Infection Prevention and Control Practices and Processes in Audiology

AUTHORS: Siobhán Brennan, Lucy Evans, Lisa Jackson, Hanna Jeffery, Melanie Lough, Helen Randall, Jennifer Stott

PUBLICATION DATE:

REVIEW DATE:

CONTENTS

CONTENTS 2
Authors 3
1. Introduction 4
1.1 Context of document 4
1.4 Background 5
2 Environment 5
2.1 General environmental hygiene 5
2.2 Health care setting 6
2.2.1 Audiology-specific considerations 7
2.3 Other setting 8
3 Personal Hygiene 8
3.1 Hand washing 8
3.1.1 The five moments of hand hygiene [13] 9
3.1.2 Alcoholic hand gel 9
3.2 Apparel 10
3.3 PPE 10
3.3.1 Gloves 10
3.3.2 PPE guidance during COVID-19 Pandemic 10
4 Equipment decontamination 11
REFERENCES 13
APPENDIX 1: Terminology 17
A1.1 Abbreviations 17
A1.2 Glossary 17
APPENDIX 2: 5 Moments for hand hygiene at the point of care 19
A2.1 Audiological context for the 5 moments of hand hygiene 20
APPENDIX 3: Infection Information 21
A3.1 Transmission 21
A3.2 Healthcare-associated infections 21
A3.3 Causes of Infection 22
APPENDIX 4: Human Factors 23
A4.1 Immunodeficiency 23
A4.2 Behavioural factors 23
A4.3 Age 23
A4.4 Cross-transmission risk 24
A4.5 Pregnancy 24

APPENDIX 5: Personal Hygiene Factors 25
A5.1 Notes on Apparel 25
A5.2 Notes on Glove Types 25
A5.3 Face Masks 25
A5.4 Visors/safety spectacles 26
APPENDIX 6: PPE Guidance during the Covid-19 Pandemic 27
A6.1 Covid-19 PPE Background 27
APPENDIX 7: Equipment 30
7.1 Decontamination of critical items 30
APPENDIX 8: Audiological Monitoring 31
A8.1 Monitoring 31
A8.1.1 Questionnaires 31
A8.1.2 OAEs 31
A8.1.3 Speech testing 32
A8.1.4 High Frequency Audiometry 32
A8.1.5 ABR 32
A8.2 Referral Criteria 32
A8.3 Ototoxicity 32
APPENDIX 9: Regulatory Framework 34

Authors

Siobhán Brennan, University of Manchester

Lucy Evans, Cwm Taf Morgannwg Health Board

Lisa Jackson, Royal Berkshire Hospital

Hanna Jeffery, Cwm Taf Morgannwg Health Board

Melanie Lough, University of Manchester

Helen Randall, Cwm Taf Morgannwg Health Board

Jennifer Stott, Royal Berkshire Hospital

1. Introduction

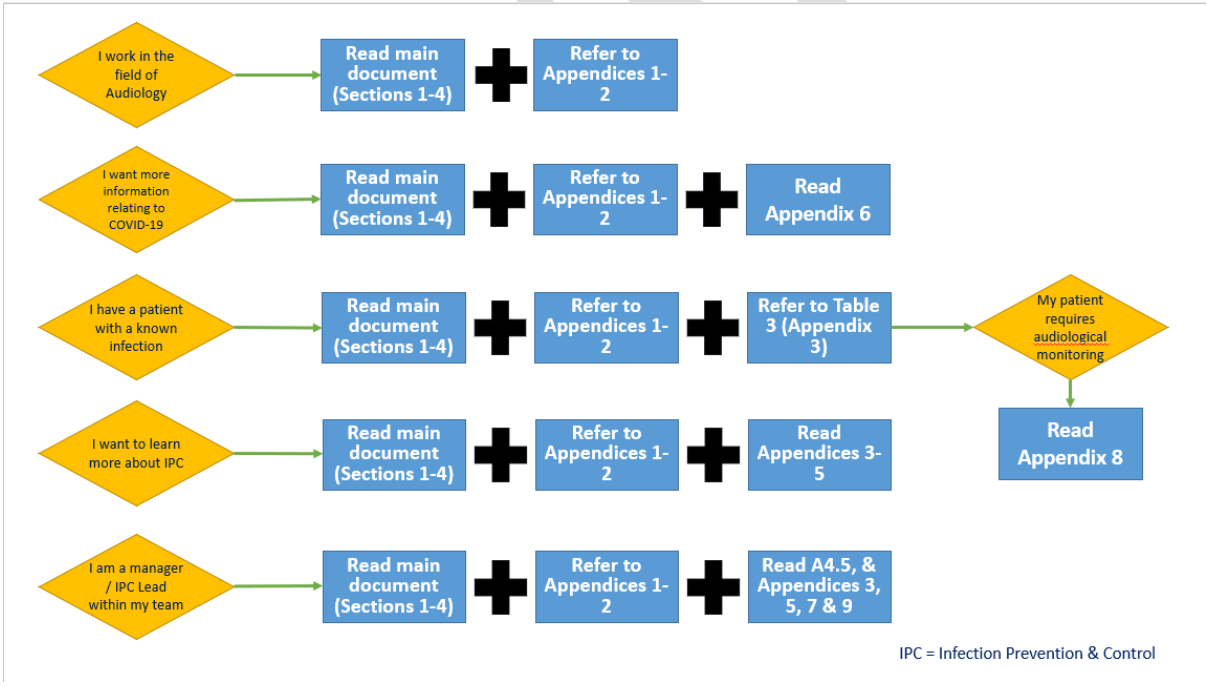
1.1 Context of document

The purpose of this document is to facilitate the writing and understanding of local infection prevention and control procedures within Audiology services. The document is intended for all Audiology staff, but particularly those who have responsibility for health and safety or infection prevention and control within a service. It is also relevant to newborn hearing screeners, school hearing screeners, volunteers and other professionals who carry out work in an Audiology clinic or multi-professional setting.

Employers within the healthcare sector will typically have infection prevention and control protocols that the Audiology Service must adhere to. All Audiology professionals must make themselves aware of these. This current document complements those protocols by providing Audiologists with background knowledge of infection types, and how these can be prevented from spreading within the Audiology clinic environment specifically. This document is not intended to supersede local employer guidance. In the event that the information in this document contradicts local guidance, readers are advised to discuss the query with their local infection prevention and control team (where one exists) or take the more protective approach of the two recommendations.

Readers are advised to refer to the Figure 1 to determine which sections of this document are most relevant to their role/interests.

Figure 1 Document Map



1.2 Disclaimer

The BAA Service Quality Committee (https://www.baaudiology.org/members-home/service-quality-committee/service-quality/) takes great care to produce the highest quality documents and guidance through consultation and reviewing evidence. Each document is written with consideration of research evidence, clinical practice documentation, expert opinion and clinical consensus from which clinicians and managers can make informed decisions, within the scope of the document. In addition, the documents can help inform allied health professionals, government agencies and the hearing health-

care industry about current best practice. The BAA disclaims any liability to any party for the accuracy, completeness, or availability of the documents, or for any damages arising from the use of the documents and the information they contain.

1.4 Background

Infectious diseases are caused by small organisms such as bacteria and viruses. These can be contracted in a variety of ways (described in Appendix 3). The severity and presentation of symptoms can be variable.

Prevention of infections is important in order to:

- Protect staff and patients from harm relating to infections and secondary complications
- Protect vulnerable people
- Reduce sickness absence
- Reduce the use of antibiotics, which may help slow the decline in their effectiveness
- Reduce preventable costs to the NHS from hospital admissions and GP care

For these reasons, Audiologists should have an awareness of infections which:

- Can be readily passed between Audiology patients and staff
- Pose increased risk to pregnant patients and staff
- Pose increased risk to people with specific health conditions
- Pose increased risk to people with cochlear implants and other implanted devices
- Can cause ear/hearing problems (and when to refer these for medical care)
- May be identified in clinic

2 Environment

2.1 General environmental hygiene

“Environment”, here, refers to the more permanent fixtures and fittings within in an audiology workplace, such as ceiling tiles, carpets, wall coverings, doors, windows, tables and chairs. All audiologists should be familiar with the following basic housekeeping rules:

- Surfaces which are smooth and non-porous are easier to clean. Clinical areas should be surveyed by the audiologist on a regular basis for potential sources of indirect infection transmission, for example:
  - Stains on walls, carpets, ceilings or furniture
  - Worn areas of walls, carpets, ceilings or furniture
  - Chips or cracks in work surfaces
  - Missing sealant, skirting board or coving
  - Fissures in walls
  - Overt pipes
  - Faulty ventilation system, or visibly unclean grilles/ducts.

  Where such fomites are observed, they should be reported to building maintenance staff.
- Food or drink should not be consumed in clinical areas.
- Work surfaces should be kept as clear as possible.
- Waste should be handled and disposed of correctly, in accordance with Trust or employer policy.
- Spillages on, or soiling of, the fixtures and fittings should be dealt with promptly (whether remedied by the audiologist themselves or reported to cleaning staff).

- Contaminated surfaces contribute to the transmission of many HAIs [1]. Regular environmental cleaning should therefore be performed to achieve a visibly clean workspace, free from blood or body substances, dust, dirt, debris or spillages.

Decontamination involves cleaning, disinfection or sterilisation.

Cleaning aims to remove foreign material from objects with either water and detergents or enzymatic products [2]. To clean use soap and water or a disposable cleaning wipe.

Disinfection is defined as the process of removing many or all pathogenic microorganisms from inanimate objects [3]. To disinfect use a disinfectant wipe for the duration described in the manufacturer's recommended contact time (typically 15-30 seconds). If the contact time of a particular wipe is not known, follow table 2 as a guide, using the listed contents of the wipes displayed on the packaging. **The contact time refers to the length of time the disinfectant remains visibly wet on a surface.**

Sterilization describes the process of destroying all form of microbial life, including bacterial spores, by use of chemical or physical methods [3].

Wipes that serve both a cleaning and disinfectant purpose with single use are also available. However, if the surface is particularly contaminated by dirt/debris, use two wipes (one to clean, followed by one for disinfecting). Only wipes that are moist (i.e. not old/dried out) will be effective. The disinfectant solution contained within the wipe has to be allowed to air dry on the surface to be disinfected to be effective. It is NOT recommended that the disinfectant solution is wiped away to speed this process.

2.2 Health care setting

Audiologists should make themselves aware of the difference between cleaning, disinfecting and sterilising – see above, and https://www.audiology.org/publications/guidelines-and-standards/infection-control-audiological-practice [4]. Which method is chosen, and the frequency it should be done depends on a number of variables:

- Whether the fixture or fitting is in a clinical area
- The frequency that patients or the public will likely have contact with the fixture or fitting
- Presence of disease/disease symptoms (i.e. in an individual, or at times of epidemic or pandemic)
- Increased susceptibility to disease (e.g. patient known to be immuno-compromised)
- Severity of illness caused.

Note: Disinfection does not work unless the surface being disinfected is already clean

Good environmental infection prevention requires forward planning, organisation, and collaboration with cleaning and infection prevention and control services. Despite its age, 'The national specifications for cleanliness in the NHS: Guidance on setting and measuring cleanliness outcomes in primary care medical and dental premises' [5] remains a useful tool to develop standards, facilitate identification of "functional areas", assess risk and develop a cleaning schedule. The schedule includes the assignment of tasks to ensure clarity surrounding individual responsibilities. This tool was used to create the audiology department example in Table 1 (accessed via the Excel spreadsheet link below). This is neither an exhaustive, nor a "one size fits all", document and should therefore be tailored to your particular department before use.

Table 1 Example Audiology infection prevention plan. The default information contained within the table assumes standard precautions are required. The level of risk (and therefore cleaning schedule) will need to be updated if transmission based precautions are required.


Table 1

It is possible that much of this preparatory work has already been done, either by service managers or an infection prevention and control team. Where this is the case, it is prudent to review the documentation when the levels of risk are believed to have changed. For example, when a patient with a known infection has to attend an appointment, Table 3 (Appendix 3) should be consulted to determine potential modes of transmission. Whenever it is possible that transmission could occur indirectly via contaminated environmental objects, the level of risk should be increased and transmission-based precautions should be considered. It should be noted that (where appropriate) it is possible within the spreadsheet (Table 1) to alter the risk level, and consequently the cleaning schedule, by using the drop-down boxes in the 'Risk…' column. These drop-down lists allow you to see how precautions may need to be changed in practice. Any changes must be communicated in a timely manner to cleaning staff.

Your infection prevention plan can also be referred to when treating inpatients on hospital wards. For instance, it is most likely that the primary piece of furniture you have contact with is the patient's table. Therefore, the standard precautions for 'Tables/desks' should be followed.

If a patient falls ill during an appointment, or they reveal previously undisclosed symptoms to you (e.g. vomiting or diarrhoea within the previous 48 hours, unexplained rash, fever or respiratory symptoms [14]), risk levels should be re-assessed, and transmission-based precautions considered. Specifically ask the patient which areas they have visited within the health care setting and inform cleaning staff immediately.

2.2.1 Audiology-specific considerations

Audiologist's desk. Ear moulds have been shown to harbour a variety of bacteria and fungi [6], the most predominant being Coag Neg staphylococcus. As such, the audiologist's desk on which hearing aids, specula and other tools are often placed, should be given particular focus in infection prevention planning. Disinfection is recommended given that it is not always visibly obvious whether cerumen contains blood or mucous [4], and due to the potential for cross-transmission of infection via ear moulds [6]. Before disinfection, the desk surface should always be cleaned [7]. However, a more time efficient method would be to place a disposable barrier (e.g. paper towel) on the table between each patient to prevent any gross contaminants from getting on the table. The barrier can be disposed of and disinfectant wipes used between patients, and the desk given a full clean at the end of every day. In cases where hearing aids or accessories are placed inadvertently off the barrier, or where wet

contaminants are placed on a porous barrier, the aforementioned cleaning + disinfection recommendation should be followed.

Sound-proofing. Carpeted floors and walls are rarely seen in other clinical departments, but they contribute to the reduction of reverberation times to an acceptable level for conducting audiological assessments. It should be ensured that cleaning services are aware of the unique cleaning requirements of sound-proofed clinic rooms, such as those given by QuietStar [8].

Ventilation systems. Although droplet-transmitted pathogens, such as COVID-19, are unlikely to be spread via air conditioning systems [9], regular cleaning and maintenance of ventilation/air conditioning systems is recommended (including 12 monthly inline filter replacement, reference to manufacturer's guidance is advised). It is important to confirm with building maintenance staff that this is up-to-date. It is also useful to determine whether the ventilation system in your department is centralised (i.e. air is circulated between different rooms), as the use of such systems may need to be curtailed in times of infection outbreak.

2.3 Other setting

Some audiology work environments are less permanent or controllable (e.g. domiciliary settings [10], care homes, car interiors when conducting home visits). However, the same basic principles can be applied. Standard precautions should include identifying appropriate surrogate work surfaces (preferably clear, smooth and non-porous), using disposable barriers under equipment, hearing aids and accessories (including in your car), and following the infection prevention plan for any surfaces you come into direct contact with. Patient-specific factors may be more important in determining risk levels in these settings, particularly if the patients you are seeing are unable to attend the audiology department due to poor health.

For specific and current recommendations for domiciliary care during the period of sustained transmission of COVID-19 across the UK the reader is directed to current Public Health England resources [11].

3 Personal Hygiene

3.1 Hand washing

Handwashing is the most effective procedure which helps prevent the spread of infection. Handwashing is hugely important in the healthcare environment where there is higher risk of HAIs such as Methicillin-resistant Staphylococcus aureus (MRSA) and Clostridium Difficile.

Thorough handwashing is also vital in the care of vulnerable patients being treated in the healthcare environment. Effective hand decontamination eventually leads to a reduction in morbidity and mortality [7]

Hands should be washed using aseptic technique before and after the patient has been seen or when hands are physically soiled. When hand washing, the aim is to achieve "Medical asepsis". Medical asepsis is defined as: *"The absence of disease-causing microorganisms." [12]*

Medical Aseptic handwashing technique (Clean technique)

Hands should be washed for a minimum of 20 seconds using soap and warm water following the below technique. Hands should be dried thoroughly with paper towels. Elbow or wrist taps should be used if available and turned on/off using elbows or wrists (contact free). If elbow or wrist taps are unavailable for example at a domiciliary appointment, extra caution should be exercised to ensure the taps are turned on/off using paper towels.

Handwashing technique:

- Palm to palm
- Palm over the back of the hand
- Palm to palm fingers interlaced
- Back of fingers to opposing palms with fingers interlocked
- Rotational rubbing of the thumbs in the palm
- Rotational rubbing of clasped fingers in the palm
- Hand hygiene should extend to include washing of exposed forearms.

3.1.1 The five moments of hand hygiene [13]

The five moments of hygiene is an illustration which shows the 5 moments that hand hygiene is required and this can be applied to all appointment types (Appendix 2). It should be carried out,

Before patient contact: Clean hands before touching a patient when approaching him/her. E.g. Prior to performing otoscopy.

Before a Clean/Aseptic procedure: Clean your hands immediately before any clean/aseptic procedure. Aseptic procedures are not routinely carried out within Audiology.

After body Fluid Exposure Risk: Clean your hands immediately after an exposure risk to body fluids (and after glove removal) E.g Otoscopy of an infected ear.

After patient contact: Clean your hands immediately after touching a patient and his/her immediate surroundings when leaving the patient's side. E.g. after carrying out otoscopy and prior to touching the computer keyboard.

After contact with patient surroundings: Clean your hands after touching any object or furniture in the patient's immediate surroundings when leaving- even if the patient has not been touched. E.g after touching the computer keyboard and prior to touching your patient, or after the patient has left the clinic room and the appointment has concluded.

3.1.2 Alcoholic hand gel

Alcohol gel can be used to maintain infection prevention and control during the appointment however:

- It can only be applied to physically clean skin.
- It is not as effective if applied to recently moisturised hands.

- Hands will still need to be washed with soap and water after several applications (refer to manufacturer guidance) to prevent a build-up on skin.
- It is not to be used if seeing patients suffering from Clostridium difficile (C.Diff) or other diarrhoea like illnesses. This is because alcohol gel is not effective against Clostridium difficile spores and therefore handwashing with soap and water should take place instead [14].
- Hands should also be in good health with no sign of skin irritation, cuts, cracks, redness, soreness etc. An appointment with occupational health may be required if excessive hand washing is causing skin irritation where a medicated or more effective emollient may be prescribed.

3.2 Apparel

- Uniforms and workwear must be clean and in good condition (refer to A5.2 for cleaning instructions).
- Watches, wrist and hand jewellery must not be worn except for a plain wedding band with no stones. If a plain wedding band is worn, it must be moved or removed when hand washing.
- Nail varnish or false nails are not to be worn and nails are to be kept short.
- The clinician should also be "bare below the elbow". Coats should be removed, and long sleeves rolled up. If the staff member is unable to roll their sleeves up or be "bare below the elbows" for religious or cultural reasons then disposable coverings should be available and staff should refer to their local trust policy regarding this.
- Cuts and abrasions should be covered with a waterproof dressing.
- Long hair should be tied back off the collar and off the face [10].

3.3 PPE

Employers have a duty to provide staff who are at risk within their job role with Personal Protective Equipment to keep them safe at work. PPE is widely used within the healthcare setting and is used to reduce the transmission of viruses, diseases, and infections. PPE should be located close to the point of use, stored safely in a clean, dry area and used within the expiry date [15]

The PPE discussed in this section is PPE that is more commonly used in Audiology. At the time of writing, advice on PPE for Audiology has only recently been established. Readers are advised to refer to the most up-to-date local and national guidance.

3.3.1 Gloves

Gloves are optional for all Audiology appointments providing there is no risk of splashes, droplets of blood or body fluid (refer to A5.3 for material considerations). If wearing gloves, they should be well fitting. If gloves are too tight, they are more likely to tear. If the gloves are too loose it may affect the clinician's ability to grip and affect the clinician's ability to carry out the task.

Gloves should not be a replacement for good hand hygiene and should never be decontaminated with alcohol based hand rub or soap [15].

Disposable gloves are single use and are to be disposed immediately after a procedure or after each patient contact followed by hand hygiene.

3.3.2 PPE guidance during COVID-19 Pandemic

Due to the Coronavirus pandemic, all patient facing clinicians must wear a level of PPE. Appendix 6 expands on this.

4 Equipment decontamination

Multi-use equipment used in Audiology has to be reprocessed before re-use to avoid transmission of infectious diseases between patients and reduce the number of resident microorganisms on inanimate objects. The level of decontamination required depends on the infection risk posed by the piece of equipment or healthcare related item.

According to the Spaulding classification [16] healthcare items can be divided into non-critical, semi-critical and critical items. Items touching intact and healthy skin (such as supra-aural headphones, videonystagmography goggles) are classed as non-critical, whereas items entering the ear canal and coming into contact with cerumen, mucous membranes or broken skin are considered semi-critical (i.e. loop curette used for wax removal, reusable specula). Critical items are used to enter sterile body tissues or cavities, such as needles or implants. Spaulding proposed different levels of decontamination required for healthcare objects dependent on the classification they fall under, as described in Table 2 (below). Critical items are covered in Appendix 7.

Table 2 Spaulding classifications of required decontamination levels required for different equipment types [17, 18]

Spaulding classification	Decontamination level required	Equipment examples from Audiology	Disinfectant
Non-critical items	cleaning followed by **low** level disinfection	Any equipment touching the patient's skin or hair. • Headphones (circum-aural and supra-aural) • bone-conductor • video nystagmography goggles • Otoscope • Tympanometer • VEMP electrodes • distraction toys	**Exposure time ≥1 minute:** • Ethyl or isopropyl alcohol (70-90%) • Sodium hypochlorite (5.25-6.15% household bleach diluted 1:500 provides >100 ppm available chlorine) • Phenolic germicidal detergent solution • Iodophor germicidal detergent solution • Quaternary ammonium germicidal detergent solution
Semi-critical items	cleaning followed by **high** level disinfection[1]	Any equipment entering the ear canal or coming into contact with cerumen • Otoscope specula • Tympanometry tips • Insert headphones • Loop-curette • Caloric irrigation tubes	**Exposure time 12-30 m at ≥20°C:** • Glutaraldehyde based formulations: Glutaraldehyde (>2%); glutaraldehyde (1.12%) and 1.93% phenol/phenate. • Hydrogen peroxide 7.5% • Ortho-phthalaldehyde (OPA) 0.55% • Hydrogen peroxide (7.35%) and 0.23% peracetic acid; hydrogen peroxide 1% and peracetic acid 0.08%

			• Wet pasteurization at 70°C for 30 minutes with detergent cleaning

[1] The FDA definition of high-level disinfection is a sterilant used for a shorter contact time to achieve a 6-$\log_{10}$ kill of an appropriate *Mycobacterium* species

Items specified as single use by the manufacturer must not be reprocessed or reused. These items are only to be used for a single procedure on the same patient and have to be discarded afterwards [19]. It is not recommended to reuse a single-use item on the second ear of the same patient if the item shows any signs of contamination, such as discharge.

REFERENCES

1. Otter, J.A., et al., *Evidence that contaminated surfaces contribute to the transmission of hospital pathogens and an overview of strategies to address contaminated surfaces in hospital settings.* Am J Infect Control, 2013. **41**(5 Suppl): p. S6-11.
2. Centre for Disease Control and Prevention. *Cleaning: Guideline for Disinfection and Sterilization in Healthcare Facilities*. 2008; Available from: https://www.cdc.gov/infectioncontrol/guidelines/disinfection/cleaning.html.
3. Centre for Disease Control and Prevention. *Introduction, Methods, Definition of Terms: Guideline for Disinfection and Sterilization in Healthcare Facilities*. 2008; Available from: https://www.cdc.gov/infectioncontrol/guidelines/disinfection/introduction.html.
4. American Academy of Audiology. *Infection Control in Audiological Practice* 2003, ; Available from: https://www.audiology.org/publications/guidelines-and-standards/infection-control-audiological-practice.
5. National Patient Safety Agency: National Reporting and Learning Service, *The national specifications for cleanliness in the NHS: Guidance on setting and measuring cleanliness outcomes in primary care medical and dental premises.* 2010.
6. Bankaitis A.U., *What's growing on your patients' hearing aids? A study gives you an idea.* The Hearing Journal, 2002. **55**: p. 48-54.
7. National Institute for Clinical Excellence (NICE). *Healthcare-associated infections*. 2019; Available from: https://cks.nice.org.uk/healthcare-associated-infections#!scenario.
8. Quietstar. *Cleaning& Disinfection GuideGeneral guide and instructions for cleaningQuietStar carpets, vinyl's, wall fabrics& ceilings*. 2020; Available from: https://www.baaudiology.org/app/uploads/2020/06/Cleaning-Disinfection-Guide-QuietStar-Limited-June-2020.pdf.
9. Department of Health, *Health Building Note 00-09:Infection control in the built environment*. 2013.
10. National Institute for Health and Clinical Excellence. *Healthcare-associated infections: prevention and control in primary and community care*. 2012; Available from: https://www.nice.org.uk/guidance/cg139/resources/healthcareassociated-infections-prevention-and-control-in-primary-and-community-care-pdf-35109518767045.
11. Public Health England, *COVID-19: how to work safely in domiciliary care in England*. 2020.
12. Burke A. *Standard Precautions, Transmission Based, Surgical Asepsis: NCLEX-RN*. 2020; Available from: https://www.registerednursing.org/nclex/standard-precautions-transmission-based-surgical-asepsis.
13. World Health Organisation. *About SAVE LIVES: Clean Your Hands. My 5 Moments for Hand Hygiene*. 2020; Available from: https://www.who.int/gpsc/5may/background/5moments/en/.
14. Organisation, W.H. *System change - changing hand hygiene behaviour at the point of care*. 2020; Available from: https://www.who.int/gpsc/tools/faqs/system_change/en/.
15. Public Health England. *COVID-19: Guidance for the remobilisation of services within health and care settings: Infection prevention and control recommendations*. 2020; Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/910885/COVID-19_Infection_prevention_and_control_guidance_FINAL_PDF_20082020.pdf.
16. Lawrence, C.A. and S.S. Block, *Disinfection, sterilization, and preservation.* Disinfection, sterilization, and preservation., 1968: p. 517-31.
17. Centre for Disease Control and Prevention. *Guideline for Disinfection and Sterilization in Healthcare Facilities: Methods of sterilization and disinfection*. 2008; Available from: https://www.cdc.gov/infectioncontrol/guidelines/disinfection/tables/table1.html#anchor_1554822678).
18. Centre for Disease Control and Prevention. *A Rational Approach to Disinfection and Sterilization*. 2008; Available from: https://www.cdc.gov/infectioncontrol/guidelines/disinfection/rational-approach.html.
19. Medicines and Healthcare products Regulatory Agency. *Single-use medical devices: implications and consequences of reuse*. 2019; Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/842614/Single-use_medical_devices_v2.3_Oct-19.pdf.
20. World Health Organisation, *Your 5 moments for hand hygiene.* 2009.

21. Centre for Disease Control and Prevention. *Lesson 1: Introduction to Epidemiology*. 2012, ; Available from: https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section10.html.
22. Healthline. *What You Need to Know About Pathogens and the Spread of Disease*. 2019; Available from: https://www.healthline.com/health/what-is-a-pathogen#types.
23. Sheil W.C. *Medical Definition of Reservoir of infection*. 2017; Available from: https://www.medicinenet.com/script/main/art.asp?articlekey=14969.
24. World Health Organisation. *Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations*. 2020; Available from: https://www.who.int/news-room/commentaries/detail/modes-of-transmission-of-virus-causing-covid-19-implications-for-ipc-precaution-recommendations.
25. Improvement, N.E.N. *Standard infection control precautions: national hand hygiene and personal protective equipment policy*. 2019; Available from: https://improvement.nhs.uk/documents/4957/National_policy_on_hand_hygiene_and_PPE_2.pdf.
26. Health Protection Agency South West. *Infection control guidelines for community settings*. 2007; Available from: https://www.cornwall.gov.uk/media/3639680/Infection20Control20in20Community20Settings-1-.pdf.
27. Meidani, M., et al., *Immunocompromised patients: Review of the most common infections happened in 446 hospitalized patients.* J Res Med Sci, 2014. **19**(Suppl 1): p. S71-3.
28. Lee, R.L., et al., *Comparative efficacy of a simplified handwashing program for improvement in hand hygiene and reduction of school absenteeism among children with intellectual disability.* Am J Infect Control, 2015. **43**(9): p. 907-12.
29. Wyer, M., et al., *Involving patients in understanding hospital infection control using visual methods.* J Clin Nurs, 2015. **24**(11-12): p. 1718-29.
30. Lee, R.L.T., et al., *A cluster randomized controlled trial of a simplified 5-step handwashing technique versus a conventional 7-step handwashing technique among Chinese students with intellectual disabilities.* J Appl Res Intellect Disabil, 2020.
31. Montecino-Rodriguez, E., B. Berent-Maoz, and K. Dorshkind, *Causes, consequences, and reversal of immune system aging.* J Clin Invest, 2013. **123**(3): p. 958-65.
32. National Institute for Health and Clinical Excellence. *Scenario: Prevention and control of healthcare associated infections*. 2019; Available from: https://cks.nice.org.uk/topics/healthcare-associated-infections/management/management/.
33. Public Health England. *Guidance on the investigation, diagnosis and management of viral illness, or exposure to viral rash illness,in pregnancy*. 2019; Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/821550/viral_rash_in_pregnancy_guidance.pdf.
34. Health and Safety Executive. *Risk Assessment Action Flowchart*. 2020; Available from: https://www.hse.gov.uk/mothers/flowchart.htm.
35. Chin, T.L., et al., *Viral infections in pregnancy: advice for healthcare workers.* J Hosp Infect, 2014. **87**(1): p. 11-24.
36. NHS England and NHS Improvement. *Uniforms and workwear: guidance for NHS employers*. 2020; Available from: https://www.england.nhs.uk/wp-content/uploads/2020/04/Uniforms-and-Workwear-Guidance-2-April-2020.pdf.
37. England, P.H. *Scrubs, gowns, alginate bags and linen cages*. 2020; Available from: https://www.england.nhs.uk/coronavirus/wp-content/uploads/sites/52/2020/04/C0294-letter-linen-and-laundry-15-april-2020.pdf.
38. Health and Safety Executive. *Selecting latex gloves*. Available from: https://www.hse.gov.uk/skin/employ/latex-gloves.htm.
39. Malik, S.S. and S.S. Malik, *A simple method to prevent spectacle lenses misting up on wearing a face mask.* Ann R Coll Surg Engl, 2011. **93**(2): p. 168.
40. ENT UK. *Audiology & Otology Guidance during COVID-19 Pandemic*. 2020; Available from: https://www.entuk.org/sites/default/files/ENT%20UK%20Guidance%20%28Otologic%20Surgery%29%20v7.pdf.
41. Association of Independent Hearing Healthcare Professionals, B.A.o.A., British Society of Audiology, British Society of Hearing Aid Audiologists,, *Audiology & Otology Guidance during COVID-19 Pandemic*. 2020.
42. Public Health England. *COVID-19: personal protective equipment use for non-aerosol generating procedures*. 2020; Available from:

https://www.gov.uk/government/publications/covid-19-personal-protective-equipment-use-for-non-aerosol-generating-procedures.
43. National Screening Committee. *The UK NSC recommendation on cytomegalovirus screening in newborns*. 2017; Available from: https://legacyscreening.phe.org.uk/cytomegalovirus.
44. Khoza-Shangase, K., *Risk versus benefit: Who assesses this in the management of patients on ototoxic drugs?* Journal of pharmacy & bioallied sciences, 2017. **9**(3): p. 171.
45. Bankaitis, A., *Audiological changes attributable to HIV.* Audiology Today, 1996. **8**(6): p. 14-16.
46. Association, A.S.-L.-H., *Audiologic management of individuals receiving cochleotoxic drug therapy.* 1994.
47. Maru, D. and G.-A. Malky, *Current practice of ototoxicity management across the United Kingdom (UK).* International Journal of Audiology, 2018. **57**(sup4): p. S29-S41.
48. Durrant, J., et al., *American Academy of Audiology position statement and clinical practice guidelines: ototoxicity monitoring.* Wahington: American Academiy of Audiology, 2009.
49. Knight, K.R.G., D.F. Kraemer, and E.A. Neuwelt, *Ototoxicity in children receiving platinum chemotherapy: underestimating a commonly occurring toxicity that may influence academic and social development.* Journal of Clinical Oncology, 2005. **23**(34): p. 8588-8596.
50. Konrad-Martin, D., et al., *Audiological monitoring of patients receiving ototoxic drugs.* Perspectives on hearing and hearing disorders: research and diagnostics, 2005. **9**(1): p. 17-22.
51. Baguley, D.M. and P. Prayuenyong, *Looking beyond the audiogram in ototoxicity associated with platinum-based chemotherapy.* Cancer Chemotherapy and Pharmacology, 2020: p. 1-6.
52. Jacob, L.C., et al., *Auditory monitoring in ototoxicity.* Braz J Otorhinolaryngol, 2006. **72**(6): p. 836-44.
53. van As, J.W., H. van den Berg, and E.C. van Dalen, *Platinum-induced hearing loss after treatment for childhood cancer.* Cochrane Database of Systematic Reviews, 2016(8).
54. Reavis, K.M., et al., *Distortion-product otoacoustic emission test performance for ototoxicity monitoring.* Ear and hearing, 2011. **32**(1): p. 61.
55. Jacob, L.C.B., et al., *Auditory monitoring in ototoxicity.* Revista Brasileira de Otorrinolaringologia, 2006. **72**(6): p. 836-844.
56. American Speech Languange Hearing Association. *Ototoxicity: Early Detection and Monitoring*. 2005; Available from: https://leader.pubs.asha.org/doi/full/10.1044/leader.FTR1.10072005.1.
57. Osterhammel, D. and P. Osterhammel, *High-frequency audiometry: Age and sex variations.* Scandinavian Audiology, 1979. **8**(2): p. 73-80.
58. Dreschler, W., vd, et al., *The role of high-frequency audiometry in early detection of ototoxicity.* Audiology, 1985. **24**(6): p. 387-395.
59. Zeigelboim, B.S., P.L. Mangabeira-Albernaz, and Y. Fukuda, *High frequency audiometry and chronic renal failure.* Acta Otolaryngol, 2001. **121**(2): p. 245-8.
60. Reuter, W., et al., *Extended high frequency audiometry in pre-school children.* Audiology, 1998. **37**(5): p. 285-94.
61. Hosford-Dunn, H., *Auditory Brainstem Response audiometry. Applications in central disorders.* Otolaryngologic Clinics of North America, 1985. **18**(2): p. 257-284.
62. Fausti, S.A., et al., *Comparison of ABR stimuli for the early detection of ototoxicity: conventional clicks compared with high frequency clicks and single frequency tonebursts.* Journal of the American Academy of Audiology, 2003. **14**(5): p. 239-250.
63. British Society of Audiology. *Recommended Procedure Auditory Brainstem Response (ABR) testing for post Newborn and Adult*. 2019; Available from: https://www.thebsa.org.uk/wp-content/uploads/2020/01/FINAL-RP-ABR-post-newborn-and-Adult-Nov2019b.pdf.
64. Ganesan, P., et al., *Ototoxicity: A Challenge in Diagnosis and Treatment.* J Audiol Otol, 2018. **22**(2): p. 59-68.
65. Konrad-Martin, D., et al., *Applying US national guidelines for ototoxicity monitoring in adult patients: perspectives on patient populations, service gaps, barriers and solutions.* International journal of audiology, 2018. **57**(sup4): p. S3-S18.
66. Maru, D. and G.A. Malky, *Current practice of ototoxicity management across the United Kingdom (UK).* Int J Audiol, 2018. **57**(sup4): p. S76-S88.
67. Mudd P.A., J.J.W. *Ototoxicity*. 2019; Available from: https://emedicine.medscape.com/article/857679-overview.
68. McRorie, T.I., J. Bosso, and L. Randolph, *Aminoglycoside ototoxicity in cystic fibrosis: evaluation by high-frequency audiometry.* American Journal of Diseases of Children, 1989. **143**(11): p. 1328-1332.

69. *The Management of Health and Safety at Work Regulations*. 1999.
70. *Health and Safety at Work Act*. 1974.
71. Health and Safety Executive, *Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR)*. 2013.
72. *Health and Social Care Act*. 2008.
73. *Public Health (Control of Disease) Act*. 1984.
74. *The Public Health (Infectious Diseases) Regulations* 1988.
75. *The Management of Health and Safety at Work (Amendment) Regulations*. 2006.
76. *Control of Substances Hazardous to Health (COSHH)*. 2002.
77. *The Health Protection (Notification) Regulations*. 2010.

APPENDIX 1: Terminology

A1.1 Abbreviations

ABR – Auditory Brainstem Response

AGP – Aerosol generating procedure

AIDS - Acquired Immune Deficiency Syndrome

BNF - British National Formulary

BNFC - British National Formulary for Children

BSA – British Society of Audiology

CDC - Centers for Disease Control and Prevention

CMV - Cytomegalovirus

COSHH – Control of Substances Hazardous to Health

DNA - Deoxyribonucleic acid

DPOAE – Distortion product otoacoustic emissions

FDA – The Food and Drug Administration

GP – General Practitioner

HAI - Healthcare-associated infection

HIV – human immunodeficiency viruses

IPD - Invasive pneumococcal disease

MRSA - Methicillin-resistant Staphylococcus aureus

NHS – National Health Service

OAE - Otoacoustic emissions

PPE – Personal Protective Equipment

RIDDOR - Reporting of Injuries, Diseases and Dangerous Occurrences

RNA – Ribonucleic acid

SARS – Severe acute respiratory syndrome

WHO – World Health Organisation

A1.2 Glossary

Anosmia - the loss of the sense of smell, either total or partial.

Aseptic – completely free from bacteria, fungi, viruses, or other microorganisms that could cause disease; surgically sterile.

Bacteraemia - blood stream infection

Conjunctivitis - Inflammation of the transparent covering of the eye because of bacterial infection or allergic reaction.

Cystitis - infection of the bladder

Dyspnoea - difficult or laboured breathing

Endocarditis - infection of the heart valves

Fomites – inanimate objects that can transmit infection

Hemorrhagic colitis - An inflammation of the inner lining of the colon, with sudden and bloody diarrhoea.

Impetigo - red sores and blisters often starting around mouth and nose area. These will form golden crusts when blisters burst

Jaundice - yellow colour of the skin and whiteness of the eyes

Myalgia - Pain or tenderness in one or more muscles which can involve any area of the body.

Myelitis - Inflammation of the spinal cord which can disrupt the normal responses from the brain to the rest of the body, and from the rest of the body to the brain.

Myocarditis - Inflammation and damage of the heart muscle.

Meningitis - An infection of meninges, protective tissue of the brain

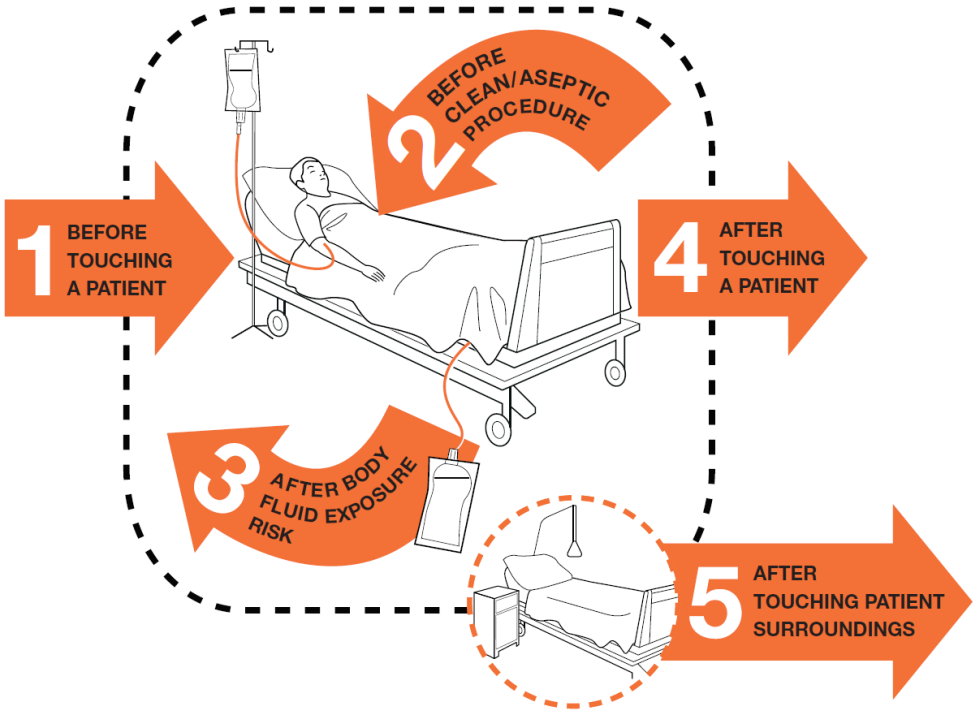
Otitis – ear infection

Septicaemia/ Sepsis - An infection of the blood stream resulting in a cluster of symptoms such as drop in a blood pressure, increase in heart rate and fever

APPENDIX 2: 5 Moments for hand hygiene at the point of care

Figure 2: World Health Organisation "Your 5 moments for hand hygiene" [20]

Your 5 Moments for Hand Hygiene



1	BEFORE TOUCHING A PATIENT	WHEN?	Clean your hands before touching a patient when approaching him/her.
		WHY?	To protect the patient against harmful germs carried on your hands.
2	BEFORE CLEAN/ ASEPTIC PROCEDURE	WHEN?	Clean your hands immediately before performing a clean/aseptic procedure.
		WHY?	To protect the patient against harmful germs, including the patient's own, from entering his/her body.
3	AFTER BODY FLUID EXPOSURE RISK	WHEN?	Clean your hands immediately after an exposure risk to body fluids (and after glove removal).
		WHY?	To protect yourself and the health-care environment from harmful patient germs.
4	AFTER TOUCHING A PATIENT	WHEN?	Clean your hands after touching a patient and her/his immediate surroundings, when leaving the patient's side.
		WHY?	To protect yourself and the health-care environment from harmful patient germs.
5	AFTER TOUCHING PATIENT SURROUNDINGS	WHEN?	Clean your hands after touching any object or furniture in the patient's immediate surroundings, when leaving – even if the patient has not been touched.
		WHY?	To protect yourself and the health-care environment from harmful patient germs.

World Health Organization | Patient Safety — A World Alliance for Safer Health Care | SAVE LIVES Clean Your Hands

WHO acknowledges the Hôpitaux Universitaires de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.

May 2009

A2.1 Audiological context for the 5 moments of hand hygiene

Before patient contact:
WHEN? Clean hands before touching a patient when approaching him/her. E.g. Prior to performing otoscopy.
WHY? To protect the patient against harmful microorganisms carried on the clinicians hands.

Before a Clean/Aseptic procedure:
WHEN? Clean your hands immediately before any clean/aseptic procedure. Aseptic procedures are not routinely carried out within Audiology.
WHY? To protect the patient from harmful microorganisms, including the patient's own, from entering his/her body.

After body Fluid Exposure Risk:
WHEN? Clean your hands immediately after an exposure risk to body fluids (and after glove removal) E.g Otoscopy of an infected ear.
WHY? To protect yourself and the healthcare environment from harmful patient microorganisms.

After patient contact:
WHEN? Clean your hands immediately after touching a patient and his/her immediate surroundings when leaving the patient's side. E.g. after carrying out otoscopy and prior to touching the computer keyboard.
WHY: To protect yourself and the healthcare environment from harmful patient microorganisms.

After contact with patient surroundings:
WHEN? Clean your hands after touching any object or furniture in the patient's immediate surroundings when leaving- even if the patient has not been touched. E.g after touching the computer keyboard and prior to touching your patient, or after the patient has left the clinic room and the appointment has concluded.
WHY? To protect yourself and the healthcare environment from harmful patient microorganisms.

APPENDIX 3: Infection Information

A3.1 Transmission

A pathogen can be transferred from reservoir to host via different modes of transmission, which are generally divided into direct and indirect modes [21]. Direct transmission can occur by physical contact (skin-to-skin, exchange of bodily fluids, touching contaminated surfaces) or droplets (i.e. by sneezing or coughing).

A pathogen is defined as an organism that causes disease upon entering the body. There are several different types of pathogens, for example viruses, bacteria and parasites as well as fungi. They thrive and survive so long as they have a reservoir where they are able to replicate and subsequently spread to a new host [22]. A reservoir can be any person, animal, plant, soil or substance in which pathogens can live and multiply. The reservoir acts as a source from which other individuals can be infected and be able to retain the infectious agent [23].

Transmission via indirect contact is when an individual comes into contact with either an object or area contaminated by an infected source. Pathogens may be transmitted indirectly via contamination of common objects / fomites. Indirect transmission is common for vomiting illnesses, where pathogens may spatter and contaminate surfaces which are commonly touched.

Another mode of indirect transmission is via droplets. WHO states that transmission via droplets happens when “a person is in in close contact (within 1 m) with someone who has respiratory symptoms (e.g., coughing or sneezing)” [24] This poses the risk of having the mucosae of the mouth and nose or conjunctiva of the eyes exposed to respiratory droplets that are potentially infective [24]. It is worth noting that respiratory infections can be transmitted through droplets of different sizes; respiratory droplets consist of droplet particles >5-10 µm in diameter. However, particles which are <5µm in diameter are referred to as droplet nuclei [24]. Another mode of transmission of interest is airborne transmission which is different to droplet transmission. Airborne transmission is made possible due to the presence of microbes within droplet nuclei. These microbes “can remain in the air for long periods of time and can be transmitted to others over distances greater than 1 m” [24].

Infectious pathogens can also be transmitted via vectors which are living organisms capable of transmitting “infectious pathogens between humans, or from animals to humans” [24]. WHO states that vectors (e.g. mosquitos, fleas and ticks) transmit parasites, viruses and bacteria which result in human illnesses caused by vector-borne diseases. An example of a vector-borne illness is Lyme disease which is a bacteria that can be transferred by ticks to humans. These diseases are more prevalent in tropical and subtropical areas [24].

A3.2 Healthcare-associated infections

Healthcare-associated infections (otherwise known as nosocomial infections) are simply those diseases that originated in a hospital or healthcare setting, or as a result of a healthcare intervention [7]. Some strains of pathogen, such as meticillin-resistant species are more likely to be found in a hospital setting than outside. Audiologists should be aware of how inadequate infection prevention and control practices in the clinic could lead to their patients contracting a healthcare-associated infection (HAI), as well as the necessary precautions they need to take to prevent further transmission when treating inpatients who have HAIs, for example. They should also be aware of their responsibility to contact their infection prevention and control team if there is a suspected or actual HAI incident [25] as, 1) trusts have a duty to monitor and report HAI cases, and 2) it is important to learn from the incident, in order to prevent future failures.

The most common pathogens that cause HAIs are bacterial, and are often harmless to healthy individuals. However, they can be fatal to certain at-risk groups. For example, those pathogens that can naturally be found in gut flora may only cause harm to a patient if the balance of “good” and “bad” bacteria in their gut is disrupted, as would be the case after taking anti-biotic treatment. Furthermore, difficult-to-treat drug-resistant pathogen species are more commonly found in hospital settings than in the community (e.g. MRSA), requiring extra vigilance amongst hospital-based audiologists and those treating inpatients on the ward.

A3.3 Causes of Infection

Table 3, embedded below, is a comprehensive list of pathogens that have the potential to be transmitted to people who utilise Audiology Services in the UK. It is organised by mode of transmission. Clinical presentation and at-risk populations are specified, where known.

Table 3 Full list of infections and pathogens important to UK Audiology practice categorised by primary mode of transmission.


Table 3

APPENDIX 4: Human Factors

The vulnerability of different groups to infection is well documented [26]. Vulnerability to infection can be related to a wide range of factors including co-morbidities, behavioural factors and inherent attributes such as age. An individual's increased susceptibility to infection may not be known to the audiology professional so they should be alert to this risk and pertinent questions on this included during history taking. If an individual's increased susceptibility to infection is known prior to the appointment they should be booked at the start of the clinic list if possible.

A4.1 Immunodeficiency

Immunodeficiency is a broad term to describe the body's immune system not being as effective as expected. Being immunocompromised describes a person who has an immunodeficiency. It is caused by a wide range of conditions. Conditions causing immunodeficiency have a plethora of presentations and affect the body in a range of ways. These conditions include AIDS, cancer, diabetes and malnutrition. It is more common for immunodeficiency to be acquired. Furthermore, immunodeficiency can be and is most commonly iatrogenic (caused by medical treatment) and it is worth noting that some antibiotic use can cause immunodeficiency. Having an immunodeficiency can be a temporary or long-standing phenomenon for an individual and for individuals who are, infection has a high rate of morbidity and mortality [27].

A4.2 Behavioural factors

Behavioural factors, such as a reduced tendency to wash hands has been observed in some groups, for example in groups who do not fully understand the need for handwashing or who find the process complex [28]. The importance of hand washing can be supported in the audiology clinic or during audiological care in patients' homes. It has been observed that discussion with patients and engaging patients in their own safer care can be particularly effective [29].

Hand hygiene resources, including those in easy read format, should be readily available for patients and good hygiene practices in hearing aid use shared with patients alongside other issued hearing aid information.

Audiology staff should also be aware of additional support that an individual may need in maintaining good personal hygiene if dexterity is limited.

Within the context of infection prevention and control, the risks of ingestion of clinically used substances such as alcohol-based gel should be considered. Prominent notification of this type of risk should be made in the patient records for individuals who have a history of consuming inappropriate substances.

A4.3 Age

Newborn babies have "passive" immunity from antibodies received from their mothers during the final trimester. However, this immunity decreases over the first few months of life and childhood immunisations are offered from 2 months of age. Young children are particularly vulnerable to infection [30]. Audiology staff involved in newborn or paediatric work should be aware of their employer's policy on reducing infection risk for these patients. This may include additional infection prevention and control processes when entering post-natal wards and special care baby units.

A decline in immune function is also observed with the aging process. As people age the body does not respond as effectively to antigens. Furthermore a poor response to vaccination has also been observed [31].

A4.4 Cross-transmission risk

Audiology staff should be aware of patients, staff and visitors for whom there is a greater cross-infection risk and questions identifying these risks should be included in the patient history taking or pre-visit preparations. Those listed by NICE [32] when referring specifically to increased cross-transmission risk associated with HAIs include:

- *"Those: with diarrhoea, vomiting, an unexplained rash, fever or respiratory symptoms.*
- *Known to have been previously positive with a multi-drug resistant organism (MDRO), for example, meticillin-resistant Staphylococcus aureus (MRSA).*
- *Who have been hospitalised outside the UK in the last 12 months"*

To reduce risks these individuals should be seen at the end of a clinic and seperated from others by at least 1 metre.

Since the publication of this NICE guidance COVID-19 also presents increased risk of cross-contamination discussed in Appendix 6 and for which Trust-specific and the most recent PHE guidance should be consulted.

A4.5 Pregnancy

There are infections which present additional risks to pregnant staff or their babies. Table 3 highlights infections known to carry an increased risk. Of particular note are viral infections which typically present with a generalised rash illness including parvovirus B19, measles, rubella, varicella, human herpes virus 6 and 7 and enterovirus. Exposure to patients with known or suspected rash illnesses is advised against for pregnant staff, and their midwife, GP or obstetrician contacted urgently if exposure has occurred [33].

Pregnant staff should discuss mitigation of risk with their line manager at the earliest available opportunity. Risk mitigation should include reduced exposure and universal infection control precautions and could include a temporary change in duties [34] [35].

APPENDIX 5: Personal Hygiene Factors

A5.1 Notes on Apparel

A publication from 2007 “Uniforms and workwear: Guidance for NHS Employers” was updated April 2020 [36]. The guidance suggests that washing uniforms with detergent at 30^0C will remove most gram-positive micro-organisms including MRSA. It also states that a ten minute wash at 60^0C is sufficient to remove almost all micro-organisms.

More recently, due to the Covid 19 pandemic, a guidance document was released from Public Health England stating that organisations should consider the use of theatre scrubs for staff who do not usually wear a uniform but who are likely to come into close contact with patients. Healthcare laundering should be utilised if available. If this is not available, then the staff member should ensure their uniforms are taken home in either a plastic bag which can then be disposed of via household waste or a cloth bag which can be laundered with the uniform. It states uniform should be laundered:

- Separately from other household linen
- In a load not more than half the machine capacity
- At the maximum temperature the fabric can tolerate, then ironed or tumble dried. (Usually hospital uniforms and scrubs are suitable to be washed at a 60^0C wash therefore should be used for all patient facing clinicians.)

It also recommends best practice is to change into and out of uniform at work and to not wear uniform when travelling. This is more to do with public perception rather than evidence of an infection risk. Healthcare settings should provide changing rooms/areas where staff can change into their uniforms on arrival at work [37]

A5.2 Notes on Glove Types

Types of gloves used in healthcare are latex, or non latex options such as nitrile, neoprene, or vinyl. Polythene gloves are not suitable for clinical use.

Glove choice is dependent on the work entailed, the wearer of the gloves and the environment they work in.

Latex Gloves contain natural rubber latex proteins that can cause asthma and Urticaria. They can also cause more severe reactions such as anaphylaxis.

Powdered latex gloves pose more of a risk as the natural rubber latex proteins can attach to the powder particles and therefore when the gloves are removed, the proteins can become airborne and then inhaled. Therefore, low protein, non- powdered latex gloves which are single use would be preferable and lessen the risk, however, if latex gloves are not essential then a non-latex option should be selected [38].

A5.3 Face Masks

Fluid-resistant (Type IIR) surgical masks prevent respiratory droplets from entering the nose and mouth. They are not routinely used within Audiology however have been used historically by clinicians for procedures such as wax removal.

Type IIR masks should:

- Be well fitted to cover the mouth and nose.

- Be kept in place for the whole session.
- Not be touched
- Not be allowed to sit around the neck

Hand hygiene should be carried out after disposal.

Type IIR face masks are for sessional use. Meaning they should only be used for one session e.g. a morning session of appointments but then changed before lunch and a new one put on for the afternoon session. They should also be changed if they become damp [15].

A5.4 Visors/safety spectacles

Visors/safety spectacles provide protection against contamination to the eyes from respiratory droplets, blood splashes, body fluids or excretions. Types of eye protection:

- Full face shield or visor
- Polycarbonate safety spectacles or equivalent

Note: Regular spectacles if required should be worn in addition to, not instead of, visors or safety spectacles.

Visors/safety spectacles should:

- Be well fitted
- Not be allowed to dangle after or between each use
- Not be touched once put on
- Visors/safety spectacles can be single use only or reusable. Check with the manufacturer whether your visor/safety spectacles are reusable or single use only. If they are single use only they must be discarded after the clinical session has ended into clinical waste. However, if they are reusable, please refer to your manufacturer guidelines on how to disinfect the visors/safety spectacles correctly and follow your local infection prevention and control policy [15].
- When worn with masks, visors and safety spectacles and regular spectacles can be prone to "fogging". This is due to the face mask pushing the exhaled air upwards towards the spectacles. Anti-fog masks should be available or alternatively, spectacles can be washed with soapy water and allowed to air dry or can be dried off with a soft tissue. The droplets form because of the inherent surface tension between the water molecules. Washing the spectacles with soapy water leaves behind a thin surfactant film that reduces this surface tension and causes the water molecules to spread out evenly into a transparent layer [39]

APPENDIX 6: PPE Guidance during the Covid-19 Pandemic

A6.1 Covid-19 PPE Background

Due to the Coronavirus pandemic, all patient facing clinicians must wear a level of PPE. Although it is not a legal requirement for the patient to wear a fluid resistant mask during their appointment, most trusts have adopted a protocol to include the use of fluid resistant masks for both patients and staff members. The level of PPE worn is dependent on the treatment being delivered and the current risk level.

Since no aerosol generating procedures have been identified within Audiology clinics, the PPE which will mostly be worn by clinicians would be:

- Type IIR Fluid resistant mask
- Visor or safety spectacles (depending on procedure)
- Plastic apron
- Gloves

Vestibular testing is not deemed an aerosol generating procedure, however the clinician can still don a higher level of PPE in case the patient vomits. It has also been recently advised that should the clinician need to perform tympanometry or micro suction on a patient with a wet perforation, the clinician should either avoid carrying out these procedures or don the enhanced PPE. This is because ENT UK report the middle ear an extension of the upper aerodigestive tract. Therefore, any procedure that involves forced air current across the surface of the film of liquid in the middle ear created by the wet perforation should be treated as a potential aerosol generating procedure [40].

In the presence of a dry tympanic membrane perforation it is reasonable to follow the same recommendations as for an intact tympanic membrane [40].

This assumes unless the perforation is “wet”, the clinician can continue with Tympanometry or micro suction without the need to don enhanced PPE. Enhanced PPE may also be required for audiology staff when working in a surgical setting which should be checked before attending. Enhanced PPE consists of:

- FFP3 mask
- safety spectacles or Visor
- Long sleeved gown
- Gloves

See the table below for guidance on which PPE is appropriate.

Table 4 PPE for Audiological Procedures [41]

	Proximity	Activity	Hand & respiratory hygiene	Gloves ◆	Aprons	Fluid-resistant surgical mask II (FRSM)	Eye protection
In Clinic	Where you can work in an area maintaining 2m separation	Case history, explanation, instruction, rehab & counselling etc	✓	✗	✗	✗	✗
	Where working in close contact (within 2m) conducting procedures with low risk of splashes, droplets of blood or body fluids	Any audiological procedure other than those listed below	✓	optional ▲	optional ▲	✓★	optional ▲
	Where working in close contact (within 2m) conducting procedures with ▲ high risk of splashes, droplets of blood or body fluids	Wax removal (any procedure) for a **NON PERFORATED** TM. ***Use a non-fenestrated suction tube with micro-suction*** Caloric/vestibular chair BAHA abutment site care Case by case where risk identified	✓	✓	✓	✓★	✓✦
Home	Domiciliary setting where environment not under practioner control	Any audiological procedure	✓	✓	✓	✓	optional ▲

▲ Risk assess refers to utilising PPE when there is an anticipated/likely risk of contamination with splashes, droplets of blood or body fluids. Where staff consider there is a risk to themselves or the individuals they are caring for they should wear a fluid repellent surgical mask with or without eye protection as determined by the individual staff member for the care episode/single session.

★ Ask patient to wear face mask where possible

✦ With regard to micro suction, consider whether the viewing apparatus e.g. microscope/loupes provides adequate eye protection & to use goggles/visor would impede view.

◆ consider risk of cross contamination and dexterity inhibited , good hand hygiene can negate need for gloves

A6.2 Donning/Doffing PPE

The donning of PPE can be undertaken outside of the clinic room in a “Clean room”, where PPE is stored. It should be donned (put on) in the following order:

1. Plastic apron or gown
2. Fluid resistant type IIR mask
3. Visor or safety spectacles (if required)
4. Gloves. If wearing a gown, ensure the cuff of gown is covered by the cuff of the glove

All PPE should be doffed (removed) inside the clinic room and disposed of in clinical waste bins/bags. The order in which PPE is doffed is important:

1. The gloves should be removed first. Pinch the palm of one glove and remove the glove. Then use the fingers of your un-gloved hand to slip under your remaining glove and remove. Roll the second glove over the first and dispose in the yellow/orange bin inside the clinic room.
2. Hand hygiene undertaken
3. Next the apron or gown should be removed. If wearing an apron, break the ties at the neck, and let the apron fold down on itself. Break the ties at the waist and fold the apron in on itself being careful not to touch the outside of the apron. Discard the apron in the yellow bin inside the clinic room.
4. If wearing a gown, the clinician should unfasten the neck and waist ties, pull the gown away from their shoulders, touching the inside of the gown only using a peeling motion ensuring the outside of the gown is untouched. Roll into a bundle and discard into a clinical waste bin.
5. Hand hygiene should again be undertaken.
6. If wearing a visor, the clinician can remove it by handling the straps and pulling away from behind. If the visor is single use then discard after the appointment or clinic session.

7. Surgical face masks do not need to be changed for every patient, but the clinician may change them for every session or when they become damp. When removed they should be discarded in an appropriate bin. Ensure the outside of the mask is untouched and hand hygiene should take place afterwards.
8. Alcohol hand gel should also be available at this point for hand decontamination. Hands should be washed with soap and water at the earliest opportunity to do so [42]

Visual guides for Donning and doffing can be found at:

https://www.gov.uk/government/publications/covid-19-personal-protective-equipment-use-for-non-aerosol-generating-procedures

https://www.england.nhs.uk/coronavirus/primary-care/infection-control/

APPENDIX 7: Equipment

The efficacy of both disinfection and sterilization depends on many factors, which are beyond the scope of this document. Further information can be found from the Centre for Disease Control and Prevention [178]. Factors to consider with regards to audiology are the nature of the healthcare object to be cleaned (i.e. crevices, uneven surfaces) and the thoroughness of cleaning prior to disinfection or sterilization.

7.1 Decontamination of critical items

Table 5 [17, 18]

Spaulding classification	Decontamination level required	Equipment examples from Audiology	Sterilant
Critical items	Cleaning followed by sterilization	Not really applicable to audiology, besides implants.	• Steam sterilization • Heat-sensitive items: EtO, hydrogen peroxide gas plasma • Germicides: ≥2.4% glutaraldehyde-based formulations, 0.95% glutaraldehyde with 1.64% phenol/phenate, 7.5% stabilized hydrogen peroxide, 7.35% hydrogen peroxide with 0.23% peracetic acid, 0.2% peracetic acid, and 0.08% peracetic acid with 1.0% hydrogen peroxide

APPENDIX 8: Audiological Monitoring

This document centres around infection prevention. For the risks and rehabilitation requirements for specific infections that pose long term Audiological risk further documentation should be sought such as the CMV screening in neonates, as new information or considerations emerge on a regular basis [43] This document has outlined the need for alertness and dynamic risk assessment when conducting clinics. This section aims to outline the need for vigilance in monitoring post infection, referral criteria and potential ototoxic risks.

A8.1 Monitoring

Monitoring requires a collaborative approach between Audiology and the service treating the infection or supplying a medication with potential ototoxic risk [44]. Those with known additional risk factors for complications (for instance immune-compromised patients such as those with HIV) that already have an otological risk should be considered priority [45]. Monitoring is only as reliable as the information at hand. Ideally, this would include a baseline before the medication is due to start and no more than 72 hours into treatment, depending on the class of drug [46]. This guidance is about infection prevention, ototoxic risk from the infection or treatment medication should be considered secondary to the immediate risk to others from infection. Therefore, depending on the infection and the infection control procedure required, it could be preferable to rely on additional options such as previous testing or patient report [47]. It is prudent after a significant usage of known ototoxic medication to conduct monitoring up to a year post usage to ascertain that the hearing is stable and no progressive loss has occurred. The timeframe can be longer in cases of infections [46], [48]. Children can be at higher risk than adults and therefore a more systematic monitoring system is likely to be required, this can be up to 5 years [49-51].

The sensitivity and specificity of testing can vary, however the basics of monitoring should consider;

- The risk of the medication and/or health condition.
- Be conducted at appropriate intervals
- Where possible methods for early detection should be strongly considered [52].

Clear guidance for monitoring timeframes, such as via Cochrane Reviews, for each potentially ototoxic medication remain inconclusive, however there is a tendency to have a higher risk of side effects in children [53]. Therefore, monitoring must be part of an individualised treatment plan based on the patient's age, health at the time of illness, infection and medications used.

A8.1.1 Questionnaires

Questionnaires can ascertain potential other symptoms of audio-vestibular change, such as tinnitus [51]. The test battery can be considered from the following:

A8.1.2 OAEs

DPOAEs can be considered as part of a test battery for potential otological change, however should not be considered in isolation [54]. Combining OAEs with high frequency audiometry can be a useful early detection tool for monitoring audiological risk [55]. There are also limitations where there are conductive or existing losses greater than 40dB [56]

A8.1.3 Speech testing

Speech in noise problems can be an early sign of difficulties following infection or ototoxic drugs. Speech testing can be used to identify processing changes, particularly methods of speech in noise testing such as QuickSin, which can be carried out within the capabilities of the individual patient [51].

A8.1.4 High Frequency Audiometry

The debate about the use of high frequency audiometry has been present for over 40 years, the difficulties initially were that zero dB HL was not verified above 8 kHz [57]. High frequency audiometry, levels above 8 kHz, has the same risk as per 6/8 kHz of inaccuracy for headphone positioning, however has been shown to be effective for detection of ototoxicity during research [58]. High frequency audiometry can also show otological changes dependent on health, such as in renal failure, as the high frequencies are likely to show the impact of illness prior to the standard 250 Hz-8 kHz [59]. It can be particularly useful in testing those over 5, with appropriate equipment [60]. ASHA use the standard of a 10 dB test retest variability for 9-14 kHz, therefore suspicion should be raised when there is a greater than 10 dB shift in thresholds for high frequency audiometry [50]. In order for high frequency audiometry to be acceptable for routine clinical usage it would be recommended that there is published UK guidance for performing high frequency audiometry, therefore of technique clarification and reference data for the equipment required.

A8.1.5 ABR

ABR can be useful in determining hearing impairment where other forms of testing are not possible, it can also be sensitive to lesion specific information [61]. There are limitations given the time and frequencies of standard testing [62]. Information on the types and uses of ABR testing can be found in the BSA procedure guidance [63].

A8.2 Referral Criteria

All patients should be considered for referral into Audiology for further evaluation when there is a known risk of complications following illness or treatment. The aims of referral are to identify early change in hearing, consideration for changes in therapy alteration, prevention of further complications or provision of auditory rehabilitation where required [64]. Stakeholders could include oncologists, pulmonologists, infectious disease specialists, ototolaryngologists and pharmacists [65].

A8.3 Ototoxicity

Ototoxicity can be irreversible, where possible prevention is the focus, monitoring pathways can determine whether a change in management is applicable in the individual cases, or what rehabilitation may need to be put in place [66]. Further information can be accessed about drug management policies through the World Health Organisation, National or local guidance. Ototoxicity refers to medication which has a potential side-effect of poisoning the auditory or vestibular system, temporarily or permanently, this was initially noticed when streptomycin was used for Tuberculous in 1944 [67]. The most up to date guidance is available in the British National Formulary (BNF), which is available in print, online or via the app. https://www.bnf.org/. Care must be taken when considering potential paediatric ototoxicity as this can vary in severity, please refer to the British National Formulary for Children (BNFC) https://bnfc.nice.org.uk/.

At the time of print there are 47 medications from the BNF which can cause hearing disturbance, this number increases rapidly if you look at other potential ototoxic effects such as tinnitus, hyperacusis, aural fullness and vertigo. It is most relevant to note the family of medications that are at higher risk

of causing an ototoxic effect which include Aminoglycoside antibiotics, platinum-based chemotherapeutic agents, loop diuretics, macrolide antibiotics and antimalarials [64]. Aminoglycoside antibiotics are probably the most likely to be utilised in cases of certain bacterial infections [68].

Table 6 gives examples of medications which have ototoxic effects for adults that are relevant to this document. The BNF uses the following criteria for likelihood:
—Very common — occurs more frequently than 1 in 10 administrations of a drug
—Common — occurs between 1 in 10 and 1 in 100 administrations of a drug
—Uncommon — between 1 in 100 and 1 in 1,000 administrations of a drug
—Rare — between 1 in 1,000 and 1 in 10,000 administrations of a drug
—Very rare — occurs less than 1 in 10,000 administrations of a drug
—Frequency not known

Table 6 Potential audiological side-effects of drugs used to treat infection

Symptom	**Likelihood**	**Drug**	**Usage**
Auditory damage	Rare	Aminoglycosides (these include Gentamicin)	Bacterial infection
Hearing disturbance	Uncommon	Valganciclovir	CMV
Impaired hearing	Rare	Griseofulvin	Fungal infection
Tinnitus/Hearing impairment	Rare	Quinine	Protoal infection
Tinnitus/hearing loss	Rare	Ribavirin	Chronic hepatitis C
Tinnitus/hearing loss	Rare	Isoniazid	Tuberculosis
Tinnitus/impaired hearing	Rare	Miocycline	Bacterial infection
Tinnitus/mild hearing impairment	Uncommon	Teicoplanin	Bacterial infection
Hearing impairment/tinnitus	Rare	Streptomycin	Bacterial infection

APPENDIX 9: Regulatory Framework

Audiology services should have at least one nominated Health and Safety or Infection prevention and control representative [69], who is able to carry out risk assessments (such as COSHH) and oversee adherence to legislation and employer policies. Other Audiology staff are expected to maintain an awareness of relevant guidance and where to find it, and to abide by employer/service policies.

The Health and Safety at Work Act 1974 [70] requires the employer to care for the health, safety and welfare of employees at work. Infection prevention and control management is part of the employer's responsibility to ensure that they provide a safe working environment. The employee holds responsibility for being aware of, and adhering to, infection prevention and control policy within their workplace. Other legislation relating to Infection prevention and control includes:

- Reporting of Injuries, Diseases and Dangerous Occurrences (RIDDOR) 2013 [71]
- The Health and Care Social Act 2008 [72]. More information on the application of this document to the healthcare environment can be found in the following guidance from NHS Improvement:
    - http://www.faad.co.uk/Includes/NPSA%20cleaning%20specification.pdf
    - https://improvement.nhs.uk/resources/patient-safety-alerts/
- The Public Health (Control of Diseases) Act 1984 [73]
- The Public Health (Infectious Diseases) Regulations 1988 [74]
- The Management of Health and Safety at Work (Amendment) Regulations 2006 [75]. This contains the requirement to carry out a risk assessment in our workplace with respect to other people, including patients.
- Control of Substances Hazardous to Health (COSHH) 2002 [76]
- The Health Protection (Notification) Regulations 2010 [77]

Some diseases are notifiable to the Public Health authority by law. Notification should be made by a registered medical practitioner. Audiologists would not be expected to make such a notification but may be required to contact a medical colleague if one of these diseases was suspected. Further guidance can be found on the government website:
https://www.gov.uk/guidance/notifiable-diseases-and-causative-organisms-how-to-report

Other diseases are part of an international effort to prevent infection through a programme of vaccination. More can be read via the WHO website:
https://www.who.int/healthsystems/topics/health-law/chapter10.pdf

NHS clinical staff are typically required to be vaccinated against the following infectious diseases: Measles, Mumps, Rubella, Tetanus, Polio, Diphtheria unless there are medical exemptions. Some employers will also require or recommend you to have the vaccinations or proof of immunity for the following: BCG (Tuberculosis), Hepatitis B, Influenza, Varicella (Chickenpox). Non-clinical staff are expected to have their routine vaccinations up to date. Occupational Health will discuss your immunisation status relevant to your role at the start of your employment.