NHS National Services Scotland

Notes for Boards: IPC Considerations for the Design of a Reduced Water Healthcare Facility

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Antimicrobial Resistance & Healthcare Associated Infection (ARHAI) Scotland
An NHS Scotland Assure Service

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Introduction

NHS Boards are increasingly aware of the transmission risks associated with healthcare water and drainage systems. Water-borne Gram negative and non-tuberculous mycobacterial (NTM) healthcare associated infections (HCAI) pose a serious threat to patient safety in healthcare. Recently, health boards have been considering reduced water care as an Infection Prevention and Control (IPC) strategy to reduce the burden of infections/colonisations due to these organisms. Nationally there are no published IPC recommendations to safely design, plan and implement a reduced water care healthcare ward or facility.

This document aims to support NHS Scotland boards by providing them with a summarised set of questions and answers which will signpost them to any applicable guidance documents or publications and summarise key considerations.

Questions and answers

Question 1: How do we define reduced water care in healthcare?

Answer:

As a relatively new phenomena, at the time of publication there are no national or international published guidance documents defining reduced water in healthcare. Terminology has not been agreed, and terms such as water free care and water light care are also in use. For the purpose of this document reduced water care has been selected on the basis that water use cannot be eliminated all together. Expert opinion considers reduced water care a process in which the conventional use of water-based care using tap/shower water is replaced by alternative methods that require minimal or no water. [1] Health Boards may decide to derogate from the recommended national published guidance on layout for patient care water delivery or completely remove outlets which may alter the water and wastewater design infrastructure. [1,2,3,4,5] If choosing to derogate they should do so via an organisational risk assessment.

The purpose of reduced water care is to mitigate the risk of direct or indirect patient acquisition of Gram-negative bacteria or NTMs from contaminated water or wastewater that may arise from the healthcare water delivery system.[1]

Relevant guidance and expert opinion:

1. Inkster T, Walker J, Weinbren M. Water-free patient care: a narrative review of the literature and discussion of the pressing need for a way forward. Journal of Hospital Infection 2024;152: 36-41
2. Adult in-patient facilities (SHPN 04-01). National Services Scotland
3. Core elements - Sanitary spaces (HBN 00-02). National Services Scotland
4. HAI-SCRIBE (SHFN 30). National Services Scotland
5. National Services Scotland. ARHAI Scotland. Water Systems Literature Review. Water Systems Literature review

Question 2: What are the IPC drivers for consideration of reduced water care?

Answer:

Gram negative and NTM infections are a serious threat to vulnerable patients[1,2,3] Nationally health boards are seeking revolutionary approaches to improve patient safety and maintain environmental control to prevent patient HCAI risks and incidents/ outbreaks associated with water delivery systems.[2] Reduced water care may be considered as an outbreak control measure or as part of an overall preventative strategy to reduce HCAIs.

Expert opinion[1],[2,3,4] suggests the following are IPC drivers for consideration of reduced water care:

Minimising Waterborne Infection Risks

Reducing risk from the healthcare water delivery system (sinks, taps, drains) in high-risk settings (see Q3) are primary IPC drivers to improve patient safety. Waste water systems have been identified as a reservoir due to the ability of these pathogens to thrive within the water delivery system and are a major source of anti-microbial resistance.[1,2,4] A shift in clinical practice from the regular usage of soap and water to hand rubs, based on evidence to support their superior efficacy, has had an impact on the usage of water and associated risks.[5]

Reducing the sources of waterborne risk from the water delivery system limits the potential risk of direct or indirect exposure to these pathogens.[2,3] For example IPC risk can arise as splash-zones around the sink may become contaminated through droplet or aerosol mediated dispersion of these pathogens from the outlets or drains.

A systematic review of reduced water care highlighted that removal of sinks and implementation of water free interventions has a positive impact on Gram negative acquisition .[3] The number of included studies was small and should be interpreted with caution. Typically, reduced water care intervention interventions have been implemented in response to outbreaks.

Limiting biofilm formation in water distribution systems

Biofilm formation compounds the problem of the reservoir within the hospital water delivery system as biofilm growth contributes to the proliferation and dissemination of waterborne organisms.[1,3.]

Removal of infrequently used and unused outlets, reduces the risk associated with biofilm formation and transmission events from these reservoirs.[1]

Relevant guidance and expert opinion:

1. National Services Scotland. ARHAI Scotland. Water Systems Literature Review.
2. Garvey M, Holden E. Will we need water in the hospitals of the future? The role of water vs waterless systems – cases for vs case against. Journal of Hospital Infection 2024; **153:47-49.**
3. Low JM, Chan M, Low JL, Chua M, Lee J. The impact of sink removal and other water-free interventions in intensive care units on water-borne healthcare-associated infections: a systematic review. Journal of Hospital Infection 2024; **150:61-71**
4. Inkster T, Walker J, Weinbren M. Water-free patient care: a narrative review of the literature and discussion of the pressing need for a way forward. Journal of Hospital Infection 2024;**152: 36-41**
5. National Services Scotland. ARHAI Scotland Literature Review: Hand hygiene products. January 2024

Question 3: What clinical settings should be considered for reduced water care?

Answer:

Reduced water care should be considered for clinical settings where the Water Safety Group (WSG) and IPCT have identified an ongoing water infection risk from the water delivery system. Risk may be identified due to insufficient turnover of water within the water delivery system or where acquisition of waterborne pathogens has been identified as a clinical risk to vulnerable patients.[1,2.] Reduced water care may also be considered in the design of new facilities for high-risk patient groups.

Consideration should be given to the following clinical settings for implementing reduced water care:

High Risk Clinical Settings

Within the following settings, patients may be immunocompromised and also have an increased risk to infection from invasive devices:

- Transplant units
- Intensive care units (neonatal, paediatric, or adult)
- Haematology or oncology units[1]

Burns Units may also be considered as an area for implementing reduced water care. Patients may be at increased infection risk in relation to exposed wounds and may require elimination of water sources as a transmission source for infection.[1]

Primary or Tertiary Care Outpatient Settings

In settings such as GP practices or outpatient departments, where there is lower water usage, there may be risk of water stagnation within the water delivery system. Staff usage of hand rubs as the predominant method of hand hygiene may contribute further risk as outlets are infrequently used. The design and layout of the existing water system infrastructure should be considered to prevent IPC risk.

Relevant guidance and expert opinion:

1. National Infection Prevention and Control Manual: Home
2. National Services Scotland. ARHAI Scotland. Water Systems Literature review

Question 4: What are the perceived barriers for implementation of reduced water care?

Answer:

Expert opinion[1] considers the following as perceived barriers for implementation of reduced water care:

Operational Considerations

- **Clinical service disruption** – remedial work required to render the water delivery system safe (downsizing of water tanks, water outlet removal, reduced water flow) impacting on clinical service and risk to vulnerable patients was considered as one of the major barriers to implementation.[1]
- **Sustainability** – whilst water usage may decrease, increased usage of wipes may impact on cost associated with clinical waste management as not all wipes are biodegradable. Risks to the wastewater delivery system may arise with inappropriate disposal of wipes.[2]
- **Safe Storage** – The use of alternative products such as wipes, bottled water, rinse free shampoo caps all require safe storage, increasing the storage capacity needed. This may present operational challenges within the existing design footprint which may already have limited storage capacity. [3,4]

Governance

- **Policy or guidance** – nationally there is no policy or guidance which recommends reduced water care in NHS Scotland. Any deviation from current national guidance on Clinical Wash Hand Basin requirements should be viewed as a design derogation and requires ratification, clinical and specialist input through water safety groups and IPC approval via relevant board governance processes. Staff are seeking national guidance to support this practice.[1]
- **Clinical** – in the absence of policy and guidance, staff and organisations may have concerns regarding the lack of national official endorsement or liability in relation to acquisition of healthcare associated infections should these occur

where reduced water care practice has been implemented. Safety concerns may relate to staff concern associated with skin health. In addition, with a reliance on the usage of wipes there is a risk associated with outbreaks which have been reported due to contaminated wipe products.[1,2] Furthermore, there are certain circumstances where soap and water are recommended e.g. for patients with a suspected or known gastrointestinal illness, which staff may feel represents a transmission risk if sinks are not immediately accessible. [3]

Acceptability

- **Patient acceptability** – Nationally there has been no recognised published research around patient acceptability of reduced water care as an acceptable healthcare practice.[1]
- **Healthcare workers acceptability** – Research has identified staff have differing levels of acceptability. Hand rubs are universally accepted as a practice for hand hygiene in line with the National Infection Prevention and Control Manual. However, in situations where hand rubs are not advocated this was viewed as a patient safety risk that could compromise safe IPC management of patients, and risk of staff acquisition. Alternative solutions should be considered when evaluating the removal of CWHB from patient rooms.[1,2] Staff also have a range of views on the use of alternative hygiene products for patient care.[1]

Relevant guidance and expert opinion:

1. Inkster T and Pybus S. Implementation and barriers to waterless care: a questionnaire study of infection prevention and control practitioners, clinicians, and engineers. Journal of Hospital Infection 2024; **152: 122-125.**
2. Garvey M and Holden E. Will we need water in the hospitals of the future? The role of water vs waterless systems – cases for vs case against. Journal of Hospital Infection 2024; **153:47-49.**
3. National Services Scotland. ARHAI Scotland Literature Review: Hand hygiene products. January 2024
4. National Services Scotland. ARHAI Scotland. Water Systems Literature Review. Water Systems Literature review

Question 5: What interventions should be considered to support reduced water care?

Answer:

A structured, multi-disciplinary approach with early planning is required to successfully support implementation of reduced water care. Representation from relevant stakeholders, ratification via the locally agreed governance procedures with agreed alternative options and processes that capture all risks require to be in place. Expert opinion suggests the following interventions should be considered:

- **Options** for alternative hand hygiene processes and/ or an agreed location should be considered to facilitate hand hygiene where the sole use of hand rubs are not indicated for IPC purposes. Other considerations should include alternative care products (oral care, products for hygiene including hair washing) water for consumption and water for other care procedures such as dissolving of oral medications.[1,2,3] Sterile water should be considered for devices that use water.
- **Infection Prevention and Control –** surveillance systems should include implementation dates to support trend analysis. IPCT require to be involved in risk assessments. Reduced water interventions do not replace current Standard Infection Control and Transmission-Based Precautions outlined in the National Infection Prevention and Control Manual.[4]
- **Education–** to support compliance and address any perceived barriers experienced by staff, patients, and visitors.[1]
- **Water Safety Group –** all changes to the water delivery system must be documented within a water safety plan, that includes a risk assessment, agreed actions and a process for monitoring.[4]
- **Estates –** Alternative water delivery system design and layout should be considered to support reduced water care. HAI SCRIBE must be in place prior to removal or relocation of any water outlets and agreed and included in risk assessments at the Water Safety Group[5].

- **Safe Storage of Consumables –** sufficient, appropriate safe storage should be assessed to ensure it is free from environmental contamination for all required consumable supplies both at departmental and hospital level.[2]
- **Procurement -** careful calculation of stock, standardisation of product ranges and supportive material for staff all should be agreed so that staff are aware of product differentials e.g. biodegradable.
- **Waste Management –** consideration of storage both at departmental and hospital wide level.

Relevant guidance and expert opinion:

1. Inkster T and Pybus S. Implementation and barriers to waterless care: a questionnaire study of infection prevention and control practitioners, clinicians, and engineers. Journal of Hospital Infection 2024; **152: 122-125.**
2. National Infection Prevention and Control Manual: Home
3. Low JM, Chan M, Low JL, Chua M, Lee J. The impact of sink removal and other water-free interventions in intensive care units on water-borne healthcare-associated infections: a systematic review Journal of Hospital Infection. 2024
4. National Services Scotland. ARHAI Scotland. Water Systems Literature Review.
5. HAI-SCRIBE (SHFN 30). Scottish Health Facilities Note 30 Parts A B and C: HAI SCRIBE manual, implementation, assessment question sets, and checklists. October 2014

Question 6: What, if any, unintended consequences may arise as a result of reduced water care?

Answer:

A potential consequence of reduced water use within clinical areas is lower flow rates and velocities within the water system distribution pipe work than initially calculated at design.

Areas of low flow can create environmental conditions that support microbiological growth and enhance biofilm formation, due to a number of factors.

This can include greater adhesion of opportunistic pathogens and planktonic bacteria to pipe surfaces, which could then colonise if the flow of water did not provide sufficient forces to flush bacteria away to prevent attachment and biofilm formation.[1]

A reduced flow rate may also result in a reduction in the effectiveness of chemical dosing and any supplementary biocides added to the system, as concentration levels and contact time may be reduced.

Cold water systems with insufficient flow could also be more susceptible to greater thermal gains (from the surrounding environment) if they are not correctly insulated, increasing water temperatures to levels that promote microbiological growth.

In smaller distribution systems, a reduction in overall water consumption may affect the time taken to turnover the contents of cold-water storage tanks to minimise stagnation and stratification. SHTM 04-01 Part A: 2014 suggests a nominal 12-hour total onsite storage capacity.[2] The quantity of stored water should be assessed in relation to daily consumption so that a reasonable rate of turnover is achieved. If it is established that storage is excessive, the capacity should be reduced where it is practicable to do so.

Drainage systems require sufficient water flows and velocities during operation of sanitary outlets to discharge waste through the system and prevent sediment and solids from accumulating within the drainage pipework (BS EN 12056-2:2000).[3] Reduction in overall water consumption from departments may increase the risk of blockages occurring, this depends on the pipework configuration and remaining inlet source.

Further, modifying an installed pipework system may also bring with it unintended retrograde contamination, possibly from contaminated tools, poor workmanship etc. Having in place a suitable governance structure and quality checking process will aid in controlling this risk. For any modifications of existing water systems, method statements should be reviewed to ensure that pipe work alterations are arranged to eliminate dead ends and avoid stagnation. Redundant pipe work should be removed and cut back to the connection point at the main distribution branch. Following modification works, as fitted record drawings and schematics diagrams should be updated to reflect all pipe work alterations carried out.

In order to demonstrate these factors have been considered, where reduced water care is being consider an impact risk assessment should be undertaken based on the patient group served and susceptibility to infection. Control measures should be implemented to manage any identified risks associated with reduced water care.

To mitigate a number of these risks, Health Boards should also consider introducing a programme of enhanced flushing of outlets within clinical areas to improve turnover and compensate for this impact of reduced water care.

Relevant guidance and expert opinion:

1. J. M. R. Moreira, J. S. Teodosio, F. C. Silva, M. Simoes, L. F. Melo, F. J. Mergulhao. Influence of flow rate variation on the development of Escherichia coli biofilms. Bioprocess Biosyst Eng 2013; **36:1787–1796**.
2. Water safety (SHTM 04-01) | National Services Scotland
3. BS EN 12056-2:2000 Gravity drainage systems inside buildings Part 2: Sanitary pipework, layout, and calculation. BS EN 12056 - Gravity drainage systems inside buildings

Question 7: What design options should be considered to support a water free or water light healthcare environment?

Answer:

Guidance from NHS England in relation to NTMs advises that when designing high risk units and where risk assessment allows, wash hand basins should be situated outside the patient area (such as in a lobby or en-suite) rather than within the patient's bedroom. 1

Where en-suite bathrooms are provided based on clinical risk assessment, all access for maintenance, replacement or calibration of water system components should be accessed from outside the patient rooms to minimise the risk of cross-contamination.[1]

Some healthcare settings have been retrofitting areas to implement reduced water care which has resulted in a reduction and removal of hand wash or trough sinks. In some cases, these have been repositioned outside patient rooms in corridors. When removing sinks, consideration must be given to the impact on the water system as per question [6].

Repositioned sinks should be placed in an area where a splash zone of up to 2m can be delineated and should not cause an obstruction in the corridor or relocated space. If sinks are to be moved outside rooms, consideration should be given to installation of elbow operated or automatic doors to prevent staff contaminating the environment with soiled hands whilst travelling to the sink.

Patient acceptability of staff using the sink in the patient's bathroom has not been explored and there may be concerns about patient dignity if staff have to access this sink for hand hygiene while the ensuite is occupied by the patient.

Relevant guidance and expert opinion:

1. NHS Estates Technical Bulletin (NETB) No 2024/3. NHS England » NHS Estates Technical Bulletin (NETB) No.2024/3