Revisiting legacy IPC guidelines

Why 20th-century detergent-based cleaning protocols no longer meet today's infection risks

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Legacy

Noun*

something that is a part of your history or that remains from an earlier time

Adjective*

used to describe something which still exists or is still used, but is from an earlier time than other similar things which have since been invented.

*Cambridge dictionary definitions

When did cleaning become a “thing” in healthcare?

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Florence Nightingale (1850's)

Image credit: Florence Nightingale Museum Collection

Contributions included:

- Hand washing
- Hygiene practices
  - Cleaning wards
  - Cleaning bedding
  - Cleaning equipment
- Professional training
- Public Health Advocacy
  - Statistics to demonstrate impact of hygiene on mortality
    - Non-combatant mortality rate 1174 per 1000 soldiers
  - Advocating for better sanitisation and healthcare conditions

What legacy factors have we inherited?

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Legacy Factors

Cleanliness is important

- Clean enough to not cause concern for patients

Detergent cleaning as standard

Cleaning Workforce

National Quality and Safety Standards

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Clean and safe environment

3.13 The health service organisation has processes to maintain a clean, safe and hygienic environment – in line with the current edition of the *Australian Guidelines for the Prevention and Control of Infection in Healthcare*[17] and jurisdictional requirements – to:

a. Respond to environmental risks, including novel infections
b. Require cleaning and disinfection using products listed on the Australian Register of Therapeutic Goods, consistent with manufacturers' instructions for use and recommended frequencies
c. Provide access to training on cleaning processes for routine and outbreak situations, and novel infections
d. Audit the effectiveness of cleaning practice and compliance with its environmental cleaning policy
e. Use the results of audits to improve environmental cleaning processes and compliance with policy

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3.14 The health service organisation has processes to evaluate and respond to infection risks for:

a. New and existing equipment, devices and products used in the organisation
b. Clinical and non-clinical areas, and workplace amenity areas
c. Maintenance, repair and upgrade of buildings, equipment, furnishings and fittings
d. Handling, transporting and storing linen
e. Novel infections, and risks identified as part of a public health response or pandemic planning

Current IPC Guidelines on Cleaning

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Cleaning requirements – Hidden in plain sight

Risks from the environment

- Suggestion of an association between poor environmental hygiene and transmission of infectious agents
- Transmission may occur between
  - Contact with contaminated equipment
  - Indirectly via hands of HCW who have contact with contaminated equipment or the environment
- Environmental surfaces can be safely decontaminated using less rigorous methods than those used on medical instruments and devices
- The level of cleaning required depends on the objects involved and the risk of contamination
- All surfaces require regular cleaning
- Intensive care units and isolation areas require additional levels of cleaning, especially where there is a risk of multi-resistant organism transmission

Current Environmental Cleaning Guidelines

- Detergent solution is recommended for routine cleaning
- If MROs suspected or known
  - Detergent + disinfectant

Good practice statement

Updated

9. It is good practice to routinely clean surfaces as follows:

- Clean frequently touched surfaces with detergent solution at least daily, when visibly soiled and after every known contamination.
- Clean general surfaces and fittings when visibly soiled and immediately after spillage.

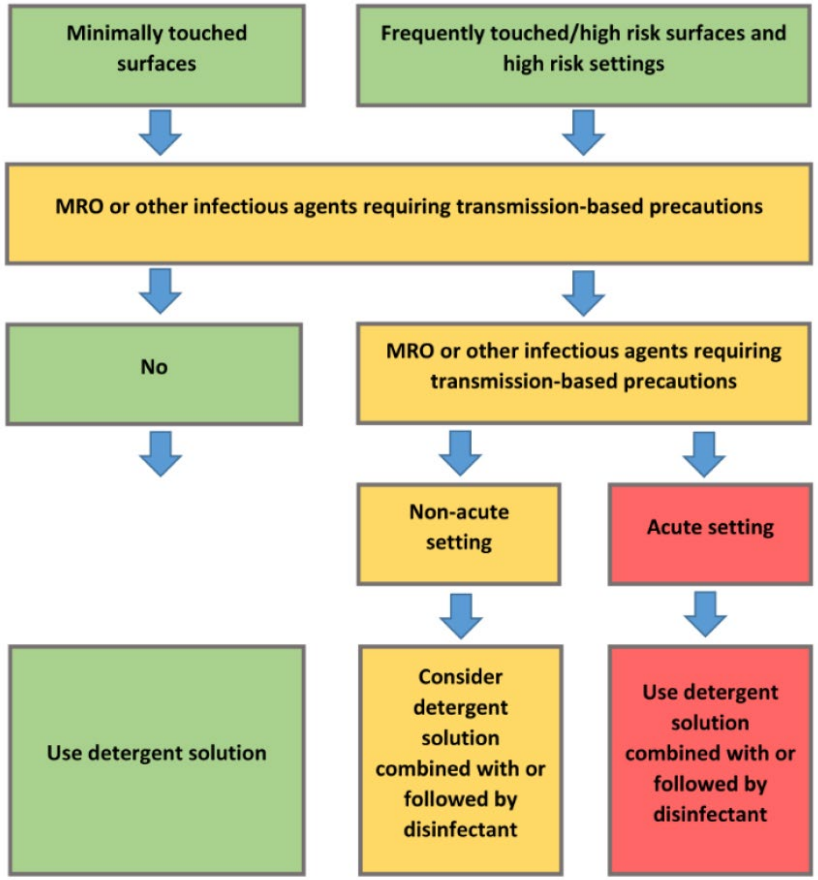

Figure 8. Processes for routine cleaning and product choice

Additional cleaning

Risk of transmission of particular infections should be assessed and the cleaning schedule adjusted if a known infectious agent is present

If blood or body fluid soiling, presence of MROs or other infectious agents requiring transmission-based precautions are known or suspected:

- Clean with detergent + disinfection or a chlorine-based product
- The use of sodium hypochlorite disinfection in addition to a detergent solution is suggested for terminal cleans of rooms of patients known or suspected to have *C. difficile* associated disease or multi-drug resistant organisms.

+ Disinfectants

Disinfectant requirements:

- Have enough time in contact with the surface to kill the germs
- Used at the right concentration
- Applied to a clean, dry surface
  - Must be used after a detergent OR
  - As part of a 2-in-1 detergent + disinfectant product
- Effective against those germs

Existing evidence

Dettenkofer et al. 2004

Systematic Review –

Does disinfection of environmental surfaces influence nosocomial infection rates?

Summary:

- The inanimate environment is generally thought to be only a minor direct factor contributing to nosocomial infection
- Disinfectants pose a danger to staff, patients and the environment and require safety precautions
- Disinfectants in waste water are of concern
- Concern about a possible link between antibiotic and biocide resistance has been raised
- Well designed studies are needed

Issues

Language used in the guidelines regarding transmission from the environment is cautious

Disinfection is only required if there is:

- blood or body-fluid soiling
- known MRO or transmission-based precautions

Question –

Are our cleaning protocols actually preventing infection or just creating the appearance of cleanliness?

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Prior room occupancy

Mitchell 2015 - Systematic review and meta-analysis

- Regardless of organism present, the risk of acquisition increases
- **Odds ratio 2.14**
- Current cleaning practices fail to reduce the risk of acquisition

Data in this area would suggest we are not preventing infection

But is this the result of:

- the cleaning agent,
- the frequency,
- the technique or
- the way the cleaning protocol is adhered to?

Issues

Language used in the guidelines regarding transmission from the environment is cautious

Protocols state disinfection is only required if there is:

- blood or body-fluid soiling
- known MRO or transmission-based precautions

Current cleaning protocols are not preventing infection

Question –

Do we need to change the language?

Contaminated surfaces are a significant vector for transmission of pathogens

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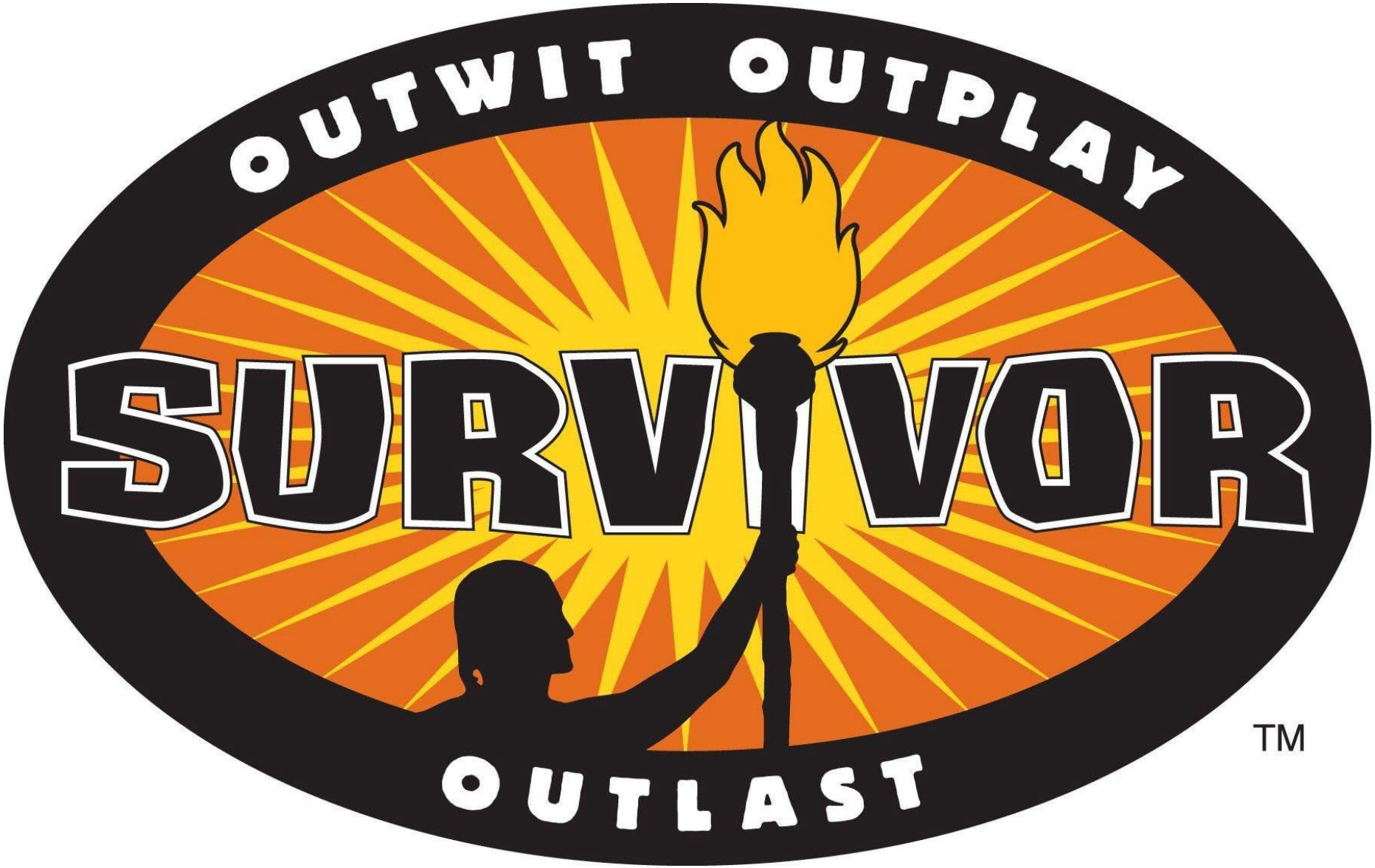
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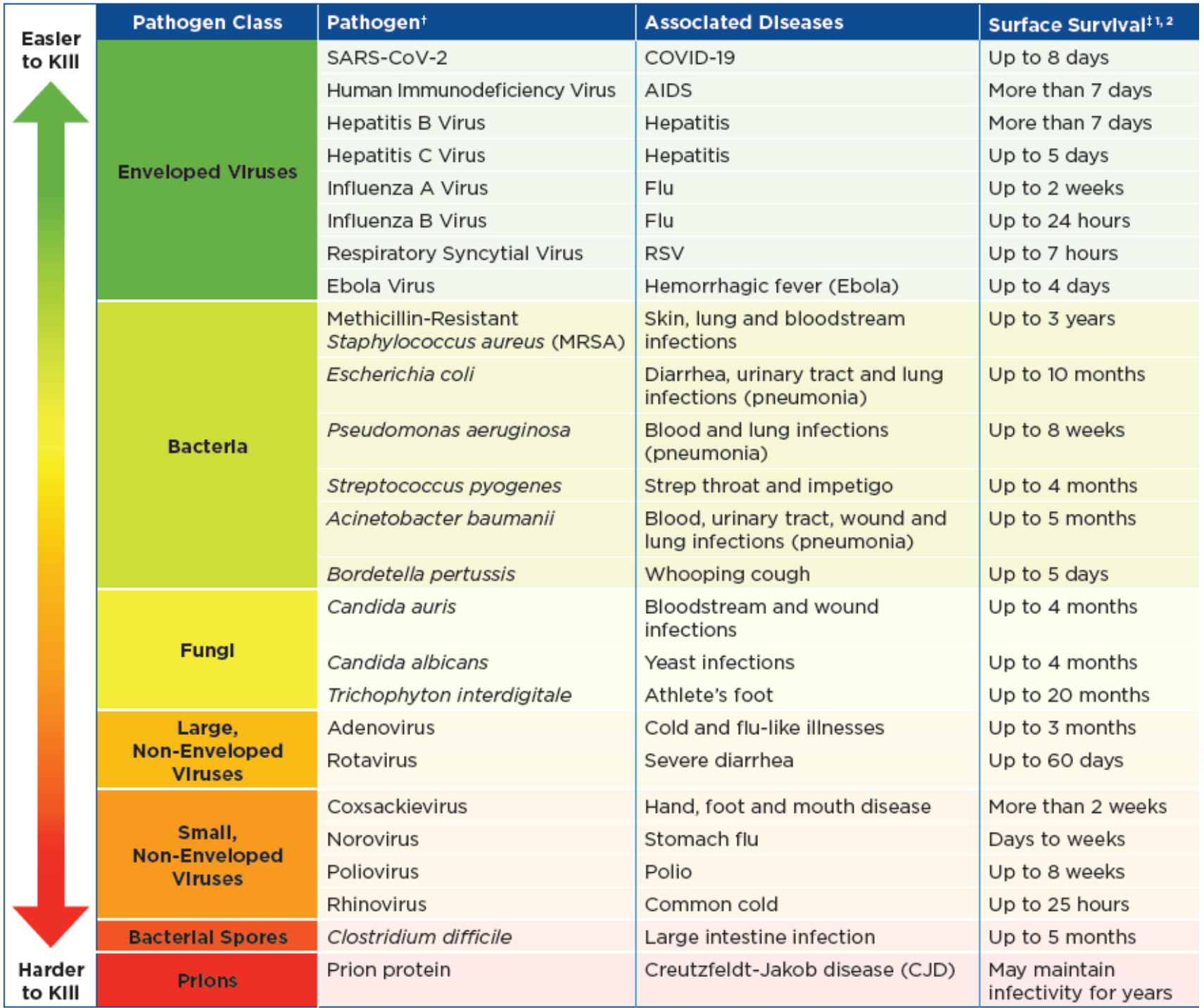

Pathogen Class	Pathogen†	Associated Diseases	Surface Survival‡ [1,2]
Enveloped Viruses	SARS-CoV-2	COVID-19	Up to 8 days
	Human Immunodeficiency Virus	AIDS	More than 7 days
	Hepatitis B Virus	Hepatitis	More than 7 days
	Hepatitis C Virus	Hepatitis	Up to 5 days
	Influenza A Virus	Flu	Up to 2 weeks
	Influenza B Virus	Flu	Up to 24 hours
	Respiratory Syncytial Virus	RSV	Up to 7 hours
	Ebola Virus	Hemorrhagic fever (Ebola)	Up to 4 days
Bacteria	Methicillin-Resistant *Staphylococcus aureus* (MRSA)	Skin, lung and bloodstream infections	Up to 3 years
	Escherichia coli	Diarrhea, urinary tract and lung infections (pneumonia)	Up to 10 months
	Pseudomonas aeruginosa	Blood and lung infections (pneumonia)	Up to 8 weeks
	Streptococcus pyogenes	Strep throat and impetigo	Up to 4 months
	Acinetobacter baumanii	Blood, urinary tract, wound and lung infections (pneumonia)	Up to 5 months
	Bordetella pertussis	Whooping cough	Up to 5 days
Fungi	*Candida auris*	Bloodstream and wound infections	Up to 4 months
	Candida albicans	Yeast infections	Up to 4 months
	Trichophyton interdigitale	Athlete's foot	Up to 20 months
Large, Non-Enveloped Viruses	Adenovirus	Cold and flu-like illnesses	Up to 3 months
	Rotavirus	Severe diarrhea	Up to 60 days
Small, Non-Enveloped Viruses	Coxsackievirus	Hand, foot and mouth disease	More than 2 weeks
	Norovirus	Stomach flu	Days to weeks
	Poliovirus	Polio	Up to 8 weeks
	Rhinovirus	Common cold	Up to 25 hours
Bacterial Spores	*Clostridium difficile*	Large intestine infection	Up to 5 months
Prions	Prion protein	Creutzfeldt-Jakob disease (CJD)	May maintain infectivity for years

From: https://www.cloroxpro.com/resource-center/hierarchy-of-pathogen-resistance/

Primary reference:
Kramer A., Schwebke I., Kampf G. How long do nosocomial pathogens persist on inanimate surfaces? A systematic review. BMC Infect. Dis. 2006; 6:130

TABLE 1

TABLE 1 Survival times and infectious doses retrieved or extrapolated from published studies[a]

Organism	Survival time	Infectious dose
Methicillin-resistant *Staphylococcus aureus*	7 days–>7 mo	4 CFU
Acinetobacter	3 days–>5 mo	250 CFU
Clostridium difficile	>5 mo	5 spores
Vancomycin-resistant *Enterococcus*	5 days–>4 mo	$<10^3$ CFU
Escherichia coli	2 h–16 mo	10^2-10^5 CFU
Klebsiella	2 h–>30 mo	10^2 CFU
Norovirus	8 h–7 days	<20 virions

a Survival times and infectious doses of a range of pathogens according to, or extrapolated from, original studies, some of which involved animal-based research (2, 7 – 14).

From: Dancer, S. J. (2014). Controlling hospital-acquired infection: focus on the role of the environment and new technologies for decontamination. *Clinical microbiology reviews*, *27*(4), 665-690.

Evidence/language has moved on since 2004

Peters et al 2022

Systematic review

Impact of environmental hygiene interventions on healthcare-associated infections and patient colonization

Summary:

- Although more high-quality studies are needed…
- The review demonstrates a strong relation between interventions to improve healthcare environmental hygiene and a reduction in both environmental bioburden and in patient colonization or HAI.
- Healthcare institutions may be able to lower their HAI rates by improving environmental hygiene practices.

Issues

Language used in the guidelines regarding transmission from the environment is cautious

Protocols state disinfection is only required if there is:
- blood or body-fluid soiling
- known MRO or transmission-based precautions

Current cleaning protocols are not preventing infection

Organisms have long survival times on surfaces

Question –

Is detergent cleaning enough?

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Detergent cleaning

Cleaning is the physical removal of organic matter, debris, and microorganisms from surfaces or objects, typically achieved through mechanical action and the use of water with detergents

Detergents have no biocidal activity

Use of detergents can increase transmission of pathogens:

- If cleaning equipment or cleaning solutions are not changed frequently enough

Donskey 2019

- Cleaning floors with detergent showed an **increase** in organisms post-clean compared to pre-clean (mop head changed after every 3rd room)
- Cleaning floors with a detergent/disinfectant + disposable mop heads resulted in large reductions in MRSA, and undetectable levels of *Candida* spp, and *C. difficile*

Is detergent cleaning enough?

TGA definitions:

Medical device:

Is an instrument, apparatus, appliance, material or other article intended for: diagnostic, prevention, monitoring, treatment and/or alleviation of disease.

Reusable medical device (RMD):

A medical device that is designed or intended by its manufacturer as suitable for reprocessing and reuse for multiple patients.

Spaulding's Reprocessing of reusable medical devices (RMD) classification:

Non-critical RMD require cleaning **and** low-level disinfection

Is detergent cleaning enough?

Australian guidelines suggest **reserving disinfection** for outbreaks and for cleaning of rooms of patient's known to have an MRO or on transmission-based precautions.

Issue:

- Guidelines **do not** address patients who are colonised or not yet detected

Donskey 2019

- Described environments being contaminated with pathogens in the absence of patient's known to be colonised or infected.

Is detergent cleaning enough?

Yes – according to Australian guidelines

No – according to:

USA Guidelines

Healthcare Infection Control Practices Advisory Committee (HICPAC). Guidelines for disinfection and sterilization in healthcare facilities (2008).

APSIC Guidelines

Asia Pacific society of infection control working group. APSIC guidelines for environmental cleaning and decontamination (2013).

Is detergent cleaning enough

Grabsch et al. (2012)

“Significant reduction in vancomycin-resistant enterococcus colonization and bacteraemia after introduction of a bleach-based cleaning-disinfection Programme”

Austin Hospital - study period 2009-11

The programme included:

- a new product (sodium hypochlorite 1000 ppm and detergent)
- standardized cleaning-disinfection practices + 3 x annual super-cleans
- employment of cleaning supervisors, and
- modified protocols to rely on alcohol-based hand hygiene and sleeveless aprons instead of long-sleeved gowns and gloves.

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- employment of cleaning supervisors, and
- modified protocols to rely on alcohol-based hand hygiene and sleeveless aprons instead of long-sleeved gowns and gloves.

Standardised detergent + bleach cleaning was responsible for:

- 25% reduction in VRE colonisation
- 83% reduction in hospital-wide VRE bacteraemia

Issues

- Language used in the guidelines regarding transmission from the environment is cautious
- Protocols state disinfection is only required if there is:
  - blood or body-fluid soiling or known MRO or transmission-based precautions
- Current cleaning protocols are not preventing infection
- Organisms have a long survival time on surfaces
- Detergent cleaning is NOT enough

Question –

Should chlorine be the first choice of disinfectant?

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Guidelines suggest sodium hypochlorite as the preferred disinfectant

“The use of sodium hypochlorite disinfection in addition to a detergent solution is suggested for terminal cleans of rooms of patients known or suspected to have *C. difficile* associated disease or multi-drug resistant organisms.”

Benefits:

- Cheap and easily accessible
- Can kill a variety of pathogens
- Evidence to support bleach cleaning (Grabsch et al. 2012)

Issues:

- There is no requirement for TGA listing unless making claims
- Efficacy against today’s key pathogens require different concentrations for each
  - E.g. C. auris 6000+ppm (Weber 2019)
- Chlorine is rapidly inactivated following contact with organic soiling
- OH&S risks to staff

Issues

- Language used in the guidelines regarding transmission from the environment is cautious
- Protocols state disinfection is only required if there is:
  - blood or body-fluid soiling or known MRO or transmission-based precautions
- Current cleaning protocols are not preventing infection
- Organisms have a long survival time on surfaces
- Detergent cleaning is NOT enough
- Unsure if bleach cleaning is the best disinfectant to recommend

Question –

Is today’s infection risk any different?

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Factors affecting environmental cleaning – is it different now?

Changes to the healthcare environment

- Higher risk environment
  - More invasive devices
  - More complex treatments

- Complex equipment
  - Much harder to clean all surfaces
  - Many more items within the clinical space

- Vulnerable populations
  - Older
  - More co-morbidities
  - More patients and higher turnover

Factors affecting environmental cleaning – is it different now?

Changes to healthcare pathogens

- More multi-drug resistant pathogens
- New and emerging diseases

Biofilm

- Unclear on the role of biofilm on environmental surfaces leading to transmission of pathogens to patients
- Less susceptible to detergents and disinfectants

Greater understanding of transmission pathways

- Leads to questioning of current practice

Issues

- Language used in the guidelines regarding transmission from the environment is cautious
- Protocols state disinfection is only required if there is:
  - blood or body-fluid soiling or known MRO or transmission-based precautions
- Current cleaning protocols are not preventing infection
- Organisms have a long survival time on surfaces
- Detergent cleaning is NOT enough
- Unsure if bleach cleaning is the best disinfectant to recommend
- Today's infection risk IS different

Do we already have the answers?

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REACH Trial

Researching Effective Approaches to Cleaning in Hospitals

Mitchell et al. 2019

RCT - To evaluate the effectiveness of an environmental cleaning bundle to reduce health care-associated infections in hospitals

Cleaning bundle to address routine cleaning and discharge cleaning

Showed significant reduction in HA-VRE infection 0.35 => 0.22 per 10,000 OBDs (p=0.03)

Showed increased cleaning of frequent touch points

- Bathrooms Odds Ratio 2.07
- Bedrooms Odds Ratio 1.87

* No change in hand hygiene compliance or antibiotic use during the study period

REACH trial

Researching Effective Approaches to Cleaning in Hospitals

Reach cleaning bundle

- Optimising product use - Disinfection was standard for all discharge cleans and daily high-risk areas
- Staff training – including technique
- Audit with feedback
- Communication

Focus on real world cleaning – getting the basics right

Key take aways

- Routine cleaning does reduce a patient's risk of healthcare associated infections
- Ensuring that cleaning staff know what to use, how to use it, when to use it, and are recognised for needing time to do it can improve a patient's outcome

CLEEN trial

CLEaning and Enhanced disiNfection

Using detergent and disinfectant….

Browne et al. 2024

RCT – 10 wards in a single hospital

Assessed the effect of enhanced cleaning and disinfection of shared medical equipment on health-care-associated infections (HAIs) in hospitalised patients.

Multimodal cleaning bundle

Relative reduction in HAIs 14.9% => 9.8% following intervention (OR 0.62 p=0.0006)

CLEEN trial

CLEaning and Enhanced disiNfection

Multimodal cleaning bundle

- Additional 3hrs dedicated cleaner
- Cleaned/disinfected shared medical equipment – once a day
  - Commodes
  - Blood pressure monitors
  - Infusion stands and pumps
- Ongoing education
- Audit and feedback

Supports fomite transmission in HAIs

Cleaning of medical equipment is a key intervention to prevent HAIs

Identifies a likely issue with clinicians being responsible for cleaning shared equipment

Answers

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Question	Answer
Do we need to reconsider the “cautious” language in relation to cleaning and environmental contamination?	Yes
Are our cleaning protocols effectively preventing infection?	No
Is detergent-based cleaning sufficient on it’s own?	No
Should chlorine continue to be the first-line disinfectant of choice?	Uncertain
Is today’s infection risk profile different from previous years?	Yes
Do we already have the answers?	Some
Is there more to consider	Always

Confounders

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Measuring cleaning performance

Verification of traditional cleaning

- Currently no routine standardised tests to confirm effective cleaning
  - Visual
  - Gel markers
  - ATP
  - Sampling cannot always detect the pathogen of interest

Surface Contamination

Usually discussed in terms of

- Contact with the environment
- Direct shedding of organisms from patient to the environment

What role does the air have on surface contamination?

- Airborne particles will eventually fall to surfaces
- Is there a need to consider “cleaning” indoor air in terms of reducing surface bioburden?
- Could indoor air quality be a measure of cleanliness?

Facilities Maintenance

Aging infrastructure can inversely affect cleaning

- Poorly maintained surfaces are:
  - Difficult to clean
  - Affect motivation/effort to clean

Compatibility of cleaning/disinfection agents with surfaces

One size fits all approach

Do cleaning and disinfection methods need to differ for different wards? Different organisms?

OR

Does having one protocol that encourages the highest standard for all clinical areas work better?

Achievability and Equity

Cleaning recommendations need to be able to be followed.

Setting affordable and achievable goals encourages participation and compliance.

Is there something more?

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Cleaning Workforce

AI can’t replace the need for a cleaning workforce

However, there are several items that can affect the impact of cleaning:

- Time allocation for cleaning
- Respect for the work to be done and the people doing it
- Unintentional biases
  - Female
  - NESB
  - Literacy levels
  - Age

Cleaning agent VS Cleaning adherence

How certain are we that it is the cleaning protocol and choice of cleaning agent that is the problem

VS

Adherence to the cleaning protocol and correct use of cleaning agents?

Future Considerations

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Future Considerations

Further research

- Which is more important – cleaning/disinfection agent VS cleaning adherence
- Quantifying environmental cleanliness or measurement of bioburden
- Biofilm – detection, elimination, role in transmission from environment
- Efficacy of cleaning/disinfection agents
- Indoor air quality in relation to surface bioburden

- Novel cleaning approaches or antimicrobial surfaces


Video
Studio

Future considerations

Environmental hygiene must be treated as a patient safety intervention – not a housekeeping task

- Creation of hierarchy of roles similar to technicians in CSSD
- Encourage specialisation and reflect this in career/salary

Dedicated EFT for cleaning with standardised training and time allocation for tasks

Improved communication between cleaning services, clinical units and infection control teams

Revisiting Legacy IPC Guidelines

20th-Century detergent-based cleaning protocols **no longer** meet today's infection risk

Recommendation

Disinfection should be included as standard for all environmental cleaning

Adherence to protocols may be as important as cleaning/disinfection agents

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