

**NIPCM** 

# National Infection Prevention & Control Manual

IPC for the built  
healthcare  
environment

# National Infection Prevention & Control Manual (NIPCM)

## Outline

1. History
2. Methodology
3. Water



The screenshot displays the NIPCM website interface. At the top left is the NIPCM logo. To its right is a navigation menu with links for 'NIPCM Index', 'Care Home IPCM', 'Evidence and research', 'Search', and 'Contact us'. The NHS National Services Scotland logo is in the top right corner. Below the navigation is the title 'National Infection Prevention and Control Manual'. The main content area features a photograph of two healthcare workers in blue scrubs looking at a tablet. A blue overlay on the right side of the image contains the 'NIPCM Index' menu with the following items:

- ▶ About the Manual
- ▶ Responsibilities
- ▶ Chapter 1 - Standard Infection Control Precautions (SICPs)
- ▶ Chapter 2 - Transmission Based Precautions (TBPs)
- ▶ Chapter 3 - Healthcare Infection Incidents, Outbreaks and Data Exceedance
- ▶ Chapter 4 - Infection Control in the Built Environment and Decontamination
- ▶ Addendum for Infection Prevention and Control within Neonatal Settings (NNU)
- ▶ A-Z Pathogens
- ▶ Glossary
- ▶ Appendices

# ARHAI Scotland

**ARHAI = Antimicrobial Resistance & Healthcare Associated Infection**

ARHAI Scotland is responsible for the coordination of national surveillance and reporting of **healthcare associated infections** (HAIs) and the monitoring of **antimicrobial resistance** and antimicrobial prescribing.

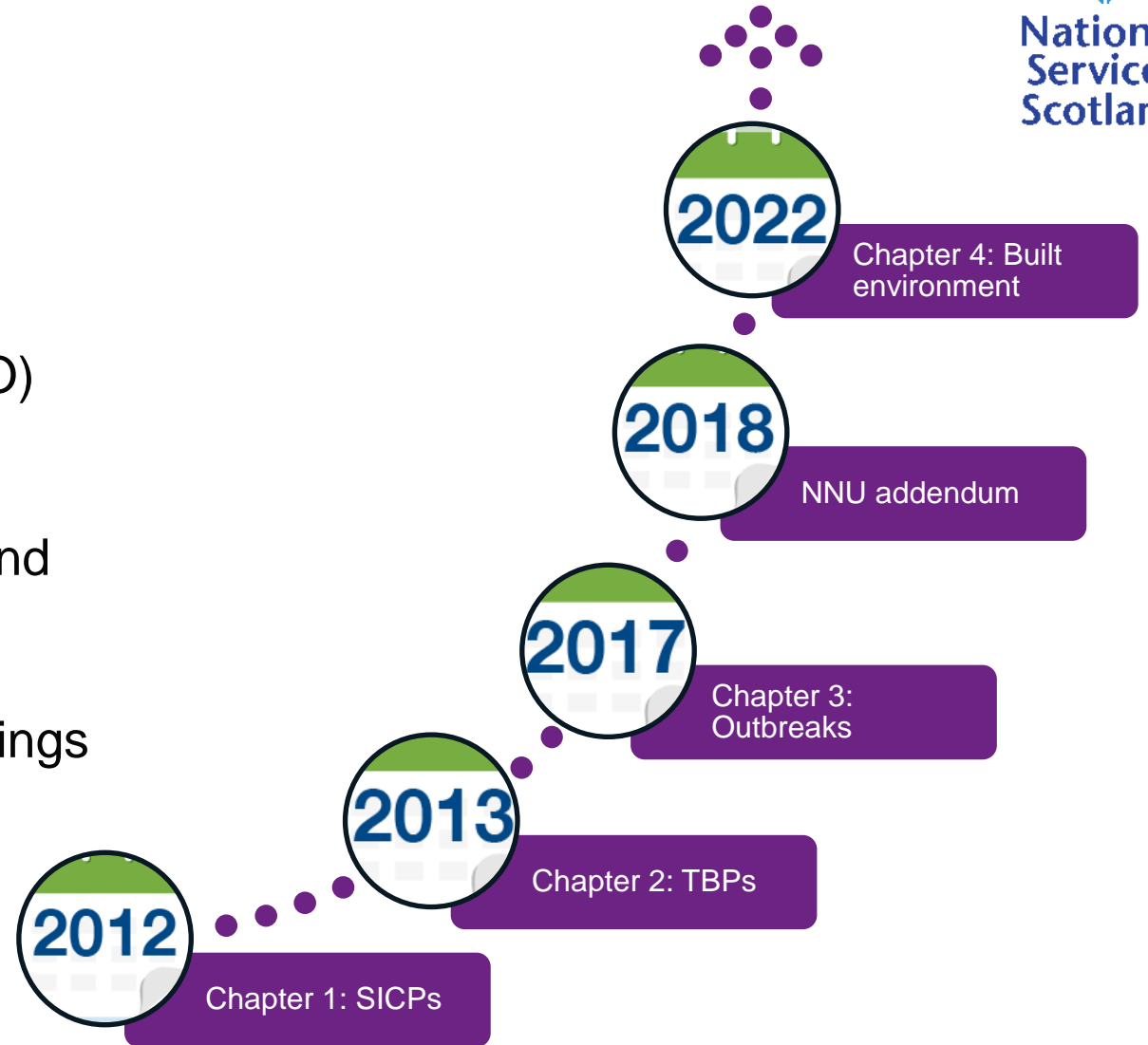
- Previously Health Protection Scotland (HPS)
- Formation of NHS Scotland Assure

Responsible for:

- Development and maintenance of the NIPCM
- Reactive guidance

## History of the NIPCM

- Launched 2012
- Endorsed by Chief Nursing Officer (CNO)
- ARHAI (**A**ntimicrobial **R**esistance & **H**ealthcare **A**ssociated **I**nfection) Scotland
- Best practice for all involved in care provision across all health and care settings in Scotland





[NIPPCM Index](#) ▾

[Care Home IPCM](#)

[Evidence and research](#)

[Search](#)

[Contact us](#)



National Infection Prevention and Control Manual

## Chapter 4 - Infection Control in the Built Environment and Decontamination

[Home](#) > [Chapter 4 - Infection Control in the Built Environment and Decontamination](#) >

### Introduction

Currently, chapter 4 exists as a repository for evidence reviews and tools relating to IPC in the built environment including delivery of appropriate decontamination within health and care settings and risk mitigation for water based pathogens.

### Content

[Bed spacing](#)

[ICBED Publications](#)

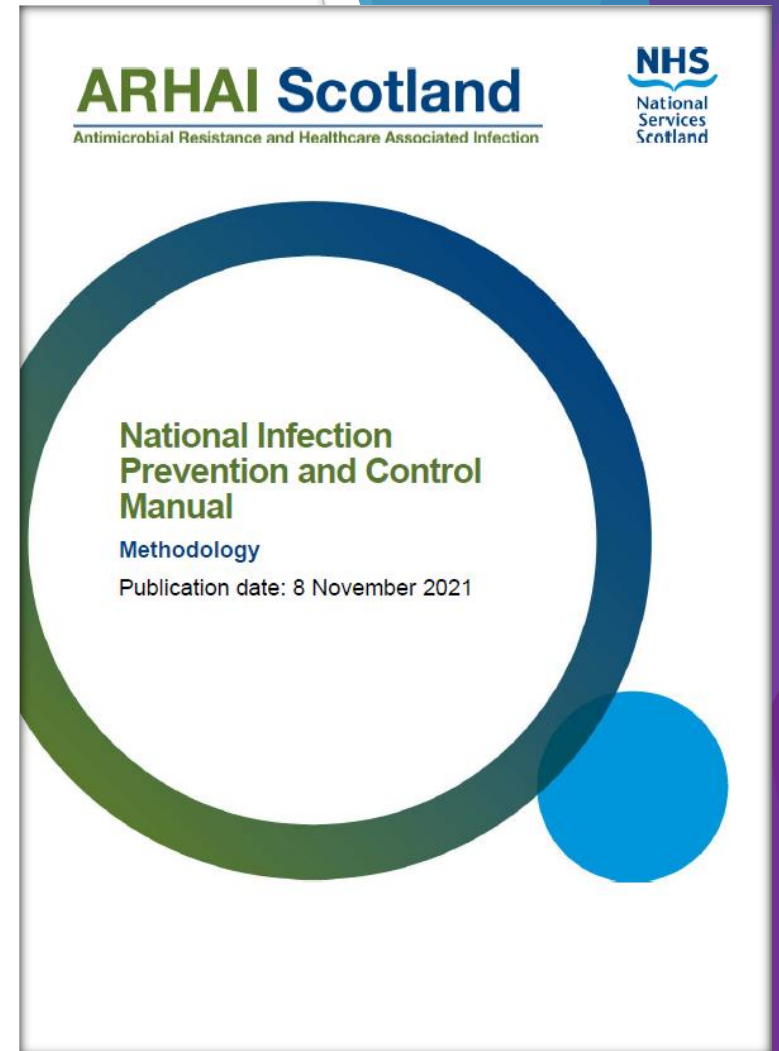
# NIPCM methodology

Evidence-based

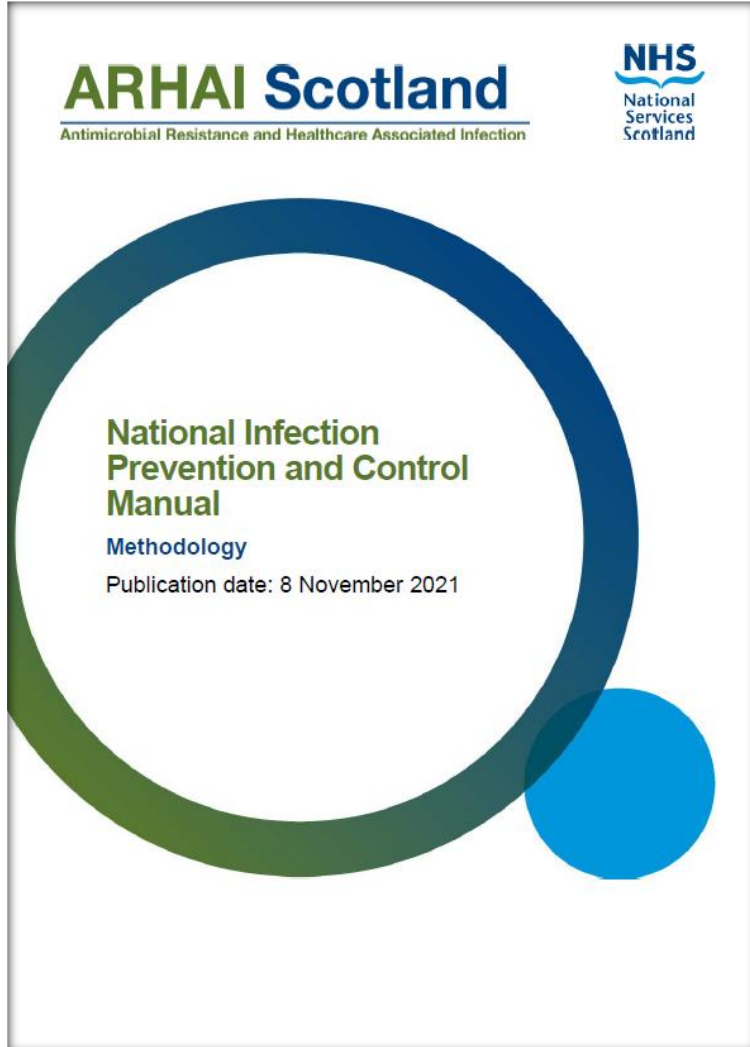
NIPCM Systematic literature review methodology

The IPC team at ARHAI Scotland:

- 15 Healthcare Scientists
- 7 Senior IPC nurses
- 3 Consultant IPC nurses
- 1 Information Officer



# NIPCM methodology



Details regarding:

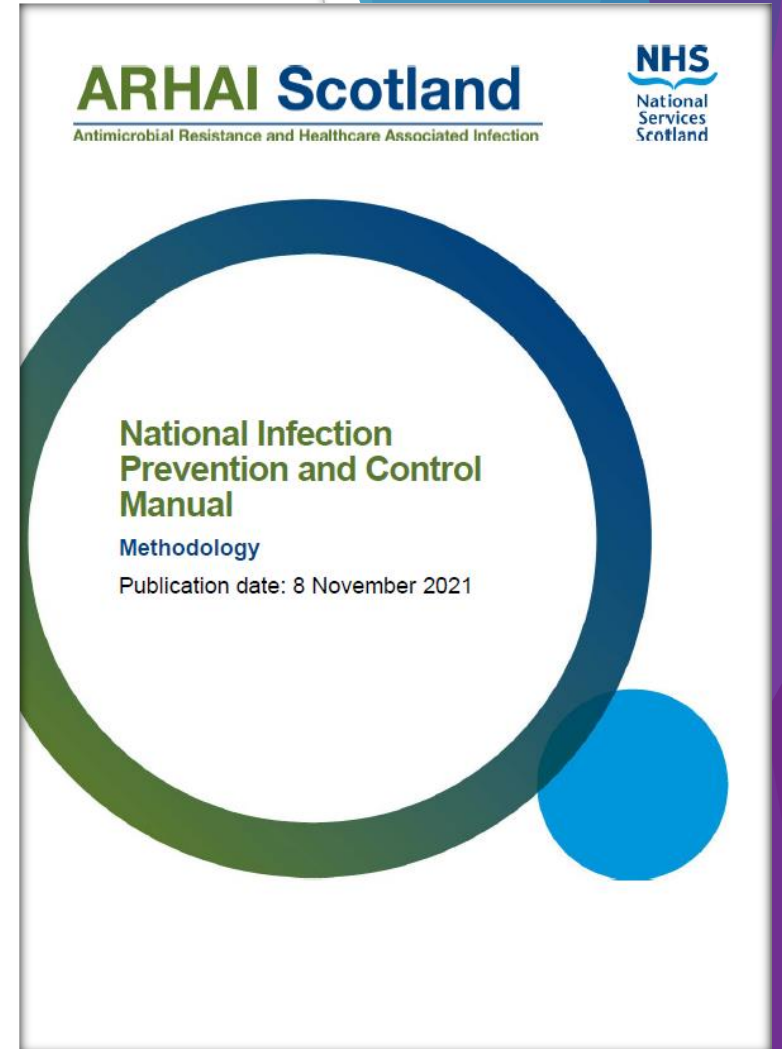
- Working Groups
- Literature review methodology
- Search strategies
- Inclusion/exclusion criteria
- Critical appraisal method
- Grading of recommendations
- Update schedules

# Working groups

3 working groups (1 for the built environment)

Representation from:

- Infection control managers
- Infection control nurses
- Infection control doctors
- Microbiologists
- Estates & Facilities
- Health & Safety
- Occupational Health
- Invite: expert groups (linen, decon, dental, neonatal..)
- Lay person





## Levels of evidence

The following grades were given to the papers included in this evidence table:

**1++** High quality meta analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias

**1+** Well conducted meta analyses, systematic reviews of RCTs, or RCTs with a low risk of bias

**1-** Meta analyses, systematic reviews of RCTs, or RCTs with a high risk of bias

**2++** High quality systematic reviews of case-control or cohort studies

High quality case-control or cohort studies with a very low risk of confounding, bias, or chance and a high probability that the relationship is causal

**2+** Well conducted case control or cohort studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is causal

**2-** Case control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal

**3** Non-analytic studies, e.g. case reports, case series

**4** Expert opinion



## Levels of evidence

The following grades were given to the papers included in this evidence table:

**1++** High quality meta analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias

**1+** Well conducted meta analyses, systematic reviews of RCTs, or RCTs with a low risk of bias

**1-** Meta analyses, systematic reviews of RCTs, or RCTs with a high risk of bias

**2++** High quality systematic reviews of case-control or cohort studies

High quality case-control or cohort studies with a very low risk of confounding, bias, or chance and a high probability that the relationship is causal

**2+** Well conducted case control or cohort studies with a low risk of confounding, bias, or chance and a moderate probability that the relationship is causal

**2-** Case control or cohort studies with a high risk of confounding, bias, or chance and a significant risk that the relationship is not causal

**3** Non-analytic studies, e.g. case reports, case series

**4** Expert opinion



Excluded

# AGREE appraisal of guidance documents

- For guidance documents
- Final grading of:
  - AGREE 'strongly recommend'
  - AGREE 'recommend (with provisos or alterations)'
  - 'Would not recommend'
  - 'Unsure'

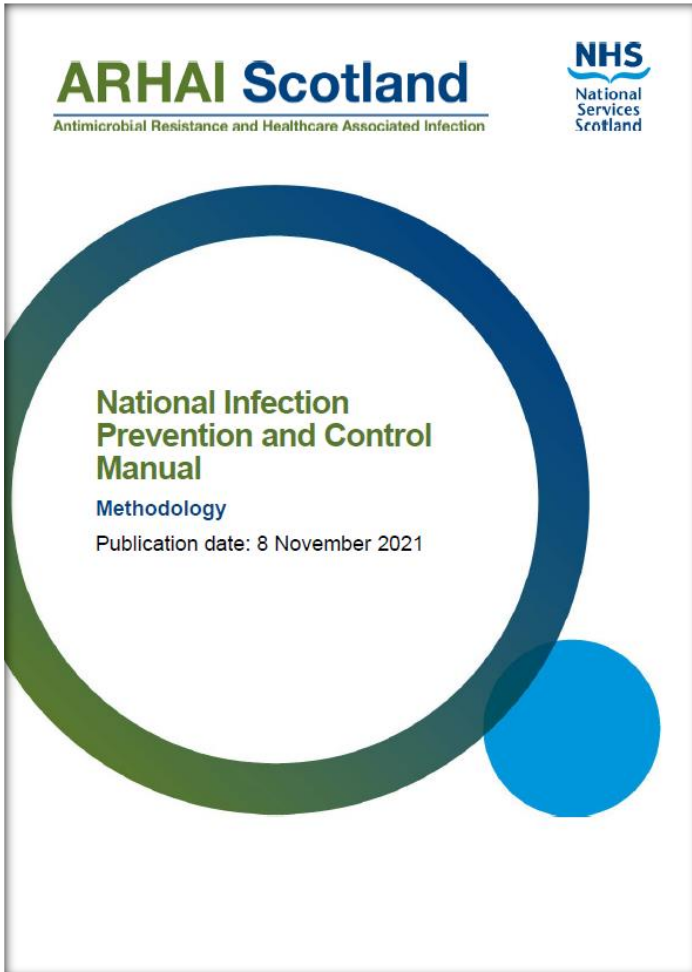


**AGREE**  
REPORTING CHECKLIST

# NIPCM grading for conclusions/recommendations

Grade	Descriptor	Levels of evidence
<b>Mandatory</b>	'Recommendations' that are directives from government policy, regulations or legislation	N/A
<b>Category A</b>	Based on high to moderate quality evidence	SIGN level 1++, 1+, 2++, 2+, AGREE strongly recommend
<b>Category B</b>	Based on low to moderate quality of evidence which suggest net clinical benefits over harm	SIGN level 2+, 3, 4, AGREE recommend
<b>Category C</b>	Expert opinion, these may be formed by the Working Groups when there is no robust professional or scientific literature available to inform guidance.	SIGN level 4, or opinion of working group
<b>No recommendation</b>	Insufficient evidence to recommend one way or another	N/A

# Literature review - steps



Research questions & search strategy

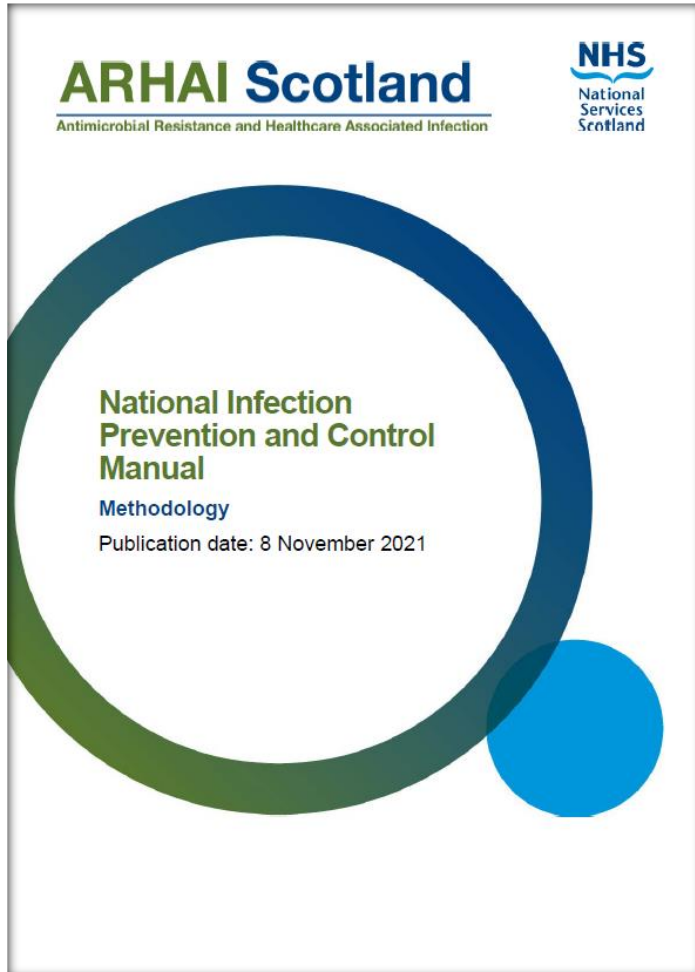
Screening: inclusion/exclusion criteria

Critical appraisal of evidence (SIGN50 + AGREE)

Grading of conclusions + evidence tables

Draft literature review

# Literature review - steps



Literature review complete

Draft recommendations (direct from literature review)

Draft recommendations (expert opinion)

Final evidence tables produced

Final recommendations

# Chapter 4: IPC in the built environment & decontamination

Areas of development:

**Water**



**Ventilation**



## Water systems literature review

*Infection prevention and control (IPC) related aspects/impacts of the healthcare water system*

- Systematic literature review
- NIPCM methodology
- Aim = summary of the extant scientific and grey literature





# Research questions

## 37 research questions

- General information about the organisms associated with healthcare water systems
- Prevention and control of infection linked to healthcare water
- Outbreak/incident management
- Organisational Management



## Limitations of the evidence base

- Publication bias
- Quality of evidence
- Lack of baseline data



# General information

## Which organisms can be responsible for water-associated colonisation/infection in healthcare settings?

- ~82 papers included
- Long list of organisms
  - Water/water system as the source
  - Patient/point of use as the source
  - Pseudo-outbreaks

Journal of Hospital Infection 102 (2019) 75–81

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

Journal of Hospital Infection

journal homepage: [www.elsevier.com/locate/jhin](http://www.elsevier.com/locate/jhin)

---

### Tap out: reducing waterborne *Pseudomonas aeruginosa* transmission in an intensive care unit

M.I. Garvey<sup>a,b,\*</sup>, M.A.C. Wilkinson<sup>a</sup>, K.L. Holden<sup>a</sup>, T. Martin<sup>a</sup>, J. Parkes<sup>a</sup>, E. Holden<sup>a</sup>

<sup>a</sup> University Hospitals Birmingham NHS Foundation Trust, Queen Elizabeth Hospital Birmingham, Edgbaston, Birmingham, UK  
<sup>b</sup> Institute of Microbiology and Infection, The University of Birmingham, Edgbaston, Birmingham, UK

---

ARTICLE INFO	SUMMARY
<p><b>Article history:</b> Received 25 June 2018</p>	<p><b>Background:</b> <i>Pseudomonas aeruginosa</i> is a ubiquitous and important opportunistic pathogen in immunocompromised or critically ill patients. Nosocomial <i>P. aeruginosa</i> outbreaks occur frequently in intensive care units (ICUs) and are a major cause of hospital-acquired infections. To minimize contamination of water outlets in ICUs, we investigated the effectiveness of a water treatment system to reduce the number of <i>P. aeruginosa</i> in tap outlets across the intensive care unit (ICU) at a tertiary care hospital. Tap outlets were routinely decontaminated using a thermal washer-disinfector (TWD) weekly from new outlets on the ICU over an 18-month period. The number of <i>P. aeruginosa</i> in tap outlets was routinely undertaken. Tap water sampling on ICU indicated that 30% of the tap outlets were positive for <i>P. aeruginosa</i> by one time, and whole genome sequencing of <i>P. aeruginosa</i> in tap water to patient. Since their installation, tap outlets have been negative for <i>P. aeruginosa</i>, and the number of <i>P. aeruginosa</i> in tap outlets has fallen by 50%.</p>



Journal of Hospital Infection 115 (2021) 75–82

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

Journal of Hospital Infection

journal homepage: [www.elsevier.com/locate/jhin](http://www.elsevier.com/locate/jhin)

---



### Sink drains as reservoirs of VIM-2 metallo- $\beta$ -lactamase-producing *Pseudomonas aeruginosa* in a Belgian intensive care unit: relation to patients investigated by whole-genome sequencing

D. De Geyter<sup>a,\*</sup>, R. Vanstokstraeten<sup>a,1</sup>, F. Crombé<sup>a</sup>, J. Tommassen<sup>b</sup>, I. Wybo<sup>a</sup>, D. Piérard<sup>a</sup>

<sup>a</sup> Department of Microbiology and Infection Control, Vrije Universiteit Brussel (VUB), Universitair Ziekenhuis Brussel (UZ Brussel), Brussels, Belgium  
<sup>b</sup> Section Molecular Microbiology, Department of Biology, Faculty of Science, Utrecht University, Utrecht, the Netherlands

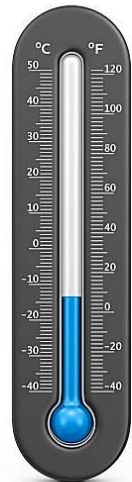
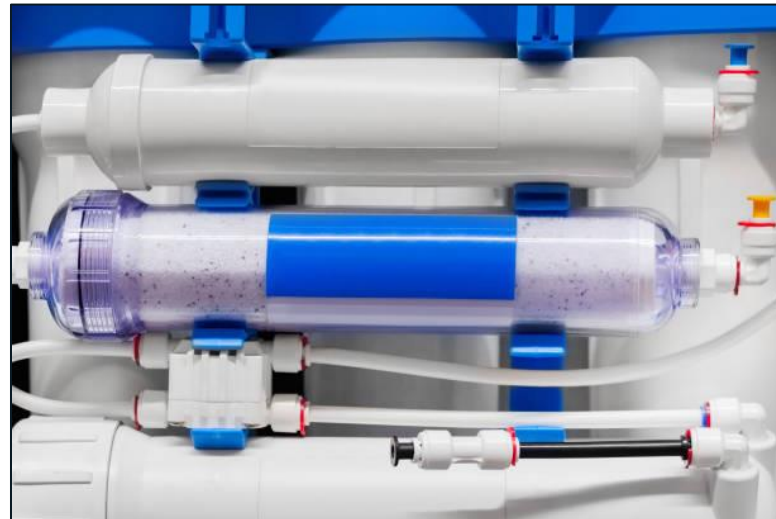
---

ARTICLE INFO	SUMMARY
<p><b>Article history:</b> Received 24 March 2021</p>	<p><b>Background:</b> Hospital-acquired infections caused by VIM-encoded metallo-<math>\beta</math>-lactamase-positive <i>Pseudomonas aeruginosa</i> are a major problem in intensive care units (ICUs).</p>

to minimize contamination of water outlets in ICUs, we investigated the effectiveness of a water treatment system to reduce the number of *P. aeruginosa* in tap outlets across the intensive care unit (ICU) at a tertiary care hospital. Tap outlets were routinely decontaminated using a thermal washer-disinfector (TWD) weekly from new outlets on the ICU over an 18-month period. The number of *P. aeruginosa* in tap outlets was routinely undertaken. Tap water sampling on ICU indicated that 30% of the tap outlets were positive for *P. aeruginosa* by one time, and whole genome sequencing of *P. aeruginosa* in tap water to patient. Since their installation, tap outlets have been negative for *P. aeruginosa*, and the number of *P. aeruginosa* in tap outlets has fallen by 50%. Tap outlets free of *P. aeruginosa* can subvert clinical isolates in an ICU. Published by Elsevier Ltd. All rights reserved.

## Water/ water system as probable source

- *Legionella* spp.
- Non-tuberculous Mycobacteria (*M. mucogenicum*, *M. intracellulare*, *M. gordonae*, *M. avium*, *M. abscessus*)



## Patient and/or point of use as probable source

- *Klebsiella pneumoniae*
- *Klebsiella oxytoca*
- *Serratia marcescens*
- *Enterobacter cloacae*
- *Citrobacter freundii*
- *Pantoea agglomerans*
- *Escherichia coli*
- *Stenotrophomonas maltophilia*
- *Pseudomonas aeruginosa*



## Pseudo-outbreaks

- An increase in identified organisms in patient samples (contamination) but without colonisation or infection in the patients

### Example:

*Stenotrophomonas maltophilia* in bronchoscopy samples from contaminated automated endoscope reprocessor



# Water-free care

3 studies with evidence of benefit of water-free patient care

Taps removed, patient care replaced with disposable products

Balance of risks

Option for a water-free pilot study in NHS Scotland

- Patient safety
- Patient comfort
- Sustainability
- Reduction of infection

## Areas of contention...

- Testing frequency
- Total viable cell count (TVC) testing
- Testing at commissioning
- Water testing during outbreaks





## Prevention & Control

How frequently should routine water testing be conducted?

12 evidence documents

- 6 monthly routine water testing in augmented care units
- Some evidence for increasing the frequency



## TVC (total viable cell) testing

- Correlation with pathogenic organisms?
- SHTM 04-01 Part C - quarterly
- British Standard PD 855468:2015 – 2 log difference (100 times greater) than incoming water
- **Trend analysis**



## Prevention & Control

### What are the microbiological water testing requirements at commissioning?

- Bringing a new water system into use
- Lack of guidance for microbiological testing
- SHTM 04-01: after disinfection, microbiological testing should be carried out
- *Legionella* testing as per HSG274
- *Pseudomonas aeruginosa* only if >30 days has elapsed between disinfection and occupation in absence of flushing
- What about other organisms (e.g. Non-tuberculous Mycobacteria)?

# Outbreak/incident management

What are the water testing requirements during an incident/outbreak?

- Lack of guidance
- Outbreak reports – rush to undertake disinfection
- What can the organism tell us?
- Match between patient and water sample?



## Areas for further research/ influence

- Standardised/validated tests for a wider range of organisms
- Tap design (and other components e.g. baths, drains, sinks, flow straighteners...)
- Drains (decontamination)
- Environmental sampling
  
- Additions to National Cleaning Specification
- Additions to Scottish Health Technical Memoranda



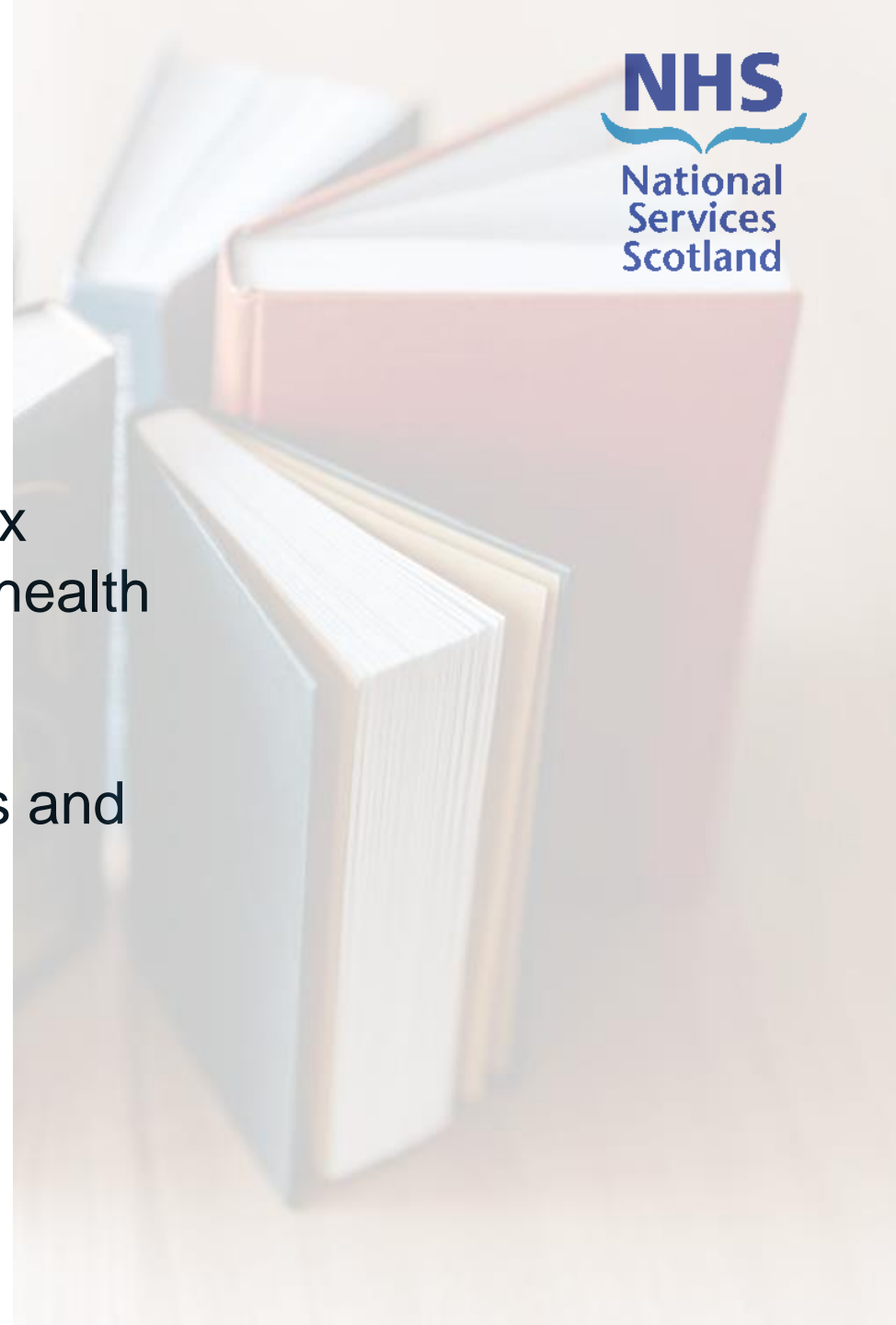
## Ventilation

- Systematic literature review in progress
- Focus on environmental sources of infection, not patient-patient transmission



## ARHAI Scotland publications

- Systematic review on *Cryptococcus neoformans/Cryptococcus gattii* species complex infections with recommendations for practice in health and care setting
- Further publication collaborations – NHS Boards and ARHAI Scotland



**Thank you**

**Emma Hooker**  
Lead Healthcare Scientist  
ARHAI Scotland

Any  
questions?