Summary of literature identified for the National Policy Guidance & Evidence (NPGE) and Infection Control in the Built Environment and Decontamination (ICBED) literature reviews

October to December 2025

Titles and abstracts are reviewed for subject relevance. Additional exclusion criteria are also applied i.e. exclusion of laboratory focussed studies such as molecular typing etc.

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

Evidence Table – National Policy Guidance and Evidence (NPGE) - literature identified

Literature review	Papers identified	Summary of Findings and Impact on ARHAI Recommendations
Transmission Based Precautions (TBPs) Definitions	Firle C, Meyer-Plath A, Pöther DC, et al. Quantification of human aerosol emission by measuring different breathing patterns. J Aerosol Sci. 2026, 191:106680. doi:10.1016/j.jaerosci.2025.106680.	This German experimental study investigated the influence of inspiratory breathing volumes and flow rate on particle counts, using 30 human participants. The study adds to the research question **"How are infectious agents released into the air of the health and care environment from the respiratory tract with consideration of particle size, distance and clearance/fallout time?"** The study demonstrated that as inspiratory duration and inspiratory volume increased, expired particles counts increased in a sigmoidal curve. Moreover, results indicated that as inspiratory volume increased, more particles of size 0.45 to 1.14µm were identified than particles of less than 0.45µm. Authors concurrently described anatomical and functional factors of the respiratory tract which could explain particle counts and sizes recorded. Further findings in relation to individual inspiratory parameters were discussed. With regards to inspiratory volume, at 1L or less, particle counts of 100-1000 particles/breath were recorded. As respiratory volume increased from 1 to 3L, particle counts then increased

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		exponentially. Maximum particle counts of 100,000 particles/breath were demonstrated at 3L (95% CI [27,000,170,000]), following which particle counts decreased slightly as inspiratory volume reached 6L. Regarding inspiratory flow rates, higher rates – where breathing duration was 'short' (0.5 to 1 seconds) and breathing volumes were 'intermediate' (1 to 3 litres) – were significantly correlated with particle counts, although accuracy error was higher for short breathing durations. Limitations to this study include an inability to quantify particle sizes smaller than 0.45µm, and a lack of subgroup analysis by gender despite differences in particle counts. No change to current literature review.
Safe Management of Linen	Bosica S, Janowicz A, Romualdi T, et al. Genomic epidemiology of a *Bacillus cereus* bacteraemia outbreak linked to contaminated hospital laundry. Microb Genom. 2025;11(9):001487. doi: 10.1099/mgen.0.001487.	This Italian outbreak report investigated epidemiological and genetic relatedness of environmental and clinical isolates of *Bacillus cereus*, following detection of 95 clinical *B. cereus* clinical isolates across three hospitals. The study adds to the research question **"What is the risk of infection transmission associated with linen in health and care settings?"** by demonstrating that hospital laundry services can act as a source for patient colonisations or infections with *B. cereus*.

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		This study describes whole genome sequencing of patient isolates implicated early in the outbreak, as well as multiple environmental sites from the hospital in which most patient cases were identified (n=80). Environmental sources found by SNP analysis to be most closely related to clinical isolates included “freshly laundered scrubs, surface swabs from the laundry transport truck and hospital bed linens”. A key limitation of this study was a lack of detail on the justification of environmental sampling at only one of the three affected hospitals, and on which other environmental samples were considered most closely related to clinical isolates. Moreover, it is not reported when and how the outbreak was controlled. No change to current recommendations.

Evidence table – Healthcare Infection Incidents, Outbreaks and Data Exceedance -literature identified

Literature review	Papers identified	Summary of scientific findings and Impact on ARHAI Recommendations
Healthcare infection incidents and outbreaks literature review	Cai B, Lu F, Yang Y, et al. The Neglected 4th Catheter: A suspected outbreak of Carbapenem-resistant *Pseudomonas aeruginosa* in a kidney transplant ward. American Journal of Infection Control. 2025 Oct 26. doi:10.1016/j.ajic.2025.10.022	This study reports an outbreak caused by Carbapenem-resistant *Pseudomonas aeruginosa* (CRPA) at the department of kidney transplant of a tertiary hospital in Shanghai, China. This study adds to the evidence base of the research question **"How can healthcare infection incidents/outbreaks be recognised/detected?"**. Outbreak investigation was initiated after six cases of CRPA were identified in September 2023, with no spatial overlap observed among these cases. A retrospective investigation of the incidence of CRPA infections and drainage fluid cultures among kidney transplant recipients from 2019 to 2023 revealed that the positive rate of CRPA in kidney transplant recipients in 2023 (5.07%) was significantly higher than that of 2019 to 2022 (0.36%) ($P < .001$). This study adds to the evidence for the research question **"How should healthcare infection incidents/outbreaks be investigated and managed?"**. The study carried out epidemiological surveillance and investigation, performed environmental sampling, and used WGS to confirm clonal

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		isolate. Environmental samples collected from the surfaces of drainage devices for positive patients, bed units, used toilets, and the public areas within the ward yielded some microbial growth, but *P aeruginosa* was not identified. Multi-locus sequence typing results established that all eleven CRPA strains isolated from six patients were ST1693, with isolates showing 100% similarity in five resistance genes and a similarity of 93.91% among 115 virulence genes. A bundle of measures was implemented to control the outbreak, including contact precautions for CRPA-positive patients, disinfection of environmental surfaces and shared equipment, training healthcare workers on standardised procedures for the collection of drainage fluid, hand hygiene, and drain placement. Limitations of the study included that environmental sampling detected no CRPA strains on the ward, hence, infection source or transmission direction cannot be established. Furthermore, a bundle of control measures was applied and therefore the effectiveness of individual measures cannot be determined. Applicability to Scottish health and care settings may also be limited. No change to current recommendations.

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Healthcare infection incidents and outbreaks literature review	Garvey MI, Moran RA, Sanches Ferreira AD, et al. Identification and response to a putatively hypervirulent, carbapenem-resistant *Klebsiella pneumoniae* ST395 hospital outbreak in the UK. Microbial Genomics. 2025 Nov 20;11(11): 001571. doi: 10.1099/mgen.0.001571	This study reports on an outbreak of hypervirulent carbapenem-resistant *Klebsiella pneumoniae* (hv-CRKP) within a vascular ward at Birmingham Heartlands Hospital site (BHH) in the spring of 2024. The study adds to the evidence base of the research question **"How can healthcare infection incidents/outbreaks be recognised/detected?"**. The study states that isolation of a carbapenem-resistant *K. pneumoniae* ST395 (containing the extended-spectrum beta-lactamase gene $bla_{CTX\text{-}M\text{-}15}$, carbapenemase gene $bla_{NDM\text{-}1}$ and virulence score of 4 due to the presence of genes encoding aerobactin and yersiniabactin), from the urine sample of a patient on the ward with symptomatic urinary tract infection on the 23rd day of admission triggered alerting the Infection Prevention Control team, immediate weekly screening all patients on the ward for CPE, and contact tracing to identify more cases. The study adds to the evidence base of the research question **"How should healthcare infection incidents/ outbreaks be investigated and managed?**". The outbreak was investigated using PCR, including both short and long read sequencing, genome characterized using Kleborate, F-type plasmid replicons were sub-typed using PubMLST

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		sequencing, and single nucleotide polymorphism analyses confirmed that all isolates matched. A bundle of measures was implemented to control the outbreak, including admission and weekly CPE screening, hand hygiene education for both staff and patients, environmental microbiological sampling, enhanced cleaning of shared medical equipment, closure of the entire ward to facilitate deep cleaning of all bays and side rooms, replacement and installation of a new toilet on the ward, and replacement of all mattresses, curtains and pillows throughout the ward. Limitations to this study include failure to identify vector for transmission or possible infection source on the ward. Furthermore, a bundle of control measures was applied and therefore the effectiveness of individual measures cannot be determined. No change to current recommendations.
Management of Incidents and Outbreaks in Neonatal Units (NNUs)	Rivera-Valenzuela G, Senaldi L, Tiwari P, et al. Investigation and control of an outbreak of methicillin-susceptible *Staphylococcus aureus* skin and	This single centre observational study from a large level four neonatal intensive care unit in the United States describes a prolonged outbreak of methicillin susceptible *Staphylococcus aureus* involving 16 infants over a 32-week period. Infections were facial skin and soft tissue infections, including two cases of *staphylococcal* scalded skin

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	soft tissue infections in a neonatal intensive care unit. Infection Control & Hospital Epidemiology. Published online 2025:1-6. doi:10.1017/ice.2025.10303	syndrome. Surveillance screening identified an additional 31 colonised infants. Whole genome sequencing showed that a single sequence type, ST 121, was responsible for most infections and that isolates in this cluster were closely related. This indicated active transmission within the unit, rather than repeated unrelated introductions. A broad range of IPC measures were introduced during the investigation. These included contact precautions, decolonisation where appropriate, reinforcement of hand hygiene, introduction of a bare below the elbows policy, enhanced cleaning of shared equipment, and changes to the handling of adhesives and tape used to secure respiratory devices. These measures coincided with the end of new infections from the outbreak strain by week 26. No staff and environmental screening was performed, and multiple overlapping control measures were implemented, which makes it hard to identify sources and determine which interventions were most effective. This paper adds to the research questions: **“How should NNU incidents or outbreaks be investigated and managed? and “What are the key measures to control incidents/outbreaks in NNUs?”**

Literature review	Papers identified	Summary of scientific findings and Impact on ARHAI Recommendations
		No change to current recommendations.

Evidence Table – Infection Control in the Built Environment and Decontamination (ICBED) - literature identified

Literature review	Papers identified	Summary of scientific findings and Impact on ARHAI Recommendations
	No literature identified.	