Latest research and updates from an Australian IPC research program

Latest research and updates from an Australian IPC research program

Prof Brett Mitchell (AM)
Central Coast Local Health District, Gosford Hospital, NSW.
Avondale University
Monash University
Hunter Medical Research Institute, NS

Disclosures

- Current recipient of NHMRC Investigator Grant
- Current recipient MRFF funding (HAPPEN study)

- No payment or fees related to this talk

- Work alongside a large number of collaborators in different countries
  - 50+ collaborators across on the talks presented today

Podcast: https://infectioncontrolmatters.com

Latest research and updates from an Australian IPC research program

Overview & results

Overview & some results

Overview

IPC workforce

CLEEN study

CATION study

PhD students

Pathogen survival

HAPPEN study

HIPPS study

Accelerometer hand hygiene usage study

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Infection Prevention and Control Workforce

Purpose and methods

Purpose

In the Australian and NZ IPC workforce, wanted to understand:

- Levels of stress
- Resilience
- Personality traits
- Workforce views

Methods

- Cross sectional anonymous online survey of ICPs
- Conducted in quarter two of 2023
- Used ACIPC list, social media and snowballing approach
- Brief resilience scale
- Work Stress Screener
- Big 5 personality test

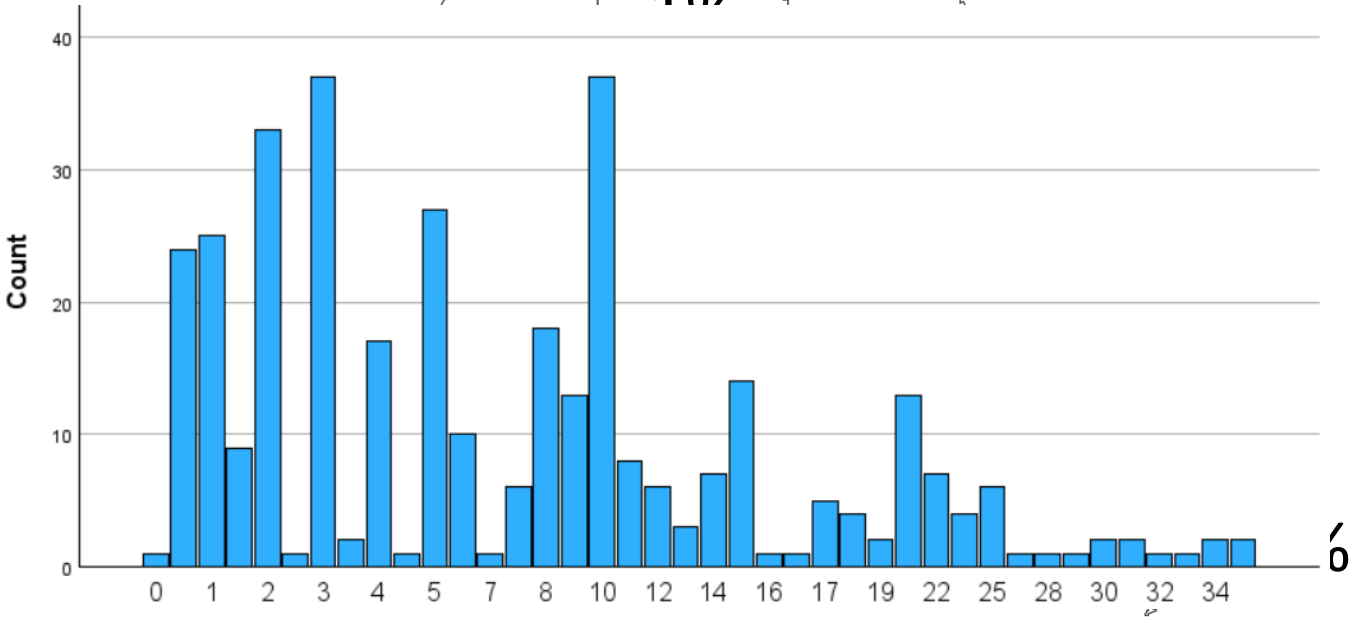
Infection Prevention and Control Workforce

Overview

- 356 ICPs across Australia and New Zealand

- 58% worked in hospitals, 11% RACFs
- 34% leading an IPC team
- 75% public sector

Distribution of years worked



- 47% not credentialled, 23% advanced
- Years working in IPC = 6 (median), 8 mean

Infection Prevention and Control Workforce

Results: WoSS / Work Stress Screener

- 5 questions
- Possible score of 0 to 15
- High score = indication that there is malignant or harmful stress

- Mean score 4.3
  - 14% score of 0
  - 8% score >10
- Significantly higher levels of stress
  - Those <6 years IPC experience
- Significantly lower levels of stress
  - Masters or higher level degree

Infection Prevention and Control Workforce

Results: Resilience, Brief resilience score

- 6 questions

- 1.00–2.99 for low resilience
- 3.00–4.30 for normal resilience
- 4.31–5.00 for high resilience

- Mean score 3.3
  - 26% low resilience
  - 8% high resilience

- Significantly higher levels of resilience
  - ≥ 6 years IPC experience
  - Masters or higher level degree

- Significantly lower levels of resilience
  - Who are credentialed
  - < 45 years old

Infection Prevention and Control Workforce

Results: Personality traits (n=243)

- **Neuroticism**
  - Tendency for negative feelings
- **Extraversion**
  - Pronounced engagement with external world
- **Openness To Experience**
  - Imaginative, creative people from down-to-earth, conventional people
- **Agreeableness**
  - Cooperation and social harmony
- **Conscientiousness**
  - Control, regulate, and direct our impulses

- **Neuroticism**
  - Mean 70 (SD 15) - LOW
- **Extraversion**
  - Mean 79 (SD 11) - HIGH
- **Openness To Experience**
  - Mean 79 (SD 9) - HIGH
- **Agreeableness**
  - Mean 87 (SD 15) - HIGH
- **Conscientiousness**
  - Mean 87 (SD 15) - HIGH

Personality traits differed between age groups and those credentialed/not credentialed, little with IPC education

Infection Prevention and Control Workforce

Results: Workforce (n=343)

- **Will you leave the profession in the next three years?**
    - 20% Yes
        - 24% in the less 6 years experience category
        - 22% in <45 years old (16% ≥45 years)

- **Retire in next 10 years**
    - 31% Yes

IPC Workforce Take-homes

- Important to think about personalities in your own team
  - Mix?
  - Tailor your leadership style
  - Conscientiousness, biggest influencer in job performance - higher knowledge and conscientious to learn (Essentials of Organizational Behavior: 14th Edition)
  - Neuroticism propensity for burnout
- Reflect on your own personality – play to your strengths and understand others
- Need to look after those less experienced
- Study is not cause and effect

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Survival of pathogens in the environment

- Systematic search of literature
- 62 papers, in which the survival of 31 pathogens was undertaken in 572 tests.
- The studies spanned 1963 to 2023, in 14 countries

Journal of Hospital Infection 147 (2024) 25–31

Available online at www.sciencedirect.com

Journal of Hospital Infection

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

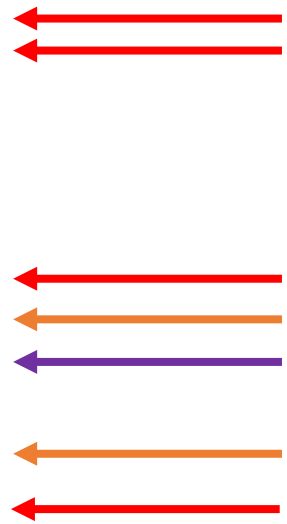
Review

How long do nosocomial pathogens persist on inanimate surfaces? A scoping review

L. Porter [a,b,†], O. Sultan [a,b,†], B.G. Mitchell [c,d,e], A. Jenney [f], M. Kiernan [g], D.J. Brewster [h,i], P.L. Russo [a,b,c,*]

Table II
Range of survival by pathogen

	Pathogen	Range of survival in days (unless otherwise indicated)
Gram positive	*Staphylococcus aureus*	<1 min to 318
	Clostridioides difficile	0.13–140
	Coagulase-negative *Staphylococcus*	<1 min to 28
	Micrococcus spp.	10–10
	Streptococcus mutans	0.13–0.2
	Bacillus spp.	1–28
	Enterococcus spp.	0.02–287
Gram negative	*Acinetobacter* spp.	0.04–90
	Burkholderia cepacia	0.13–8
	Citrobacter freundii	0.06–0.11
	Escherichia coli	<1 min to 56
	Klebsiella pneumoniae	0.57–600
	Proteus mirabilis	0.16–0.16
	Pseudomonas spp.	0.08–7
	Salmonella spp.	0.29–5
	Serratia spp.	0.29–20
	Stenotrophomonas maltophilia	0.29–1
	Haemophilus influenzae	1–1
Fungi	*Candida auris*	14–14
	Candida spp.	0.13–28
Virus	Animal virus	0.5–7
	Coronavirus	0.04–20
	Cytomegalovirus	<1 min to 0.01
	Human virus	<1 min to 12
	SARS-CoV	1–2

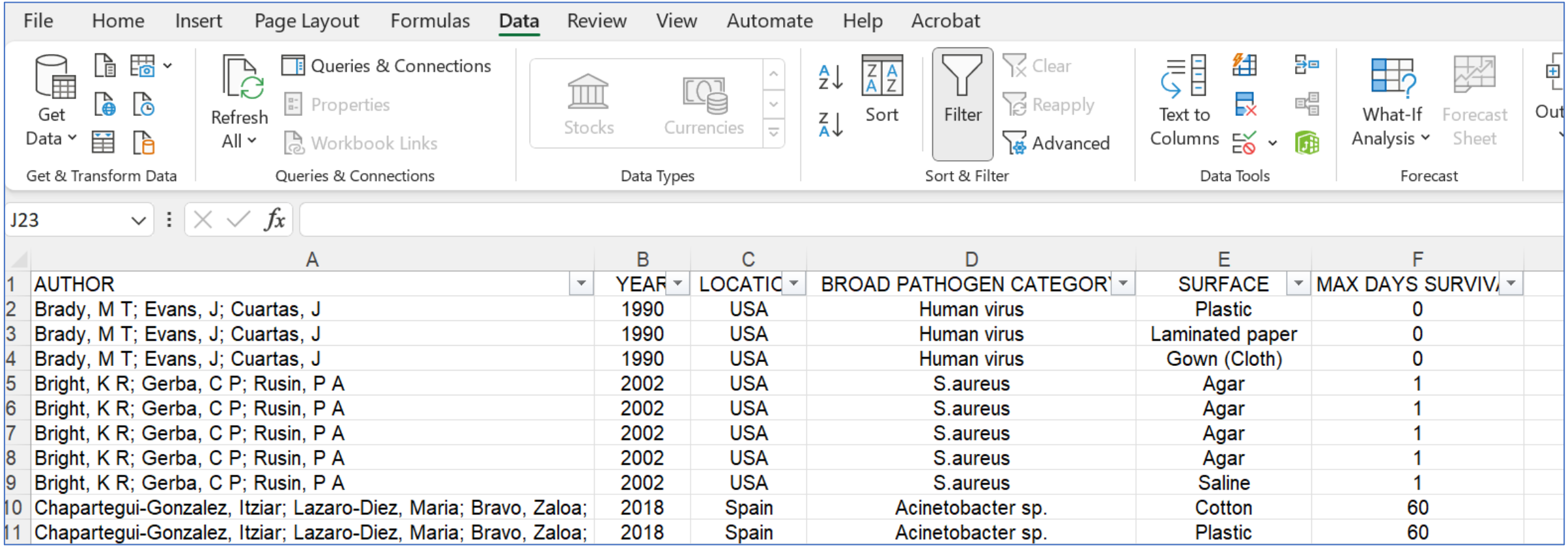


Survival time by surface type

Table III
Range of survival time by pathogen and surface

Surface	Pathogens of interest [c]	Range of survival in days (across studies)
Non-porous[a]	*Acinetobacter* spp.	0.29–60
	Clostridioides difficile	0.13–140
	Escherichia coli	0.25–11
	Klebsiella pneumoniae	2–2
	Pseudomonas spp.	0.21–7
	Staphylococcus aureus	0.04–60
Porous[b]	*Acinetobacter* spp.	1.5–90
	C. difficile	0.25–3
	E. coli	0.29–25
	K. pneumoniae	4–600
	Pseudomonas spp.	0.08–7
	S. aureus	1–168

Supplementary material: something useful?



	A	B	C	D	E	F
1	AUTHOR	YEAR	LOCATIC	BROAD PATHOGEN CATEGOR	SURFACE	MAX DAYS SURVIV
2	Brady, M T; Evans, J; Cuartas, J	1990	USA	Human virus	Plastic	0
3	Brady, M T; Evans, J; Cuartas, J	1990	USA	Human virus	Laminated paper	0
4	Brady, M T; Evans, J; Cuartas, J	1990	USA	Human virus	Gown (Cloth)	0
5	Bright, K R; Gerba, C P; Rusin, P A	2002	USA	S.aureus	Agar	1
6	Bright, K R; Gerba, C P; Rusin, P A	2002	USA	S.aureus	Agar	1
7	Bright, K R; Gerba, C P; Rusin, P A	2002	USA	S.aureus	Agar	1
8	Bright, K R; Gerba, C P; Rusin, P A	2002	USA	S.aureus	Agar	1
9	Bright, K R; Gerba, C P; Rusin, P A	2002	USA	S.aureus	Saline	1
10	Chapartegui-Gonzalez, Itziar; Lazaro-Diez, Maria; Bravo, Zaloa;	2018	Spain	Acinetobacter sp.	Cotton	60
11	Chapartegui-Gonzalez, Itziar; Lazaro-Diez, Maria; Bravo, Zaloa;	2018	Spain	Acinetobacter sp.	Plastic	60

Take-homes

- Pathogens survive for various period of time, depending on the pathogen and surface
- Some pathogens can survive for extended periods of time
- Survival in the environment can serve as a potential reservoir for ongoing transmission.

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The CLEANING AND ENHANCED DISINFECTION study

Brett Mitchell, Kate Browne, Georgia Matterson, Phil Russo, Nicole White, Andrew Stewardson, Allen Cheng, Maham Amin, Kirsty Graham, Jennie King, Martin Kiernan, Peta Tehan, David Brain, Maria Northcote.

CLEEN study
Cleaning of shared medical equipment

3 hours of **additional dedicated** cleaning of shared medical equipment per ward, per weekday

www.cleenstudy.com

CLEEN study

Study design

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Cluster 1 Wards 1&2	Control	Intervention	Intervention	Intervention	Intervention	Intervention
Cluster 2 Wards 3&4	Control	Control	Intervention	Intervention	Intervention	Intervention
Cluster 3 Wards 5&6	Control	Control	Control	Intervention	Intervention	Intervention
Cluster 4 Wards 7&8	Control	Control	Control	Control	Intervention	Intervention
Cluster 5 Wards 9&10	Control	Control	Control	Control	Control	Intervention

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CLEEN study: Different parts and outcomes

- **Effectiveness of additional cleaning on all HAIs**
  - Sub-analyses on All HAIs minus COVID-19; Pneumonia, surgical site, blood-stream and urinary traction infection combined
- **Improvements in the thoroughness of cleaning**
  - Florescent gel and UV
- **Cost effectiveness**
- **Time and motion**
  - How long does it take to clean individual pieces of shared medical equipment?
- **Cleaner interviews**
  - Cleaners' experience of receiving feedback
- **Scenario modeling**

www.cleenstudy.com

CLEEN study: Different parts and outcomes

Effectiveness (RCT)

- Preliminary results presented at ECCMID later this month
- Journal publication submitted end month
- Presentation of results at IPS conference (Manchester, UK)

- Cost-effectiveness
  - Working on analysis currently
  - ? Presentation of results at ACIPC, in addition to effectiveness

- Cleaner interviews
  - Present some findings now
  - ? Presentation of results at ACIPC, in addition to above

- Time and motion study
  - Journal paper under review
  - Present some findings now
  - ? Presentation of results at ACIPC, in addition to above

- Scenario modeling
  - Paper to come
  - ? Presentation of results at ACIPC, in addition to above

CLEEN Study: Time and motion study

How much time is needed to effectively clean shared medical equipment?

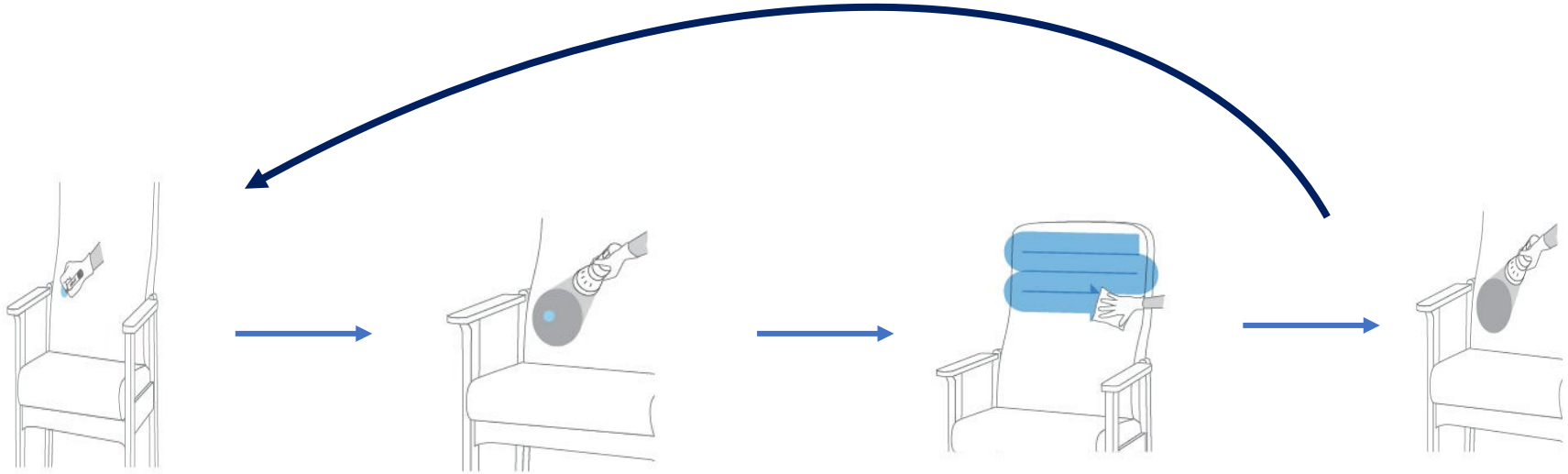
CLEEN study: Time and Motion - Why?

- How can we effectively plan cleaning programs and staff these accordingly?
- Allocating cleaning responsibility means time, especially for clinical staff
- Cost-effectiveness evaluations
- Plan future cleaning models

CLEEN study: Time and motion study

Methods

- Observational study, time and motion
- Participants received training on how to clean shared medical equipment
- UV dot placed, item cleaned, recorded how long.



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CLEEN study: Time and motion study

Results

Type of equipment	Mean time: effectively* clean (min:sec)	Min time (min:sec)	Max time (min:sec)
Blood glucose testing kit	0:50	0:27	1:10
Intravenous stand	1:20	0:40	2:01
Infusion pump	1:21	0:31	2:06
Blood pressure monitor	1:49	1:00	2:13
Patslide	2:17	1:38	3:00
Metal trolley	2:19	1:38	4:20
Wheelchair	2:29	1:21	3:38
Resuscitation trolley	2:29	2:01	3:50
Computer on wheels	2:43	1:46	4:00
Commode	2:58	2:18	4:20
Bladder scanner	3:16	2:09	5:01
Medication trolley	3:53	3:15	4:28

CLEEN study: Different parts

Effectiveness (RCT)

- Preliminary results presented at ECCMID later this month
- Journal publication submitted end month
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- Cost-effectiveness
  - Working on analysis currently
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- Scenario modeling
  - Paper to come
  - ? Presentation of results at ACIPC, in addition to above

CLEEN study: Cleaners experience study

Method and results

Methods

- Describe their personal experiences of cleaning shared medical equipment and how they prefer to receive feedback about their work
- Semi-structured focus group

Results

- Regarding feedback the cleaners preferred method was verbal or through email (small groups or individually)
- Did not like the public displays of feedback.
- Furthermore, it was noted that cleaners valued demonstrations of cleaning processes as an additional feedback method

CLEEN study take homes:

Time and motion & Cleaner's perspectives

- It takes time to clean shared medical equipment, need to factor this into planning
- Consider the cleaner's perspectives on receiving feedback
- Main results on effectiveness and cost-effectiveness to come

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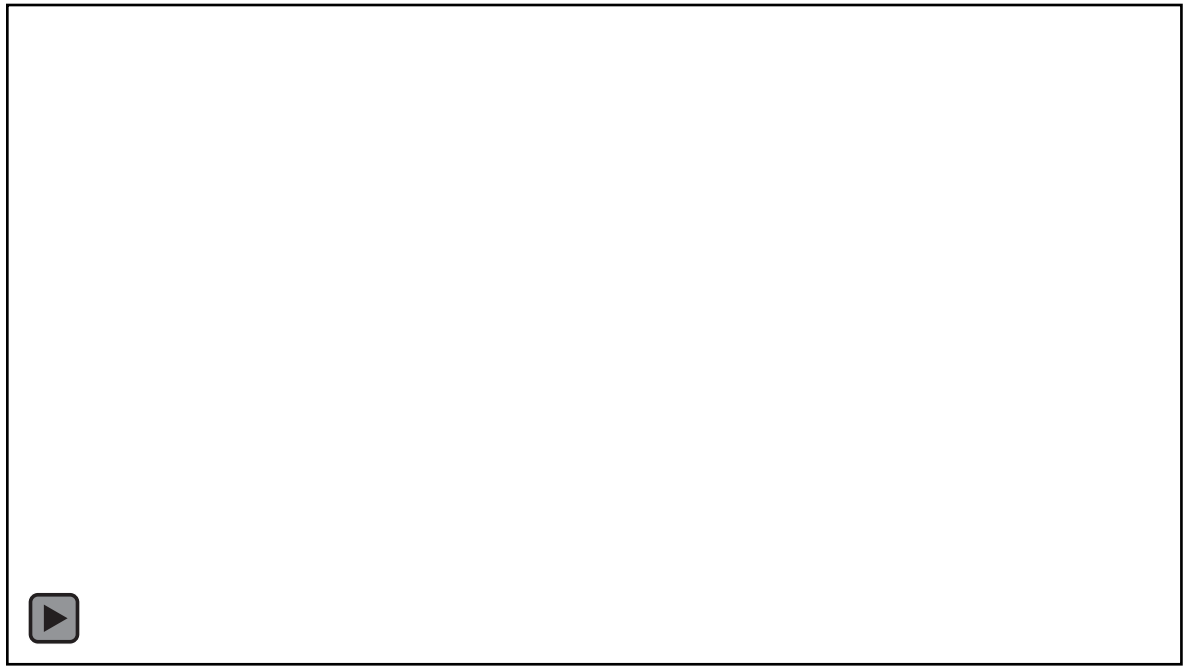
Hospital Acquired Pneumonia PrEveNtion (The HAPPEN study)

- Multi-centre RCT
- Effect of improving the quality and quantity of oral care on the incidence of HAP
- Cost-effectiveness
- Patient experience of HAP
- Attributable LOS in hospital



www.happenstudy.com

HAPPEN study: The team

Chief Investigators

- Professor Brett Mitchell
- Dr Nicole White
- Professor Allen Cheng
- Professor Helen Rawson
- Professor Phil Russo
- Professor Rhonda Wilson
- Professor Jenny Sim
- A/Professor Andrew Stewardson
- Dr Sonja Dawson
- Dr Julee McDonagh
- Dr Auxilla Madhuvu

Associate Investigators

- Liz Orr
- Jayne O'Connor
- A/Prof Caroline Marshall
- A/Prof Doug Johnson
- Professor Patricia Stone
- Professor Nick Graves
- Professor Maria Northcote
- Professor Janet Wallace

- Dr Peta Tehan
- Dr Kate Browne
- Georgia Matterson

www.happenstudy.com

Partners

Australian College of Nursing

Sigma Global Nursing Excellence

Clinical Excellence Commission

ACIPC Australasian College for Infection Prevention and Control

Cabrini

NSW Government Health Mid North Coast Local Health District

NSW Government Health Central Coast Local Health District

Consumers

HAPPEN study overview

Completed

Starts ~ June 2024

2025-2026

www.happenstudy.com

HAPPEN: Oral care and HAP survey

Methods

- A national survey of Australian Nurses in 2023 (RN or EN).
- Paper currently under review
- Describe current practices, barriers and facilitators, knowledge and educational preferences of registered nurses performing oral health care in the Australian hospital setting, with a focus on the prevention of HAP
- 179 participants

HAPPEN: Oral care and HAP survey

Results (preliminary)

Oral care priorities, training and practice

- 82% agreed that oral care is important, 66% feel oral cavity hard to clean

Perceptions of pneumonia (HAP) risk and prevention strategies

- Of all HAIs, participants ranked pneumonia as third in terms of frequency

Topic	Not important (%)	Slightly important (%)	Moderately important (%)	Very important (%)
Hand hygiene	3 (2)	23 (15)	40 (26)	**90 (58)**
Patient Mobilisation	3 (2)	19 (12)	49 (31)	**85 (55)**
Environmental Cleanliness	8 (5)	24 (15)	43 (28)	**81 (52)**
Correct use of PPE	9 (6)	28 (18)	40 (26)	**79 (51)**
Dysphagia management	3 (2)	20 (13)	56 (36)	**77 (49)**
Oral Care	7 (5)	31 (20)	47 (30)	**71 (45)**

HAPPEN: Oral care and HAP survey

Results (preliminary)

Barriers

- Uncooperative patient (n=91, 43%), inadequate staffing (n=84, 40%) and a lack of oral toilet requisite (n=63, 30%)
- Better supplies (66%)
- Insufficient time (20%)

Education and support

- In-services most popular (30%), then website
- Patient reminders (77%)
- High-quality toothbrushes
- Games and apps least favoured

Publication under review

HAPPEN: Oral care and HAP focus groups

Methods & results (preliminary)

- Three focus groups with nurses across the country
- Paper currently under development

<u>Themes</u>

- **The nurses role**
- **Challenges**
  - Time, lack of resources, education
- **Empowering patients**
  - Education
- **Prompts**
  - Patient prompts and innovation

> *And it's only later that I started to realise that there was a link between oral hygiene and respiratory health, and it's a fairly strong link. Um, and it — and it's interesting that when I mention it to nurses who were quite experienced, they — they're quite surprised by this.*

> *Equipment isn't readily available for patients to do it themselves, which leads me into the expectation is on the patients and therefore the patients aren't getting either prompted or don't know why they're doing it*

Publication in development

www.happenstudy.com

HAPPEN study: Our intervention

- **Dedicated research nurse**
  - Education patients and staff on the ward, working with them [Education, in-service, engaging patients]
  - Assist in providing oral care [Time resource]

- **Products**
  - Good quality toothbrush [Product, Patient prompt]
  - Three-sided toothbrush and toothpaste [Product]

- **Education**
  - Website, training material, short videos and more [Education, engagement]
  - Separate patient and clinician focussed

HAPPEN study overview

Completed

Starts ~ June 2024

2025-2026

www.happenstudy.com

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CATION study

- Investigate the role of chlorhexidine for cleaning meatal area for reducing UTIs in patients that self-catheterise in the community
- Double blind, placebo, cross-over RCT
- Saline Vs 0.1% chlorhexidine
- Recruitment underway
- Results late 2025

Chlorhexidine for meatal cleaning in reducing catheter-associated urinary tract infections: a multicentre stepped-wedge randomised controlled trial

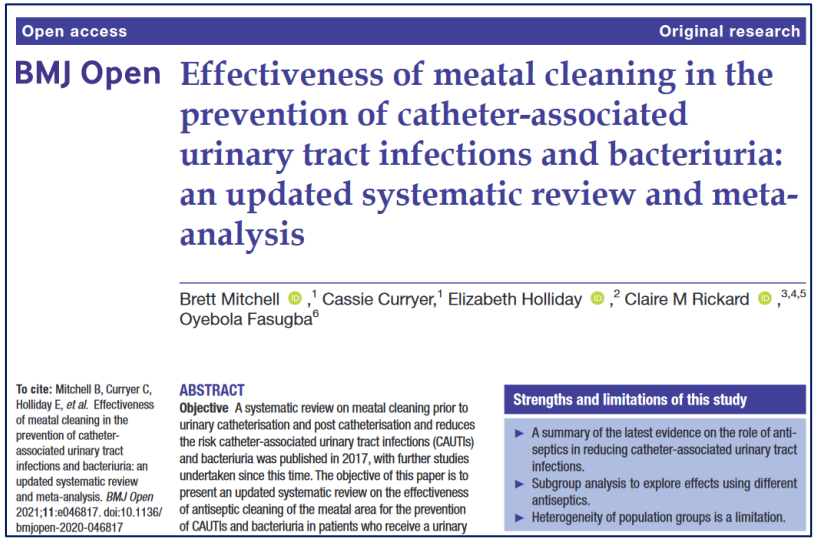
Oyebola Fasugba, Allen C Cheng, Victoria Gregory, Nicholas Graves, Jane Koerner, Peter Collignon, Anne Gardner, Brett G Mitchell

Summary

Background Evidence for the benefits of antiseptic meatal cleaning in reducing catheter-associated urinary tract infection (UTI) is inconclusive. We assessed the efficacy of 0·1% chlorhexidine solution compared with normal saline for meatal cleaning before urinary catheter insertion in reducing the incidence of catheter-associated asymptomatic bacteriuria and UTI

Lancet Infect Dis 2019; 19: 611–19

Published Online April 12, 2019



Open access Original research

BMJ Open

Effectiveness of meatal cleaning in the prevention of catheter-associated urinary tract infections and bacteriuria: an updated systematic review and meta-analysis

Brett Mitchell [1], Cassie Curryer,[1] Elizabeth Holliday [2], Claire M Rickard [3,4,5] Oyebola Fasugba[6]

To cite: Mitchell B, Curryer C, Holliday E, *et al*. Effectiveness of meatal cleaning in the prevention of catheter-associated urinary tract infections and bacteriuria: an updated systematic review and meta-analysis. *BMJ Open* 2021;**11**:e046817. doi:10.1136/bmjopen-2020-046817

ABSTRACT

Objective A systematic review on meatal cleaning prior to urinary catheterisation and post catheterisation and reduces the risk catheter-associated urinary tract infections (CAUTIs) and bacteriuria was published in 2017, with further studies undertaken since this time. The objective of this paper is to present an updated systematic review on the effectiveness of antiseptic cleaning of the meatal area for the prevention of CAUTIs and bacteriuria in patients who receive a urinary

Strengths and limitations of this study

- A summary of the latest evidence on the role of antiseptics in reducing catheter-associated urinary tract infections.
- Subgroup analysis to explore effects using different antiseptics.
- Heterogeneity of population groups is a limitation.

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HIPPS study

- Led by A/Professor Andrew Stewardson
- Establish the prevalence of healthcare-associated infections (HAIs) among adult patients in acute care hospitals in the Philippines
- 23 Level 1, 2 and 3 hospitals in the Philippines
- WHO and DoH Philippines funded
- Data collection coming mid-year

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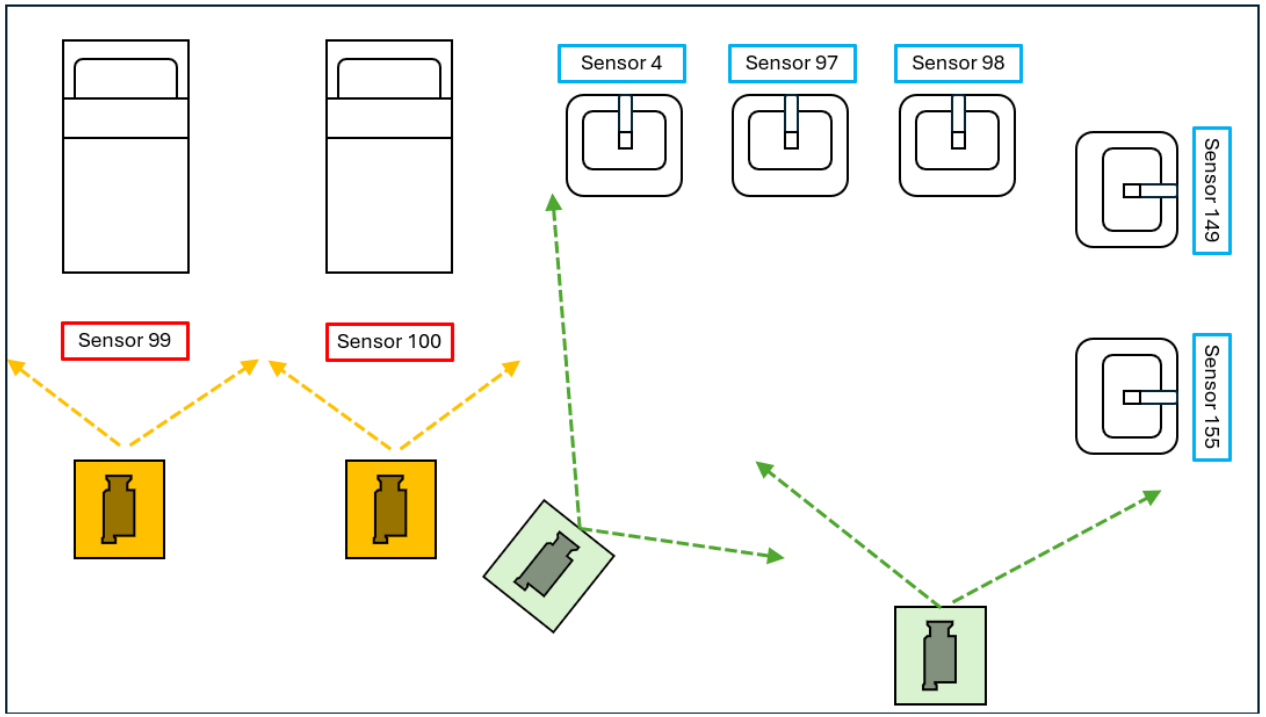
Accelerometer hand hygiene usage study

Hand hygiene sensor technology

- Real-time data collection of hand hygiene usage
- Accelerometer placed in each ABHR and soap-dispenser
- Real-time data could be used to identify historical trends and help facilitate targeted early interventions
- Identify empty ABHR and soap dispensers
- Tested this in a simulation ward with 5000+ observations and nursing activities



Publication in development

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Selection of PhD student work

Air purifier study

- Bismi Thottiyil Sultanmuhammed Abdul
- Effect of in-room air purification on the incidence of ARI
- Multi-centre, double-blind cross-over RCT

Drivers of multi-resistant organism (MRO) acquisition and transmission

- Dr Sarah Browning
- Antibiotic thresholds, gloves and gowns and clinical handwashing basins

Aseptic technique

- Hannah Kent
- Improving education and understanding of aseptic technique

HAP epidemiology & impact

- Michelle Chalker
- Incidence, mortality and attributable LOS associated with HAP

Pressure injury prevention

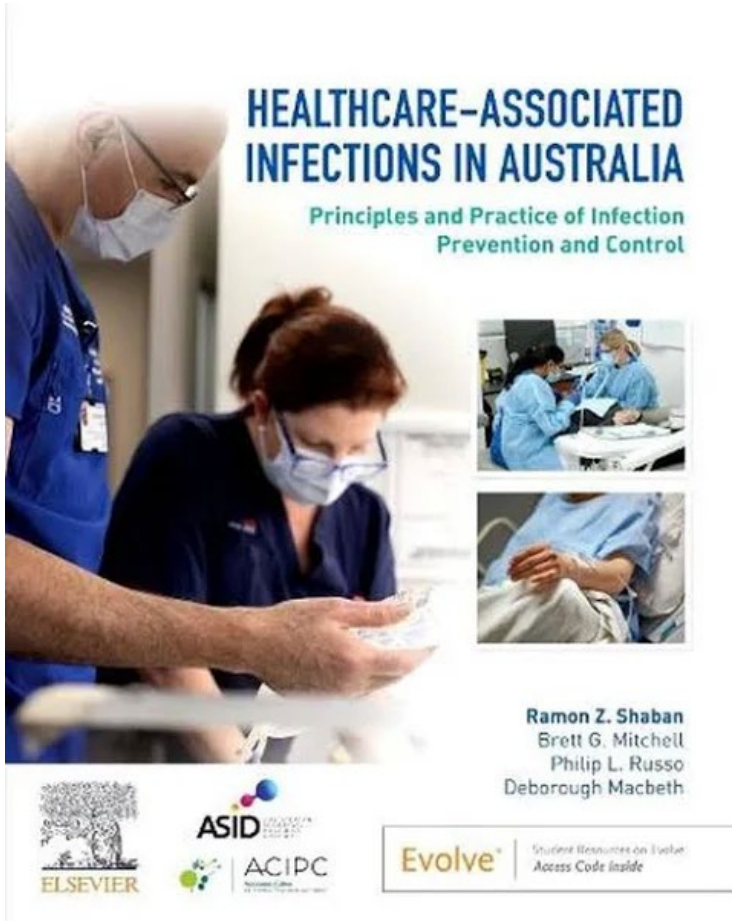
- Hayley Ryan
- Impact of a barrier wipes on pressure injury in aged care residents
- Multi-centre, single-blinded, parallel RCT

HAI Textbook

- The first Australian text to address the challenges posed by infectious diseases and healthcare-associated infections
- 76 authors
- 25 peer reviewers

Scan to order and receive an exclusive 25% discount!*

* 25% discount offer exclusively for ACIPC members. ACIPC members will receive the 25% discount code via email.



Latest research and updates from an Australian IPC research program

CLEEN (cleaning) study: **cleanstudy.com**

HAPPEN (pneumonia) study: **happenstudy.com**

CATION (UTI) study: **utipreventioncom.wordpress.com/**

Infection Control Matters podcast**: infectioncontrolmatters.com**

HAI text:

Prof Brett Mitchell (AM)

brett.Mitchell@avondale.edu.au

Belinda Henderson

Queensland Infection Prevention and Control:
Where are we already
and
Emerging Pathogen: *Candida auris*

Queensland Infection Prevention and Control Unit (QIPCU)

Belinda Henderson

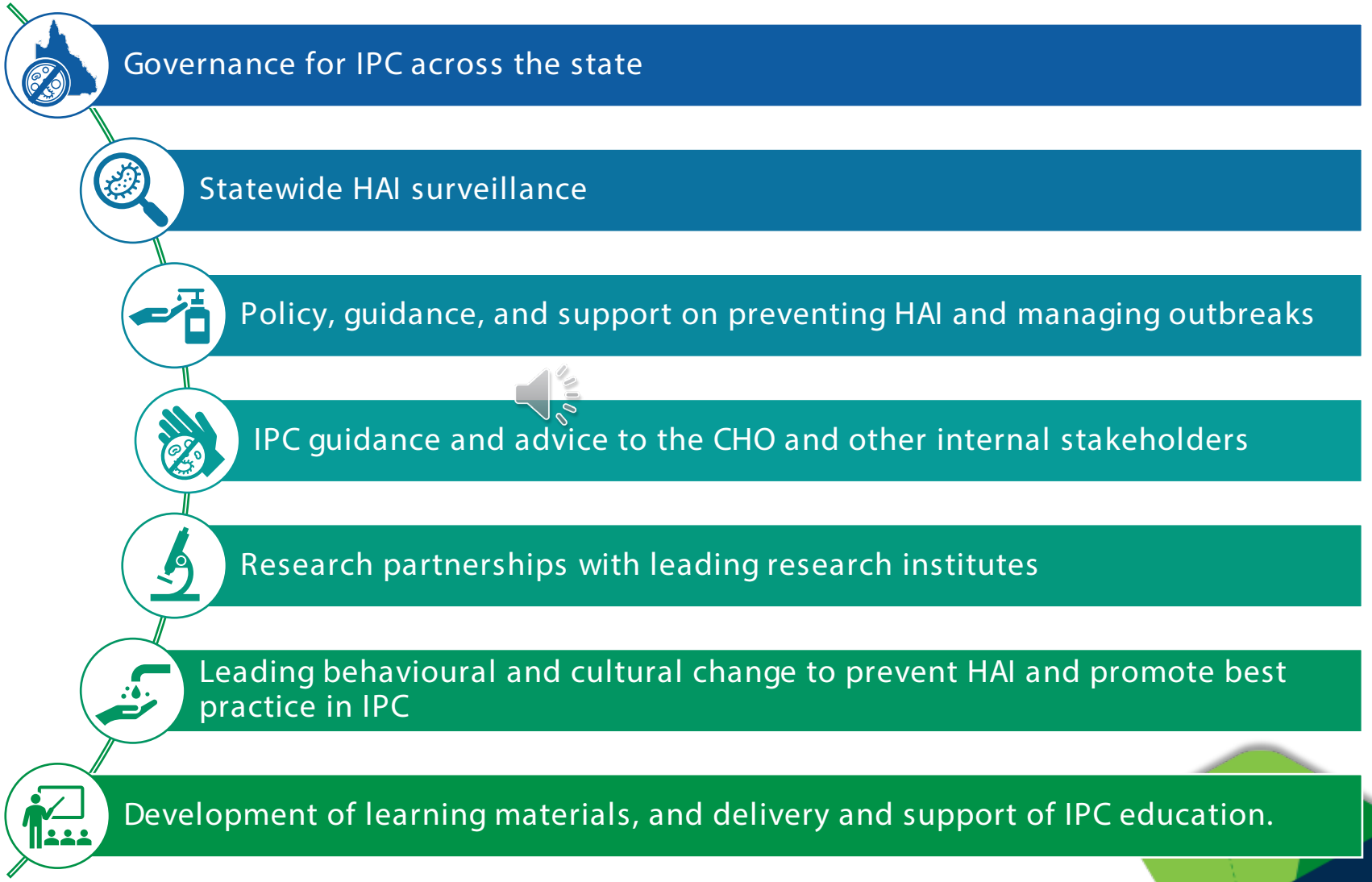
Queensland Government

Risks in the absence of a centralised IPC program- IPC teams needed help and assistance

- Patient safety compromised
- Increased cost of patient care
- Failure to meet NSQHS Standards accreditation
- Missed opportunities for quality improvement
- Failed detection and mitigation of outbreaks
- Poor data quality
- Poor organisational culture

Our approach to centralised IPC

Queensland IPC Program functions:



Benefits of our approach

Patient safety and quality of care

- Proactive system-level response to patient safety
- Advanced outbreak response readiness
- Improved quality of care and patient experience
- Improved health equity and outcomes, particularly for vulnerable groups
- Reduced variability

Efficiency

- Standardised, timely, accurate, accessible, and actionable surveillance data
- Reduced financial burden of HAI
- Optimised health service planning and delivery
- Reduced duplication across the system
- Improved procurement processes

Capacity building

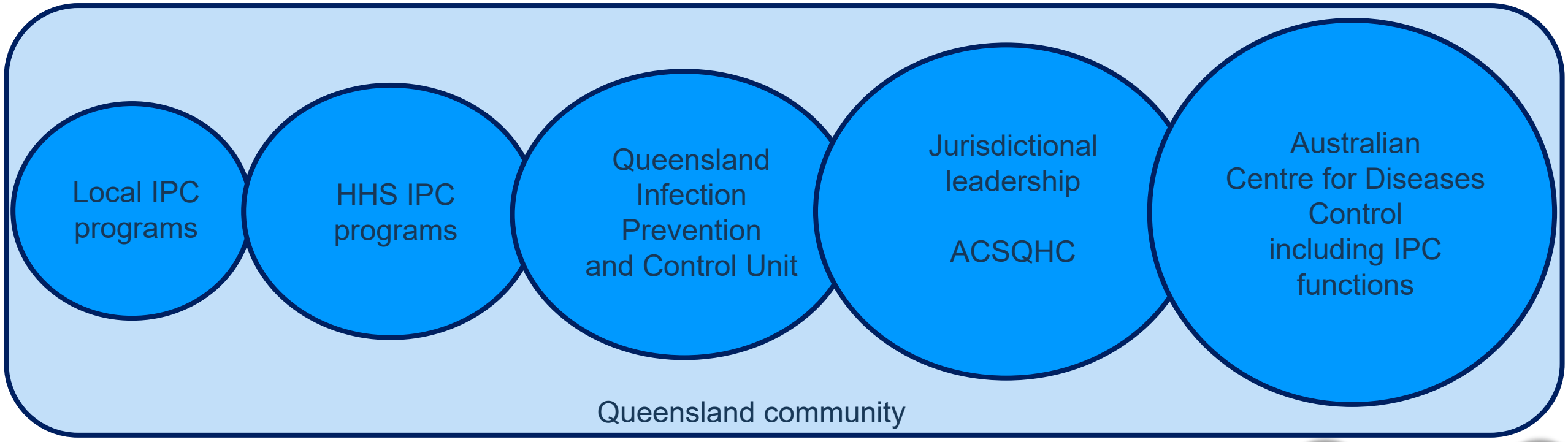
- Improved IPC support for regional, rural and remote facilities
- Capacity building of ICPs
- Collective identity
- Collaborative, innovative, agile, and responsive to the needs of the HHSs and the community
- ICPs working at top-of-scope with meaningful work

Partnerships and engagement

- Genuine engagement and collaboration
- Data sharing
- Strengthened partnership with the QICN
- Meaningful partnerships and support for clinical research and innovation
- Clinical excellence, reform, optimised efficiencies, influence on national & international policy

IPC is a state-wide priority with accountability for outcomes at a system level

IPC in Queensland



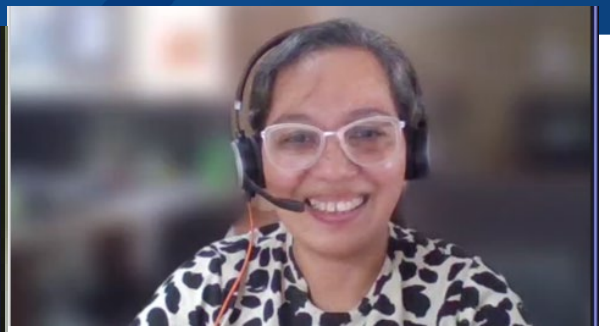
Deliverables so far..

- 10 x FIPC ACIPC scholarships
- Policy and procedure process – VHF, BBE, OE, CA
- Stakeholder engagement
- HAI surveillance activities
- HHS visits
- Virtual forum and newsletter
- QIPCU Immersion
- HH support

- Collaboration site
- HeIDI research partnership
- ICP trouble shooting and support

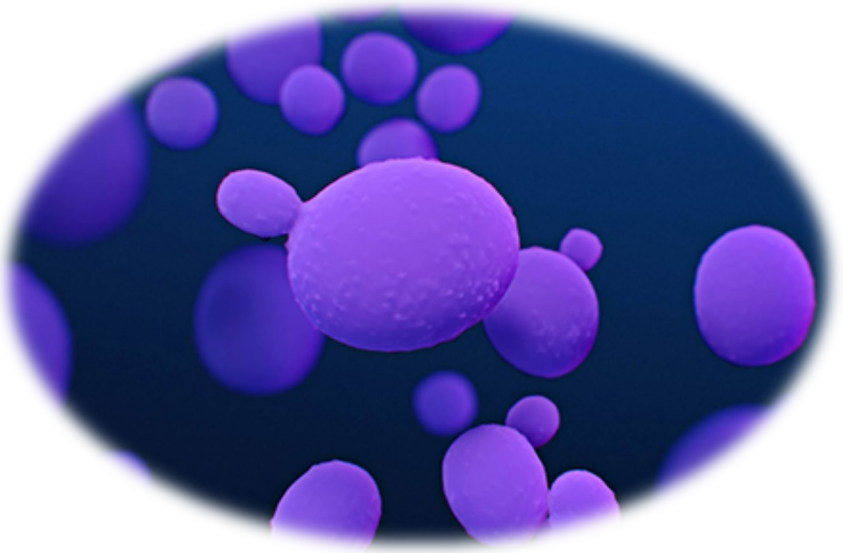
Coming soon

- Building and Capital
- Targeted First Nations health worker scholarships
- HAI dashboards




Kathryn OBrien

Candida auris



- First identified in 2009 in Japan
  - Now 40+ countries including Australia
  - South Korea 1996 misclassified
- Colonisation and candidaemia
- 5 distinct clades
  - Clade I – South Asian : first detected India and Pakistan
  - Clade II – East Asian : first detected Japan
  - Clade III – South African : first detected South Africa
  - Clade IV – South American : first detected Venezuela
  - Clade V – recently detected in Iran
- Rx challenges due to resistance

Queensland Health

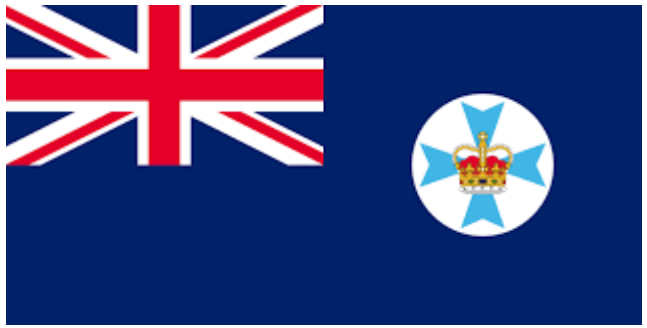
Candida auris (C. auris) – Infection Prevention and Control

Queensland Health Guideline

[Version 3.2]

Key Messages

- *Candida auris* (*C. auris*) is an emerging fungus (yeast) that poses a serious global threat.
- Clinical spectrum ranges from asymptomatic colonisation to bloodstream, bone, CSF, and intra-abdominal infections. Additionally, it has been isolated from wounds, ear and respiratory specimens, urine, bile, and jejunal biopsies.
- *C. auris* is more likely in patients who have been overseas and admitted to a healthcare facility (of any type) overseas in the last 12 months. **At-risk patients must be screened and isolated on admission into a single room with an unshared ensuite under standard and contact transmission-based precautions.**
- Early identification of cases and engagement of local infection prevention and control teams is essential to preventing outbreaks (1–5).



3.1 Early detection and risk assessment

Early detection and assessment of *C. auris* is crucial to prevent transmission and clinical impacts of an outbreak.

The following strategies are strongly recommended:

- **assess all persons presenting** for admission (including preadmission clinics, day only services such as dialysis, Emergency Departments (ED) or via ambulance) **for overseas travel in the last 12 months**. If patient has been identified to have travelled overseas, **query if they have received care in a healthcare facility whilst overseas in the last 12 months**. This includes any type of day visit to dialysis or cancer services, short stay admissions for surgical procedures (such as dental/surgical implants or cosmetic surgery) and any overnight stay in an overseas healthcare facility
- assess if the person is a known contact of a previous case of *C. auris* in a local healthcare facility and determine whether screening was actioned or if the person had recent admission to a facility with a known outbreak of *C. auris*.

Testing for *C. auris* is required for any patient who meets the following criteria:

- interhospital transfers from overseas hospitals
- admitted to, or received treatment at, any overseas healthcare or cosmetic surgery facility in the last 12 months
- interhospital transfers from hospitals that have detected *C. auris* (until the outbreak is declared over)
- contacts of confirmed cases where screening has not been attended.
- See Table 1 for further information

Patient management pending screening results:

identifying details, can be emailed to QIPCU@health.qld.gov.au.

3.3 Identification

***C. auris* infections are usually identified from clinical isolates (blood or other body fluids). From non-sterile sites, *C. auris* may be considered part of commensal flora and not be worked up unless the laboratory is made aware that identification of yeasts to species level is required for infection control purposes.**

If *C. auris* carriage or infection is suspected on epidemiological grounds (for example a known contact of a case or transferred from another centre/overseas country suspected or known to have cases), clinicians should notify the lab, by supplying clinical information on the pathology test request form (ideally also by phone call) to facilitate the application of correct methods to diagnostic samples. Testing frequency is outlined as per Table 1.

Frequency	Screening criteria
1 set of swabs on admission (bilateral axilla and groin)	International healthcare contact (including residential aged care facilities and day therapy units) within the last 12 months.
3 sets of swabs collected a minimum of 24 hours apart (bilateral axilla and groin)	Contacts of confirmed cases (healthcare or community), having share the same room ≥ 24 hours.
Point prevalence surveillance (bilateral axilla and groin)	Where novel detection of *C. auris* has occurred in a clinical setting.

Table 1: Screening frequency

CASE 1 09/2022

- 75 year old female
- Resides Brisbane
- Born South Africa
- IHT from South Africa admitted 09.09.2022
- Prolonged admission to ICU in SA – following anterior wall MI complicated by retroperitoneal bleed, hypovolaemic shock and cardiac arrest subsequent cerebral hypoxia
- Sepsis: likely VAP pseudomonas and fungal BSI
- Transferred with severe deconditioning –swabbed on admission – grew CA from groin and ESBL KP CPE – OXA-48-like rectal swab
- 3/10 E.coli CPE and VRE
- Long admission including rehab

CASE 2 – 12/2022

- 76yo male
- Resides in Brisbane
- Born in Zambia
- Hospitalised in South Africa for shingles, non-ICU – d/c 21/12/22
- Presented ED 26/12/22 admitted to ward
- CA and ESBL screen in the ward 28/12/22 – CA found in groin swab + ESBL E.coli (garden variety)
- Principle Dx HAP – multiple comorbidities
- Limited case info pt RIP

CASE 3 – 07/2023

- 49yo male
- Born and resides in Fiji – not Medicare eligible
- While in Australia, presented to ED w subtherapeutic INR in the context of recent CABG + MVR in India while traveling
- Admitted with infectious colitis
- Screening on presentation 23/6/23 – ESBL E.coli, ESBL KP (CPE) NDM-5 & VRE van A
- CA screening also undertaken- nasal swab only – negative
- Represented on 3/7/23 with sternal wound dehiscence and infection
- 4/7/23 Repeat CA swabs - groin positive
- Representation 1/52ago for sternal washout remains inpt

CASE 4 – 12/2023

- 75yo male
- Born and resides in Tonga – on holiday in Brisbane
- Presented to ED 15/12/2023 with wound breakdown following 4th toe amputation in Tonga 9/12/2023.
- Wound swab and screening CA positive on admission
- Underwent revision of amputation site and discharged 19/12/2023
- WGS - highest match Candida *duobushaemulonis*

Multi-Resistant Organism Screen
SPECIMEN TYPE: Swab Groin Bilateral

MRSA SCREEN:
ESBL/MRGN* SCREEN:

VRE SCREEN:
S.aureus SCREEN:
Candida auris SCREEN: No Candida auris isolated
ORGANISMS:
1. Candida sp.
2.
3.
COMMENT: Isolate 1: Further identified as Candida duobushaemulonii.

* MRGN = Multi-Resistant Gram Negative Bacilli

Ongoing work

- Policy update publication
- Early identification work with system leads
- Availability of WGS for all new isolates

Queensland Government

Dr Jon Otter

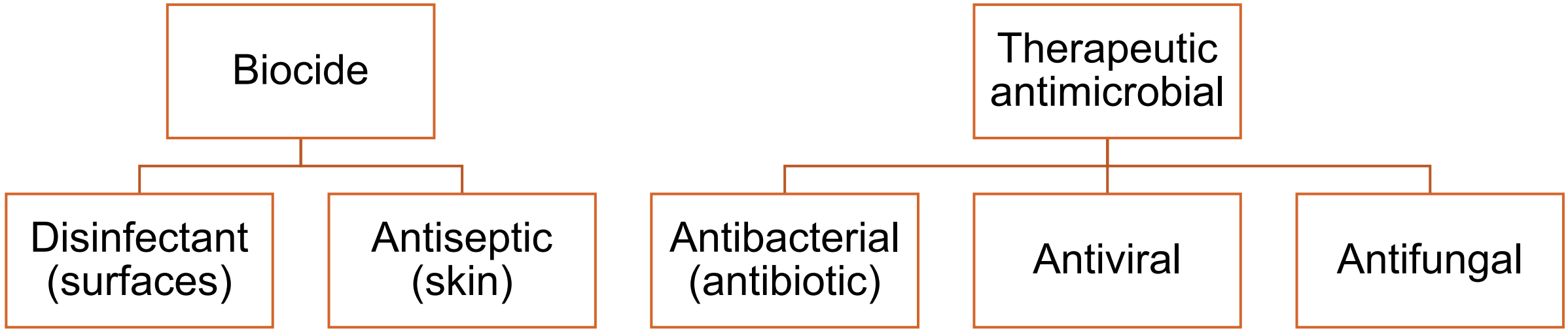
What’s next for IPC? Winter 2024 and beyond

Importance of surface contamination for HCAI and AMR

Current approaches to cleaning and disinfection

Surface disinfectant overview

Possible contribution of surface disinfectants to AMR


Biocide
Disinfectant (surfaces)
Antiseptic (skin)
Therapeutic antimicrobial
Antibacterial (antibiotic)
Antiviral
Antifungal

Biocides vs. therapeutic antimicrobials

Feature	Biocide	Therapeutic antimicrobial
Mechanism of action	Multiple cellular targets	Single process or structure
“Resistance”	Tolerance or reduced susceptibility	Resistance halts therapy
Measurement of “resistance”	No agreed methodology or breakpoints	Defined methodology and breakpoints
Mechanism of “resistance”	Intrinsic or acquired	Intrinsic or acquired

Factors affecting biocide effectiveness

Biocide

- Type / mechanism of action
- Concentration
- Formulation

Application

- Dilution
- Delivery method
- Contact time
- Soiling
- Surface type
- Interactions

Microbe

- Structure (e.g. spores)
- Reduced susceptibility
- Metabolic state (e.g. VNC)
- Community (e.g. biofilm)

Maillard & Pascoe. Nature Rev Microbiol 2024.

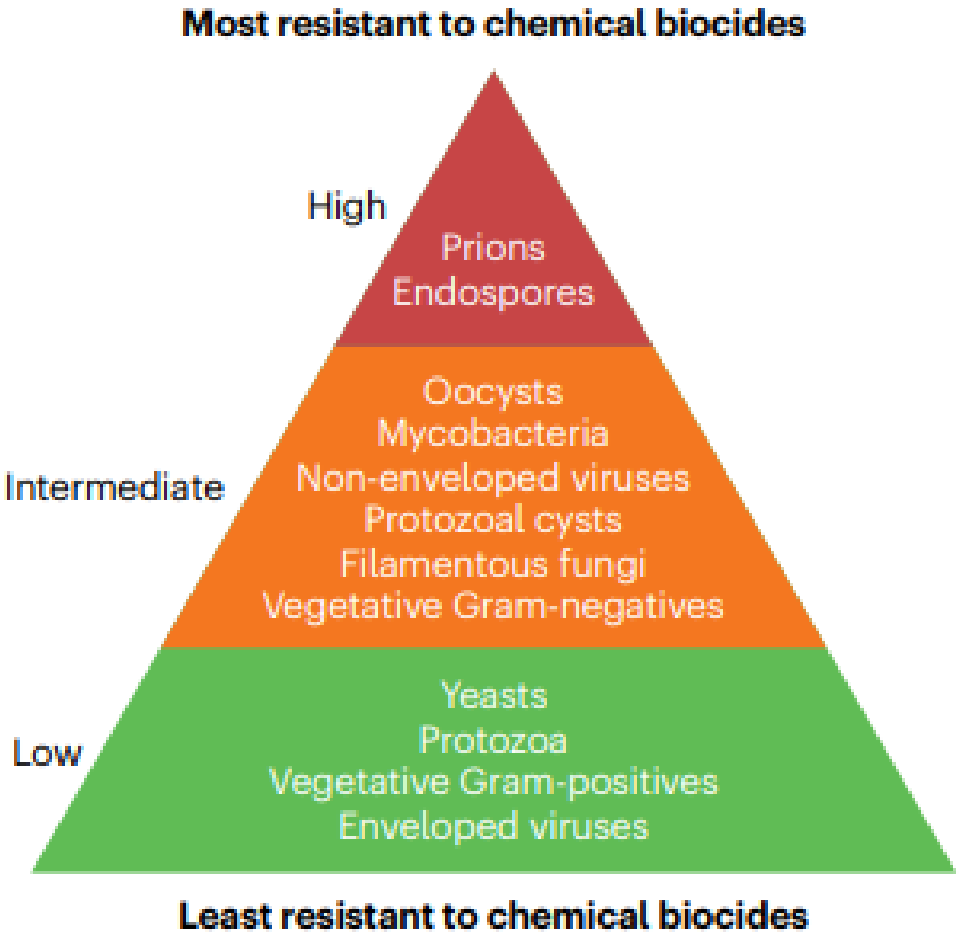
The importance of formulation

Examples of bacteria

- *Bacillus subtilis* spores
- *Clostridioides difficile* spores
- *Mycobacterium chelonae* environmental isolates
- *Mycobacterium massiliense* environmental isolates

- *M. chelonae* standard culture collection
- *Pseudomonas aeruginosa*
- *Staphylococcus aureus* environmental isolates

- *B. subtilis* (vegetative)
- *S. aureus* standard culture collection



Examples of biocides

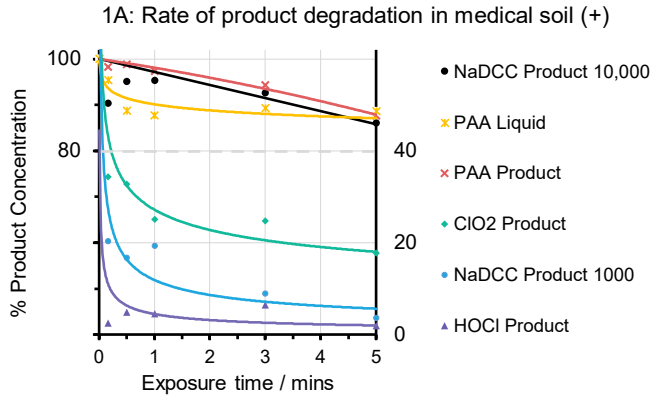
- Ethylene oxide (sterilant)
- Peracetic acid
- ClO_2
- Hydrogen peroxide
- Aldehydes
- Sodium hypochlorite

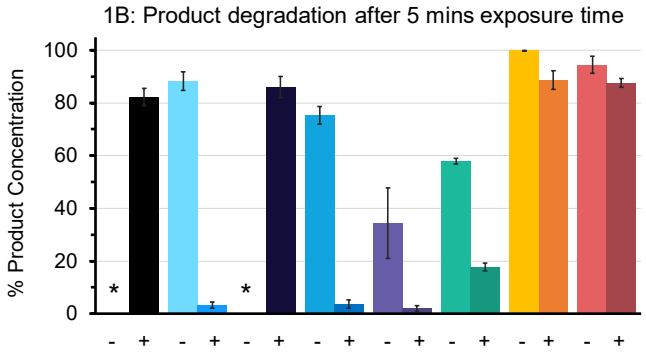
- Povidone–iodine
- Phenolics
- Complex QAC formulations
- Biguanides-based formulations

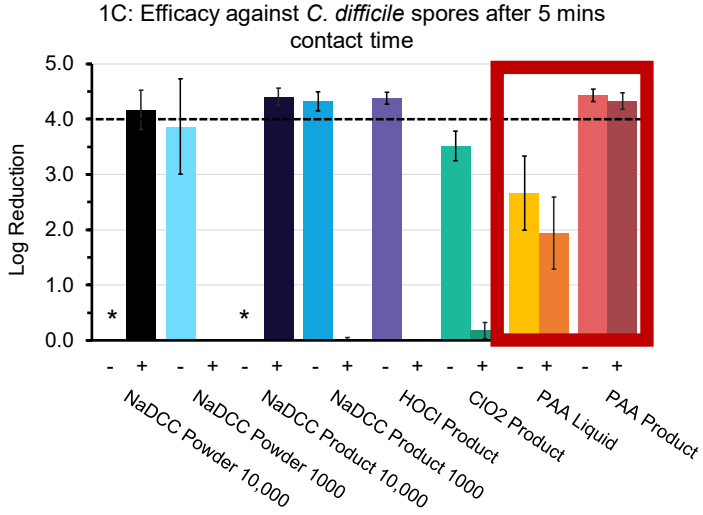
- 70% IPA/ethanol
- Simple QAC solutions
- Simple biguanide solutions
- Antimicrobial dyes

Maillard & Pascoe. Nature Rev Microbiol 2024.

Importance of formulation



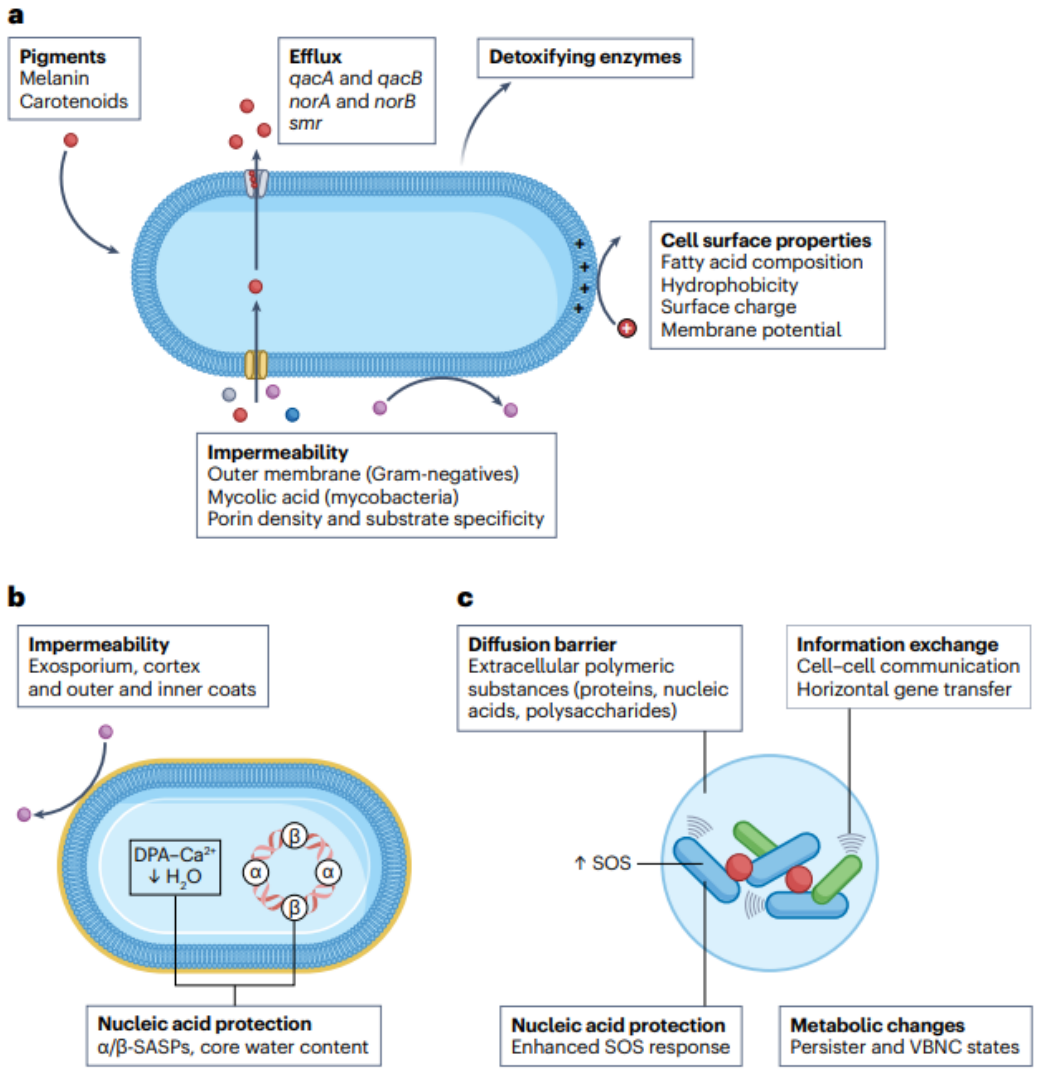




Brown et al. J Hosp Infect 2024 (accepted)

* = not tested

Intrinsic reduced susceptibility to biocides



Maillard & Pascoe. Nature Rev Microbiol 2024.

Acquired reduced susceptibility to biocides

General mechanism	Organism	Biocide (test concentration)	Change in biocide susceptibility	Antibiotic resistance	Specific mechanism	Ref.
Efflux	Mixed waterborne community	Copper (8–500 mg l^{-1})	NA (environmental isolates only)	Clarithromycin; tetracycline	CusA, CusB CusS, CutE	163
	Acinetobacter baumannii	Triclosan (128 mg l^{-1})	2–32-fold increase in MIC	Trimethoprim	FabI, AdeIJK	164
	Pseudomonas aeruginosa	BZC (12.5 mg l^{-1})	12-fold increase in MIC	Ampicillin; cefotaxime; ceftazidime	MexAB–OprM; MecCD–OprJ	165
	Campylobacter spp.	BZC; chlorhexidine; cetylpyridinium chloride	Twofold to fourfold increase in MIC	Erythromycin; ciprofloxacin	Not established (confirmed with efflux inhibitors)	166
	P. aeruginosa	Sodium hypochlorite (100 mg l^{-1})	Approximately 2.5-fold increase in MIC	Ampicillin; tetracycline; chloramphenicol kanamycin	MuxABC–OpmB[a]	134
Porins	*Mycobacterium chelonae*	Glutaraldehyde (0.2–2%)	>6 $\log_{10}$ survival of resistant strain in 2% glutaraldehyde	Rifampicin, vancomycin, clarithromycin, erythromycin	Msp	80
	Escherichia coli	Chlorophene (0.5–2.49 mM) Povidone-iodine (67–111 µg ml^{-1})	Increased growth in twofold to fivefold higher concentrations of biocide after 500 generations	Ampicillin; chloramphenicol; norfloxacin	OmpR; EnvZ	82
Metabolic changes	*E. coli*	Hydrogen peroxide (200 µM)	Increased growth in approximately twofold higher concentration after 500 generations	Ampicillin; chloramphenicol	RNA polymerase (*rpo*)	82
	Mycobacterium smegmatis	Triclosan (0.8–1.6 mg ml^{-1})	Fourfold to sixfold increase in MIC	Isoniazid	Lipid metabolism (InhA)	112
	Listeria monocytogenes	Triclosan (1–4 µg ml^{-1})	No change in MIC	Aminoglycosides	Heme metabolism (*hemH*, *hemA*)	111
Modifications of surface change	*P. aeruginosa*	BZC (50–1600 mg l^{-1})	7–25-fold increase in MIC	Polymyxin B	*pmrB*	67
Extracellular metal-binding protein	*Klebsiella pneumoniae*	Silver (≤64 µM)	NA (clinical isolates only); resistance to silver based on literature values	β-Lactams, fluoroquinolones, aminoglycosides (plasmid-encoded)	SilE	167

BZC, benzalkonium chloride; MIC, minimum inhibitory concentration; NA, not applicable. [a]Induction of SOS response and antioxidant enzymes also noted.

Maillard & Pascoe. Nature Rev Microbiol 2024.

Biocide and therapeutic antimicrobial cross-resistance

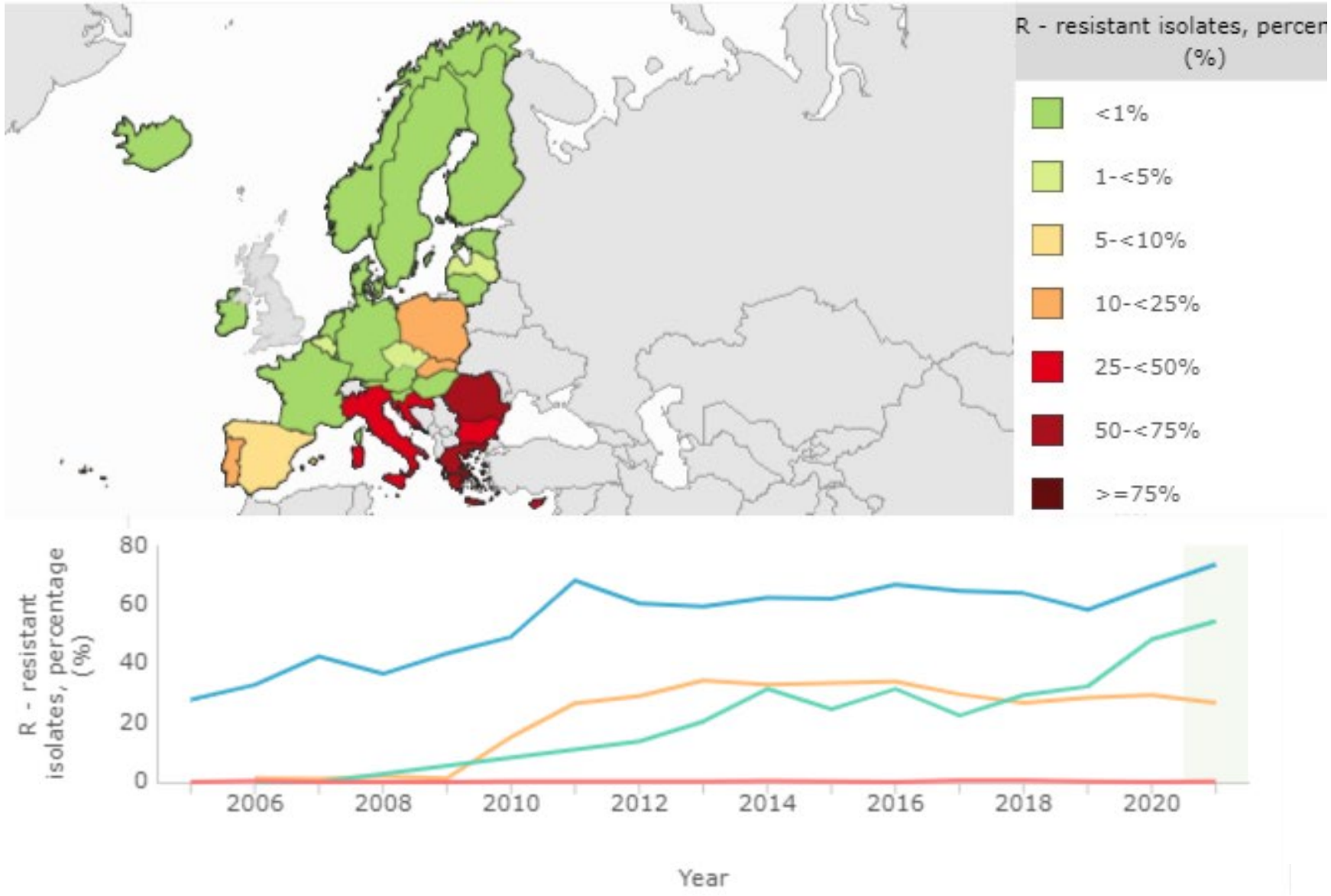
- Direct – shared mechanism for reduced susceptibility to biocides and resistance to therapeutic antimicrobials
- Indirect
  - Exposure to biocides can “switch on” AMR
  - Co-selection of resistance genes on the same mobile genetic element
- Cross-resistance to other biocides can occur
- Risk of cross-resistance varies by biocide
  - Oxidising agents less prone to cross-resistance
- Limited evidence of “real world” impact

Why I’m not too worried about reduced susceptibility to biocides

Biocide reduced susceptibility	Therapeutic antimicrobial resistance (AMR)
Subtle and difficult to measure	Barn door
Few examples of clinically significant issues	We are running out
Have been using for decades without “failures”	New therapeutic antimicrobials don’t last long
We can “formulate our way out”	Formulation isn’t a way out

Why I'm <u>really</u> worried about resistance to therapeutic antimicrobials (aka AMR)

% invasive K. pneumoniae isolates resistant to carbapenems (CRE)



ECDC 2023.

Surface disinfectants in healthcare: when to use them, how to choose them, and their contribution to AMR

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Priorities

What’s hot in IPC

Promoting antimicrobial stewardship

Embedding digital systems to enhance our clinical services

Preventing Gram-negative bloodstream infection

Preventing SSI

Preventing the transmission of SARS-CoV-2 in our hospitals

Promoting antimicrobial stewardship

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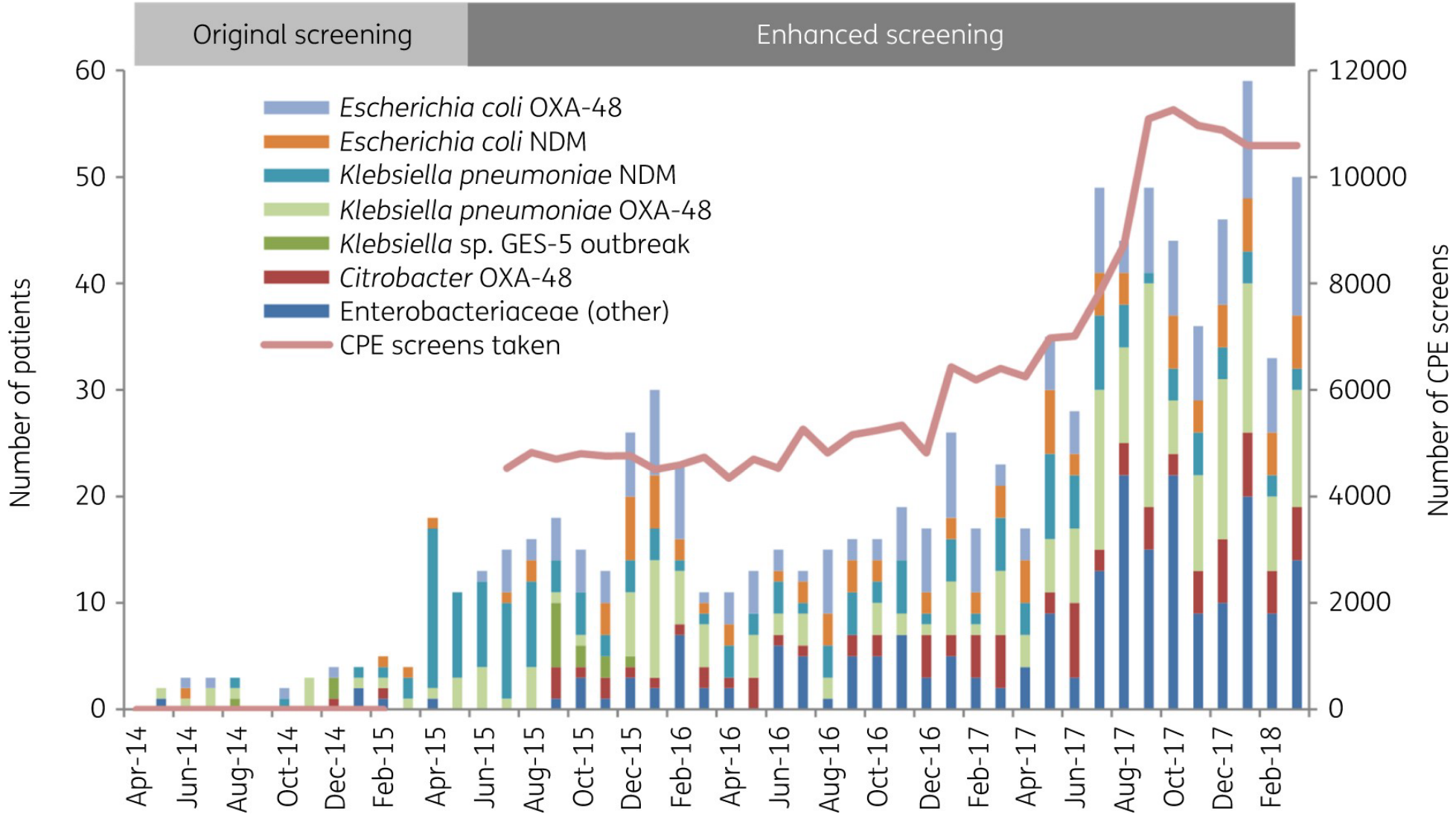
CPE: seek and ye shall find?

Overall trend in CPE detected at Imperial, by bacterial species and mechanisms, deduplicated by patient



Otter et al. J Antimicrob Chemother 2020.

Promoting antimicrobial stewardship

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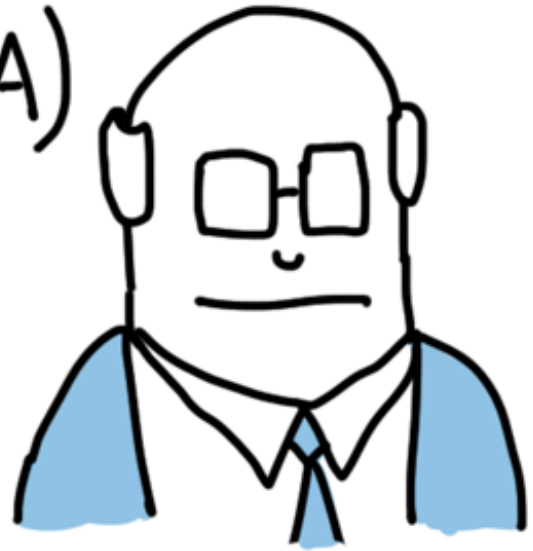
WHO LED THE DIGITAL TRANSFORMATION OF YOUR COMPANY ?

A)

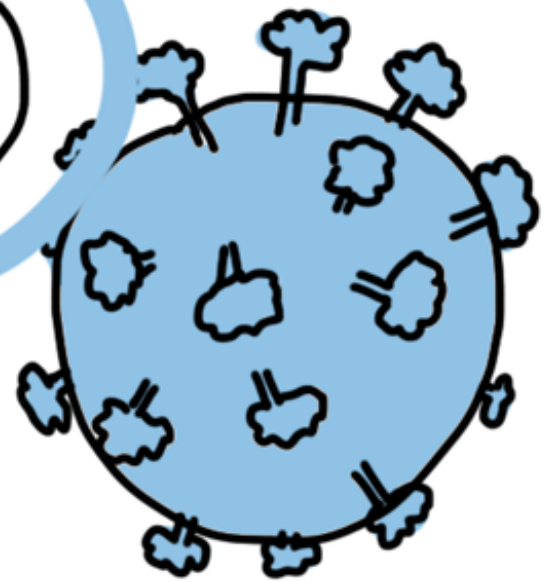


THE CEO

B)

THE CTO

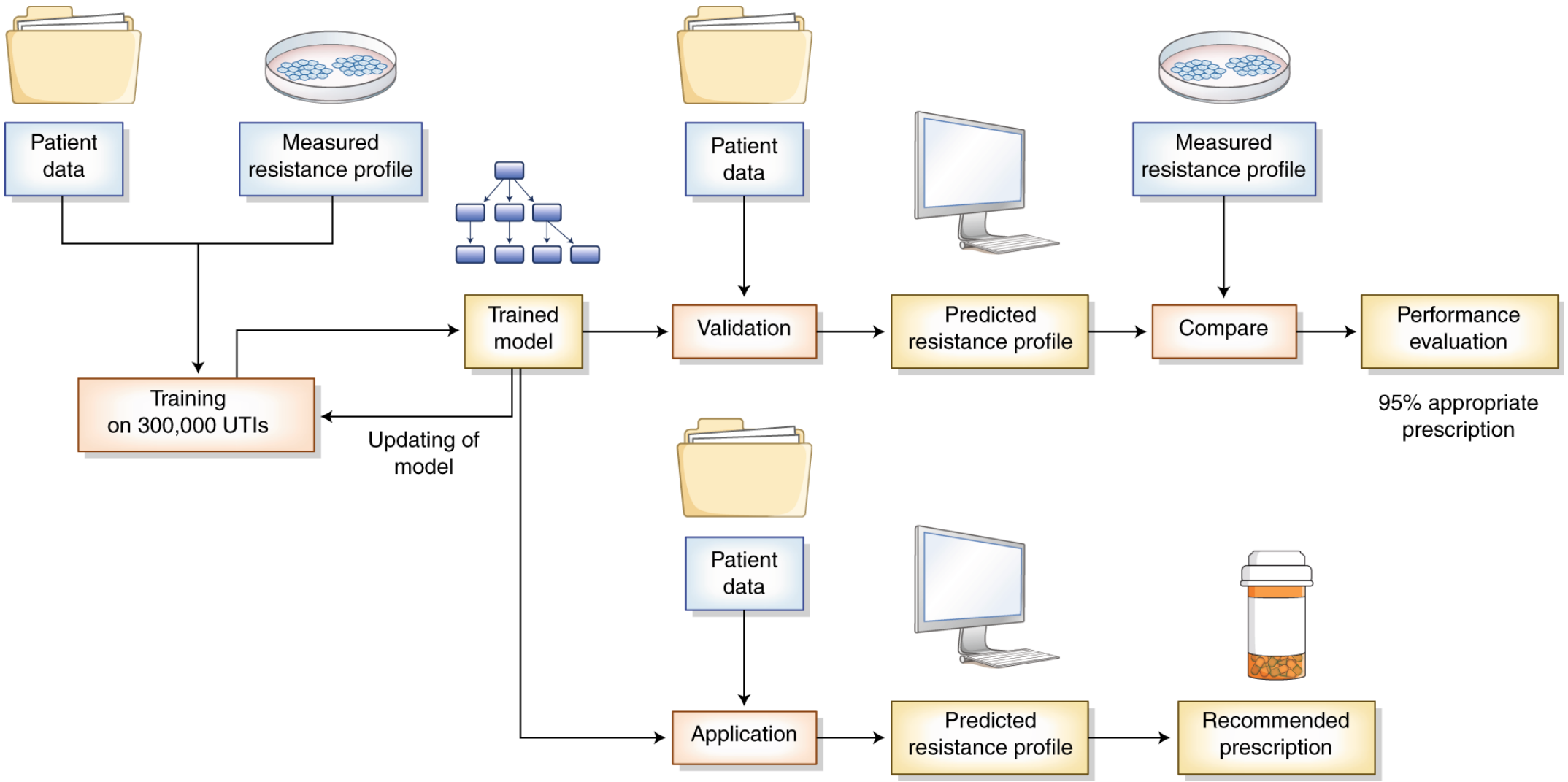
C)



COVID-19

BUSINESSILLUSTRATOR.COM

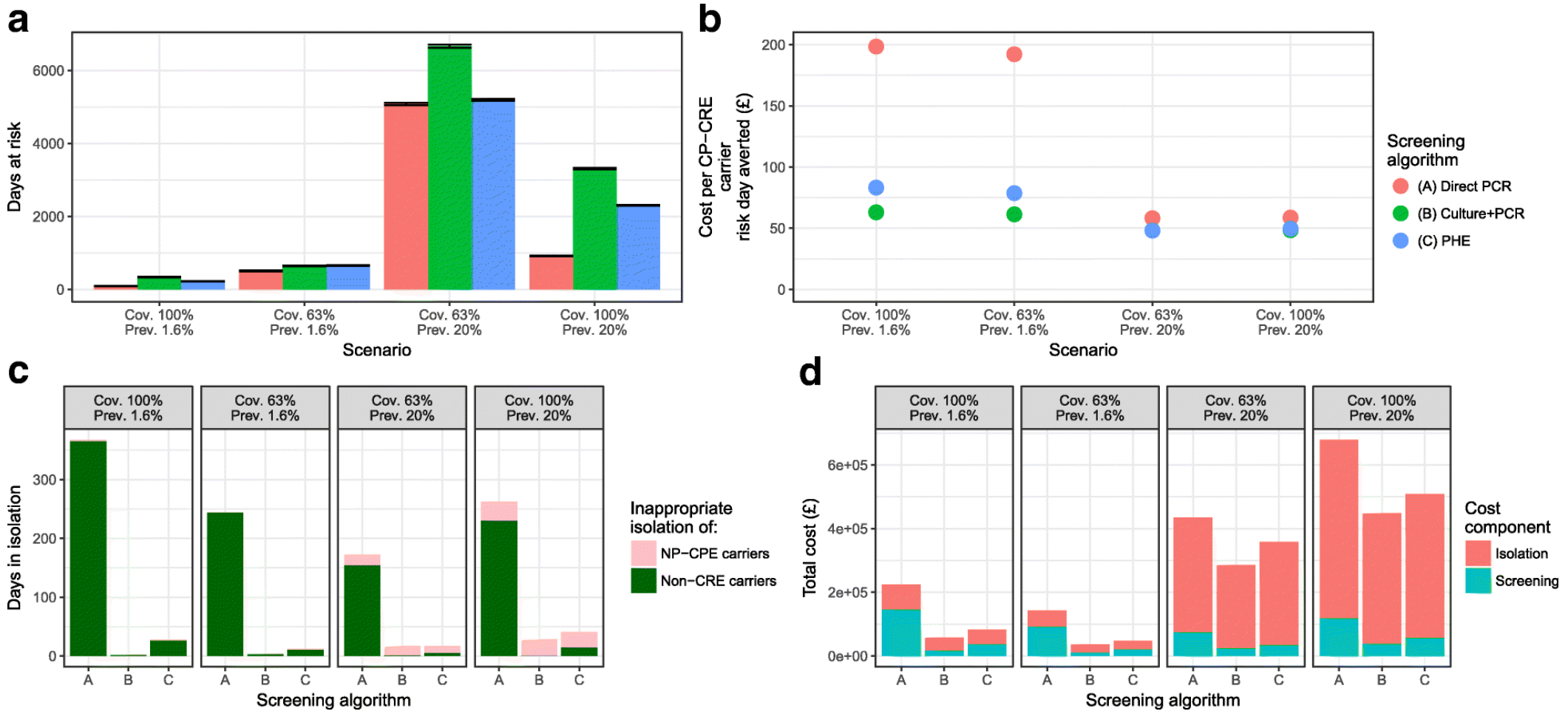
Machine learning / AI: antimicrobial prescribing decision support



Didelot et al. Nature Medicine 2019.

Modelling

Fast and expensive (PCR) or cheap and slow (culture)? A mathematical modelling study to explore screening for carbapenem resistance in UK hospitals



Knight BMC Medicine 2018.

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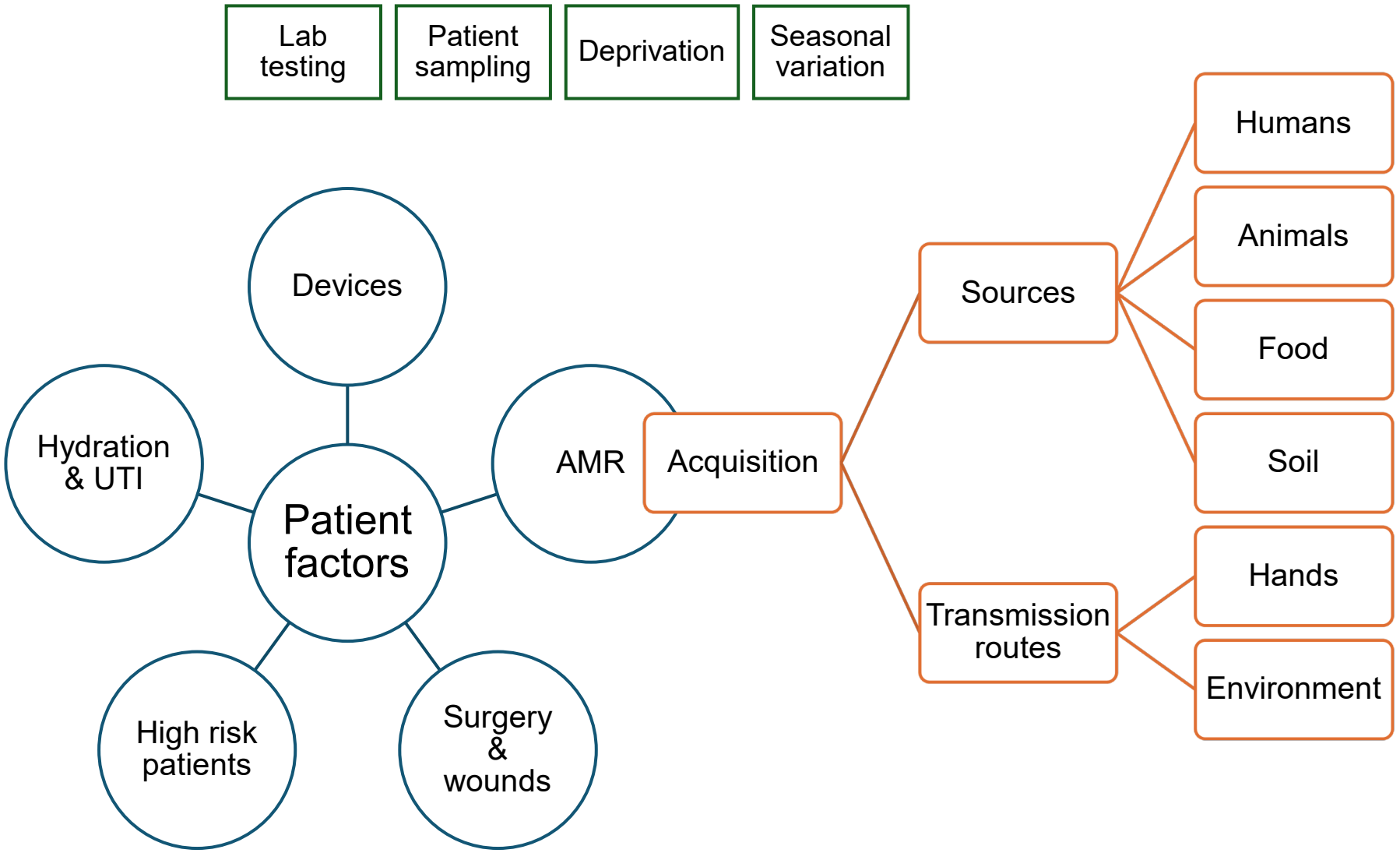
Drivers of Gram-negative BSI



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Patient experience

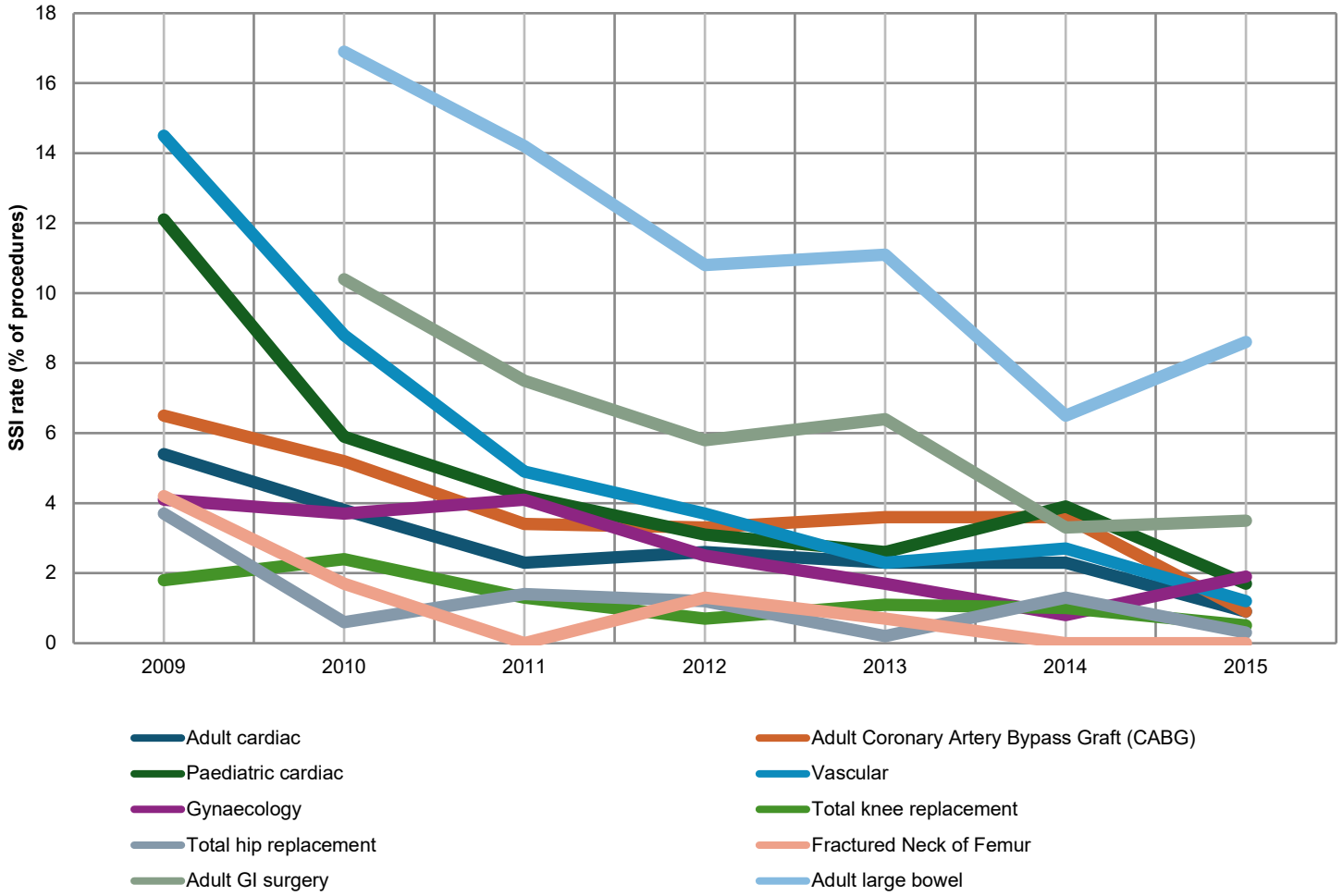
17 patients who had suffered an SSI were enrolled into a semi-structured interview

‘I was crying, I was just not well at all. I couldn’t keep a drink down. The GP came and said what do you expect, you’ve had major surgery. I started to think I was going mad, perhaps you are supposed to feel like this. My husband was at his wits end, he didn’t know what to do. He called the NHS helpline and they said to buy some anti-sickness tablets from the chemist but they didn’t work. He rang the hospital and they weren’t very helpful, he rang the ward and they said she has been discharged so there is nothing we can do. Then after three or four days I was getting terrific pains in my stomach and I felt like I had wet myself, there was a lot of blood just gushing out of me.’

Tanner et al. J Infect Prevent 2012

SSI prevention: a success story

SSI surveillance at GSTT began to be enhanced in January 2009. The Trust now performs SSI surveillance in 12 surgical specialties. Assuming that the latest and lowest rate of SSI was achievable from the start of the programme, the reductions achieved suggest that 774 SSIs have been prevented. Assuming each SSI costs £5,239, this has resulted in savings of £4,056,443 over 6 years.



Unpublished data, with permission from GSTT.

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PPE	Transmission routes	Testing and laboratory factors	Vaccination
Organizational transformation	Guidelines and policy development	Regulatory framework	Outbreaks
Non-COVID pathogens	Antimicrobial stewardship	Digital transformation	Applied research

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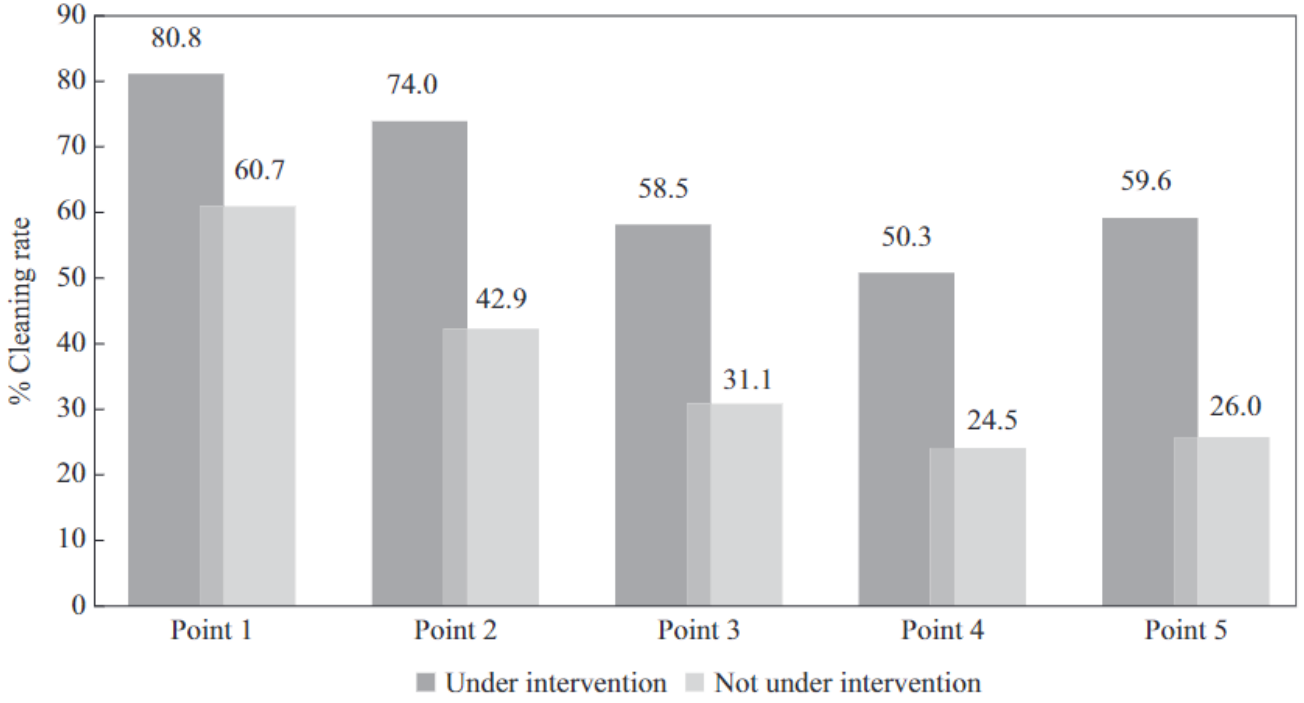
Priorities

What’s hot in IPC

More effective surface disinfection improves patient outcomes

- Prospective intervention cluster cross-over study in Israel.
- Performed over 15 months, including 7,725 patients.
- Intervention was a switch from “bucket-based” chlorine disinfection to routine use of QAC-based wipes.

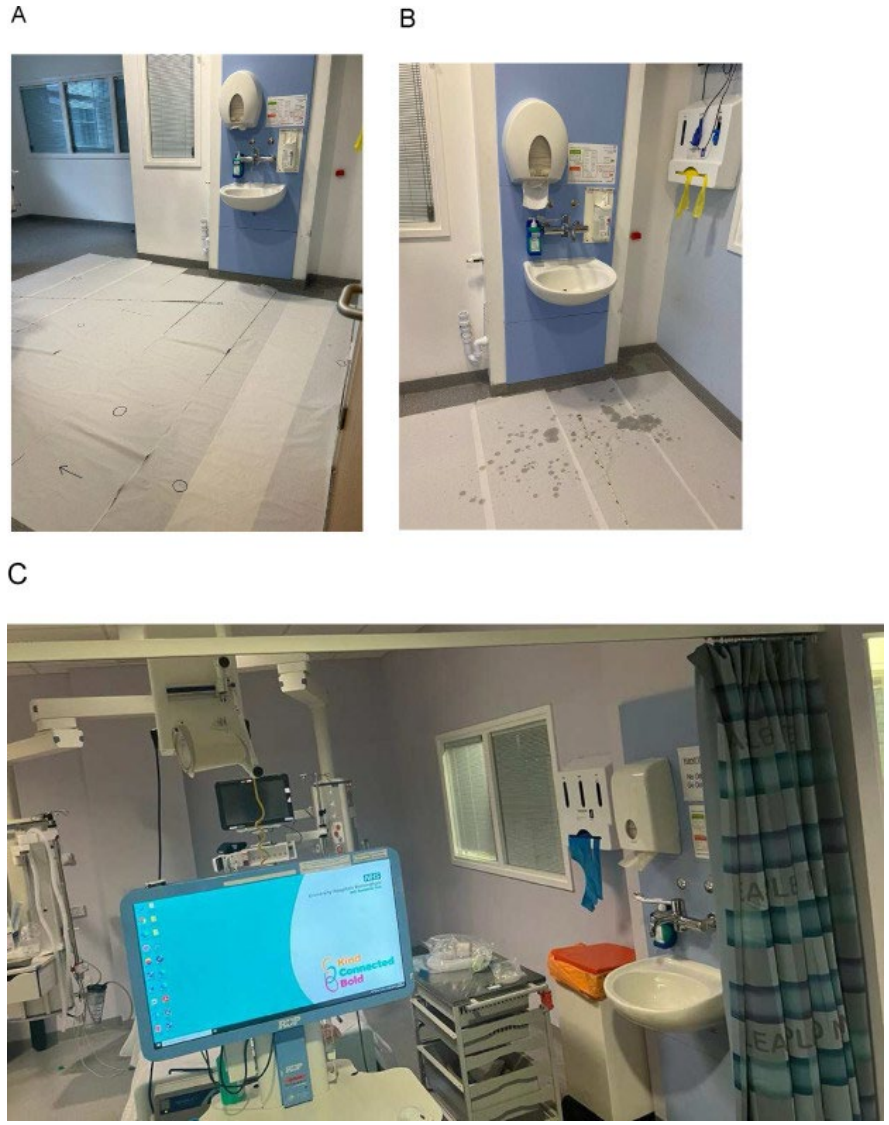


Outcome	Effect (95% CI)	*P*-value
CLABSI/CAUTI[a]		
IRR	1.6 (0.7, 3.5)	0.3
IRD	12.2/100,000 person-days (−9.7, 34.2)	0.3
CLABSI[a]		
IRR	2.0 (0.5, 8.0)	0.3
IRD	5.2/10,000 person-days (−5.4, 15.7)	0.3
CAUTI[b]		
IRR	1.4 (0.8, 2.4)	0.2
IRD	6.7/10,000 person-days (−4.2, 17.7)	0.2
MDRO contamination[c]		
OR	0.7 (0.5, 1.0)	0.06
Predicted probability difference	−7.0% (−13.6%, −0.5%)	0.04
MDRO acquisition[d]		
HR	0.4 (0.2, 1.0)	0.04
Risk difference	−7.6% (−7.7%, −7.4%)	NA
In-hospital mortality[e]		
IRR	0.8 (0.7−1.0)	0.03
IRD	−19.8/10,000 person-days (−37.9, −1.6)	NA

Dadon et al. J Hosp Infect 2023.

“Gonna take you right in to the sink splash zone” (duh duh duh)

Category	Examples	Prevalence
A	Vascular access equipment	65%
Bi	Ventilator equipment	18%
Bii	Respiratory equipment	27%
C	Haemofiltration / dialysis	12%
D	Personal care items	68%
E	Nutrition / enteral care	33%
F	Alcohol gel / PPE	57%
G	Housekeeping / cleaning	5%
H	Patient skin contact items	43%
I	Medicines / infusion pumps	32%
J	Negatinve pressure wound care	5%
K	Patients with IV devices	12%
L	Patinets with urinary catheters	18%
M	Invasive monitoring equipment	5%
N	Patinet admission packs	5%

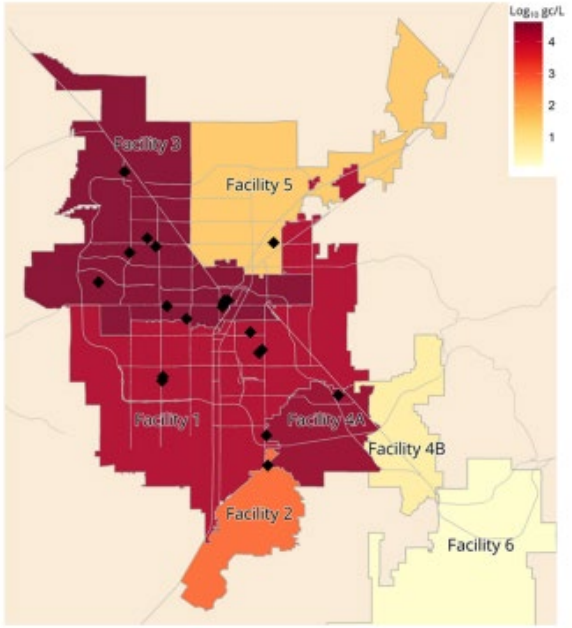


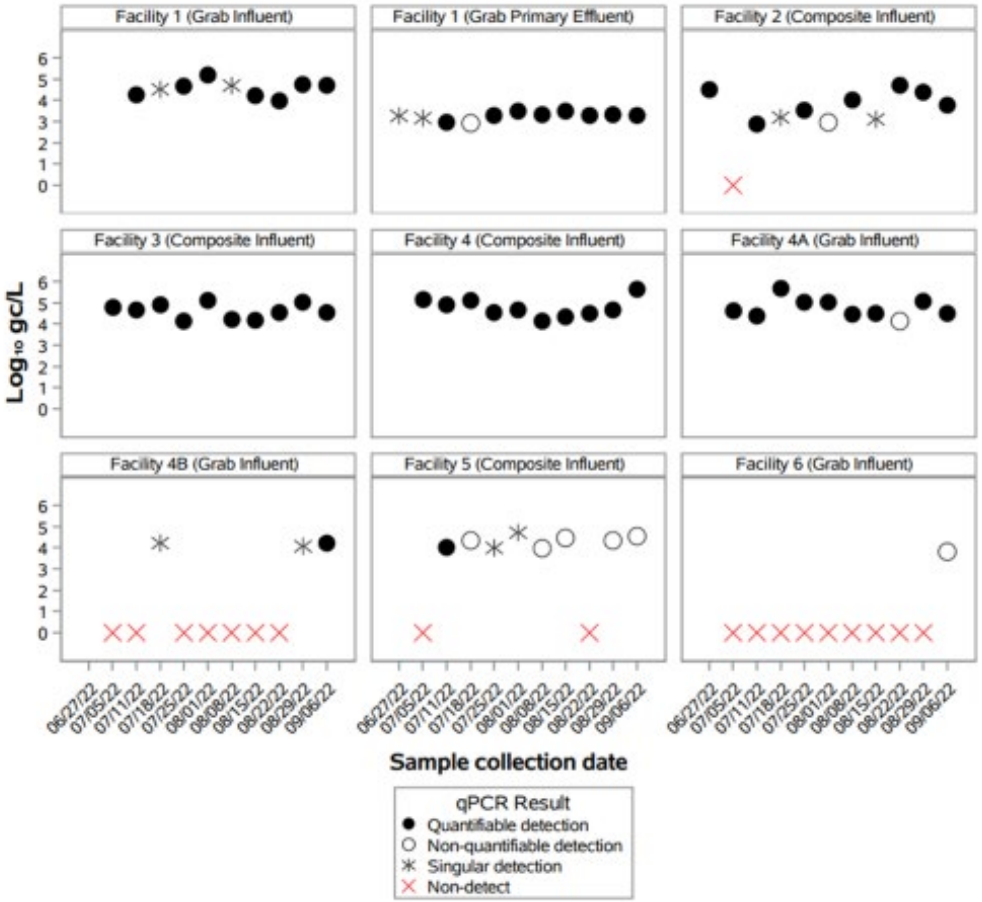
The sink splash zone. Panel A: after running the tap. Panel B: after hand hygiene. Panel C: equipment in the sink splash zone.

Candida auris: coming to a hospital near you…(& wastewater surveillance is pretty cool)

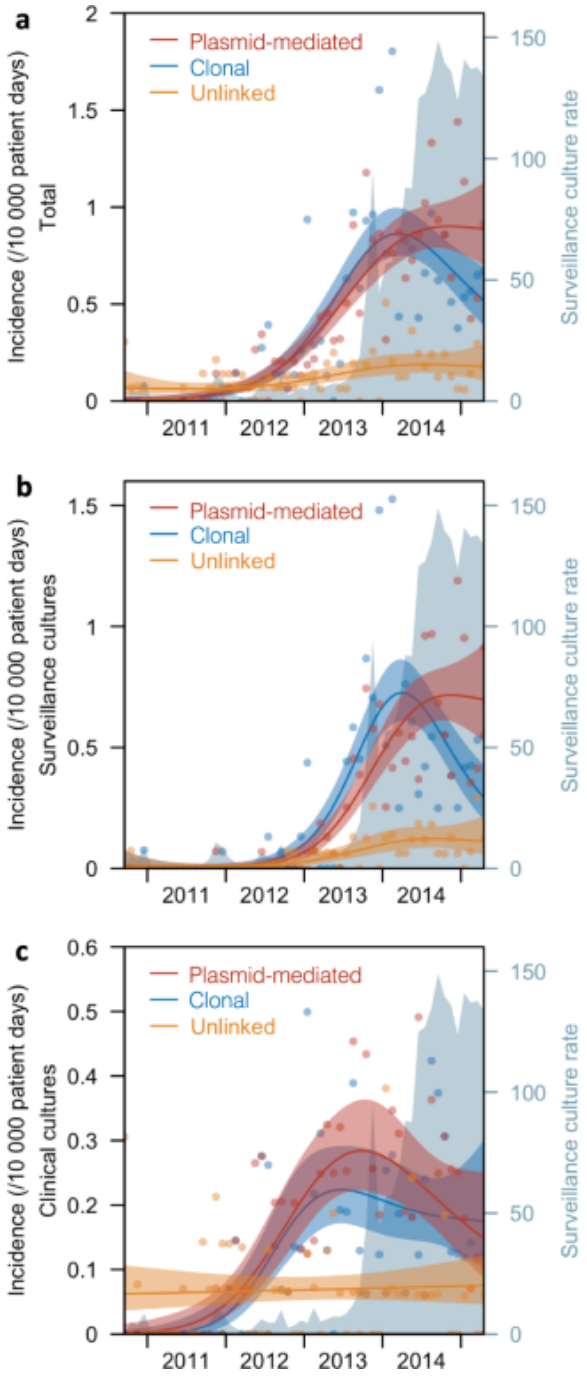
Positive detection 72 of 91 samples (79%); higher detection frequencies in sewersheds serving healthcare facilities involved in the outbreak (94 vs 20% sample positivity)

	number of state-licensed healthcare facilities, Las Vegas metropolitan area[a]		
facility/sewershed	hospitals[b]	skilled nursing facilities	number of hospitals or skilled nursing facilities with reported *auris* clinical or colonization cas
1	17	12	7
2	4	2	2
3	13	17	11
4A	2	3	1
4B	0	1	0
5	2	2	1
6	1[c]	2	0
total	39	39	22





Barber et al. Env Sci Tech 2023.



Horizontal plasmid transfer is a key driver of CPE transmission

Genomic analysis of 1312 CPEs submitted to government ref lab in Singapore between 2010 and 2015.

Significant risk factors for clonal spread of CPE:

- direct or indirect ward-level contact;
- direct or indirect hospital-level contact;
- bacterial species (*Klebsiella* and *Enterobacter* a higher risk of spread than *E. coli;*
- carbapenemase type (NDM and OXA-type a higher risk of spread than KPC)

Significant risk factors for plasmid-mediated spread of CPE:

- **none**

Marimuthu et al. Nat Comm 2022.

Water-free care demands our attention

Retrospective cohort study including 552 German ICUs, comparing HCAI prevalence in patients cared for in rooms with or without sinks.

Parameter	Category	aIRR	95% CI	*P*-value (type III)
Presence of sink in patient room	Sink group	1.21	(1.01–1.45)	0.039
	No-sink group	1=reference		
Type of ICU	Interdisciplinary in hospital <400 beds	1.001	(0.83–1.21)	0.004
	Interdisciplinary in hospital ≥400 beds	1.278	(1.04–1.57)	
	General surgical	1.255	(1.00–1.59)	
	Special surgical (neurosurgical, cardiovascular)	1.335	(1.00–1.78)	
	Paediatric	2.133	(1.14–4.01)	
	Weaning	0.952	(0.60–1.53)	
	Others	2.11	(1.44–3.10)	
	Medical/neurological	1=reference		
Length of stay (days)	Risk increase per day	1.01	(1.00–1.02)	0.016
Invasive ventilation use	Risk increase per 1%	1.009	(1.00–1.01)	0.001
Urinary tract catheter use	Risk increase per 1%	1.014	(1.01–1.02)	<0.001

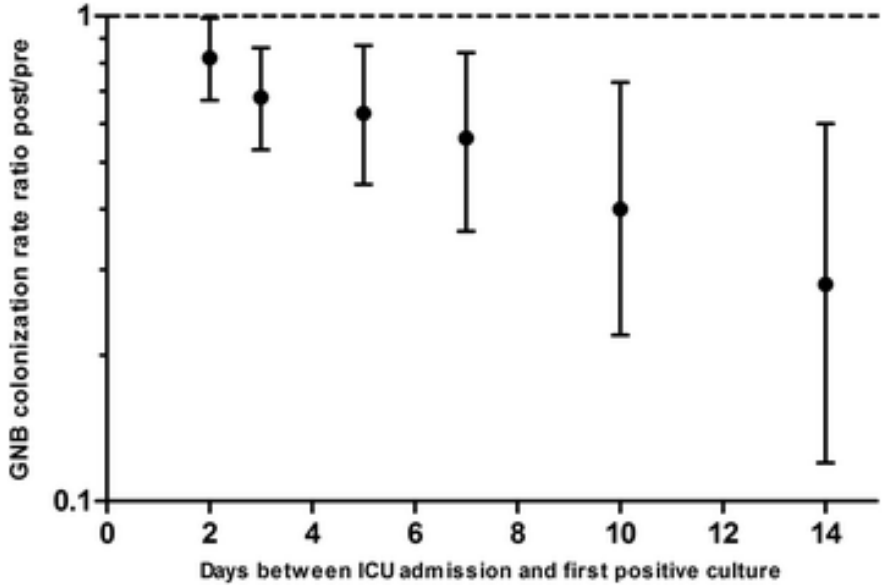
CI, confidence interval.

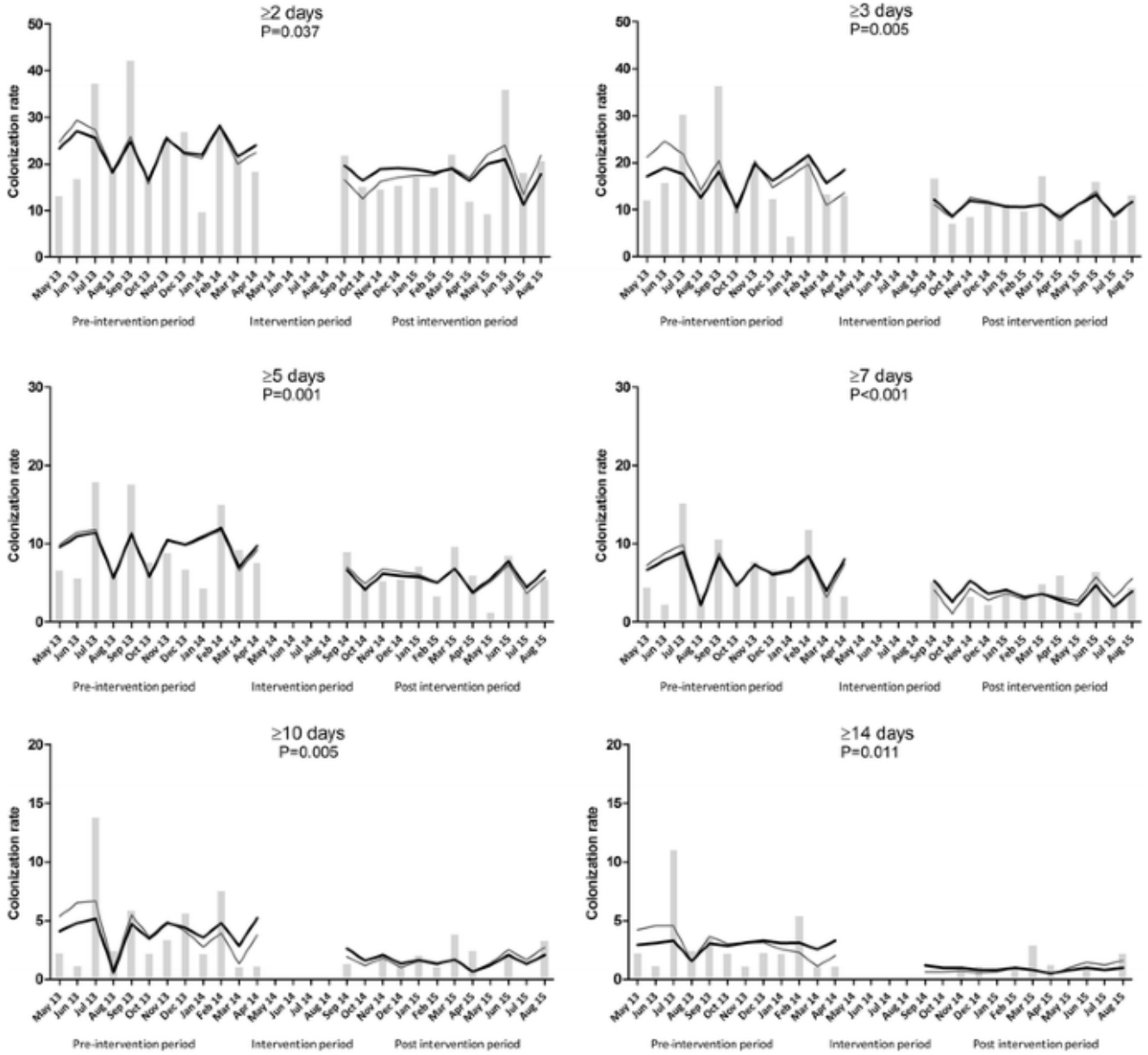
Multivariable analyses identified sinks as a risk factor for BSIs and UTIs

Fucini et al. J Hosp Infect 2023.

Water free critical care

Overall rate of Gram-negative rod colonisation rate: were 26.3 GNB/1000 ICU admission days pre-intervention and 21.6 during the intervention (rate ratio 0.82; 95%CI 0.67–0.99; P = 0.02).





Hopman et al. Antimicrobial Resistance & Infection Control 2017;6:59

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Slides: www.jonotter.net

STAY A STEP AHEAD

of winter infections

gama healthcare | ACIPC Australasian College for Infection Prevention and Control

Scan the QR code to register for the IPC webinar **"Winter Preparedness & the Hidden Threats".**

23rd April 2024 at 7pm AEST

Lunch

STAY A STEP AHEAD

of winter infections

gama healthcare | ACIPC Australasian College for Infection Prevention and Control

Scan the QR code to register for the IPC webinar **"Winter Preparedness & the Hidden Threats".**

23rd April 2024 at 7pm AEST

Renae McBrien

Sustainable infection prevention solutions

Children’s Health Queensland

Environmental Sustainability Plan 2021-2024

An action plan to tackle the environmental impact of our health service.

Enviromental sustainability plan

2021-2024

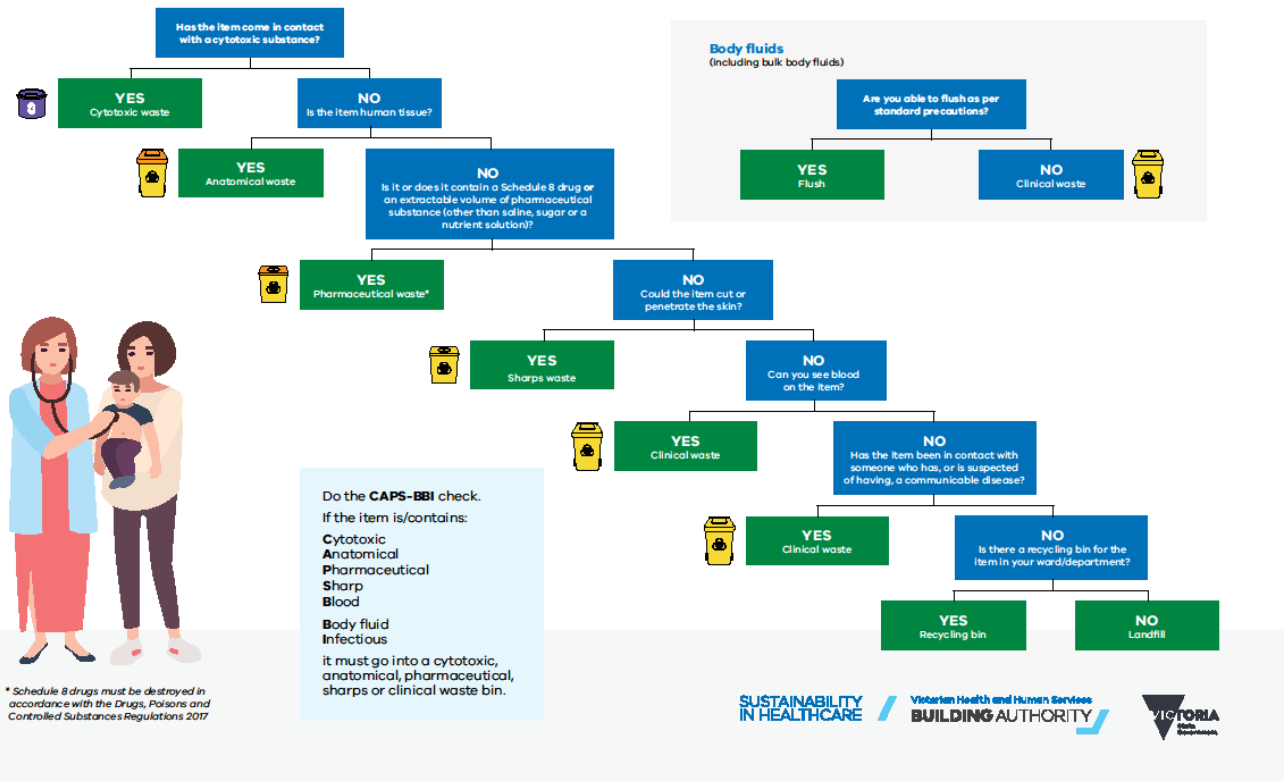
SUSTAINABILITY MATTERS

Queensland Government

Children's Health Queensland

- 1 million pieces of unnecessary plastic removed from health care
- 44% diversion rate from landfill
- 500 000 kg a year into resource recovery and recycling
- 11 sustainable community partnerships
- 40 recycling streams
- Direct legally established relationship with International Aid
- $1.7 million in favourable financial outcomes

Hospital waste is regulated and confusing!



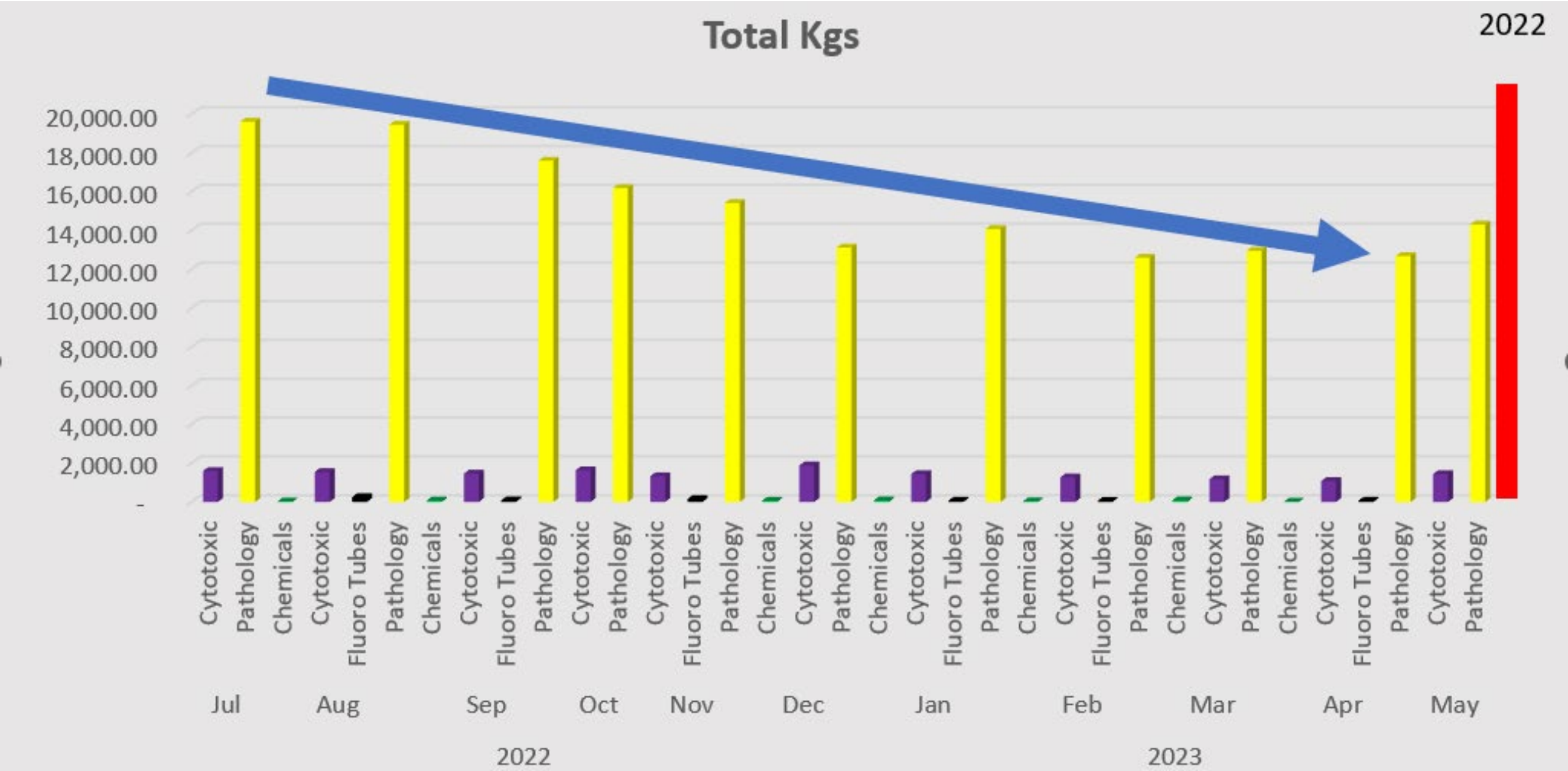
Clinical & Related	Yellow bin & yellow bag			
Cytotoxic	Purple bin & purple bag			CYTOTOXIC HANDLE WITH CARE
General	Green bin, clear bag			
Confidential	Blue bin			LOCKED
Cardboard	Blue bin			RECYCLING
Clean paper	Blue bin			RECYCLING
Co-mingled		Green bin white lid		RECYCLING
Sharps	Yellow (Clinical)	Purple (Cytotoxic)	Red (Pharm)	
Chemical	Black			

SUSTAINABILITY MATTERS

Clinical waste
(no sharps)

- ✓ Discarded material with saturated or free flowing bodily fluids
- ✓ Known infectious waste and PPE from infectious patients
- ✓ Laboratory waste including specimens and cultures
- ✓ Human tissue and bodily fluids and blood products
- ✓ Chest drains and tubes
- ✓ Blood IV lines and bags
- ✓ Infectious vomit
- ✗ Urine and faecal matter
- ✗ Nappies
- ✗ Small spots of blood or dried blood
- ✗ IV and NGT lines and bags

QCH Clinical Waste Reduction - $64 000 a year

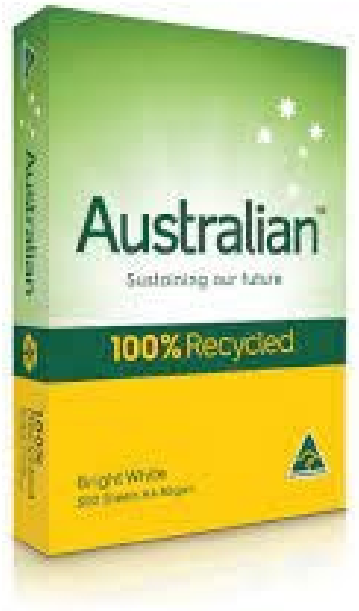


Building an advanced modular recycling system

Creates value in our waste for the manufacturing and recycling industry.

Cardboard / Paper Recycling and Management

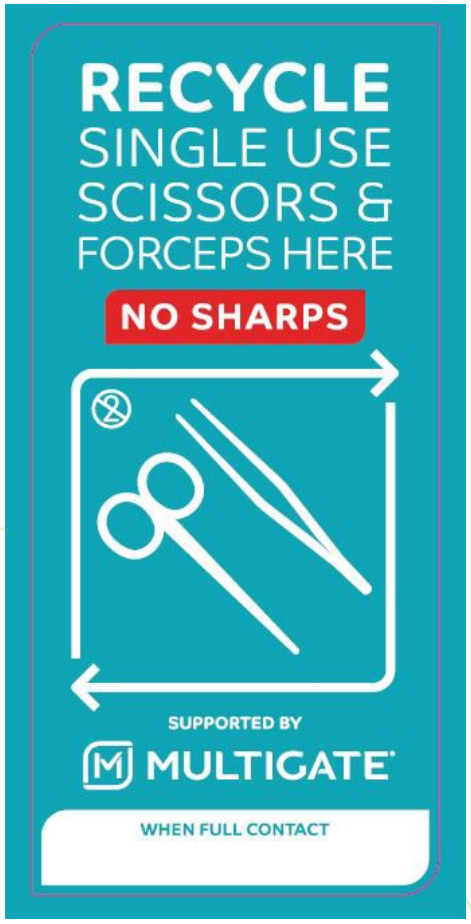
- Segregated clean paper and cardboard is revenue raising at commercial volumes.
- 1 tree = 16.67 Reams
- QCH Reduced paper usage by 5000 Reams from 2020 to 2021 – 2.35 million!
- Circular procurement of 100% Recycled paper - Australian made



Staff Freebie – FREE Moving Boxes program!

Children's Health Queensland

Theatre /Clinical Metal Recycling



Recycle all single use metal into the dedicated theatre metal recycling bins.

These bins will accept all clean

- Diathermy wires
- Laryngoscope blades
- Single use scissors and forceps
- ECG dots

QCH averages 1.5 Tonnes of metal recycled every month!

Hospital plastic hard and Soft Plastic – sterile feed stock Operating Theatre Recycling– every case, every day.

- 660L recycled of clear sterilised plastic clean every day.
- 40% reduction in landfill by recycling single use plastics.


LDPE – Soft plastic recycling stream

- clinical medication rooms
- ICU beside
- Operating theatres
- 1600L a day

Tangalooma EcoMarines
On a mission to save the bay
Mil-tek

Children's Health Queensland Hospital and Health Service

SUSTAINABILITY MATTERS

Soft plastic

(no sharps or blood products)

- ✓ Clear plastic only
- ✓ Stretchy plastic not crunchy
- ✗ Coloured plastic
- ✗ Stick labels or paper

All soft plastic must be sealed in the bag and tied off.

Queensland Government

Children's Health Queensland

Containers for Change

CHQ partnered directly with Qld Dept of Environment to establish Containers for Change within key locations in our hospital.

CHQ partners with Community Co Recycling to support circular economy, sustainable employment opportunities and of course a return of 10c!

Averaging 9000 contains a month.

First Qld Hospital to recycle Blister packs

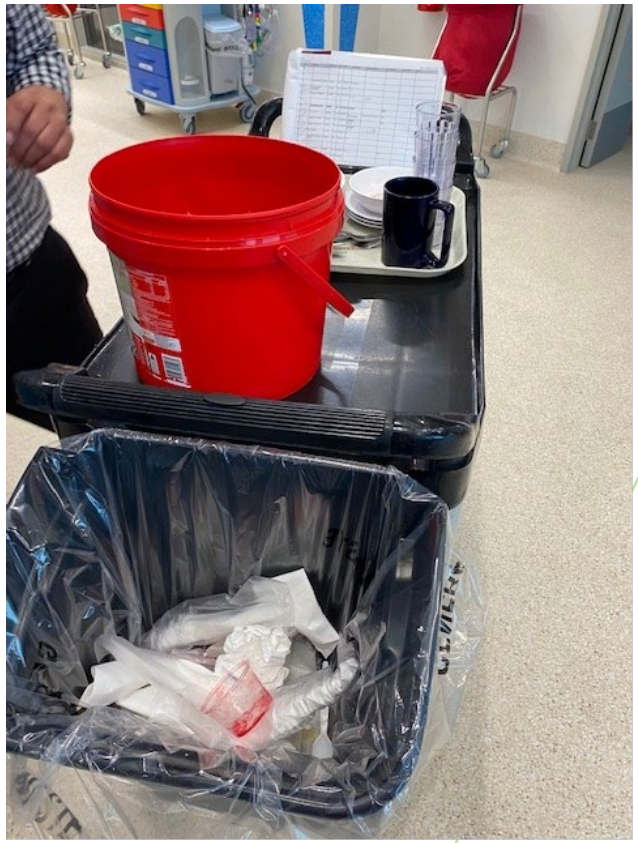
- Funded by QCH Containers for Change
- Established on S4Hanna for other HHS's!

Children's Health Queensland Food/Organic Waste Stream

Queensland Children's Hospital have responded to the Queensland Dept of Environment Organic Strategy 2030 and have targeted all food waste across our hospital.

Kitchen, product, and ward plate waste is now all captured into our organic compost stream.

600% increase in organic waste over 12 months - 21 900 kg in 2023.



Children's Health Queensland
Food/Organic Waste Stream

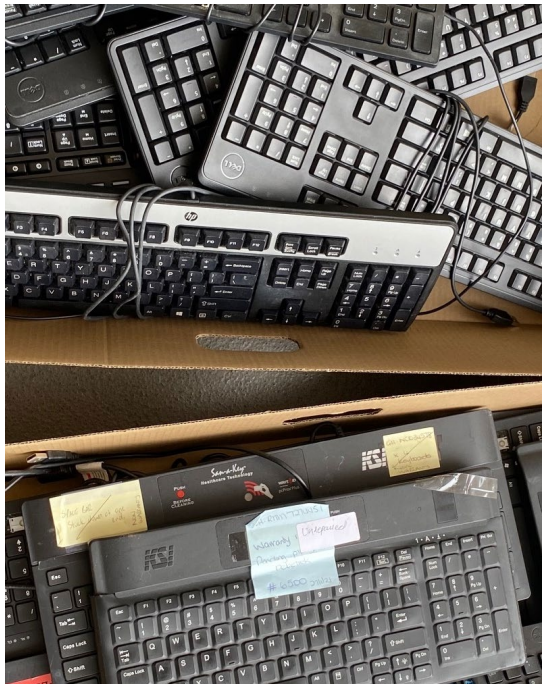
Qld Organic Waste strategy targets

- 85% of all food waste (Kitchen, product, ward plate waste) is now all captured into our organic compost stream.
- **21 953 kg food waste locally composted**
- **561 kg of food rescued into Oz Harvest programs**

OZHARVEST

Children's Health Queensland – circular economy partnerships

CHQ partners with not for profit community programs to rescue clean, repeatable waste Reverse Garbage, Substation 33 use hospital waste to promote sustainable education in primary and secondary schools and within their retail space.



CHQ Partnerships
National Battery Stewardship Council
Ecomarines

- CHQ has made the commitment to the NBS Council
- Free battery recycling –cost saving of over $10 000 a year
- Developing Qld Cadetship program for Environmental leaders

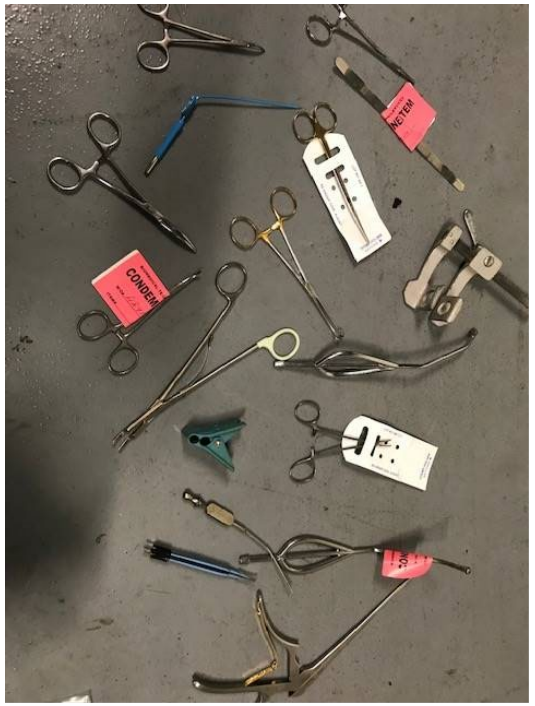
Health Technology Sales – community reach

Platform for our local health community to rescue, repair and reuse.

www.health.qld.gov.au/hts

End of Life Assets…. Still have Life!
Queensland Govt – Health Technology Sales

What do we do with end of contract assets, equipment no longer fit for purpose and even broken medical supplies and equipment……



Children’s Health Queensland

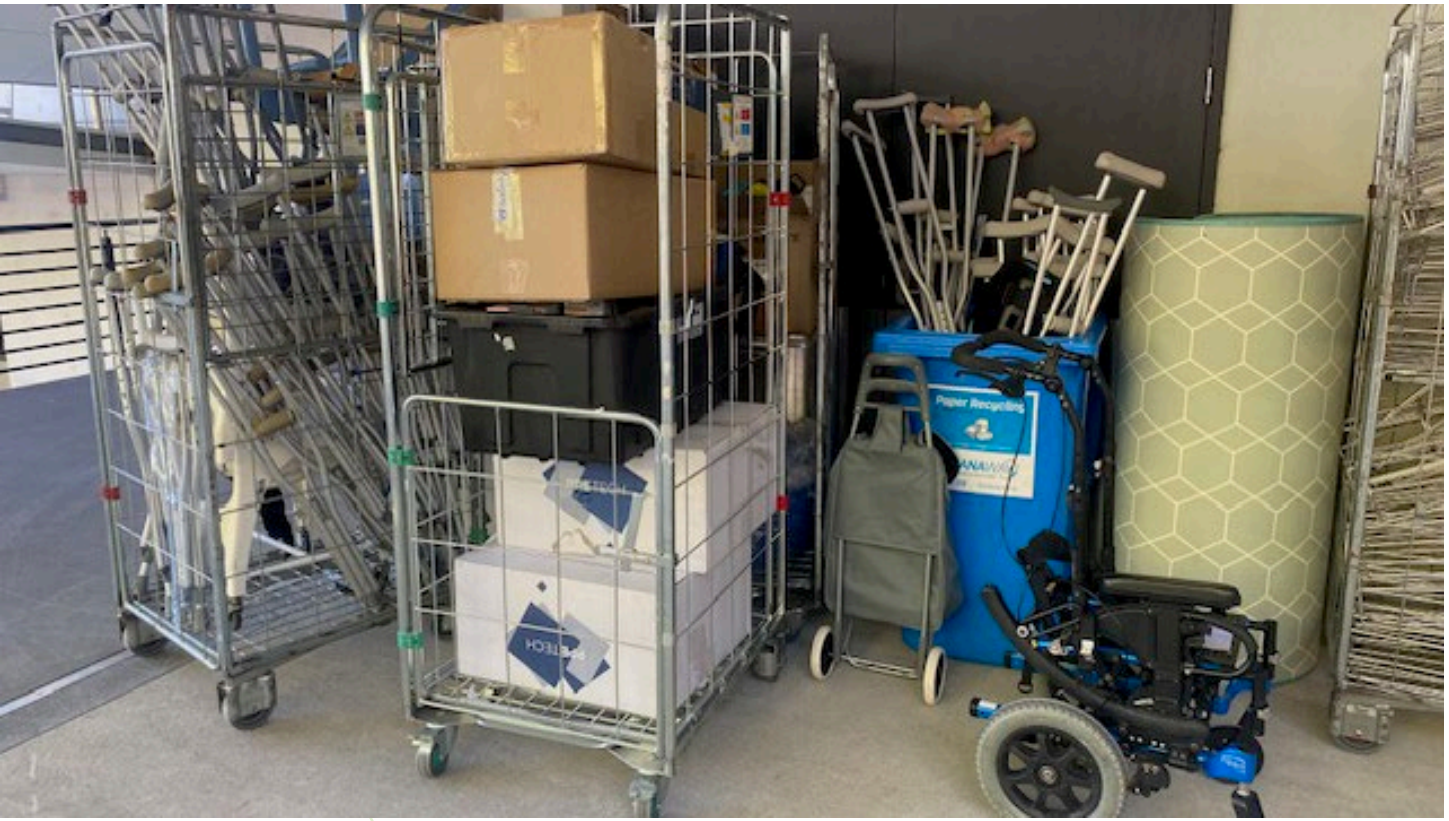
Connecting Human health to the Vet industry

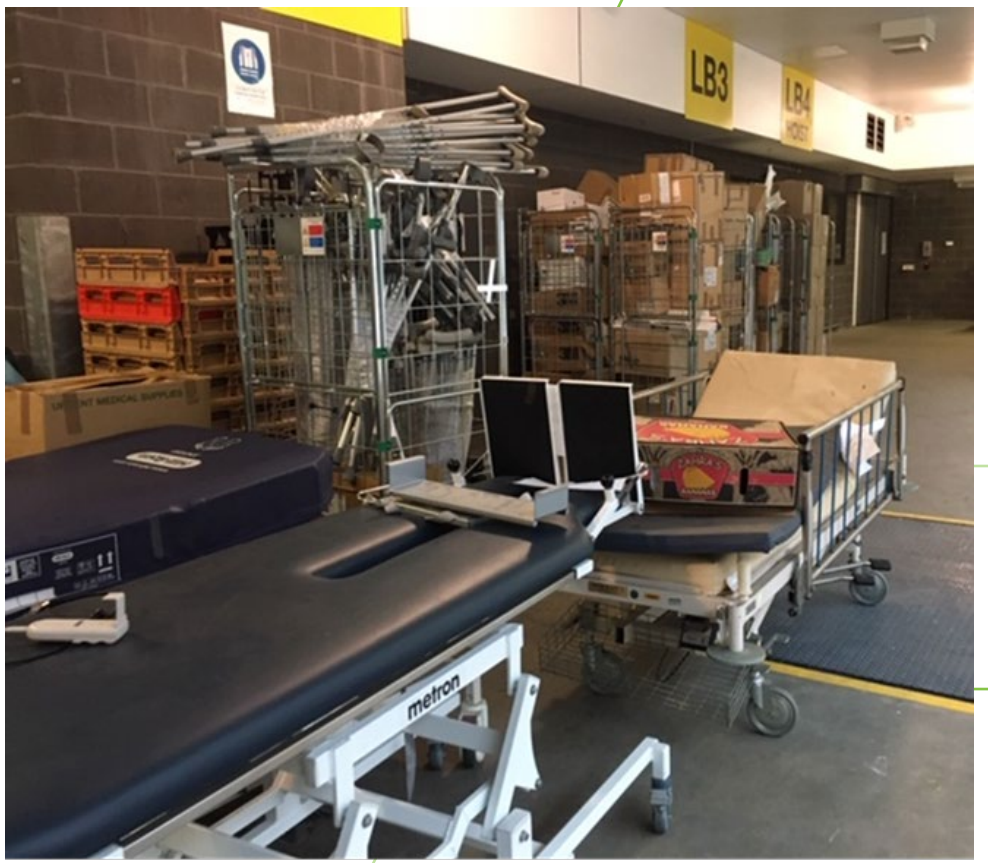
Allows us to connect with over 1600 buyers to repurpose, repair and reuse our resources
Expired medical consumables sold to RSPCA and local vets.

Queensland Children's Hospital – Donations in Kind

Supporting International aid through Rotary

CHQ Donations in Kind – Rotary partnership






1800 100 700
STORAGE KING
astorageking.com.au

Target = one million pieces of plastic by 2024.

Queensland Children's Hospital

Top 4 Plastic pollution in our bins

1. Plastic Gloves and gowns
2. Expired Consumables
3. Plastic wipes and buckets
4. Plastic bags

Children's Health Queensland

Removal of gowns and gloves from bedside care and replaced with good hand hygiene

300 000 single use plastic items a year

Removal of single use plastic trays and replaced with reusable plastic trays

250 000 trays a year saved.

"Allowing environmental science to influence clinical practise"

'Green ware' reusable

Refillable wipes – product stewardship – cheaper and more sustainable

- Establish new local practices to refill buckets
- Establish supporting procurement and supply chain

Plastic wipe buckets – no longer recycled but reused within our local community. 10 000 buckets saved.

Removal of plastic bags from cleaners trolleys to transport cleaning linen to laundry - now use a bucket.

Over 170 00 plastic bags a year saved.

Removal of excess bins across the hospital and admin areas - Over 300 bins removed

200 000 bin liners saved

New internal process to review all consumables BEFORE they expire and are actively redistributed across health

Children's Health Queensland Hospital and Health Service

SUSTAINABILITY MATTERS

MEDICAL MARKET DAY

SAVE OUR SUPPLIES • SAVE OUR PLANET • SAVE OUR BUDGET

Let's save our consumables, before they expire!

Review your consumable expiry dates.
Bring along any **near expring consumables (within 1-2 months)** or excess stock from your cost centre and swap it for **free** with other clinical areas.

October 9
2pm - 4pm
Auditorium
Level 7 QCH

Bring a box to take back some supplies!

Contact renae.mcbrien@health.qld.gov.au

Queensland Government

Clinical Staff love Medical Market Day!

Review and redistribute stock across cost centres within a hospital

80% reduction in expired consumable waste
$800 000 dollars in cost saving across organisation
Dramatically reduced consumable waste

QCH able to save our supplies across HHS's

- Nursing staff were able to identify consumables that were nearly expired but were simply not going to used in a paediatric hospital.
- Mobilise the DC logistics and HHS contacts to rapidly move these supplies into the PAH ICU shelves in a neighbouring Qld Health hospital.

- Saved Qld Health over $15 0000.


Environmental
Sustainability Plan
2021-2024
SUSTAINABILITY MATTERS

gama healthcare | ACIPC Australasian College for Infection Prevention and Control

a greener path to safe patient care

Scan the QR code to learn more about GAMA Healthcare's sustainability journey and IPC solutions.

Panel Discussion

STAY A STEP AHEAD

of winter infections

gama healthcare | ACIPC Australasian College for Infection Prevention and Control

Thank you for attending the **IPC Tour 2024!**

Scan the QR code to download winter campaign resources.