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Infection control guidelines for optometrists 2007

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Information from peer-reviewed articles, guidelines from professional societies and manufacturers' instructions were considered to determine the risk factors in optometric practice and to make recommendations for disinfection, sterilisation and reprocessing of instrumentation and other equipment used in practice and measures for personal protection.

Wherever possible, all practitioners should adopt measures to decrease the risk of transmission of infection, such as single use instruments/equipment, appropriate methods of reprocessing where items are reused, routine employment of standard infection control precautions and application of more rigorous procedures for infected or immuno-suppressed individuals.

Key words: disinfection, infection, infection control, sterilisation, vaccination

Optometrists have an obligation to take reasonable precautions to ensure that their patients and staff are not exposed to infection while attending or working at their practice. This paper presents infection control guidelines that aim to provide information to optometrists to assist them in minimising the risk of transmission of infection in their practices.

Infection control guidelines for optometric practice in Australia were developed in 1986[1] and revised in 1995.[2] Since then, the scope of optometric practice has expanded in a number of states in Australia, so that optometrists may now be involved in the therapeutic management of patients, some of whom may have infectious conditions such as conjunctivitis. Some of the procedures that are used for these patients require more rigorous attention to infection control than was previously necessary.

In 1996, the National Health and Medical Research Council (NHMRC) and the Australian National Council on AIDS (ANCA) adopted the terms 'standard precautions' and 'additional precautions'

(based on modes of transmission of infectious agents) to define appropriate work practices with infection control for the care and treatment of all patients, regardless of their infectious status.[3] The precautions include work practices that aim to achieve a basic level of infection control, particularly in the handling of blood, other body fluids, secretions and excretions, non-intact skin and mucous membranes. Although there is no direct reference to optometric practice, the standard precautions have application in optometric practice because of the possibility of contact with mucus membranes, tears and blood. All optometrists need to be aware of the infection control procedures designed to minimise cross infection.

Additional precautions are recommended in health-care settings for patients known or suspected of being infected or colonised with disease agents that cause infections and which may not be contained with standard precautions alone. They should be applied when there is risk of airborne or droplet transmission of respiratory secretions or when there is inherent resistance to standard sterilisation procedures, for example, suspected variant Creutzfeldt-Jakob disease (vCJD).

There are no universal guidelines that apply to the decontamination of ophthalmic instruments used by optometrists and thus it is necessary to refer to the manufacturers' guidelines or other professions for information.

Risk factors in optometric practice

In optometric practice, infection may be transmitted from patient to staff, staff to patients, patient to patient and staff to staff by direct contact, aerosol formation or contamination of equipment or instruments in the practice.

There are several instances in which optometrists may be exposed to blood, tears and mucous membranes or to infection:

1. removal of foreign bodies
2. assessment of patients with ocular trauma
3. assessment of patients with conjunctivitis
4. assessment of patients with microbial keratitis
5. lacrimal lavage, removal of eyelashes
6. expressions of glands and cysts
7. contact lens fitting
8. assessment of patients who are incontinent (this includes young children) or patients who vomit.

Some communicable diseases that could be encountered in optometric practice are human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS), hepatitis A, B and C, tuberculosis, measles, mumps, rubella, chicken pox, shingles, mononucleosis (glandular fever), herpes, influenza, impetigo, infectious conjunctivitis and keratoconjunctivitis, adenovirus 8 and CJD.

HIV/AIDS

HIV has been isolated from the tears, contact lenses and ocular tissues[4–7] but there is no evidence of transmission through these. Infection requires direct contact between blood/body fluids and mucous membranes or damaged skin for example, through sexual contact or sharing needles and/or syringes with an infected person, through transfusions of infected blood or blood clotting factors. Injuries from needles containing HIV-infected blood or infected blood entering an open cut or a mucous membrane have also been reported as causing HIV infection.[8]

HEPATITIS A, B AND C

Hepatitis B surface antigen may be present in the conjunctival fluid and there is a risk that it may be transferred to a tonometer or contact lenses.[9,10]

CJD

The number of cases of CJD in Australia is extremely low[11] and there is no evidence that it is a significant risk in optometric practice. Similarly, there is no evidence of CJD transmission by contact with intact skin. As there is lymphoid tissue in the cornea,[12] there is a theoretical possibility of transmission of vCJD and other forms of CJD between patients through ophthalmic devices that contact the eye, for example, trial contact lenses and tonometers. Such transmission is described as 'highly improbable'.[12] The NHMRC lists the cornea and anterior chamber as 'low infectivity sites' (sites that are demonstrated or predicted to be infectious but not consistently) and the conjunctiva as a semi-critical site.

ADENOVIRUSES

Adenoviruses are highly contagious and can survive outside the host for long periods, even on dry surfaces.[13]

Disinfection, sterilisation and reprocessing

Several terms are used to describe infection control procedures. Optometrists should be familiar with these.

'Cleaning' is the removal of foreign material using water and detergents or enzymatic products[14] and is the first stage recommended in reprocessing. Cleaning of instruments is an essential prerequisite, as organic material such as dried mucus, tears, skin or make-up may harbour infective organisms in dangerous concentrations and prevent adequate disinfection or sterilisation. Cleaning may require scrubbing of all surfaces of an instrument to remove debris. Insoluble deposits may require utilisation of isopropyl alcohol,[2] however, alcohol can damage some materials, so its use will depend on the type of material to be cleaned.

'Disinfection' is the term used for the inactivation of virtually all pathogenic micro-organisms but not necessarily all microbial forms, for example, bacterial endospores, fungi, protozoa. Disinfection is usually achieved using thermal (heat and water) or chemical means.

'Sterilisation' is the term used when all viable micro-organisms are eliminated, including bacterial spores. Sterilisation is usually achieved through autoclaving, which involves exposure of the item to high temperature and pressure.[14]

'Reprocessing' is the process of cleaning and disinfection and/or sterilisation of a device that is to be reused.

A 'hygienic' state is a state of cleanliness that offers little or no threat to health.[2]

'Sanitary conditions' are those that are physically clean and healthy.[2]

1. Remove jewellery.
2. Wet hands with water (to decrease the risk of dermatitis avoid using hot water).
3. Apply recommended amount of product to hands (use liquid hand-wash dispensers with disposable cartridges and disposable dispensing nozzles).
4. Rub hands together vigorously for at least 15 seconds, covering all surfaces of the hands and fingers.
5. Rinse hands with water.
6. Dry thoroughly with disposable towel, patting hands dry to minimise chapping (do not use multiple-use cloth towels or hand-dryers).
7. Use disposable towel to turn off tap, if elbow or foot controls not available.

Additional recommendations
- Cover cuts and abrasions with water-resistant occlusive dressings or use surgical gloves.
- Keep fingernails clean and short; do not wear artificial nails.
- Use non-perfumed, hypoallergenic hand creams to avoid cracking of skin/dermatitis, e.g. sorbolene.

A poster demonstrating an appropriate hand-washing technique with soap and water is available on the World Health Organization's website.[20]

Table 1. Recommended procedures for hand-washing[18,19]

Information from peer-reviewed articles, guidelines from professional societies and manufacturers' instructions were considered in determining risk factors in optometric practice and recommendations on disinfection, sterilisation and reprocessing procedures for instrumentation and other equipment used in optometric practice.

RECOMMENDATIONS FOR OPTOMETRIC PRACTICE

Identification and management of staff and patients with infectious diseases

Optometrists may consider asking patients to provide information about their general health in a registration form, when they present at the practice. If their eye examination is not urgent, patients with short-term infectious illnesses should be asked to reschedule their appointment.

Optometrists and staff with infectious diseases need to be aware of the precautions to take to avoid the transmission of disease when dealing with patients and the conditions that should exclude them from attending work (examples include influenza and conjunctivitis).

If it is practice policy that some pretesting of patients is undertaken by other practice staff prior to the patient being seen by the optometrist, staff should be advised to seek the advice of the optometrists for any patients presenting with a 'red eye' or ocular discharge before this testing is undertaken.

Hand-washing

Hand-washing is considered to be the most important measure in preventing the spread of infection in the healthcare setting.[15] The prevalence of infection decreases as hand hygiene is improved.[16,17]

The aim of hand-washing is to remove transient flora that colonise the superficial layers of the skin, which are most frequently associated with health-care associated infections. Usually, resident flora are attached to deeper layers of the skin and are more resistant to removal but are less likely to cause infection.

Hand-washing must be performed before and after significant contact with any patient and after activities likely to cause contamination, for example, handling food, emptying waste paper baskets, going to the toilet, blowing one's nose. Hand-washing should also be performed after the removal of gloves. When seeing patients, optometrists must avoid touching their own face, nose, mouth and eyes.

Hand-basins should be fitted in all consulting rooms and locations where contact lenses may be inserted or removed and must be kept clean. Elbow or foot controls are recommended to regulate the flow of water. Recommended hand washing procedures are presented in Table 1.

PRODUCTS FOR HAND HYGIENE

It is difficult to compare studies of suitability of products for hand hygiene due to differences in methodology and study design. Hand hygiene products in order from most to least effective are alcohol formulations, chlorhexidine, iodophors, triclosan, plain soap.[18] Other factors influence the suitability of products, for example, the drying effects of alcohol-based soaps limit frequent use.

Plain soap

Plain (non-antimicrobial) soap is not recommended for use by health-care workers, as it has minimal antimicrobial activity (although it can remove loosely adherent transient bacteria)[21] and it can become contaminated with gram-negative bacteria.[18,22]

Alcohol-based antiseptics

Alcohol-based hand antiseptics contain isopropanol, ethanol, n-propanol or a combination of two agents; they denature proteins and are effective against gram-positive and gram-negative bacteria, mycobacteria, fungi, enveloped viruses (HSV, HIV, influenza), hepatitis B (less susceptible) and hepatitis C. They are not effective against bacterial spores, protozoan cysts (for example, *Acanthamoeba*), certain non-

enveloped viruses and CJD. They are more effective for hand-washing than soap or antimicrobial soaps but are not effective when hands are visibly dirty or contaminated with proteinaceous materials such as blood.[18]

Chlorhexidine

Preparations that use 4% chlorhexidine are most effective. Chlorhexidine has residual activity on the skin[23] but allergic reactions are uncommon. Infection rates have been reported as being lower after antiseptic hand-washing using chlorhexidine than after hand-washing with plain soap or alcohol-based hand rinse.[19] Chlorhexidine-based hand-wash is commonly accepted as the most suitable hand hygiene product, with 4% w/v chlorhexidine widely used as a bacterial skin cleaner for hygienic and surgical handwashing.[15]

Other products

Iodine and iodophors have good bactericidal activity but cause more irritant contact dermatitis. Quaternary ammonium compounds for example, benzalkonium chloride, are only bacteriostatic and fungistatic and are affected by organic material. Triclosan (found in antibacterial hand-wash for home use) is often only bacteriostatic and has poor activity against gram-negative bacteria.[18]

Water versus waterless hand-cleaning

Alcohol-based hand rubs/gels[15,18] are more effective at encouraging health-care workers to clean their hands between patients despite being poorer antimicrobials.[24] Care must be taken to remove visible soil before use. Dry skin and irritation are common. Hand rubs/gels should only be used when:

1. there are emergency situations where there is insufficient time/facilities
2. there are inadequate hand-washing facilities
3. staff members have allergies.

• Suitability of hand-rubs

Although hand-rubs are used in some hospital and medical situations, where there is restricted access to hand-washing facilities, they are unsuitable for use in contact lens practice because the residual debris and bacterial toxins on the hands, and chemicals from the hand-rub, may be transferred to the lens prior to insertion in the patient's eye. All optometrists fitting contact lenses should ensure that they have access to proper hand-washing facilities.

Personal protective equipment

Powder-free surgical gloves should be available for use in all practices. Gloves should be worn when there is a possibility of contamination with blood or body fluid (for example, where either the patient or the optometrist has open wounds) or when optometrists or their staff are in contact with high-risk patients (for example, those with serious communicable diseases, such as hepatitis B, active herpetic lesions).[18] Optometrists should frequently check their hands for cuts or abrasions. Gloves do not replace hand-washing; hands should be washed before and after using gloves. Although broken skin may be detected through stinging when the hands are wiped with an alcohol swab, there is the possibility of contact dermatitis developing from alcohol swab use.[25]

Latex gloves are not suitable for all optometrists and patients, and latex-free nitrile gloves are available as an alternative. Latex allergy has been reported to occur in 4.3 per cent of health-care workers and in 1.4 per cent of the population.[26] Optometrists intending to wear latex gloves during a patient examination must ask the patient if they are allergic to latex prior to conducting any procedures involving direct contact.

Safety glasses, face shields and masks should be used during procedures where there is potential for splashing/splattering or spraying of blood or body fluids or the potential for airborne infection.[15] Surgical masks should be used, if either the optometrist or the patient has a cold or influenza. Enclosed footwear should be worn to protect from injury/contact with sharps, such as needles used for foreign body removal.

Gloves are also recommended when contact with cleaning solutions such as glutaraldehyde or sodium hypochlorite cannot be avoided.

Immunisation for optometrists

Optometrists should consider being immunised against influenza (yearly), hepatitis A (when seeing institutionalised patients, including nursing homes) and hepatitis B. There is currently no vaccination against hepatitis C available. In addition, optometrists should consider whether they have been immunised against measles/mumps/rubella.

Instrumentation in optometric practice

Single-use instruments and equipment should be used whenever possible in optometric practice but there are several items in optometric practice that are reused. All reusable instruments need to be cleaned immediately and then disinfected or sterilised, depending on intended use. Guidelines for disinfection or sterilisation of devices, instruments and equipment are discussed below and summarised in the Appendix.

REPROCESSING OF OPHTHALMIC DEVICES

Device classifications help guide practitioners to select the appropriate method of reprocessing for devices. The Centers for Disease Control and Prevention (CDC),[27] US Food and Drug Administration (FDA)[28] and the Australia Government Department of Health and Ageing[29] describe different levels of risks for reusable devices: critical, semi-critical and non-critical. Examples of devices used in optometric practice are shown in Table 2.

CONTACT LENSES

Ideally trial contact lenses should be used only once. If it is necessary to use trial lenses on a number of patients, in-practice disinfection procedures must be effective against bacteria, viruses (adenovirus, hepatitis, HIV), fungi and *Acanthamoeba*. Although there is a theoretical risk of transmission of HIV via trial contact lenses, there have been no reported cases.

All trial contact lenses used in patients who are carriers of infectious diseases

Level of risk	Application	Process	Example
Critical	Entry/penetration into sterile tissue, cavity or bloodstream	All items must be sterile e.g. steam under pressure	Needles, scalpels[14]
Semi-critical	Contact with intact mucosa or non-intact skin	Items should be sterile or there must be a minimum of high-level disinfection—preferably steam sterilisation or thermal disinfection (or high level chemical if heat not tolerated)	Tonometer probes, contact lenses, gonioscopy lenses, lacrimal cannulae[14]
Non-critical	Contact with intact skin	Items must be clean or undergo low/ intermediate level disinfection	Blood pressure cuffs, stethoscopes, head and chin rests, phoropters, epilation forceps

Table 2. Levels of reprocessing of medical devices

(for example, CJD, HSV, hepatitis, HIV or adenovirus) must be disposed of immediately. All multiuse contact lenses should be cleaned and rinsed just prior to and immediately after use and patients should be warned of the risks of reused lenses prior to fitting. Note: soft contact lenses that cannot be heat-treated are not suitable for use as trial lenses unless they are discarded after use.

Soft contact lenses cleaning procedures

The following procedures are based on the International Organization for Standardization (ISO) instructions for cleaning soft contact lenses:[30]

1. Clean contact lens with a hydrogel lens cleaner via digital cleaning (20 seconds per side).
2. Rinse with sterile preserved/aerosol saline.
3. Fill glass vial with sterile saline.
4. Label with lens parameters and date of heating.
5. Sterilise in autoclave at 134 degrees C for at least three minutes or 121 degrees C for at least 10 minutes.
6. Alternative: thermal disinfection unit 78 to 90 degrees C for 20 to 60 minutes.[31–33]
7. Optometrists could consider asking a local dentist or general medical practitioner to autoclave contact lenses, if they do not want to purchase their own bench-top unit.

Additional notes:

- Despite its efficacy, 3% hydrogen peroxide is not recommended, as contact lens parameter changes may occur with prolonged storage in peroxide.[34] In addition, lenses cannot be stored for longer than 24 hours in the neutralised peroxide solution[35] and transfer to a new storage solution carries the risk of recontamination.
- Chemically preserved disinfectants are not suitable, as they have unknown efficacy against viruses and are questionable at limiting biofilm formation and fungal growth.
- Practitioners should take care to avoid cutting themselves when removing metal seals on contact lens containers.

Gas permeable contact lenses cleaning procedures[30]

1. Clean contact lens with approved gas permeable (GP) cleaner via digital cleaning (20 seconds per side).
2. Rinse with sterile preserved/aerosol saline.
3. Soak in 3% hydrogen peroxide for a minimum of three hours.
4. Rinse with sterile preserved/aerosol saline.
5. Dry GP lens with a clean tissue and store in a dry container. There is significantly less risk of contamination during dry storage compared to long-term storage in conditioning solutions.[36,37]
6. GP lenses must be thoroughly surface cleaned and rinsed prior to reuse.

The use of a solution of sodium hypochlorite containing 20,000 ppm of available chlorine has been declared important for decontamination procedures for the reuse of rigid trial set contact lenses and ophthalmic devices in England because of vCJD.[38]

Recording of contact lens use and processing[30]

Optometrists should maintain a record of processing of contact lenses that logs:

1. the patient reference
2. the date of use
3. the date and method of hygienic management
4. contact lens details
5. a note to indicate when it is time to disinfect trial lenses again (this should occur monthly).

TONOMETERS

As tonometer probes are the most common item in the consulting room to regularly come into contact with mucous membranes and tears of patients, optometrists must ensure that they are cleaned and maintained appropriately. They should be cleaned before and after use.

In the literature,[33,39] there is some controversy about the most suitable method to disinfect tonometers. Common practice is to wash the tonometer prism, wipe with an alcohol swab and allow to air dry. The hepatitis C virus is removed only with a five-minute soak in 3% hydrogen peroxide or 70% alcohol, followed by wash in cold

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