# Association of Neurophysiology Scientists of Australia Inc.

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# **Neurophysiology Infection Control Guidelines**

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## 1. PURPOSE

These guidelines have been prepared to offer guidance towards best infection control practice in the routine clinical setting within Australia.

# 2. INTRODUCTION

The following guidelines should be considered as minimum standards to perform routine neurophysiological testing. They have been prepared by a sub-committee governed by ANTA Inc. and have been presented to stakeholders within the field of Clinical Neurophysiology in Australia (see Appendix 1). A review of international guidelines was made to ensure that this ANTA Inc. guideline is consistent with worldwide standards.

# 3. LIMITS OF THE GUIDELINE

These guidelines are prepared with respect to routine neurophysiological testing in clinical practice. They are not to be used instead of hospital or practice implemented policies (hand hygiene, contact precautions etc.) but to ensure all practices are in keeping with documented Australian standards for infection control. There may be times when it is appropriate to deviate from these guidelines and it is the responsibility of the technologist to understand why this is necessary and any effect this may have prior to making this decision. These guidelines do not relate to testing within the operating theatre.

# 4. GENERAL RECOMMENDATIONS

(i) Documentation

All clinical neurophysiological departments should have infection control guidelines which are researched, documented and adhered to. This should meet the minimum Australian standards as documented by the Australian government and National Health and Medical Research Council. The requirements of local regulations and hospital policy (if relevant) need to be considered when formulating these guidelines. All staff in the area should be aware of the contents of departmental guidelines and all new staff should undergo induction into the guidelines in order for all staff to adopt and implement the guidelines.

(ii) Registers

If a department holds dangerous substances, these must be kept on a register with safety data sheets, risk assessments and quantity held documented <sup>(6)</sup>.

## 5. GENERAL STANDARD PRECAUTIONS

Standard precautions are applied to all patients, regardless of infectious status and procedure to be performed, and are the minimum infection control practices required.

(i) Hand Hygiene

Hand hygiene is the most important means to prevent the spread of infection. The aim of hand hygiene is to protect patients from acquiring infectious agents from the healthcare worker, to protect patients from acquiring infectious agents during procedures and to protect the healthcare worker and surrounds from infectious agents from the patient.

There are five moments of hand hygiene <sup>(1, 2)</sup>:

- Before touching a patient or surroundings
- Before performing an aseptic procedure
- After a body fluid exposure risk
- After touching a patient
- After touching patient surroundings.

Hand hygiene must also be performed after removal of gloves:

a) Alcohol-Based Hand Rub (ABHR)

Alcohol-based hand rubs are more effective against most common infection agents than plain or antiseptic soap and water <sup>(3)</sup>. Alcohol-based rubs must contain between 60%-80% v/v ethanol and should be used for routine hand hygiene <sup>(4)</sup>.

Hands must be visibly clean and dry before use. Cover all hand surfaces and fingernails with rub, then leave to dry for 20-30 seconds <sup>(4)</sup>.

#### b) Plain Soap and Water Wash

If hands are visibly soiled, hands must be washed with soap and water and dried with single use product such as paper towel. Wet hands, lather all surfaces of hands and nails for 15-20 seconds then rinse under running water. Pat the hands dry with a fresh paper towel, being careful not to rub skin which can cause skin damage <sup>(4)</sup>. When using taps to control water, once hands are washed, use the paper towel to turn off the water to prevent re-contamination <sup>(4)</sup>. Hot air hand dryers are not recommended and should be replaced with single use towels once inoperative <sup>(2)</sup>.

## (ii) Nail Polish and Jewellery

Artificial/false nails are associated with higher levels of infectious diseases and chipped nail polish also encourages growth of bacteria <sup>(3)</sup>. Clear nail polish allows visual assessment of nail damage or visible soiling, but must be removed if chipped or every 4 days <sup>(3, 18)</sup>. Natural nail tips should also be less than 0.6cm long <sup>(2)</sup>. Artificial/false nails or coloured nail polish must not be worn by health professionals <sup>(2, 17, 18)</sup>.

Increased contamination can occur with the wearing of jewellery, in particular rings, watches, bracelets which are exposed frequently to different surfaces or patients. Long necklaces pose a similar problem. Wearing of these should not be worn, but a plain wedding band may be worn as long as it is moved around when hand hygiene is performed <sup>(1, 2, 3)</sup>.

## (iii) Footwear and Hair

Footwear should be suitable for the duties being performed and designed to minimise the risk of injury if sharps are dropped <sup>(3)</sup>. Hair should be clean and secured off the face and neck <sup>(18)</sup>.

## (iv) Personal Protective Equipment

Personal protective equipment (PPE) provides a barrier between patient and healthcare worker to eliminate transmission of infectious agent to the patient <sup>(5)</sup>. PPE includes gloves, gowns, masks, eye wear and face shields.

Gloves protect the patient and healthcare worker and should be used to prevent contamination when there is direct contact with blood or bodily substances, non-intact skin and infectious materials <sup>(2)</sup>. They do not eliminate the need for hand hygiene <sup>(2)</sup>.

Gloves should be used when <sup>(2)</sup>:

- Performing head measurements
- Application of electrodes
- Removal of EEG electrodes
- Cleaning of electrodes
- Cleaning the patient's head
- EMG
- Environmental cleaning.

They are to be discarded after electrode application and before performing testing and a new pair of gloves applied for removal. Gloves should be peeled off with the opposite hand, ensuring the glove is turned inside-out and the un-gloved hand does not touch the contaminated/outside surface of the glove. Hand hygiene is to be performed on glove removal <sup>(2, 5)</sup>.

Gloves should not be worn when operating equipment and the surrounding environment should not be touched (door handles, taps, chairs etc) when gloves are on. If they are, gloves need to be changed before touching the patient and the touched surface should be wiped down. All gloves used must be single use gloves and disposed of after each patient.

Gown, eye shield and mask are only required if additional contact precautions are in place. This is discussed in Section 9.

PPE	Putting on PPE	
Gown	Cover from neck to knees, to wrist	
	Ties at back	
Mask	<ul> <li>Secure ties at back of head</li> </ul>	
Eyewear		
Gloves	Gloves should cover wrist of gown	

Sequence for putting on PPE<sup>(3)</sup>:

Sequence for removing PPE <sup>(3)</sup>:

PPE	Removing PPE	
Gloves	<ul> <li>Grasp outside with opposite hand and peel off</li> <li>Slide finger under second glove</li> <li>Pull second glove off over first glove</li> </ul>	
Hand hygiene		
Eyewear		
Gown	<ul> <li>Unfasten ties</li> <li>Pull away from neck, touching inside only turning inside-out</li> </ul>	
Mask	<ul> <li>Grasp bottom then top tie and remove over head</li> </ul>	
Hand hygiene		

## 6. NEUROPHYSIOLOGICAL STANDARD PRECAUTIONS

(i) Electrode Application

Skin preparation for electrode application should be completed with products suited for this purpose. To reduce impedance, an abrasive paste should be used. This skin is now classed as non-intact skin. The use of skin scarification with sterilised blunt needles is highly discouraged <sup>(6)</sup>. Skin preparation agents should be decanted into a small single use container for each patient then discarded <sup>(16)</sup>.

# (ii) EMG and Sub-dermal Electrodes

Skin should be rubbed in a circular motion for 30 seconds minimum with an anti-microbial solution. This must be allowed to air dry before electrode insertion. Anti-microbial solutions such as 70% isopropyl alcohol or alcohol chlorhexidine 0.5% should be used <sup>(6)</sup>.

# (iii) Sharps

All healthcare workers need to be cautious with sharps for the prevention of injuries. Single use sharps need to be disposed of in an appropriate container meeting *AS4031: Non-Reusable Containers for the Collection of Sharp Medical Items Used in HealthCare Areas* or *AS/NZ4261: Reusable Containers for the Collection of Sharp Items Used in Human and Animal Medical Applications* standards. The container must be located in the area of use; it must be placed out of reach of children and secured to prevent tipping over. Safe disposal of all single use sharps must be done by the health care workers <sup>(7)</sup>. Single use sharps are not to be re-sheathed under any circumstances <sup>(7)</sup>.

Reusable needles must immediately be put in a puncture resistance container and labelled. Safe handling polices and procedures must be in place for transportation and reprocessing <sup>(7)</sup>.

If a needle-stick injury did occur, follow local protocol. Most health providers state to clean wound/site with soap and water for at least 30 seconds and contact occupational medicine unit/ infection control or staff health unit <sup>(5, 7, 8)</sup>.

# 7. TRANSMISSION-BASED PRECAUTIONS

(i) Airborne Precautions

Used when the patient has known or suspected infection with an airborne microorganism. Examples include measles, varicella and tuberculosis. Respiratory protection is required when attending these patients. This requires the technologist to wear a P2 respirator mask, fitted correctly, with hand hygiene performed before putting on mask and after taking off the mask <sup>(3)</sup>.

(ii) Droplet Precautions

Used when the patient has known or suspected infection with a microorganism that can be transmitted by coughing, sneezing, talking or certain procedures. It applies when a person will be within one metre of the patient. Examples include influenza, mumps and rubella. Respiratory protection is required when attending these patients. This requires the technologist to wear a surgical mask, correctly fitted, when within one metre of the patient, with hand hygiene performed before putting on the mask and after taking off the mask <sup>(3)</sup>.

(iii) Contact Precautions
 Used when the patient has known or suspected infection with a microorganism that can be transmitted by direct or indirect contact. Examples include Methicillian

Resistant Staphylococcus aureus (MRSA), Vancomycin Resistant Enterococcus (VRE). This requires the technologist to wear gloves and gown when entering the patient environment. Once left environment, de-glove then de-gown, perform hand hygiene and clean equipment down with antimicrobial wipes <sup>(3)</sup>. Hospital or local policy should be followed when attending these patients. In some circumstances a mask is required but this is dependant upon the procedure and infectious agent.

(iv) Specialist Departments Precautions
 Often adult and neonatal intensive care units, high dependency units and isolation rooms will have individual and special precautions. Hospital or local policy should be followed for these patients and areas.

## 8. CREUTZFELDT-JAKOB DISEASE (CJD)

(i) Classic Creutzfeldt - Jakob disease (cCJD)
 Classic CJD refers to all forms of human transmissible spongiform encephalopathy (TSE) (sporadic, inherited and acquired). The prion which causes cCJD is resistant routine processing requiring additional precautions and procedures to be put in place. There is some evidence that iatrogenic transmission has occurred through contaminated neurosurgical instruments in contact with the central nervous system tissue and grafts. This is very rare but possible. The risk of infectivity of cCJD in body tissues is described as high or low in the following table <sup>(3,9,10,14)</sup>.

Infectivity Category	Tissues	Secretions Excretions	and
High-Infectivity or	Brain		
Medium Infectivity	Dura Matter		
(Higher Infectivity)	Pituitary Gland		
	Spinal Cord		
	Posterior Eye (including retina, vitreous humour		
	and optic nerve)		
	Cranial and dorsal root ganglia		
	Olfactory epithelium		
Lower-Infectivity or no	Cornea	CSF	
detectable infectivity	Anterior chamber of eye	Amniotic fluid	
(Lower Infectivity)	Kidney	Faeces	
	Liver	Breast milk	
	Lung	Nasal mucous	
	Lymph nodes/spleen	Saliva	
	Placenta	Semen	
	Uterus	Serous exudate	
	Adipose tissue	Sweat	
	Adrenal gland	Tears	
	Blood and blood products	Urine	
	Bone marrow		
	Oral tissue (teeth, gingival tissue, dental pulp)		
	Heart muscle		
	Intestine		
	Peripheral nerve		
	Prostate		
	Skeletal muscle		
	Testes		
	Thyroid Glad		

High-risk patients are those who have a definite risk of cCJD transmission (generally showing neurological symptoms) and low-risk patients are those who represent a potential risk through identified risk factors or signs of neurological symptoms <sup>(9)</sup>. Risk assessment to be performed to determine CJD status and should be administered by medical staff prior to procedure that may require additional precautions.

The prion involved in the cCJD infection is resistant to routine processing and sterilisation as per AS/NZS 4187<sup>(10)</sup> and additional precautions are needed, depending on the risk assessment made <sup>(9)</sup>. Reprocessing refers to a process of cleaning/disinfecting/sterilising reusable equipment for reuse on any patient. The following table can be used to help <sup>(10,9)</sup>:

Patient	Procedure inv	olving exposure	Procedure invo	olving exposure
Risk Category	to higher-infe	ctivity tissue:	to lower-infect	ivity or no risk
			tissue:	
High ris	Additional Dra	soutions	Routine	Reprocessing
patient		Additional Precautions		
Low risk			Routine	Reprocessing
patient	Additional Precautions		Precautions	
No risk	Routine	Reprocessing	Routine	Reprocessing
patient	Precautions		Precautions	

For neurophysiological tests, the following precautions are needed for patients with low or high risk<sup>(10)</sup>:

Testing	Precautions Required	
Scalp EEG	Routine Reprocessing Precautions	
Evoked Potentials	Routine Reprocessing Precautions	
IOM - any	Additional Precautions	
	Additional Precautions for High risk	
ERG	Routine Reprocessing Precautions for Low risk	

Additional Precautions involves the incineration or use of reusable equipment kept for future use solely on that patient, quarantined from other equipment to prevent cross-contamination, with single use instruments used where possible <sup>(10)</sup>.

If reprocessing is required, anionic detergent is to be used which will decrease the risk of prion transmission. Disinfectants such as glutaraldehyde should not be used as they enhance prions adhering to surfaces allowing for cross contamination risks. Equipment should not be left to dry, rather kept in sterile water prior to processing (<sup>14,19</sup>). Ultrasound cleaners can be used but steam sterilisation at 134°C for 3 minutes is recommended <sup>(9)</sup>. This equipment should now be put aside for exclusive use by patient, or if the patient's risk is reclassified as low, the equipment can be returned to general use. Instruments should be processed as soon as possible after use, regardless of whether CJD status has been determined or not (<sup>19</sup>).

## (ii) Variant Creutzfeldt-Jakob Disease (vCJD)

Variant Creutzfeldt-Jakob Disease (vCJD) will not be discussed in these guidelines as it has not been reported in Australia to date. The Department of Health and Ageing released CJD Infection Control Guidelines in 2007 and state "vCJD is excluded from the scope of this chapter as vCJD has not been reported in Australia to date. Infection control issues regarding patients with suspected or confirmed vCJD will be incorporated into Part 6, Appendix 9 once vCJD is reported in Australia and will be available on the Department of Health and Ageing website" <sup>(9)</sup>. ANTA Inc. will review this document if cases are reported <sup>(9)</sup>.

# 9. CLEANING/DISINFECTION/STERILISATION

All reusable equipment requires reprocessing via cleaning, disinfection and/or sterilising. Processing of reusable equipment varies dependant upon the degree of risk of infection or spread of potentially infectious material to patient, healthcare worker and environment. All cleaning, disinfection and sterilising processes must comply with AS/NS 4187<sup>(10)</sup>.

Processing levels		
Critical	Entry or penetration into sterile tissue, cavity or blood stream	High risk of infection if contaminated and must be sterile at time of use.
Semi-Critical	Contact with non-intact skin or mucous membranes	Should be single use or sterilised after each use. High level disinfection may be used if sterilisation is not possible.
Non- Critical	Contact with intact skin	Cleaning is sufficient for most items but low or intermediate level disinfection may be required dependant upon circumstance.

Processing levels (3, 11):

As the skin is abraded prior to application of EEG and EP electrodes, the skin is non-intact and there is potential for contact with whole blood, plasma and extracellular fluid <sup>(15,16)</sup>.

Neurophysiology equipment:

	Entry or penetration into	Needle Electrodes
Critical	sterile tissue, cavity or	Depth Electrodes
	blood stream	Electrocorticographic electrodes
	Contact with non-intact	Scalp electrodes
Semi-Critical	skin or mucous	Corneal ERG electrodes
	membranes	Nasopharyngeal electrodes
		Surface Stimulators and
		electrodes
Non- Critical	Contact with intact skin	Felt pads
		Marking pencil and tape measure
		Headphones

All processing must be performed immediately post-procedure to prevent spread of infectious agents and to prevent drying of materials onto equipment. All patients must be considered potentially infectious as infectious status may not be known.

(i) Critical Items

Critical items in neurophysiology are all items that enter sterile tissues, including needle electrodes for EEG and NCS, indwelling depth electrodes, electrocorticographic electrodes <sup>(16)</sup>. These items require sterilisation prior to reuse <sup>(3, 6, 16)</sup>. Disinfection is not a substitute for sterilisation <sup>(10)</sup>.

All needles and electrocorticographic electrodes, ideally, should be single use. If the needle is re-usable it should be placed on special needle transport trays with

Velcro-like surface. The item should be cleaned ultrasonically for 5 minutes then sterilised <sup>(6)</sup>:

a) Ethylene oxide steriliser

Used for heat and moisture sensitive items that cannot withstand temperatures above  $60^{\circ}C^{(6, 10, 17)}$ .

b) Steam sterilised <sup>(17)</sup>

Gravity displacement - 10-15 minutes at 133°C to 135°C

Pre-vacuum cycles - 3-4 minutes at 133°C to 135°C

Flash sterilisation - 3 minutes at 133°C

- c) Autoclaving 15 minutes at 121°C or 3 minutes at 134°C <sup>(6)</sup>
- (ii) Semi-Critical Items

Semi-critical items refer to any item that has contact with non-intact skin or mucous membranes <sup>(3, 6, 7, 10, 11, 17).</sup> This would include scalp electrodes for EEG and EP, nasopharyngeal electrodes, electro-caps and corneal electrodes for ERG <sup>(16)</sup>. These items require sterilisation or high level disinfection <sup>(3, 6, 16)</sup>.

Scalp Electrodes:

Scalp electrodes may have contact with non-intact skin and may have contact with the vascular system so require cleaning then sterilisation for reuse.

Ag/AgCl and Gold disc Electrodes must be cleaned to remove foreign material prior to sterilisation <sup>(3, 6, 7, 17)</sup>. Warm water should be used as it assists with mechanical removal of soil, along with a cleaning agent which is non-abrasive to prevent damage <sup>(10)</sup>. Ensure the connector is not exposed to water.

Electrodes should then be sterilised by one of the following means:

a) Ethylene oxide steriliser

Used for heat and moisture sensitive items which cannot withstand temperatures above  $60\,^{\circ}\text{C}\,^{\scriptscriptstyle(6,\,10,1\,7)}$ 

b) Steam sterilised <sup>(17)</sup>

Gravity displacement - 10-15 minutes at 133°C to 135°C

Pre-vacuum cycles - 3-4 minutes at 133°C to 135°C

Flash sterilisation - 3 minutes at 133°C

c) Autoclaving - 15 minutes at 121°C or 3 minutes at 134°C<sup>(6)</sup>

It is preferable to sterilise semi-critical items whenever they are compatible with available sterilisation processes  $^{\rm (11).}$ 

Corneal ERG electrodes:

Most corneal ERG electrodes are single use items and therefore should not be reprocessed. If a multiple use item, the electrode should be washed with detergent and water then cleaned with an alcohol swab. This is followed by disinfection for 10 minutes in hypochlorite (1000ppm) then rinsed <sup>(6)</sup>.

Mushroom electrodes:

Mushroom electrodes must have the porous material used for connection with the scalp changed between each patient and prior to sterilisation or disinfection. If this is unable to be done, their use in neurophysiology should be discouraged. Mushroom electrodes can also be used without porous padding, which minimises risk of contamination. This does not eliminate the need for sterilisation or disinfection.

#### (iii) Non-Critical Items

Non-critical items refer to those in contact with intact skin such as a nerve conduction stimulator, marking pencils, tape measures, headphones, head-box, cables and ring electrodes for NCS <sup>(16)</sup>. These items should be wiped over with detergent and cleaned without damaging the equipment itself, then allowed to air dry prior to reuse <sup>(16)</sup>.

If any of these items have contact with non-intact skin, they must be considered a semi-critical item <sup>(16)</sup>.

# **10.GENERAL CLEANING**

(i)

#### Environmental Cleaning

Environmental cleaning should be completed after every patient. This includes wiping down patient chair, head box, bench. All tape measures used for measuring need to be wiped down between each patient and all linen in contact with the patient needs to be changed. Consumables should be decanted for individual patient use and replaced after each patient. Hard surfaces should be washed with detergent and warm water <sup>(3)</sup>. Detergent impregnated wipes can be used for small areas and equipment but do not replace detergent and water <sup>(3)</sup>.

Additional cleaning of testing areas should be completed regularly to remove visible dust and dirt  $^{\rm (3)}$ 

Area	Frequency
Bench	Weekly
Computer	Weekly
Curtains	Biannual
Door Handles	Daily
Floor	Twice weekly
Fridge (Drug/other)	Weekly
Light Switch	Weekly
Sink	Daily

#### (ii) Spills

Spills should be cleaned up promptly and with the appropriate substances dependant upon the spill.

Most simple spills can be cleaned with detergent and water by the technologist or cleaning staff. This often includes some bodily substances.

In the event of spills including bodily substances appropriate infection control caution should be taken and/or advice taken from Infection Control authority within the workplace.

Spill kits for all dangerous substances and bodily substance spills must be in each clinical area where the spill may occur  $^{(3)}$ .

Safety Data Sheets (SDS) which accompanies dangerous substances provides the instructions for cleaning up if the substance is spilt.

Spill cleanup for bodily fluid <sup>(3)</sup>:

Size of Spill	Processes Required	
Small <10cms	<ul> <li>PPE</li> <li>Wipe with absorbent material</li> <li>Place in plastic bag or leak proof container for disposal</li> <li>Clean area with warm water and detergent</li> <li>Wipe area with sodium hypochlorite</li> <li>Allow to dry</li> <li>Hand hygiene</li> </ul>	
Large >10cms	<ul> <li>PPE</li> <li>Cover area with absorbent clumping agent</li> <li>Use disposable scoop and scraper (in spill kit) to dispose of substance</li> <li>Place in plastic bag or leak proof container for disposal</li> <li>Clean area with warm water and detergent</li> <li>Wipe area with sodium hypochlorite</li> <li>Allow to dry</li> <li>Hand hygiene</li> </ul>	

# (iii) Toys

All toys and objects that are handled by children or put in their mouths must be washable. It is required that these are washed and allowed to dry between patients, using detergent and water, or detergent impregnated wipes. Toys with a non-washable cover or those difficult to clean must not be used in health organisations or must be single use then disposed of <sup>(7, 12)</sup>.

# 11.HEALTHCARE WORKER PROTECTION

(i) Vaccinations

On commencement of work, screening and vaccination should be provided for specific infectious diseases. Vaccination is required for <sup>(3, 13)</sup>:

- Hepatitis A (if working with indigenous communities)
- Hepatitis B
- Influenza
- Measles, Mumps & Rubella
- Pertusis
- Chicken Pox.
- (ii) Screening

All staff should be tested for tuberculosis on commencement through Tuberculin skin test/Mantoux then chest X-ray if positive <sup>(3, 6, 13)</sup>.

(iii) Hand Care

Due to the hand hygiene which is required to be performed, hand care is an important factor. Skin can often be affected by dryness, dermatitis, sensitivity or allergy to products <sup>(2)</sup>. Products must be chosen which are pH neutral (5.5-7) and compatible with the diverse hand products used. Moisturising lotion should be used to help maintain skin integrity.

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## Appendix 1 – Stakeholders

Stakeholders

- ANTA Inc. Members
- Document Development Committee
- Document Development Committee Advisory Group
- Other interested parties

# **Original Document**

Kate Martin.

# **Document Development Committee**

Mary Lynch, Joanne Wex, Holly Campbell, Anna Exley, Santhi Chigurupati, Malcolm Corkhill, Kate Martin, Emma Fetherston, Amy Lofts, Vicky Grant, Angela Borbelj.

# Advisory Committee

The document development committee identified a group of key stakeholders to view the draft documents for feedback. The advisory group was made up of technologists, scientists and neurologists working in the neurophysiology industry around Australia. The comments from this group were considered, compared against the reference material and included where appropriate.

# Members Feedback

On completion of the final draft the document was put out to all members of ANTA Inc. for feedback. The comments from members were considered, compared against the reference material and included where appropriate.

## **Guideline Acceptance**

This Guideline was accepted by members in July 2014.

## <u>Amendments</u>

2016 MayDisclaimer and Copyright statements added.2023 JulyRebranded to ANSA Inc.

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