ARHAI Scotland

Antimicrobial Resistance and Healthcare Associated Infection

NHS National Services Scotland

Evidence table – SICPs - literature identified April – June 2021

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 for hand hygiene	A large-scale investigation of alcohol-based handrub (ABHR) volume: hand coverage correlations utilizing an innovative Quantitative evaluation system Voniatis C.; Bansaghi S.; Ferencz A.; Haidegger T. Antimicrobial Resistance and Infection Control. 10 (1) (no pagination), 2021.	This study investigated the correlation between applied ABHR volume and achieved hand coverage. 356 medical students and surgical residents were randomly selected and given predetermined ABHR volumes; their hand sizes were calculated using specialised software. Data were collected on drying time, ABHR volume and spillage awareness for each hand hygiene event. Findings show that hand coverage achieved during a hand hygiene event is strongly correlated with applied ABHR volume. At 1ml dose, 7.10% of the hand area was uncovered, decreasing to 1.68% at 2 ml and at 3 ml it further decreased to 1.02%. Achieved coverage is correlated to hand size however, 3 ml volume proved sufficient for most hand hygiene events (84%). ABHR volume of 1.5 ml failed to cover entire hand surface even for people with smaller hands while volumes of 3.5 ml or more were inefficient due to spillage while the additional rubbing time did not improve hand coverage. The study concluded that while a 3 ml ABHR volume is reasonable for medium-sized hands, optimisation of ABHR volume may be required for each individual to ensure adequate	Adds to evidence base.

Literature review	Papers identified	Summary of Findings	Impact on Recommendations
		hand hygiene quality, prevent unnecessary costs and improve adherence.	
	Bactericidal efficacy of two modified WHO-recommended alcohol-based hand rubs using two types of rub-in techniques for 15 seconds. Suchomel M; Fritsch F; Kampf G Journal of Hospital Infection. 2021 Mar 20. VI 1	This study evaluated the bactericidal efficacy of 2 modified WHO-recommended alcohol-based hand rubs (3 ml) after a 15-second rubbing period using 2 different rub-in techniques of 3 vs. 6 steps on 20 volunteers. The modified WHO I formulation (80% w/w ethanol and 0.5% v/v glycerol and 0.125% v/v hydrogen peroxide) showed a mean $\log_{10}$ reduction of 3.63 ± 0.87 at 6 steps and 3.80 ± 0.71 at 15 seconds/3 steps which was inferior to the reference treatment of isopropanol 60% v/v as per EN 1500 (4.27 ± 0.98; 2 x 30 seconds/6 steps). The modified WHO II formulation based on isopropanol 75% w/w, glycerol 0.5% v/v and hydrogen peroxide 0.125% v/v showed mean $\log_{10}$ reduction of 4.09 ± 0.80 (15 seconds/6 steps) and 4.22 ± 0.92 (15 seconds/3 steps), this was non-inferior to the reference treatment. Findings suggest a 3 ml hand drub with a strong bactericidal effect, a 15 s application duration appears to be sufficient for both 3- and 6-step rub-in techniques.	None.
Safe management of the care environment	*Clostridium difficile* Infection Reservoirs Within an Acute Rehabilitation Environment. Weppner J et al. American Journal of Physical Medicine & Rehabilitation. 100(1):44-47, 2021 01 01.	This study examined the presence of *Clostridium difficile* spores within an acute rehabilitation environment and assessed the efficacy of implemented interventions. *C. difficile* cultures were obtained by swabbing high-touch surfaces from each 28 private rehabilitation rooms, 28 floor surfaces and 80 shared devices, gym equipment and wheelchairs within a 76-bed academic acute inpatient rehabilitation unit within an acute care hospital in the USA; swabs were inoculated onto *C diff* banana broth then incubated and *C difficile* spores identified. 2 interventions were implemented: automated UV-C device (254 nm at 12,000 $\mu Ws/cm^2$) was used to sterilise rooms and wheelchairs used by patients after discharge from the hospital and floors of the	None.

Literature review	Papers identified	Summary of Findings	Impact on Recommendations
		unit were cleaned with sporicidal disinfectants. Repeated environmental cultures on wheelchairs and floors were performed following interventions. Findings show that before interventions, *C difficile* spores were found in 1/28 (3.6%) of rehabilitation rooms, 13/28 (46%) on floors surfaces and 3/20 (15%) of wheelchairs. All cultures obtained from gym (n=20) and miscellaneous equipment (n=40) were negative. After implementation of interventions, repeat cultures obtained from floor surfaces and wheelchairs were negative for *C difficile*. The authors conclude that UV disinfection and cleaning of floors with sporicidal disinfectants reduce the presence of *C difficile* on the rehabilitation unit and recommends adopting this method wherever possible. This study did not investigate whether the interventions will have any effect on transmission of CDI nor provided more details on standard and enhanced cleaning practices. Routine disinfection of the environment and patient equipment is not currently recommended in the UK except for sanitary fittings and in cases of known or suspected infection and/or colonisation.	

Evidence table – TBPs - literature identified

Literature review	Papers identified	Summary of scientific findings	Impact on recommendations
Aerosol Generating Procedures (AGPs)	Characterization of Experimental and Clinical Bioaerosol Generation During Potential Aerosol-Generating Procedures. Doggett N; Chow CW; Mubareka S. Chest. 158(6):2467-2473, 2020 12.	This study aimed to characterise aerosols produced in uninfected human subjects (n=39) undergoing elective bronchoscopies at 2 tertiary care centres using an AeroTrak optical particle counter (OPC Model 9303; TSI Incorporated). Inpatients and outpatients > 18 years of age identified through scheduling roster were included in the study. Patients undergoing urgent bronchoscopy in the emergency department or critical care units were excluded. Findings show a significant decrease in the generation of larger particles (1.0 µm and 5.0 µm) compared with baseline ($p<0.01$) however, 18 of 39 (46%) patients showed increased aerosol production in 0.3 µm size particles with a sizeable increase in 4 participants. Findings from this study show a small number of participants exhibiting a measurable increase in fine particle production however; the study is underpowered to identify factors determining increased fine particle production. Further studies are required to elucidate bioaerosol generation during bronchoscopy.	None.

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

Literature review	Papers identified	Summary of scientific findings	Impact on Recommendations
Management of incidents and outbreaks in a neonatal unit (NNU)	Investigation of *Burkholderia cepacia* complex bacteraemia outbreak in a neonatal intensive care unit: a case series. Bharara T. et al Journal of Medical Case Reports [Electronic Resource]. 14(1):76, 2020 Jun 23. VI 1	This case report presents the investigation and management of an outbreak of *Burkholderia cepacia* bacteraemia in a neonatal intensive care unit at SGT hospital, Haryna, India between March 2019 and April 2019. During the month of March, multiple *Burkholderia cepacia* complex (BCC) isolates with similar morphologies were recovered from blood cultures received in the hospital's microbiological laboratory; all samples were traced to 4 neonates admitted to NICU. An outbreak was suspected therefore NICU in-charge and hospital infection control teams (HIC) were alerted. The organisms were multidrug-resistant, with in-vitro sensitivity to meropenem alone. Outbreak investigation was commenced and surveillance samples were collected from ventilator tubes, suction apparatus, Ambu bags, Cheatle forceps, injection preparation areas, amikacin vials, taps, bed rails and sterile saline for injection preparations. BCC was isolated from a suction bottle surveillance sample. All five isolates (4 clinical, 1 surveillance) were phenotypically typed (AST) and found to be identical. The infected neonates were cohorted and their treatment changed to injection meropenem. Suction bottles were thoroughly scrubbed followed by decontamination with 2% glutaraldehyde solution. Retraining was provided on hand hygiene and cleaning and disinfection procedures. BCC was not isolated again during follow-up post outbreak. The authors concluded that timely reporting to clinician, implementation of infection control measures such as hand hygiene, proper cleaning	Adds to evidence base. Note that 2% glutaraldehyde is not widely used in NHS Scotland.

Literature review	Papers identified	Summary of scientific findings	Impact on Recommendations
		and disinfection of NICU equipment and cohorting of infected cases controlled this outbreak.	
Management of incidents and outbreaks in a neonatal unit (NNU)	*Serratia marcescens* outbreak in a neonatal intensive care unit and the potential of whole-genome sequencing. Muyldermans A. et al Journal of Hospital Infection. 111 (pp 148-154), 2021. Date of Publication: May 2021.	This study described a *Serratia marcescens* outbreak (2018-2019) in a NICU at the University Hospital of Brussels along with the infection control measures that contributed to containment and addressing the potential of whole genome sequencing (WGS). The NICU consists of 2 open areas with 7 incubators each and 2 isolation boxes. Surveillance cultures for *S. marcescens* are not performed routinely in this unit. An outbreak occurred in 2018 – 2019 and *S. marcescens* isolates from patients and the environment were analysed and compared with isolates form previous presumed NICU outbreaks; adult blood cultures were included. Screening (oral and rectal) for colonisation and environmental screening of surfaces were initiated and WGS and whole-genome multi-locus sequence typing (wgMLST) analysis were performed. In total, 63 *S. marcescens* isolates (patients N=59; environment N=4) were analysed and included for WGS and wgMLST. The outbreak was categorised into 3 clusters including 4 environmental strains (drains N=3; baby scale N=1). The strains were different from those of a previous 2014 NICU outbreak and adult blood cultures. NICU staff and external care provides were observed to be not always compliant with good hand hygiene practice and not all parents were well educated. Gloves were not always used during patient care involving contact with mucous membranes. Standard infection control measures were reinforced including hand hygiene, glove use and gown use during procedures where contact with secretions is anticipated, disinfection of common medical devices and environmental cleaning was intensified from June 2019 onwards and from October 2019, all neonates on the NICU were screened weekly. All NICU siphons were replaced on November 2019 and weekly decontamination	Adds to evidence base.

Literature review	Papers identified	Summary of scientific findings	Impact on Recommendations
		with acetic acid 10% was commenced from December 2019 onwards. The drains were left to soak for 30 min before flushing with water. Seven acquired resistance genes and 29 virulence-associated genes were detected by WGS. Following the implementation of these measures, the outbreak was contained and surveillance stopped at March 2020. The authors assumed that both neonates and drains were reservoirs of *S. marcescens* cross-contamination via the hands of healthcare workers and parents. Definite containment of the outbreak was achieved after the replacement of siphons and weekly decontamination with acetic acid. WGS enabled faster recognition of an outbreak and facilitated the implementation of infection control measures.	