Health Protection Scotland

NHS National Services Scotland

Review of evidence underpinning HFS, HPS and *Pseudomonas aeruginosa* and Water (Scotland) Group HPS Guidance for neonatal units (NNUs) (levels 1, 2 & 3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of *Pseudomonas aeruginosa* infection from water

Situation	A review of the published literature from August 2015 to August 2017 was undertaken to: • Ensure the recommendations in the Guidance for neonatal units (NNUs) (levels 1, 2 & 3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of *Pseudomonas aeruginosa* infection from water remain evidence based and valid; and • Establish whether revisions/additions are required.
Background	In recent years there has been an increase in published evidence relating to outbreaks and incidents in augmented care units related to *Pseudomonas aeruginosa.* In 2013, Health Facilities Scotland (HFS), Health Protection Scotland (HPS) and *Pseudomonas aeruginosa* and Water (Scotland) Group published Guidance for neonatal units (NNUs) (levels 1, 2 & 3), adult and paediatric intensive care units (ICUs) in Scotland to minimise the risk of *Pseudomonas aeruginosa* infection from water. This guidance was reviewed in 2014 and 2015.
Assessment	Literature databases, public health websites and Google scholar were searched for relevant documents and articles (see Appendix 1: Search strategies). The review identified 11 relevant studies and 4 relevant guidance documents. **Studies:** 1. Acetic acid used to decontaminate a sink colonised with *P. aeruginosa.* 2. Water testing found *P. aeruginosa* rates highest in ICU, burns, dialysis units and haematology, but lowest transmission to patients was found in the Dialysis unit. 3. *P. aeruginosa* outbreak associated with the removal of point-of-use filters from taps. 4. Following an outbreak of *P. aeruginosa* an enhanced cleaning method described to clean sinks/taps. 5. Expert opinion rejecting the routine use of point of use filters. 6. Post *P. aeruginosa* outbreak investigation shows a positive association

	with tap/drain alignment. 7. Biofilm formation in the components of non-touch sensor taps. 8. Literature review of opportunistic plumbing pathogens- transmission, disease, infection control measures and at risk groups. 9. An outbreak investigation identified disposal of dialysis ultra-filtrate bags in patient sinks to the spread of *P. aeruginosa* 10. Installation of self disinfecting drains produced a significant reduction in *P. aeruginosa* infection rates 11. Following an outbreak of *P. aeruginosa* in a neonatal unit, bottled water was introduced after failed decontamination of the colonised taps, resulting in a drop in infection rates **Guidance:** 1. Department of Health. Health Technical Memorandum 04-01: Safe water in healthcare premises: Part B Operational Management*. 2. Department of Health. Health Technical Memorandum 04-01: Safe water in healthcare premises: Part C *Pseudomonas aeruginosa* – advice for augmented care units*. 3. Health Protection Surveillance Centre (HPSC: Republic of Ireland) guidance on the environmental controls for healthcare facilities, with risk assessments for augmented care units, quality management/sampling of water systems and surveillance/actions of healthcare facilities teams. 4. Hospital Infection Society (HIS) Infection prevention and control recommendations for multi-drug resistant Gram-negative bacteria (MDRGNB). (See appendix 2 and 3 for a summary of literature and guidance) (*Scottish Health Technical Memorandum 04-01 (Parts A-G) applies in Scotland, however HTM 04-01, on which this is based, has been included in this review for information).
Recommendations	Based on the above assessment of the literature and guidance identified in this review, the following revisions to the HPS/HFS, and Water (Scotland) Group guidance should be considered: • Recommendation to remove automated sensor taps from augmented care settings • Recommendation on positioning of soap dispensers (Position soap dispensers so as to prevent soiling of the taps by drips from dispensers or during the movement of hands from the dispensers to the basin when beginning hand-washing) • Include additional detail on water sampling procedure, including additional procedure for obtaining tap swabs during microbiological sampling as outlined in the HPSC Guidance • Update references to 2013 HTM 04-01 Addendum as this has been superseded In addition, consideration should be given to whether routine microbiological sampling for *Pseudomonas aeruginosa* should be advocated in the guidance, as it is in HTM 04-01.

Appendix 1 –Search Strategies

OVID Medline Search Strategy

AND

Pseudomonas/ Pseudomonas aeruginosa/ Pseudomonas Infections/ Pseudomonas.mp Biofilms/	Infection control/ Disease outbreaks/ Cross infection/ Disease Transmission, Infectious/ Outbreak.mp

Limits – English language, 2015-current

CINAHL Search Strategy

AND

MH "Pseudomonas" MH "Pseudomonas Infections" "pseudomonas aeruginosa" MH "Biofilms"	MH "Infection Control" MH "Disease Outbreaks" MH "Cross Infection" MH "Disease Transmission" "outbreak"

Limits – English language, 01/07/2015-01/07/2017

Public health websites

Gov.uk (Public Health England/Department of Health);
European Centres for Disease Control and Prevention (ECDC);
National Resource for Infection Control;
NICE Evidence Search.

Google scholar

Google Search = Pseudomonas aeruginosa guidance, Pseudomonas aeruginosa guideline

Appendix 2: Summary of scientific literature 2015-17 which may impact on the HPS Pseudomonas guidance

Control measure	Papers identified	Summary of scientific findings	Impact on recommendations
High risk environments	#28 Where to do water testing for Pseudomonas aeruginosa in a healthcare setting Garvey M.I. et al Journal of Hospital Infection (2017) 97(2): 192-195	Researchers took water samples, following HTM 04-01 guidelines, every 6 months from all water outlets within a hospital's augmented care areas (critical care, burns, renal transplant/dialysis, clinical haematology, and bone marrow transplant wards). Samples were cultured and identified using standard microbiological investigations. Outlets that were positive for *P. aeruginosa* over the past year ranged from Critical Care having the highest number of positive results (31%), burns (29%), haemodialysis (24%) and haematology (16%). Using pulsed field gel electrophoresis (PFGE), the researchers found that clinical isolates taken from critical care, burns, and the haematology matched the corresponding water isolates from those clinical areas, implying a transmission event; However, a comparison of clinical/water isolates in haemodialysis showed no match, excluding the possibility of transmission. The researchers conclude that these results support the continued water sampling and clinical surveillance of *P. aeruginosa* from water outlets detected in critical care, burns, and the haematology unit; But the lower risk of transmission associated with haemodialysis patients supports the removal of haemodialysis units from the Water Systems HTM 04-01 addendum for *P. aeruginosa.*	Researchers found that patients within ICU were at greater risk of contracting *P. aeruginosa* than those in dialysis units. Current guidelines recognise the need for risk assessments to be carried out to determine transmission risk. **None: evidence supports current guidance**
Point of use tap filters	#58 Pseudomonas aeruginosa Outbreak in a Neonatal Intensive Care Unit Attributed to Hospital Tap Water	Investigation of an outbreak of *P. aeruginosa* in a neonatal intensive care unit identified 31 cases. To determine relatedness of strains, PFGE was performed on 21 environmental isolates and 10 case isolates (5 surveillance and 5 clinical). The researchers found that case clusters were temporally associated with absence of point-of-use filters on taps in patient rooms. After adjusting for gestational age, case patients were more likely to have been in a room without a point-of-use filter (odds ratio [OR], 37.55; 95% confidence interval [CI], 7.16–∞). Isolates from the two most recent cases were indistinguishable from water-related samples obtained from these case-patient rooms. Prior to the removal of	This investigation was conducted on a small number of cases which linked case strains to the strains found in the pre-filtered water supply; this was associated with the temporary removal of point-of use filters. The authors do not identify a definitive mechanism of exposure; more research would be required to clarify the implications of this study. Current HPS

Control measure	Papers identified	Summary of scientific findings	Impact on recommendations
	Kinsey C.B et al Infection Control & hospital Epidemiology July 2017, vol. 38, no. 7	filters no strain types from patient isolates were associated with those found in the pre-filtered water. Although water was implicated as the source, the researchers did not identify a definitive mechanism of exposure of patients to the water.	guidance does not recommend routine use of point of use filters. **None: evidence not strong enough to impact on current guidance**
Appendix 3- Guidance on cleaning sinks	#146 Continued transmission of Pseudomonas aeruginosa from a wash hand basin tap in a critical care unit Garvey M.I et al Journal of Hospital Infection 94 (2016) 8-12	Investigation of an outbreak of *P. aeruginosa* infection. Isolates taken from patients deemed to have had possible transmission events of *P. aeruginosa* were typed and compared to positive water samples from linked outlets taken at the six-monthly water sampling. Authors report a cluster of *P. aeruginosa* acquisitions during a period of five months from tap water to patients occupying the same single room in a critical care unit. Using PFGE, clinical isolates from four different patients were found to be indistinguishable from water strains. Remedial work to descale and disinfect the contaminated taps was unsuccessful, with re-colonisation occurring after 105 days. To prevent re- colonisation a new cleaning method, developed by the housekeeping staff and infection control, was employed (see # 485 for method). Details of whether this approach had been successful in reducing re-colonisation were not provided. Additional infection control measures included ensuring that waste water was disposed of in the sluice rather than down wash hand basins.	The correct disposal of waste water is already covered within current guidance. The researchers however also employed an enhanced cleaning method which was used to decontaminate taps and sinks (Although not described in paper. The method was outlined in letter to editor below **See ref #485**) **None: evidence not strong enough to impact on current guidance**
Appendix 3- Guidance on cleaning sinks	#485 Letter to the editor: Evaluating the risks of wash hand basin tap disinfection Garvey M.I. et al Journal of	Letter to editor outlining method and assessment of cleaning taps and sinks outlined in reference #146 above. Ultraviolet (UV) glow cream was used to cover the tap, sink and surrounding areas, then visualised under UV light to ensure complete coverage before commencing the new cleaning method summarised as follows: **Preparation**: emptying sink and removing organic material from the plug, drain and overflow. Tap turned on and left to run. **Cloth 1**: Clean tap and sink only. Cloth soaked in detergent, then rung dry, cloth is folded between wipes when switching surfaces	Letter to editor providing details of enhanced cleaning method from previous study #146 The current guidance outlines a 2 step cleaning process. **None: evidence not strong enough to impact on current guidance**

Control measure	Papers identified	Summary of scientific findings	Impact on recommendations
	Hospital Infection 94 (2016) 21-22	to be cleaned. Cleaning in the order: mirror, wall tiles, back splash, ledges, pipe work, dispensers, and underside and edges of the sink. Dispose of cloth. **Cloth 2** Cleaning tap outlet. Cloth soaked in detergent, then rung dry, cloth is folded between wipes when switching surfaces to be cleaned, in the order of: the tap bar, tap lever and tap spout. Dispose of cloth **Cloth 3** Cleaning the sink. Cloth soaked in detergent, then rung dry, cloth is folded between wipes when switching surfaces to be cleaned, in the order of: outside of the sink, inside surface of the sink, overflow, plug, plug chain, and drain. Dispose of cloth. Revisualisation of sink with UV light showed no evidence of residual cream.	
Point of use filters	#149 Letter to the editor: The risks of contamination from tap end filters Garvey M.I. et al Journal of Hospital Infection 94 (2016) 281e283	Letters to editor (Expert opinion): Authors discuss the risk of contamination of point of use tap filters, highlighting that they need to be replaced monthly and the cost of installing and maintaining tap end filters is high. The authors propose that a one-off cost for replacement of taps and remedial work when these outlets are positive for *P. aeruginosa* could be a more cost-effective approach compared with the long term use of tap water end filters and their associated recurring costs.	Routine use of point-of-use filters are not recommended. The author suggests that replacement of taps could be more cost effective. **None: evidence supports current guidance**

Control measure	Papers identified	Summary of scientific findings	Impact on recommendations
Installation of taps	#371 Post-Outbreak Investigation of *Pseudomonas aeruginosa* Tap Contamination by Quantitative Polymerase Chain Reaction and Environmental Factors Affecting Positivity E. Bedard et al Infection Control & Hospital Epidemiology November 2015, vol. 36, no. 11	Following an outbreak of *P. Aeruginosa in a* neonatal ICU (NICU). An investigation was carried out on the environmental factors that may have contributed and microbiological quality of the water. A total of 28 taps were sampled as follows: (1) a swab of the drain, 2) 1 L of first-flush cold water (3) a swab of the tap aerator. *P. aeruginosa* load was detected in water, aerator, and drain swabs by Quantitative PCR (qPCR) and analyzed using a multivariate regression (MARSpline). The post-outbreak investigation results obtained by qPCR detection revealed dramatically higher positivity for all sampling sites. *P. aeruginosa* was detected in the water and the biofilms, with 12 taps having 2 positive sites. When examining environmental factors against positive or negative qPCR samples the researchers found that only tap alignment to drain configuration led to significantly different positivities of the water. Results suggest that water from a tap aligned behind the drain has a higher rate of contamination by *P. aeruginosa* than other configurations. The authors conclude that further investigation with a larger number of drain configurations will be needed to determine the optimal drain positioning with relation to the tap.	Researchers found tap to drain configuration to be associated with higher rate of water contamination. Small sample size, and details of sink configurations excluded therefore results cannot be generalised from this research. Further research required. **No impact on recommendations**
Installation of taps	#387 Biofilm formation in an experimental water distribution system: the contamination of non-touch sensor taps and the implication for healthcare	An experimental water distribution system was designed to investigate colonisation of hospital tap components. *P. aeruginosa* was injected into 27 individual tap 'assemblies'. Taps were subsequently flushed twice daily and contamination levels monitored over two years. Tap assemblies were dismantled and assessed microbiologically and the effect of removing potentially contaminated components was determined. *P. aeruginosa* was repeatedly recovered from the tap water at levels above the augmented care alert level. The organism was recovered from all dismantled solenoid valves, with colonisation of the ethylene propylene diene monomer (EPDM) diaphragm confirmed by microscopy. Removing the solenoid valves reduced *P. aeruginosa* counts in the water to below detectable levels, implicating the	The research could augment the current guidance in recommending removal of automated sensor taps from augmented care settings. **Consider updating guidance**

Control measure	Papers identified	Summary of scientific findings	Impact on recommendations
	Moore G. et al Biofouling, 2015, Vol. 31, Nos. 9–10, 677–687	solenoid diaphragm as the primary contamination source. The authors conclude that EPDM diaphragm was identified as a major weakness within a non-touch tap system. The researchers conclude that these findings support the removal of sensor taps from augmented care units.	
Environment decontamination procedures	#150 Acetic acid as a decontamination method for sink drains in a nosocomial outbreak of metallo-b-lactamase-producing Pseudomonas aeruginosa Aspelund et al Journal of Hospital Infection 94 (2016) 13-20	Sinks linked to 12 patient cases were cultured for the presence of metallo-b-lactamase-producing *P. aeruginosa* (PAE-MBL). The patients had been admitted to three wards, where screening discovered PAE-MBL in 12 sink drains located in the patient bathrooms. Typing of clinical and sink drain isolates revealed identical or closely related strains. Before decontamination the minimum effective concentration of acetic acid was first established in vitro by testing on biofilms cultured from samples collected from PAE-MBL-positive sinks. The concentration that prevented visible growth was established at 24%. Colonised sinks were then treated weekly with 250 ml of 24% acetic acid. Cultures taken prior to next treatment were all negative, with one exception. The researchers conclude that acetic acid is highly effective against PAE-MBL biofilms, and may be used as a simple method to decontaminate sink drains and to prevent nosocomial transmission.	The research demonstrates the effectiveness of acetic acid in sink decontamination; however more research may be required to compare this treatment to existing decontamination practices to establish its effectiveness. **No impact on recommendations**
General recommendations	#96 Epidemiology and Ecology of Opportunistic Premise Plumbing Pathogens: *Legionella pneumophila*, *Mycobacterium*	Literature review on opportunistic plumbing pathogens (OPPPs). Highlights the role *P. aeruginosa* plays as a pathogen causing ventilator-associated pneumonia, septicaemia, urinary tract infections, and surgical wound infections. Discusses transmission, including HAI, from environmental sources, specifically water sources. The role of tap water and modes of transmission through direct contact with water and aerosols, aspiration, indirect transfer from moist environmental surfaces, and via healthcare worker hands. The authors point to the long term colonization of plumbing and the formation of biofilms as central to the resistance	Review adds to evidence base. Authors point to the role of biofilms forming in plumbing and the spread of *P. Aeruginosa* with reference to vulnerable groups such as cystic fibrosis patients, transplant recipients, and immuno-suppressed patients.

Control measure	Papers identified	Summary of scientific findings	Impact on recommendations
	avium, and *Pseudomonas aeruginosa* Falkingham III J.O et al Environmental Health Perspectives • volume 123, number 8, August 2015	of organisms to disinfection. They describe the advantages of point-of-use microbiological filters in some healthcare settings to prevent exposure of patients to OPPPs or to prevent contamination of solutions that may come in contact with patients; however, they highlight that those filters can, over time, become sources of OPPPs themselves.	**None: evidence supports current guidance**
Disposal of contaminated fluids	#173 Prolonged outbreak of clonal MDR *Pseudomonas aeruginosa* on an intensive care unit: contaminated sinks and contamination of ultra-filtrate bags as possible route of transmission? Salm F et al Antimicrobial Resistance and Infection Control (2016) 5:53	Within the scope of an outbreak investigation of MDR PAE in an ICU, the researchers examined 21 cases using univariate analysis, which showed that 66.7% (n = 14) of the cases and 28.6% (n = 6) of the controls had been located in one of the rooms with a sink colonized with the outbreak strain (p = 0.06). In the multivariable analysis, staying in a room with a colonized sink and dialysis/haemofiltration equipment showed an increased risk for acquisition of the outbreak strain (odds ratio 21.8, P-value 0.020). The researchers were able to show that reducing work processes involving sinks in patient rooms resulted in reduced MDR *P. aeruginosa* rates. The methods used to reduce activity with sinks in patient rooms included using single use wash cloths and the instruction to empty ultra-filtrate bags of the haemofiltration in a sink outside the patient room. In addition improved hand hygiene via focused training was implemented. After the implementation of these changes MDR PAE detection rate per 1000 patient days fell from 25.37 to 15.03 (P<0.001) over a period of 20 months	Multiple interventions make it difficult to identify key source of reduction in infection rates. Current recommendations state that haemofiltration bags should be disposed of in a sluice or a sink which is not a hand wash station. This research supports current practice. **None: evidence supports current guidance**

Control measure	Papers identified	Summary of scientific findings	Impact on recommendations
Flushing taps to reduce the risk of pipework system contamination	#497 Self-disinfecting sink drains reduce the *Pseudomonas aeruginosa* bioburden in a neonatal intensive care unit Fusch C et al Acta Pædiatrica. (2015) 104, pp. e344–e349	Aerosol bacterial growth was measured using a universal air sampler from sinks contaminated with *P. aeruginosa*, and was found to be associated with patient acquisition rates taken from surveillance data. Comparisons were made during refurbishment: at baseline (Phase One), followed by a further 13 months after sinks were relocated or redesigned, replacing porcelain sinks with stainless steel sinks inside and outside clinical care areas (Phase Two); after a further 13 months phase 3 was implemented and consisted of the installation of 9 self-disinfecting sink drains, which rely primarily on thermal disinfection, and were deemed the most frequently used. Results showed bacterial cultures derived from sampling were significantly reduced from phase 1 to phase 3: 56%, 24% and 13% respectively. Comparing Phases Two and Three produced an odds ratio (OR) of 0.31 and confidence interval of 0.12–0.79 (p = 0.013) for *P. aeruginosa.*	Self disinfecting drains reduce colonisation by *P. aeruginosa.* More research is required to examine the effectiveness of self-disinfecting sinks compared to current disinfection practices. **No impact on recommendations**
Preventing direct water usage colonising/ infecting vulnerable patients	#501 Water faucets as a source of *Pseudomonas aeruginosa* infection and colonization in neonatal and adult intensive care unit patients Cohen R et al American Journal of Infection Control 45 (2017) 206-9	Investigation following outbreak of *P. aeruginosa* in an NICU which usually contained 15 incubators, with 4 taps located in 2 rooms. All taps were swabbed and cultured repeatedly over several months, with all 4 taps colonised at some point during that period. Blood and sputum samples were also taken from neonates. All cultured samples were typed using enterobacterial repetitive intergenic consensus polymerase chain reaction (ERIC-PCR). These investigations showed a spatial and temporal relationship of clonal identities between the patients and the nearest taps: taps were highly colonized and cross-colonization between adjacent taps was observed. 2 case linkages were found between ventilator associated pneumonia with the same clone found in the nearest tap. All attempts to decontaminate the taps were unsuccessful, This treatment included 1 hour of soaking in an enzymatic fluid, pressure washing, dishwashing at 93^{o}C; dehydration at 120^{o}C; and finally sterilization by ethylene oxide. Subsequently tap water was banned during the investigation period and for 30 months after. Regular hand hygiene monitoring	Attempts to decontaminate colonised taps failed. Researchers conclude that sterile water used in place of tap water to bathe neonates and improved hand hygiene compliance resulted in a reduction in the number of cases. **None: evidence supports current guidance**

Control measure	Papers identified	Summary of scientific findings	Impact on recommendations
		was also implemented during the first 4 months of the investigation period. After these interventions cases reduced to 0.29 cases per 1,000 hospitalization-days compared to 2.2 during the 4 months before the intervention. The researchers conclude that the use of sterile water to bath neonates may have led to a reduction in clinical cases, in addition to improved hand hygiene practices.	

Appendix 3: Summary of guidance documents 2015-17 which may impact on the HPS Pseudomonas guidance

Guidance document	Summary	Impact on recommendations
Health Technical memorandum 04-01: Safe water in healthcare premises: Part C: *Pseudomonas aeruginosa* – advice for augmented care units. Department of Health 2016	An addendum to HTM 04-01 published in 2013 advised on how to deal with the presence of *Pseudomonas aeruginosa* in augmented care units. This guidance supersedes the 2013 addendum. As part of the 2016 revision of HTM 04-01, those sections of the addendum that introduced healthcare organisations to the concept of Water Safety Groups and Water Safety Plans are now a fundamental part of HTM 04-01 Parts A and B. Sampling and testing for *P.aeruginosa*, which were previously covered in the addendum are now covered in HTM 04-01 Part B. The recommendations in HTM 04-01 Part C are consistent with those in the Guidance, however the following recommendation is not included in the Scottish guidance: Consider the appropriate positioning of soap and antimicrobial hand-rub dispensers. The compounds in the products can be a source of nutrients to some microorganisms. Therefore, it is advisable to prevent soiling of the taps by drips from the dispensers or during the movement of hands from the dispensers to the basin when beginning hand-washing.	Need to update references to 2013 HTM 04-01 Addendum in Guidance. Recommendation on positioning of antimicrobial hand-rub dispensers already included in guidance, consider extending this to include positioning of soap dispensers. **Consider updating guidance**
Health Technical memorandum 04-01: Part B: Operational Management. Department of Health 2016	Operational management, including the organisation and remit of a Water Safety Group, the purpose and contents of a Water safety Plan and requirements and recommendations for Risk Assessments are now included in HTM 04-01 Part B. These were previously included in the 2013 addendum to HTM 04-01. The recommendations in these sections of HTM 04-01 Part B are consistent with those in the Scottish Guidance. HTM 04-01 Part B now includes procedures for testing for *P.aeruginosa* (Appendix D), Water sampling for *P.aeruginosa* (Appendix E) and Microbiological examination of water samples for *P.aeruginosa* (Appendix F), which were previously covered in the addendum. The recommendations in the appendices are consistent with the recommendations in the Scottish Guidance, with the exception of the recommendation for routine sampling for *P.aeruginosa*, which is specifically advised against in the Scottish Guidance.	Need to update references to 2013 HTM 04-01 Addendum in Guidance, including link in Appendix 4. Routine sampling of water for *P.aeruginosa* is advocated in SHTM 04-01 Part B, however it is specifically advised against in the Scottish guidance. **Consider updating guidance**

Prevention and Control of Infection from Water Systems in Healthcare Facilities Sub-Committee of the HPSC Scientific Advisory Committee. *Guideline for the Prevention of Infection from Water Systems in Healthcare Facilities.* The Health Protection Surveillance Centre. August 2015	This guidance from The Heath Protection Surveillance Centre (HPSC) provides recommendations on the following: 1. The environmental (water) controls required in all healthcare facilities to prevent health-care associated infection from water sources 2. The need for risk assessment to be in place in augmented care units to prevent infection from water sources 3. A quality managed water system to be implemented in healthcare facilities to prevent infection from water sources including bottled water 4. Advice on routine sampling and testing of water systems in healthcare facilities 5. Surveillance and actions required in healthcare facilities if healthcare-associated infection from water sources is suspected	These guidelines contain a detailed water sampling procedure with an additional procedure for obtaining tap swabs during microbiological sampling (page 60). This may augment the equivalent sections of the current guidance. All other evidence supports current guidance. **Consider updating guidance**
Prevention and control of multi-drug-resistant Gram-negative bacteria: Recommendations from a Joint Working Party. Wilson APR, Livermore DM, Otter JA, Warren RE, Jenks P, Enoch DA *et al*. Journal of Hospital Infection 92 (2016) S1eS44	Evidence-based recommendations for the prevention and control of multi-drug resistant gram-negative bacteria (MDRGNB). These have been accredited by the National Institute for Health and Care Excellence (NICE). Section 9.4.5 is specific for environmental hygiene. It recommends that environmental screening should be considered where there is any unexplained transmission of MDRGNB. They also describe strong evidence that demonstrates that respiratory equipment contributes to transmission and advise that this and other contaminated equipment should be decontaminated (or respiratory secretions discarded) in designated cleaning sinks and patient wash-water should be discarded in a similar manner. The researchers raise the possibility that sensor taps contribute to transmission, and recommend that a risk assessment should be made in accordance with the organisations' water-safety plan, this includes whether point-of use filters should be installed or taps changed.	**None**: Recommendations are aligned with current guidance on decontamination of equipment, SCIPS, disposal of contaminated fluids, risk assessments for sensor taps, and point of use filters. **None: evidence supports current guidance**