Summary of literature identified for the National Policy Guidance & Evidence (NPGE) literature reviews - October to December 2022

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.

Literature review	Papers identified	Summary of Findings	Impact on Recommendations
Hand hygiene: hand washing, hand rubbing and indications	Price L, Gozdzielewska L, Matuluko A, et al. Comparing the effectiveness of hand hygiene techniques in reducing the microbial load and covering hand surfaces in healthcare workers: Updated systematic review. Am J Infect Control. 2022;50(10):1079-1090. doi: 10.1016/j.ajic.2022.02.003	This systematic review updated the evidence on the effectiveness of the World Health Organization (WHO) 6-step technique for reducing microbial load and covering hand surfaces in comparison with other techniques. All studies which measured microbial load found the WHO 6-step technique reduced microbial load on healthcare worker hands. Findings were inconsistent for studies comparing techniques, with some suggesting the WHO 6-step technique was significantly more effective in reducing microbial load with better hand coverage compared with an alternative technique	Adds to evidence base on the following objective(s): “What is the correct process and technique to ensure that all surfaces of the hands are covered during washing?" by supporting mixed evidence for the efficacy of the WHO 6-step technique. No change to current recommendations.

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		(CDC 3-step technique or no instructions), while others found no difference. Overall risk of bias was rated high in all studies included, attributed to lack of blinding or randomisation.	
PPE: Eyewear	Bergmann N, Lindörfer I, Ommerborn MA. Blood and saliva contamination on protective eyewear during dental treatment. Clin Oral Investig. 2022;26(5):4147-4159. doi:10.1007/s00784-022-04385-1	This study investigated blood and saliva contamination of protective eyewear following dental treatment. Of the 53 participants included, macroscopic visible contamination was found on 60.4% of protective shields after dental treatment (n=32). Blood contamination was detected at baseline, after procedure and after disinfection, with a median increase of 330 pixels following treatment, equivalent to 0.3% of the surface area. Saliva contamination was only detected following procedures, with limited statistical analysis carried out due to skewed results. Utilising a novel technique usually adopted in forensic science. This pilot study provides some evidence for blood spatter from dental procedures, supporting the use of protective eyewear. Make and model of	Adds to evidence base on the following objective: “When/where should eye/face protection be used for SICPs?” by supporting use of eye protection during procedures with risk of blood and saliva splash. No change to current recommendations.

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		eyewear was not provided and infectivity of splatter was not considered.	
Surgical masks	Partridge DG, Sori A, Green DJ, et al. Universal use of surgical masks is tolerated and prevents respiratory viral infection in stem cell transplant recipients. J Hosp Infect. 2022;119:182-186. doi:10.1016/j.jhin.2021.09.005	This universal masking policy was implemented in the Haematology Department at Sheffield Teaching Hospital NHS Foundation Trust from March 2019 to February 2020, wherein staff entering stem cell transplant patient rooms were required to wear type IIR fluid-resistant surgical masks. Policy to wear gloves and aprons remained in place. Routine PCR testing for viral respiratory infections was carried out for symptomatic patients. There was a significant decrease in respiratory infection rate when universal masking was implemented, adjusting for total population incidence – 23.34 to 11.59 infections per 100 patients observed, with a risk difference of 11.7 [95% CI: 4.5 to 19.0], p=.004. This significant difference remained for only inpatient diagnosed infections – 19.69 to 7.25 per 100 patients, with risk difference of 12.4 [95% CI: 6.2 to 18.7], p=.001. Adherence to universal masking was not measured, visitor mask use was not monitored or consistently	Adds to evidence base on the following objective: “When should health care workers wear a surgical mask for SICPs?”, adding to the evidence base for universal mask use for immunocompromised patients. No change to current recommendations.

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		implemented, and masks were removed on patient request.	
Surgical Masks	Ambrosch, A., Luber, D., Klawonn, F., & Kabesch, M. A strict mask policy for hospital staff effectively prevents nosocomial influenza infections and mortality: monocentric data from five consecutive influenza seasons. The Journal of hospital infection, 2022. *121*, 82–90. DOI: https://doi.org/10.1016/j.jhin.2021.12.010	This retrospective before-after study assessed the effect on rates of nosocomial influenza infection within elderly high-risk patients after the implementation of universal surgical mask use for all staff throughout their shifts on affected wards. Data were obtained for a period of four consecutive influenza seasons from 2015 to 2019. MNP for all staff for the whole shift was introduced in 2017 and for the following seasons if at least three influenza patients were in the ward at the same time. Nosocomial influenza incidence fell nearly 50% (odds ratio; 0.40; 95% CI 0.28, 0.56; $p < 0.001$) in the years with mandatory MNP. A significant reduction in nosocomial mortality of 85% (0.15; 95% CI 0.02, 0.70; $p = 0.007$) was also observed.	Adds to the evidence base for recommendations under the objective: "When should health care workers wear a surgical mask for SICPs?" by providing evidence of reducing respiratory viral infection incidence in high-risk patients. No change to current recommendations.
Hand Hygiene: Products	Lehtinen, J. M., Kanerva, M., Tarkka, E., Ollgren, J., & Anttila, V. J. Low efficacy of three non-alcohol-based hand disinfectants utilizing	This before-after study compared the efficacy of three non-alcohol based hand disinfectants (active ingredients: silver polymer, lactic acid 1.8w% and benzalkonium chloride (BAC) 0.1% respectively) and one alcohol-based hand	Adds to the evidence base on the following objectives: "What is non-alcohol based hand rub?" by

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	silver polymer, lactic acid and benzalkonium chloride on inactivation of bacteria on the fingertips of healthcare workers. The Journal of hospital infection, 2022. *125*, 55–59. DOI: https://doi.org/10.1016/j.jhin.2022.03.012	disinfectant (active ingredient ethanol 74 w%) in reducing bacterial counts on the fingertips of healthcare workers working on hospital wards. The 'fingertips on Petri dish' method was used before and after rubbing hands with the product. All non-alcohol-based hand disinfection products had passed the EN1500 test. After use of the products alcohol-based hand rub was found to efficiently reduce bacteria on testers' fingertips (mean 6.02, 95% CI 4.14, 7.91). Lactic acid and BAC based disinfectants did not have any detectable efficacy (Lactic acid mean reduction 0.17, 95% CI -2.77, 3.10; BAC mean reduction -2.14, 95% CI -4.08, -0.20). Finally the silver-polymer-based formula showed some effect (3.64, 95% CI 2.18, 5.11).	providing examples of non-alcohol based hand rub (non-ABHR) components. "How effective is non-alcohol based hand rub at removing/killing microorganisms?" by providing comparative evidence between the efficacy of non-ABHRs and an ABHR. "When should non-alcohol based hand rub be used for hand hygiene in health and care settings?" where it suggests limitations to the use of non-ABHRs in health and care settings.

Literature review	Papers identified	Summary of scientific findings	Impact on recommendations
TBP definitions	Chan SM, Ma TW, Chu S, et al. Droplet nuclei are generated during colonoscopy and are decreased by the use of carbon dioxide and water immersion technique [published online ahead of print, 2022 Jun 25]. Digestive Endoscopy. 2022;10.1111/den.14387. doi:10.1111/den.14387	This prospective observational study investigated aerosolization and droplet production during colonoscopies and ways in which aerosol production can be minimised. Colonoscopies (n=117) were conducted by a surgeon or physician by either the air technique, the CO_2 technique, or the water immersion technique. Air measurements were taken using a portable GT-526S Handheld Particle Counter placed within 10cm of the patients' anus, near the endoscopists mouth and near the nurse's mouth. Measurements were taken for 30 minutes before the procedure to gain a baseline measure, one minute following the patient entering the room, throughout the procedure and until the patient left the room. The endoscopy team were blinded to particle counter measurements. This analysis indicated that during colonoscopy, level of difference in log (particles/cubic foot) (dCF) were significantly higher than baseline for particles sized 5μm (estimate = 2.16, [95% CI: 0.80-3.52], p =.002) and 10μm (estimate = 1.61, [95% CI: 0.58, 2.64], p	Findings from this study could contribute to the recommendations under the objective: "Which activities result in droplet transmission?" however the study did not detail any transmission events or measure particle infectivity. No change to current recommendations.

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		=.003). Meanwhile, dCf levels 0.3-1 were similar to baseline. Secondary outcomes included significantly higher numbers of aerosols for trainees versus specialists, and significantly lower aerosols for CO_2 and water techniques compared with when air was used. There was also a significant increase of droplets during water immersion. There were no significant increases in any particle size during colonoscopy compared with baseline dependent on counter location. Infectivity of particles produced was not considered in this study, so the results cannot confirm risk of transmission following these procedures.	
AGPs	Phillips F, Crowley J, Warburton S, et al. Aerosol and droplet generation in upper and lower GI endoscopy: whole procedure and event-based analysis. Gastrointest Endosc. 2022;96(4):603-611.e0. doi:10.1016/j.gie.2022.05.018	This UK study investigated aerosol and droplet production in mouth, nose or rectum gastrointestinal (GI) endoscopy. Patients chose whether to receive sedation for CO_2 or water immersion endoscopy. Procedures were conducted in the same suite and enhanced PPE was worn by staff in the procedure room to minimise aerosols produced out-with the endoscopy. AeroTrak particle counter was used to	Adds to evidence base on the following objective: “Which procedures are considered to be aerosol generating?” where it suggests that some mouth, nose and rectum GI endoscopies may be aerosol producing, however particle

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		measure particles (100L/min) with the head placed 10cm from the patients' mouth for upper GI procedures and 20cm from the anus for lower GI procedures. A VisiSize spray characterisation tool was also used to capture larger respiratory particles, placed 10cm from the patients' mouth. Absolute number of particles was reported. For particles >5μm, lower GI procedures were not significantly different relative to background (p=.082). Meanwhile, for particles <5μm, all procedure types were significantly higher than background (peroral gastroscopies: 1.99 times, transnasal endoscopy: 2.09 times, lower GI endoscopy: 1.34 times; p<.001). Sub-analysis indicated that some events during the procedures resulted in increased particle production, and a significant effect of patients having hiatus hernia on particle production, and coughing and gagging. This observational study indicates that peroral gastroscopies, transnasal gastroscopies and lower GI endoscopies may be aerosol producing. However, there was not enough data provided for full	infectivity/transmission risk not assessed. No change to current recommendations.

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		particle analysis by size, and infectivity of particles produced was not investigated.	
Respiratory Protective Equipment (RPE)	Yip, K. H., & Yip, Y. C. Use of thin silicone dressings for prolonged use of filtering facepiece respirators: Lessons from the universal community testing programme during the COVID-19. International wound journal, 2022. *19*(5), 1188–1196. DOI: https://doi.org/10.1111/iwj.13714	This experimental study in Hong Kong examined whether two different types of dressing (light silicone foam dressing and soft silicone perforated tape dressing) applied on anatomical locations to reduce mask-related pressure injuries would impact quantitative respirator fit testing. A fit factor of 114 or higher reflected an effective seal without leakage, and a grading result of 200 indicated maximum fit. Of the 12 participants that applied the light silicone foam dressing, 33% had a fit factor of 200. The mean fit factor was 167.5 (SD 36.6, CI: 146.8-188.2). Of those participants who applied a soft silicone perforated tape dressing, 58% had a fit factor of 200. The mean fit factor was 186.8 (SD 21.0; CI: 174.9-198.6). In this small cohort, dressing materials applied under respirators did not decrease the respiratory protection.	Adds to the evidence base for recommendations under the objective: “What if a face fit test is unsuccessful?” by providing evidence for potential mitigations that could increase users wearability whilst still enabling a wearer to pass the quantitative fit test, however further research is required, also noting that this is arguably an occupational health issue. No change to current recommendation.

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

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Management of Incidents and Outbreaks in Neonatal Units (NNUs)	Hernandez-Alonso, E., Bourgeois-Nicolaos, N., Lepainteur, M., Derouin, V., Barreault, S., Waalkes, A., et al. Contaminated Incubators: Source of a Multispecies Enterobacter Outbreak of Neonatal Sepsis. Microbiology spectrum, 2022. 10(4), e0096422. DOI: https://doi.org/10.1128/spectrum.00964-22	This outbreak report describes the measures taken to identify and control an Enterobacter outbreak of bloodstream infections in a French NICU from 2016 to 2018 affecting 20 premature infants (out of 1,621 admittances). The rate of Enterobacter invasive infections had risen from 0.7% 2015 to 2.14% in 2016. An outbreak investigation and surveillance programme was introduced and included: (1) Patient cohorting, (2) Assessment of IPC policies, followed by training sessions and audits. (3) Auditing of biocleaning practices of equipment and hospital environment. (4) Introduction of environmental surveillance. (5) Reinforcing supervision of antibiotic consumption. (6) Monthly multi-disciplinary team meetings held. Multiple outbreak containment strategies were undertaken with no success. Primary reservoir and source of contamination was identified as neonatal incubators; sampling methodology during 'on'/'in use' conditions	Adds to the evidence base for recommendations under the objectives: "How should NNU incidents/outbreaks be investigated and managed?" where it provides evidence of management examples. "What are the key measures to control incidents/outbreaks in NNUs and how should these be implemented in Scotland?" by providing evidence of the importance of reviewing the management of equipment.

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		identified this. Once the incubators were replaced the outbreak was contained.	
Management of Incidents and Outbreaks in Neonatal Units (NNUs)	Wang, B., Song, J., Song, J., Mao, N., Liang, J., Chen, Y., et al. An Outbreak of Severe Neonatal Pneumonia Caused by Human Respiratory Syncytial Virus BA9 in a Postpartum Care Centre in Shenyang, China. Microbiology spectrum, 2022. *10*(4), e0097422. DOI: https://doi.org/10.1128/spectrum.00974-22	This outbreak report described an outbreak of severe neonatal pneumonia in a postpartum centre in Shenyang city, China; caused by Human respiratory syncytial virus (HRSV); between the 17· January and 3 February 2021. Respiratory samples (34) were collected from 21 neonates and 13 nursing staff. The samples were screened for 27 pathogens (16 viruses, 11 bacteria); 20 samples tested positive for HRSV (16 neonate and four nursing staff samples). Overall, there were 16 hospitalised neonates with seven being admitted to ICU and nine to general wards. All four nursing staff had asymptomatic infections. An investigation into the genetic characteristics of the HRSV responsible was undertaken. The 2nd hypervariable region of the G gene was obtained from six neonates and two nursing staff. Homology analysis showed that all eight sequences were identical and belonged to the HRSV BA9 genotype.	Adds to the evidence base for recommendations under the objective: "How should NNU incidents/outbreaks be investigated and managed?" by providing evidence for screening of neonates. No change to recommendations.

Literature review	Papers identified	Summary of scientific findings	Impact on Recommendations
Healthcare infection incidents and outbreaks in Scotland	Li, L., Wang, R., Qiao, D., Zhou, M., & Jin, P. Tracking the Outbreak of Carbapenem-Resistant *Klebsiella pneumoniae* in an Emergency Intensive Care Unit by Whole Genome Sequencing. Infection and drug resistance, 2022. *15*, 6215–6224. DOI: https://doi.org/10.2147/IDR.S386385	This outbreak report describes the investigation of the identification of origin and transmission route of a CRKP (carbapenem-resistant *klebsiella pneumoniae*) outbreak in an emergency intensive care unit (EICU) in 2018 in China. Retrospective analysis showed that all 10 outbreak strains were carbapenemase positive in modified carbapenem inactivation method (mICM) and all belonged to sequence type 11 (ST11) clone, harboured a set of resistance genes and virulence genes. The phylogenetic tree of CRKP isolates based on two outbreaks revealed that the initial isolate A1 in the EICU ward belonged to one branch of isolates in another hospital, this introductive isolate evolved and caused a subsequent outbreak in the EICU. The study concluded that rapid and early monitoring of genomic and epidemiological data (inclusive of admission and post-discharge surveillance) yields a clear transmission map of a CRKP outbreak.	Adds to the evidence base for recommendations under the objectives: "How can healthcare infection incidents/outbreaks be recognised/detected?" by providing evidence for retrospective investigation of an outbreak. "How should healthcare infection incidents/outbreaks be investigated and managed?" where it provides evidence for a microbiological investigation. No change to current recommendations.

Literature review	Papers identified	Summary of scientific findings	Impact on Recommendations
Healthcare infection incidents and outbreaks in Scotland	Cetin C & Arslan U. *Burkholderia cepacia* outbreak in immunocompetent children in a tertiary hospital in Turkey: A case series. Asian Pac J Trop Med. 2022. 15:374-8. DOI: https://www.apjtm.org/text.asp?2022/15/8/374/351766	This outbreak report detailed an outbreak of *Burkholderia (B.) cepacia* (bloodstream infection) in 12 immunocompetent children at a tertiary hospital in Turkey in 2018. Inclusion criteria were based on hospital-acquired infection definitions as per CDC guidelines. At the onset of the outbreak the hospital infection control committee launched an investigation; epidemic site visits were organised to identify the source, contact precautions were taken and patients were cohorted. Environmental cultures were collected from various areas in the hospital. Samples were collected from various fluids and medications. *B. cepacia* was isolated from samples taken from the surface cleaners; the antibiotic susceptibilities of these isolates were found to be identical with the isolates from patients' blood cultures. The outbreak was controlled after removing the surface cleaners from use. Key points identified in the successful management of this outbreak were: rapid identification of the outbreak, defining the	Adds to the evidence base for recommendations under the objectives: "What is the definition of a healthcare infection incident / outbreak?" where it provides evidence for defining an outbreak. "How should healthcare infection incidents / outbreaks be investigated and managed?" by providing evidence for epidemiological and environmental investigation. No change to current recommendations.

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		source and taking appropriate measures to control the outbreak.	
Healthcare infection incidents and outbreaks in Scotland	Lee, A. L. H., Leung, E. C. M., Wong, B. W. H., Wong, L. C. H., Wong, Y. L. Y., Hung, R. K. Y., et al. Clean clothes or dirty clothes? Outbreak investigation of carbapenem-resistant *Acinetobacter baumannii* related to laundry contamination through multilocus sequence typing (MLST). Infection control and hospital epidemiology, 2022. 1–7. Advance online publication. DOI: https://doi.org/10.1017/ice.2022.255	This outbreak report investigated the source of an outbreak of carbapenem-resistant *Acinetobacter baumannii* (CRA) in an acute setting in Hong Kong using multilocus sequence typing (MLST). There were 58 patients involved in this outbreak with 53 colonised and 5 infected (3 with sacral sore infections, 2 pneumonia); 27 patients belonged to a cluster. Clinical samples were collected from infected patients and close contacts; environmental sampling was performed in patient surroundings and laundry facilities. OXA-23 was positive in 64.7% of isolates. A CRA isolate from the evaporative cooler in the laundry was identical to that of 11 patients across three wards. Additional isolates found within laundry were identical to patient isolates across 5 wards. There was no significant difference between sequence type distributions of clinical and environmental isolates (p=0.12) indicating	Adds to the evidence base for recommendations under the objective: “How should healthcare infection incidents/ outbreaks be investigated and managed?” by providing evidence for microbiological and environmental investigation. No change to current recommendations.

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		a high likelihood of CRA originating from the same source. The study concluded that MLST confirmed that contamination of the laundry evaporative cooler and surrounding environment caused a polyclonal CRA hospital outbreak.	
Healthcare infection incidents and outbreaks in Scotland	Iglói, Z., van Loo, I. H. M., Demandt, A. M. P., Franssen, K., Jonges, M., van Gelder, M., et al. Controlling a human parainfluenza virus-3 outbreak in a haematology ward in a tertiary hospital: the importance of screening strategy and molecular diagnostics in relation to clinical symptoms. The Journal of hospital infection, 2022. *126*, 56–63. DOI: https://doi.org/10.1016/j.jhin.2022.03.017	This report of a human parainfluenza virus 3 (HPIV-3) outbreak involving 53 patients at the haemato-oncology ward of the Maastricht University Medical Centre in 2016 described the infection control measures and molecular epidemiology investigation. HPIV-3 RT_PCR was validated using oropharyngeal rinse samples. Screening of new and admitted patients was implemented allowing identification of asymptomatic infection or prolonged shedding of HPIV-3 thereby allowing cohort isolation. Monitoring showed that at the first positive PCR there were 20 patients (38%) who were asymptomatic and the average duration of shedding was 14 days [range 1-58]. Asymptomatic patients had a lower	Adds to evidence base on the following objective: "How should suspected healthcare infection incidents/outbreaks be assessed?" where it provides evidence for new and existing patient screening as part of control measures and follow up. No change to recommendations.

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		viral load, shorter period of viral shedding (≤14 days) and were mostly immune-competent oncology patients. The implementation of a sensitive screening method identified both symptomatic and asymptomatic patients that allowed early cohort isolation. This is particularly important in wards that combine patients with varying immune status.	