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National Health and Medical Research Council
and the Australian National Council on AIDS

Infection Control

in the Health Care Setting

Guidelines
for the Prevention
of Transmission of
Infectious Diseases



National Health and Medical Research Council
NHMRC

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Preface

The Australian National Health and Medical Research Council (NHMRC) and the Australian National Council on AIDS (ANCA) have jointly reviewed infection control guidelines titled *Management guidelines for the control of infectious disease hazards in health care establishments* and *Infection control in office practice: Medical dental and allied health*. An Infection Control Working Party was established in March 1995 to undertake this task, and to continue the work of the joint ANCA/NHMRC Infection Control Review Group. Terms of reference and membership of the Working Party are included on page xiii.

Following extensive consultation with professional groups, industry and the community there appeared to be a need for national infection control guidelines which would address the needs of a broad range of health care settings. The resulting document *Infection control in the health care setting - Guidelines for the prevention of transmission of infectious diseases - April 1996* has been prepared by the Infection Control Working Party with this in mind, and replaces the previous publications referred to above.

As well as providing current technical information or 'best practice' for infection control, the document addresses some ethical issues for which a national approach is desirable. This includes policy guidelines on health care workers who may be infected with blood borne viruses such as HIV, hepatitis B and hepatitis C.

The scope of this document is intentionally broad, and whilst it does not attempt to cover all aspects of infection control in detail, it aims to establish a nationally accepted minimum standard for infection control. The guidelines outline the principles of infection control and provide a rationale against which practitioners and health care establishments can develop detailed protocols and systems for infection control which are relevant to their own area of health care.

The principles and standards outlined in this document are applicable to a wide range of health care establishments including hospitals, office practice (medical and dental), nursing homes, extended care facilities, community nursing, and emergency and first aid services.

Infection Control Working Party

Terms of reference

1. In accordance with NHMRC public consultation procedures:
 - finalise the draft NHMRC/ANCA document *Infection control in office practice: Medical, dental and allied health*; and
 - review the current NHMRC/ANCA publication *Management guidelines for the control of infectious diseases in health care establishments*;
2. Develop draft national policy guidelines on health care workers (including students) who are infected with HIV, HBV or HCV;
3. Maintain an ongoing review of infection control issues (including iatrogenic infections);
4. Report to CDSC and the ANCA Infection Control Review Group.

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Executive summary and recommendations

The need to review infection control guidelines has arisen due to the changing patterns of health care, changes in professional roles and responsibilities, and to changing perceptions of the risks associated with health care.

Changing patterns of health care include moves to non-hospital care, including 'hospital in the home' care, new modalities of care (technological advances in both procedures and instrumentation), recognition of blood borne viruses as a major cause of cross infection, awareness of new and emerging diseases and concerns about other infectious agents such as the PrP protein ('prion') implicated in transmission of Creutzfeldt-Jakob disease (CJD).

Although public expectation is that there is zero risk associated with health care, it should be appreciated that all health care procedures involving penetration of normally sterile body tissues, cavities or blood stream carry some degree of risk. The risk of patients developing infectious complications following treatment depends in part on the nature of the procedure, but may also be due to endogenous infection, and the length of time patients remain in hospital (long-stay patients are potentially exposed to infection when they are least able to resist infection). It should also be appreciated that health care workers are frequently involved in high risk procedures and may be exposed to infectious patients during provision of routine health care.

A practical approach to health care involves risk assessment and risk management based on strategies which minimise the risk of infection for both patients and health care workers. A risk management approach to infection control also involves balancing the costs and consequences of specific infection control procedures against the benefits that will flow from their application. The ongoing challenge in the current economic climate is to minimise the risks of disease transmission by adoption of a cost effective infection control strategy.

Risk minimisation strategies historically included the adoption of 'Universal Precautions', a concept defined in Australia as work practices which assumed that all blood and body substances were a potential risk of infection, independent of perceived risk. This concept was widely accepted as a 'first-line' approach to infection control. It provided a high level of protection against transmission of infection from carriers of blood borne viruses.

However, in Australia, it was perceived that the term 'Universal Precautions' was ambiguous, resulting in some confusion in its interpretation and false sense of security in its application. Some health care workers appeared to consider the use of gloves to be a substitute for hand washing, and there was concern that this mistaken perception could increase the risk of nosocomial transmission of infection.

As an alternative to the term 'Universal Precautions' the National Health and Medical Research Council and the Australian National Council on AIDS recommends adoption of the terms 'Standard Precautions' (applied as the first line approach to infection control) and 'Additional Precautions' where Standard Precautions may be insufficient to prevent transmission of infection. This change in terminology reflects a two tiered approach based on modes of disease transmission, and is in line with changes in terminology adopted by the US Centers for Disease Control and Prevention (CDC).

Infection control in the health care setting is based on the key principles of hygiene, cleanliness and sterility. It includes implementation of Standard Precautions and Additional Precautions, design of the premises, choice and type of equipment used (sharps reduction, ease of cleaning and sterilizing), occupational health and safety considerations, safe disposal of clinical waste, the appropriate use of antibiotics, regular monitoring of infections (acquired as a result of treatment in hospital or in office practice, as well as due to occupational exposure), an effective and ongoing education and training program for all levels of staff, and incorporation of infection control into a comprehensive quality management program.

However, infection control is not simply a matter of implementing standards and guidelines. It involves improving awareness and changing attitudes and work practices at both the institutional and individual level. It is essential that everyone involved in health care contribute towards raising the level of patient care, and patients' understanding of their treatment and care. Patients' rights should be considered when applying infection control standards. Infectious patients should be adequately informed about the risks of transmission of their infection to others, and the need for any additional precautions, such as special patient accommodation, prior to these precautions being implemented.

The revised guidelines have been structured in three parts:

- Part 1 Concepts, Principles and Process (white pages)
- Part 2 Infectious disease in the health care setting (green pages)
- Part 3 Special Issues (blue pages)

Recommendations

The principles of infection control should apply equally for similar procedures conducted in all health care settings. These revised infection control guidelines represent current best practice, and in some instances may offer significantly different advice or emphasis from previous NHMRC guidelines. The following recommendations have been selected for particular attention:

Standard and Additional Precautions

- Adoption of the terms 'Standard Precautions' and 'Additional Precautions' are recommended. 'Standard Precautions' apply to work practices which assume that all blood and body substances are potentially infectious and should be used as a first line approach to infection control. Standard Precautions include use of protective clothing (gloves, gowns, masks and eye protection) and regular hand washing. 'Additional Precautions' apply in those situations where Standard Precautions may be insufficient to prevent transmission of infection, and are used in addition to Standard Precautions - see pages 11 and 42. This change in terminology, reflecting a two tiered approach based on modes of disease transmission, is in line with changes in terminology adopted by the US Centers for Disease Control and Prevention (CDC).

Cleaning instruments and equipment

- The importance of thorough cleaning of instruments and equipment prior to disinfection or sterilization should be emphasised in all infection control education programs. The cleaning process should be adequately documented and checked regularly. Research into optimal conditions for cleaning, for example, detergent contact time, effective concentration and pH of detergents, should be encouraged.

Sterility

- Instruments and equipment used in a sterile (critical) site MUST be sterile. The simplest most effective means of sterilization is by steam under pressure (autoclaving). Sterilization procedures must be adequately monitored and documented. It is anticipated that benchtop autoclaves, as used in office practice, will be required to have a built-in drying cycle and print out facility for monitoring temperature and pressure (as applicable) and holding time, by the year 2000.
- Instruments used in semi-critical sites should be sterilized where possible or high level disinfected. Re-usable items must be processed to a sterility assurance level generally accepted for that particular sterilization process.
- New technologies for sterilizing heat sensitive equipment are now available, including low temperature glow plasma sterilizers and peracetic acid automated sterilizing systems. New systems of sterilization should be carefully monitored to ensure optimum performance and safety.

- Information should be obtained about the safety of sterilization procedures for re-usable items, and for re-use of items labelled as single-use.
- It is the responsibility of each health care professional who works with sterilization equipment to understand both its benefits and limitations. Formal training in sterilization practices, such as that provided by TAFE colleges, should be required.

Multi-dose vials and multi-use products

- Injectable products packaged in multi-dose vials should not be used except in particular cases, for example, where products such as insulin and human growth hormone are intended solely for use by an individual patient
- Where medications or preparations are intended for multi-use, care must be taken to ensure contamination of the product does not occur during use. Manufacturers of multi-use products which may potentially become contaminated during routine medical procedures should be encouraged to register single-use products that will minimise this risk.

Instrument and equipment design

- Equipment design, systems of operating and instrument handling should minimise the chances of a penetrating injury.
- Manufacturers should be encouraged to develop equipment which reduces the risk of sharps injuries and allows safer re-use. Manufacturers should also be encouraged to develop low cost equipment for single-use.
- Equipment intended for re-use should be designed to facilitate cleaning and sterilization or disinfection.
- Safety features of equipment should be considered prior to selection and purchase of that equipment.

Hepatitis B vaccination for health care workers

- Health care establishments should maintain immunisation programs that offer all staff, including trainees, hepatitis B vaccination, with post-vaccination testing to identify non-responders. Adequate information on the risks/benefits of vaccination should be provided to all staff to encourage participation. Hospital accreditation should require documented evidence of vaccination programs.
- A nationally endorsed health screening card for health care workers, indicating their vaccination status (in accordance with the recommended NHMRC immunisation schedule) should be considered.

Surveillance

- All health care establishments should establish an ongoing monitoring system for acute infections of nosocomial/iatrogenic importance in both patients and in patient-contact staff, including contract staff (agency and VMOs) and trainees, so that problems at all levels can be recognised quickly, to allow timely investigation and control, and to provide feedback for future preventive action. The system must include safeguards regarding privacy and assurances that treatment will not be compromised or staff subjected to discrimination. Support should be given for developing such monitoring systems through the microbiology reporting system.
- National minimum standards for collection of integrated national data on nosocomial/iatrogenic infection, including post-discharge follow-up, should be established.
- National surveillance of nosocomial/iatrogenic infection due to re-use of items labelled for single-use should be considered.
- National surveillance of occupationally acquired infection should be established.

Protocols and compliance with infection control standards

- Health care establishments should have in place specific protocols for infection control practice, based on national minimum standards such as these guidelines. They should have documented procedure manuals which demonstrate compliance with these standards. National systems for quality management should be considered.

Education and training in infection control

- Infection control education and training programs for HCWs should be targeted to their specific needs, continually updated and directly applied. Newly appointed or redeployed staff will require an appropriate level of training. Training programs provided by health care establishments should be adequately documented and linked to accreditation.
- Universities and training colleges which offer undergraduate courses in health related areas should ensure that the curriculum includes adequate and current information on infection control.

Work restrictions

- Infectious staff should not work with patients who belong to vulnerable categories until cleared by an infectious diseases (ID) specialist. This specialist should be nominated by the infection control committee or professional advisory board of the health care establishment.
- Local guidelines should be developed to identify particular infections likely to cause problems in each of the areas to which staff allocations are made, taking into account the likely general and specific immune status of the patients and the procedures undertaken. The decision whether or not an individual infected health care worker poses a risk should be assessed on a case-by-case basis, according to their activities in the health care establishment. This should not be left to the judgement of the individual HCW but be the responsibility of the advisory board and nominated ID consultant.

Leave entitlement

- Each health care establishment should have a clear and non-discriminatory industrial policy regarding award entitlements for infected health care workers. This should include policy regarding redeployment in either the short or long term.
- Income protection policies for self-employed health care workers need to define compensation for infected health care workers, both in the short and longer term.

Accident advisory service

- Hospitals should maintain a 24-hour advisory service for investigation and management of incidents which have potential to transmit infection either to or from staff. State and Territory health authorities should make arrangements for similar advice to be available to individual practitioners and small health care facilities on a 24 hour basis.
- In the event of accidental exposure to blood or body fluids contaminated with blood, information should be obtained as to the circumstances of the exposure, factors contributing to the exposure and management outcomes.

Funding implications

- There has already been a major upgrading (with associated costs) of infection control practice as new information about transmission of blood borne viruses and relative ineffectiveness of chemical disinfectants became available. There are additional funding implications where significant changes in infection control practice are required. These standards may not be routinely applied in many non-hospital settings without recognition that additional costs may be incurred, and will ultimately be borne by patients or third parties. Therefore, there should be specific funding provision and support for infection control in the development of fee-setting schedules and methods of payment for provision of health care in all health care settings, including office practice, in addition to specific funding for implementation of infection control strategies in hospitals.

- Key stakeholders and consumers should be consulted prior to any change in funding arrangements being implemented for hospitals, nursing homes and other health care agencies.

Roles and responsibilities

- Governments must appreciate they have a significant role in infection control as regulators and monitors of public and occupational health.
- Employers and employees must comply with Occupational Health and Safety standards.
- Health care establishments should display a written statement or poster indicating their compliance with infection control standards, to improve public confidence in the health care system.

Future directions

- There should be ongoing evaluation and review of infection control policies and practice, due to the dynamic nature of research and product development in the area of infection control. This information should be provided to staff on a regular basis, through ongoing education and training and should be implemented in future infection control strategies.
- New techniques such as DNA fingerprinting and restriction analysis of bacterial species for epidemiology studies, as well as computer assisted surveillance, will provide reliable high quality data on organism spread to more fully track outbreaks.
- There are a number of challenges which should be addressed in future strategies, including multiple drug resistant organisms, changing technologies (including increased laparoscopic procedures and interventional radiology), shorter in-patient stays, and increased use of day surgery. Post-discharge follow-up will allow evaluation of these changes.

Recommendations for health care workers and students infected with blood borne viruses

Exposure prone procedures and testing

- Health care workers (HCWs) undertaking exposure prone procedures have an ongoing responsibility to know their infectious status for HIV, hepatitis B and hepatitis C and should not perform exposure prone procedures where there is established evidence of a risk of transmission of infection from HCW to patient. HCWs who engage in exposure prone procedures should be encouraged to seek routine testing if they believe they are at risk of occupational or other exposures. If there is any uncertainty about the level of risk involved, the matter should be referred to an expert panel established by relevant State/Territory health authorities for individual assessment.
- Emphasis should be placed on the elimination of potentially unsafe practices.
- Individuals with HIV test results which have been confirmed positive by a State Reference Laboratory should not perform any procedure where there is a risk of HIV transmission. Where there is any uncertainty about the level of risk involved, individuals should be assessed by a State/Territory health and/or professional advisory board on a case-by-case basis to determine their continuing participation or modification of work practices.
- HCWs should not perform exposure prone procedures if they are HBV DNA or hepatitis B 'e' antigen (HBeAg) positive. Individuals who test positive for hepatitis B surface antigen (HBsAg) should only perform exposure prone procedures on the advice of a State/Territory health and/or professional advisory board. HBeAg positive individuals should not perform exposure prone procedures, as persons with the 'e' antigen pose a higher risk of infection to contacts than those who are HBsAg positive but HBeAg negative.

- HCWs with hepatitis C viraemia (current infection) should not perform exposure prone procedures, as in this situation there is a reasonable risk of transmission of infection. Individuals with indeterminate hepatitis C (HCV) test results should not be excluded from performing exposure prone procedures on the basis of test results alone. If test results are positive or indeterminate, HCWs should be clinically assessed by an experienced physician, over a reasonable period of time, for any sign of current/active infection. Where there is insufficient evidence of current/active infection, the treating doctor, or the individual concerned, should seek the advice of a State/Territory health and/or professional advisory board.
- The situation should be reviewed once further information becomes available about the real risk of inoculation injury of surgeons performing 'exposure prone' and the risks to patients if infected health care workers perform exposure prone procedures.
- It is the responsibility of the HCW's employer (including self-employed), in consultation with professional boards or health department advisory panels, to ensure staff have access to appropriate testing, counselling and vaccination programs, consistent with the principles of informed consent. Relevant documentation must be maintained for specific screening and immunisation activities.

Counselling and treatment

- Counselling should be offered pre- and post-testing. Infected HCWs should have a treating physician who may consult with an advisory board (anonymous to ensure confidentiality). Treating physicians should counsel the infected HCW so that the HCW makes appropriate choices about employment, particularly in regard to the continued involvement of the HCW in direct patient care. The treating physician should also take into account the psycho-social needs of the HCW and refer as appropriate for specialist counselling and support.

Reporting

- Following confidential clinical assessment and counselling, infected HCWs should be encouraged to report their infectious status to their employer and to their professional or advisory boards. Routine disclosure of the blood borne status of HCWs to patients is not recommended, because patients, like HCWs, are best protected by adoption of appropriate infection control practices, and because there is no onus of confidentiality on the patient.
- Medical practitioners are legally required to bring to the attention of the appropriate Registration Board (medical, dental, nursing etc) any registered professional person who is unable to practise competently and/or who poses a threat to public safety.

Confidentiality

- Confidentiality for the HCW infected with a blood borne virus not only safeguards personal rights, but is in the public interest. The right to confidentiality will encourage HCWs to seek appropriate testing, counselling and treatment and to consider disclosure of their serologic status to their employers.

Assistance for HCWs who have occupationally acquired a blood borne virus

- HCWs whose work practices have been modified because of infection with a blood borne virus should be provided, where practical, with opportunities to continue appropriate patient care activities in either their current position or in redeployed positions, or to obtain alternative career training. Health care establishments should consider whether the redeployed post should be 'equivalent' to the previous position and if so in what respects.
- Health care establishments should address the question of when (or if) treated HCWs who become PCR negative should be allowed to return to work.
- Compensation for infected HCWs should consider the actual grounds for compensation or the level of proof of occupational exposure to be applied to either new cases or to retrospective cases which are revealed by current testing.
- VMOs and agency nurses who become infected due to occupational exposure should be eligible for assistance under the same conditions as permanent employees.

‘Look-Back Investigations’ of patients of health care workers infected with a blood borne virus

- Selective ‘look-back investigations’ should be considered when there is evidence of significant violation of standard infection control practices (such as the presence of exudative dermatitis) during the time the health care worker was probably infected with the blood borne virus to ensure the treated public were not placed at risk. Evidence indicates that such investigations are of no benefit in other circumstances and should not be performed.

Compliance

- States and Territories should have systems in place to ensure compliance with these recommendations.

Health care worker students and training

- Training establishments should ensure that all HCW students are adequately vaccinated (in accordance with the NHMRC recommended immunisation schedule) to ensure protection against infections that are likely to be encountered in the course of their training.
- Students should not be placed in risk-exposure situations. Strategies should be developed that enable students to acquire clinical skills without risk to patients or themselves.
- Screening for hepatitis B, hepatitis C and HIV should not be undertaken in order to exclude students from courses of study.
- Training establishments should have policies or procedures in place for counselling students who may be inhibited from completing any requirement of the course because of disability or impairment, including infection with a blood borne virus. They should inform students of these policies and implications of potential disability or impairment (risks to themselves and their patients) **prior to course admission.**
- Support and counselling services, including processes for dealing with illness, impairment or disability which occurs during the course, should be established.
- Current training requirements which involve performance of exposure prone procedures should be assessed and an attempt made to provide alternative programs for infected students.
- Courses of instruction which provide training in careers that involve invasive procedures should include information, counselling, opportunities for testing, and career advice. This inclusion should be a requirement for course accreditation.
- If necessary students undertaking modified programs should have suitable limitations (conditional registration) placed on their subsequent registration. This may require an undertaking that exposure prone procedures will not be performed by those persons who are proven to be infected with HIV, hepatitis B or hepatitis C.
- Urgent discussions should be instituted between the Universities, teaching hospitals and the various Registration Boards to define and implement policy in this matter.
- Health care trainees should be subject to the same infection control and professional conduct requirements as qualified staff.

Part 1

Concepts, principles and process

1.1 Introduction

The primary objective for all Australian health care establishments should be the continuing improvement in the quality of care offered to all patients. An effective infection control strategy, based on preventing transmission of infection between health care workers (HCWs) and patients and between patients, is fundamental to achieving this objective.

Spread of infection requires three elements: a source of infecting micro-organisms, a susceptible host, and a means of transmission for the micro-organism.

In a hospital or similar health care establishment, human sources or hosts of the infecting micro-organisms include both patients and staff. Human hosts may be people who are acutely ill, people who have no symptoms but who are in the incubation or window period of a disease, or people who are chronic carriers of an infectious agent. Other sources of infecting micro-organisms can be the patient's own endogenous flora, or environmental objects, including medications, medical equipment and devices, that have become contaminated.

People have variable resistance to infection depending on their age, underlying disease, and other factors which may compromise their immune status, such as medical treatment with immunosuppressive agents or irradiation. The risk of transmission of infection is also higher for patients undergoing surgery and anaesthesia, and for patients remaining in hospital for lengthy periods. Indwelling devices, for example catheters, particularly when used over longer periods, can also increase the risk of nosocomial infection.

Diseases may be transmitted via the air borne (breathing), contact (touching) or alimentary (eating) routes, and the same organism may be transmitted by more than one route.

Air borne dissemination may occur via by either air borne droplet or dust particle. Air borne transmission includes aerosols (colloidal particles in a gas) which may be generated during certain procedures, including manual washing of instruments or equipment, ultrasonic cleaners operated without close fitting lids in place and fast moving equipment such as drills. Micro-organisms carried in this manner can be widely dispersed by air currents, through ventilation or air conditioning systems.

Droplet (distinct from air borne) transmission may be generated by sneezing, coughing, talking, or by medical procedures such as suctioning and bronchoscopy. Droplet distribution is limited by the force of expulsion and gravity whereas distribution of air borne particles is dependent on air motion.

Contact may be either direct or indirect, and is usually transmitted by hand or via contact with blood or body substances.

Transmission of infection may also occur via common vehicle (contaminated food, water, medications, devices or equipment). Vector borne transmission (via mosquitoes, flies, rats and other animals) is not considered to be significant in the Australian health care setting.

Universal precautions

Universal blood and body fluid precautions ('Universal Precautions') were originally devised by the US Centers for Disease Control and Prevention (CDC) in 1985, largely due to the HIV/AIDS epidemic and an urgent need for new strategies to protect hospital personnel from blood borne infections. The new approach placed emphasis for the first time on applying Blood and Body Fluid Precautions universally to all persons regardless of their presumed infectious status. Initially, Universal Precautions, as defined by the CDC, applied to blood, body fluids that had been implicated in the transmission of blood borne infections (semen and vaginal secretions), body fluids from which the risk of transmission was unknown (amniotic, cerebrospinal, pericardial, peritoneal, pleural, and synovial fluids) and to any other body fluid visibly contaminated with blood. Universal Precautions did not apply to faeces, nasal secretions, sputum, sweat, tears, urine or vomitus unless they contained visible blood.²⁵

Australia adopted a broader definition of Universal Precautions. All blood and body substances were considered to be potentially infectious. The principle was applied universally to all patients regardless of their infectious status or perceived risk. However, in Australia, it was perceived that the term 'Universal Precautions' was ambiguous, resulting in some confusion in its interpretation and false sense of security in its application. In addition, there was concern that the use of gloves was considered to be a substitute for hand washing, and that this perception could increase the risk of nosocomial transmission of infection.

The Infection Control Working Party has recommended adoption of the term 'Standard Precautions' as the basic risk minimisation strategy, with 'Additional Precautions' where Standard Precautions may be insufficient to prevent transmission of infection, particularly via the air borne route. This change in terminology, reflecting a two tiered approach based on modes of disease transmission, is in line with changes in terminology adopted by the US Centers for Disease Control and Prevention (CDC).

Standard Precautions

Standard Precautions are work practices required for the basic level of infection control. They include good hygiene practices, particularly washing and drying hands before and after patient contact, the use of protective barriers which may include gloves, gowns, plastic aprons, masks, eye shields or goggles, appropriate handling and disposal of sharps and other contaminated or infectious waste, and use of aseptic techniques. Standard Precautions include 'Enteric Precautions'.

Standard Precautions are recommended for the treatment and care of all patients, regardless of their perceived infectious status, and in the handling of:

- blood;
- all other body fluids, secretions and excretions (excluding sweat), regardless of whether they contain visible blood;
- non-intact skin; and
- mucous membranes.

Standard Precautions also apply to dried blood and other body substances, including saliva.

Additional Precautions

Additional Precautions are used for patients known or suspected to be infected or colonised with epidemiologically important or highly transmissible pathogens that can cause infection:

- by air borne transmission (e.g. *Mycobacterium tuberculosis*, measles virus, chickenpox virus); or
- by droplet transmission (e.g. mumps, rubella, pertussis, influenza); or
- by direct or indirect contact with dry skin (e.g. colonisation with MRSA), or with contaminated surfaces; or
- by any combination of these routes.

Additional Precautions are designed to interrupt transmission of infection by these routes and should be used in addition to Standard Precautions when transmission of infection might not be contained by using Standard Precautions alone. Additional Precautions may be specific to the situation for which they are required, or may be combined where micro-organisms have multiple routes of transmission.

Additional Precautions implies a two tiered approach to infection control, and assumes that in cases where transmission of infection may not be contained by Standard Precautions alone, Additional Precautions will be applied in addition to Standard Precautions. This two tiered approach to infection control should provide high level of protection to both patients and health care workers in all health care settings.

Implementation of Standard and Additional Precautions is discussed in Section 1.7, page 42.

Principles of infection control

A successful infection control strategy is based on the following principles:

- appreciation of basic microbiology and modes of disease transmission;
- implementation of work practices which prevent transmission of infection (Standard and Additional Precautions, including use of barrier protection);
- conscientious hygiene, including appropriate hand washing (routine, aseptic, surgical) and regular cleaning of work areas, equipment and instruments;
- adoption of nationally recommended procedures for sterilization and disinfection;
- modification of clinical procedures which may be affected by or affect an underlying infectious disease, as well as consideration of alternative, non-invasive procedures;
- single-use equipment used routinely where this is practical;
- appropriate use of antibiotics;
- support for occupational health and safety policies and practice, including;
- vaccination against infections which are a potential risk in the health care setting;
- surveillance of nosocomial/iatrogenic and occupationally acquired infection;
- ongoing quality management and quality improvement activities;
- legal and ethical considerations; and
- ongoing education and training for all levels of staff involved in provision of health care, to improve awareness and to encourage compliance with national infection control standards.

The success of an infection control strategy depends on:

- a facility wide application;
- integration into a comprehensive quality management program;
- a total organisational commitment;
- ongoing assessment; and
- regular evaluation of effectiveness.

1.2 Hygiene standards for health care establishments

Consistently high hygiene standards should apply for all staff involved in patient treatment and care. Work areas and equipment must be cleaned regularly, hands must be washed frequently (see Table 1, page 15), uniforms should be clean, and hair should be tied back or covered (and beards covered) when undertaking aseptic or sterile procedures.

High standards of hygiene are required for all health care procedures whether these occur in a hospital setting, in medical or dental practices, or in any other health care establishment, including those establishments where students are trained.

Hand washing and hand care

Hand washing is generally considered to be the most important measure in preventing the spread of infection. Hands should be washed **before** significant contact with any patient and **after** activities likely to cause contamination.

Significant patient contact may include:

- physical examination of a patient;
- emptying a drainage reservoir (catheter bag);
- undertaking venipuncture or delivery of an injection.

Activities which can cause contamination include:

- handling equipment/instruments soiled with blood or other body substances;
- direct contact with body secretions or excretions;
- going to the toilet.

Table 1 page 15 summarises hand washing techniques (routine and surgical) and includes examples for each level of hand washing. Hand washing facilities (basins) are discussed on page 17.

A neutral pH soap (with no added substances which may cause irritation or dryness) should be used for routine hand washing. If liquid soap is dispensed from reusable containers, these must be cleaned when empty and dried prior to refilling with fresh soap. Scrub brushes should not be used routinely as their use may result in abrasion of the skin, and they may be a source of infection.

For routine hand washing wet hands thoroughly and lather with soap, vigorously rubbing hands together for at least 10-15 seconds. Rinse under running water. Dry hands with disposable paper towel. To minimise 'chapping' of hands, pat dry rather than rub them. If cloth towels are used a fresh towel (or fresh portion of towel if a roller towel is used) must be used each time. In hospitals or similar health care establishments, mechanical or electric hand dryers should not be used as these may disperse micro-organisms. Do not touch taps with clean hands - if elbow or foot controls are not available, use paper towel to turn taps off.

A surgical hand wash is required before any procedure which involves penetration of normally sterile tissues. This includes surgical entry into tissues, cavities or organs for diagnostic or therapeutic purposes, for example, operating theatre procedures). Hands, nails and forearms should be washed thoroughly to remove dirt and transient bacteria. A suitable anti-microbial skin cleanser, for example, containing 4 per cent w/v chlorhexidine⁵³ or detergent based povidone iodine containing 0.75 per cent available iodine⁵³ should then be applied. The first surgical hand wash for the day should be for a minimum period of 5 minutes and subsequent washes for 3 minutes. Hands should be dried carefully using sterile towels, taking care not to touch any non-sterile object. Surgical hand wash is required prior to wearing sterile gloves.

For non-surgical procedures which require aseptic techniques, such as insertion of indwelling catheters, hands should be washed thoroughly for at least 1 minute using an anti-microbial soap or skin cleanser, paying particular attention to the space between the fingers and around the nails. Hands should be carefully rinsed, keeping hands above the elbows and dried with paper towel. Do not touch taps with clean hands - if elbow or foot controls are not available, use paper towel to turn taps off.

In emergencies where there may be insufficient time for routine or surgical hand wash, an alcoholic chlorhexidine preparation may be used.

In field emergencies when hand washing facilities are limited or not available, it is advisable to use a detergent-containing towelette to cleanse hands before using any chlorhexidine antimicrobial hand washes. Single-use sachets of alcoholic chlorhexidine may be useful in field situations. Alcohol is not a good cleansing agent and is not recommended in the presence of physical dirt.

Hand care is also important, as skin that is intact (no cuts or abrasions) is a natural defence against infection. Any breaks or lesions of the skin are possible sources of entry for pathogens. Cuts and abrasions should be covered by water-resistant occlusive dressings which should be changed as necessary or when the dressing becomes soiled. HCWs who have skin problems such as exudative lesions or weeping dermatitis must seek medical advice and must be removed from direct patient care until the condition resolves.

Repeated hand washing and wearing of gloves can cause irritation or sensitivity, leading to dermatitis or allergic reactions. This can be minimised by the use of suitable hand creams. Hand care products marketed in Australia which claim a therapeutic use are generally either listed or registered on the Australian Register of Therapeutic Goods (ARTG) and must display either the Aust L or Aust R number on the label. Registered (Aust R) products are assessed for safety, quality and efficacy. Listed (Aust L) products are reviewed for safety and quality. Labelling is part of this regulatory system, and should be checked to determine the product's suitability, as some hand creams are not compatible with the use of chlorhexidine. Aqueous-based hand creams should be used prior to wearing gloves. Oil-based preparations should be avoided as these may cause latex gloves to deteriorate.

Gloves should be used as an adjunct to hand washing when contamination of hands with blood or body fluid is anticipated. Gloves should be changed and hands washed after each patient procedure and also during multiple procedures on the same patient where a risk of cross-contamination exists.

Table 1: Hand washing techniques

Type	Technique (How)	Duration	Drying	Example (When)
Routine hand wash	<p>Wet hands thoroughly and lather vigorously using neutral pH soap. Rinse under running water.</p> <p>Do not touch taps with clean hands - if elbow or foot controls are not available, use paper towel to turn taps off.</p>	10-15 seconds.	Pat dry using paper towel	<p>Before eating or smoking</p> <p>After going to the toilet</p> <p>Before significant contact with patients e.g. physical examination, emptying a drainage reservoir (catheter bag)</p> <p>Before injection or venipuncture</p> <p>Before and after routine use of gloves</p> <p>After handling any instruments or equipment soiled with blood or body substances.</p>
Hand wash prior to aseptic procedures (non-surgical)	<p>Wash hands thoroughly using an anti-microbial soap or skin cleanser. Rinse carefully.</p> <p>Do not touch taps with clean hands - if elbow or foot controls are not available, use paper towel to turn taps off.</p>	1 minute	Pat dry using paper towel	Before any non-surgical procedures which require aseptic techniques (such as inserting intravenous catheters)
Surgical wash	<p>Wash hands, nails and forearms thoroughly and apply an anti-microbial skin cleanser (containing 4 per cent w/v chlorhexidine⁵³ or detergent based povidone iodine containing 0.75 per cent available iodine⁵³). Rinse carefully, keeping hands above the elbows.</p> <p>No-touch techniques apply.</p>	First wash for the day 5 minutes and subsequent washes 3 minutes	Dry with sterile towels	Before any invasive surgical procedure (operating room procedures)

1.3 Physical environment

The design of the premises is fundamental to infection control and implementation of Standard and Additional Precautions. All new or renovated health care premises should incorporate in their design and layout the physical requirements (discussed below) which are essential for an effective infection control strategy. Adequate barriers for infection control are impossible or difficult to maintain, unless the premises have separate and clearly defined operating and cleaning areas (see page 18). Work areas should be well ventilated and have adequate lighting, and should allow easy access to equipment, and safe storage of equipment not in use.

Patient accommodation areas should also have adequate ventilation and an adequate number of hand basins should be provided to encourage staff to wash their hands regularly. The room/ward size and number of beds per room should be limited. An adequate number of single rooms with self-contained toilet and bathing facilities and staff hand washing basins should also be provided.

The design of the premises should consider movement of people and equipment in ways that minimise the risk of transmission of infection.

Ventilation

Ventilation equipment should maintain the inflow of fresh air and temperature, humidity and purity (dust, micro-organisms and gases) of the air within prescribed limits. Air conditioners and cooling towers should not be a source of contamination, particularly with respect to Legionella (see new NHMRC Australian Guidelines for the Control of Legionella Infection) and should comply with and be maintained in accordance with Federal, State/Territory guidelines on cooling towers and hot and cold water services, and with relevant Australian Standards. Hospital air-conditioning systems should be monitored regularly and serviced by accredited service technicians. Maintenance schedules should be documented.

Air conditioning or ventilation systems in critical areas such as operating theatres, delivery rooms, Tuberculosis isolation rooms, burns and intensive care units, and emergency treatment rooms, as well as in special treatment or procedural areas should provide high quality air at all times. Where the sterile supply/service unit is attached to operating rooms, ventilation should be provided by a treated air supply and air conditioning should comply with AS 1386. Air conditioning in separate sterile supply/service units should comply with AS 1132. - see National Co-ordinating Committee on Therapeutic Goods *Standard for the Operation of Sterile Supply/Services in Health Care Facilities* (January 1995).⁸²

Where there is a risk of air borne transmission of pathogenic micro-organisms, there should be a sufficient number of single rooms (1 per 100 beds) with adequately filtered air conditioning which should have external exhaust systems. No recirculation of air should be permitted. For tuberculosis isolation and treatment rooms, negative pressure ventilation should be made available, in accordance with nationally endorsed guidelines, and State and Territory tuberculosis guidelines. The Centers for Disease Control and Prevention has also produced Tuberculosis guidelines.²⁶ A minimum of six air changes per hour (ACH) are advised, including at least 2 outside air changes per hour, plus good air circulation within the room.

In office practice, air conditioners should be regularly maintained and air filters should be cleaned or changed regularly.

Patient accommodation

Wherever possible, hospitals should restrict room size and also the number of beds per room (ideally 4 beds per room), to minimise the risk of cross infection. Shared patient accommodation should include facilities such as toilets, baths and showers which are easy to clean and conveniently located to minimise unnecessary patient movement throughout the establishment. Staff hand washing basins should also be located in patient areas.

In acute care situations it is essential that there should be an adequate number of single rooms available, at least one single-patient room for every 5 ward beds. At least one respiratory isolation room per every 100 beds should be available, with its own total exhaust ventilation system and no recycled air permitted (see page 16).

For patients infected with epidemiologically significant pathogens, for example, MRSA, or gastroenteritis and enteric pathogens, a single room with self-contained toilet and washing facilities should be available. Where this is not possible, cohort placement, noting sensitivity patterns of other patients similarly infected, and where the likelihood of cross infection or re-infection is not significant, should be considered.

Patient waiting areas in both hospital outpatient areas and office practice waiting rooms should have provision for separating patients who may be highly infectious, for example, patients diagnosed with or suspected to have measles. A triage check system should be in place to identify such patients - see page 43.

Hand washing basins

Staff should be encouraged to wash their hands before and after every patient contact - see page 13. In all health care establishments hand washing basins with hot and cold water supplies, taps with hands off controls, supplies of soap or detergent and disposable paper towels or clean cloth towels should be readily available. Each operating area should contain at least one hand basin for hand washing only. Hand washing basins should comply with appropriate Australian Standards (AS 1730-1989).

In hospitals, there should be one hand washing basin OUTSIDE each single room. The ensuite hand basin inside the room is not appropriate for staff hand washing. If two single rooms are adjacent, a single staff hand washing basin is sufficient. There should be at least one hand washing basin for every 4 beds and these should be situated at the entrance to any shared area and be easily visible. If the shared ward area is smaller than 4 beds then this area will need its own hand washing facilities at or near the entrance to the room.

Taps should be fitted with an anti-splash device, and should ideally be operated without hand contact (i.e. by the elbow, knee or foot). Where filters are fitted to taps in place of anti-splash devices, they should be cleaned regularly.

In medical and dental practices hand washing basins should be provided in areas where patient treatments are performed but at a sufficient distance to avoid splashing patients. In health care practices where minimal invasive procedures occur, for example, in acupuncture clinics, hand washing basins may be either installed or easily accessible from areas where patient treatments are performed. The importance of regular hand washing must be emphasised in all situations where there is significant patient contact - see page 13.

Work and treatment areas

Work areas should be planned carefully. The area should be well lit and well ventilated. There should be sufficient bench space in work areas to accommodate the necessary equipment (including a steam sterilizer) and to ensure the separation of sterile, clean and dirty instruments and equipment. Equipment should be positioned and stored safely to minimise the risk of injury. Free access to work areas should be maintained at all times.

It may be helpful to use colour coding for particular work zones, as defined in AS 3500.1. Zones may be defined as:

- GREEN for clean zones (storage of clean instruments, equipment and medications);
- ORANGE for treatment zones (contaminated with material from the current patient);
- RED for contaminated zones (instrument cleaning area, dental or path lab).

As a general rule, staff may move from GREEN to ORANGE or ORANGE to RED zones without changing gloves, but NEVER from RED to ORANGE, RED to GREEN or ORANGE to GREEN.

Additional zones may include:

- YELLOW for hand washing zone attached to treatment areas; and
- WHITE for staff room (food storage, preparation and consumption, and potable water supply). Staff eating and recreation areas must be separate from work areas and patient treatment areas.

Sterile operating field

The concept of the 'sterile field', practised for many years by surgeons and anaesthetists, should be adopted by all practitioners undertaking invasive procedures. Anything within a defined radius must be clean, sterilized (or at least high level disinfected), and draped between each and every case.

In dental practice, the operating field includes anywhere that the patient's blood (or other body substances, including saliva) may allowably transfer during a procedures. This is discussed in further detail in Special issues No. 3b - see page 88.

Cleaning areas

Adequate barriers for infection control are impossible or difficult to maintain, unless the premises have separate and clearly defined operating and cleaning areas. Careful delineation of these areas facilitates easy identification of surfaces which should be cleaned and disinfected between patients. Both areas should have smooth impervious surfaces without crevices, adequate lighting, good ventilation (to reduce the risk of cross-infection from aerosols) and bins for the disposal of hazardous waste (AS 4187-1994:13-14).

The cleaning area should be divided into a contaminated section and a clean section:

- the contaminated section should include adequate bench space for dismantling and working on equipment, at least one deep sink or trough (stainless steel) for cleaning instruments and other equipment, cleaning and disinfecting materials and equipment including brushes and ultrasonic cleaner, and an autoclave (AS 4187-1994:13-14). Cleaning sinks must be located separately to hand washing basins to avoid risk of contamination and must be used only for decontamination of equipment and instruments. Where filters are fitted to taps in place of anti-splash devices, they should be cleaned regularly. In office practices where there are no surgical or dental procedures being carried out, for example, in acupuncture clinics, a stainless steel or smooth hard plastic bowl dedicated to use in the cleaning and decontamination of instruments and devices, may be used as an alternative to a sink for cleaning;
- the clean section should be carefully defined and protected from all vapours, splashing or aerosols produced during operating, hand washing, equipment washing, disinfection and ultrasonic cleaning. The area should have adequate storage space and be used only for the storage of effectively covered or packaged cleaned, disinfected and/or sterilized instruments and equipment. Nothing in this area should be touched while operating procedures are being carried out (AS 4187-1994:13-14).

Surface materials

Regular routine cleaning of the health care establishment premises can be carried out much more efficiently if the design of the building is adapted to its function. Unnecessary horizontal, textured, moisture retaining surfaces or inaccessible areas where moisture or soil will accumulate should, if possible, be avoided. All fixtures and fittings should be designed to allow easy cleaning and to discourage the accumulation of dust. Blinds are preferable to curtains for this reason.

Where there is likely to be direct contact with patients, or with blood and body fluids, floors and walls should be surfaced with smooth, impermeable seamless materials, such as vinyl. In equipment processing areas work surfaces should be non-porous, smooth and easily cleaned.

In hospitals all surfaces in high risk treatment areas, including the operating theatre, intensive care unit, delivery room, and premature baby department, should be smooth and impervious.

Treatment areas in office practice should not be carpeted. Where the premises are carpeted and where the procedure being undertaken is likely to result in spillage of blood or body fluids, plastic or rubber overlays can be used to prevent any spills soaking into the carpet. Flooring should be able to be easily cleaned and in good repair.

Routine cleaning of facilities and surfaces

Standard Precautions (see page 11) should be implemented when cleaning surfaces and facilities. Staff should wear suitable gloves and other protective clothing appropriate for the task. Protective eyewear should be worn where splashing is likely to occur.

Toilets, sinks, wash-basins, baths, shower areas, and surrounding areas should be cleaned regularly or as required. Bed pans and urinals should be cleaned with an abrasive cleaner, rinsed in warm water then dried and stored appropriately. Cleaning methods for these items should avoid generation of aerosols.

Although environmental surfaces play a minor role in the transmission of infections, a regular cleaning and maintenance schedule is necessary to maintain a safe environment, in office practice as well as in hospitals. Surfaces should be cleaned on a regular basis using only cleaning procedures which minimise dispersal of micro-organisms into the air. In hospitals, floors should be cleaned daily or as necessary with a vacuum cleaner fitted with a bacteria retaining filter, which should be changed in accordance with manufacturer's instructions. The exhaust air should be directed away from the floor to avoid dust dispersal. A ducted vacuum cleaning system can also be used, as long as safe venting of the exhaust air is ensured. Alternatively, damp dusting or cleaning with a dust retaining mop is acceptable. Brooms disperse dust and bacteria into the air and should not be used in patient areas. Routine surface cleaning should proceed as follows:

- clean and dry work surfaces before and after each session, or when visibly soiled. Spills should be dealt with immediately - see spills management page 19;
- use detergent and warm water for routine cleaning;
- where surface disinfection is required, use in accordance with manufacturers' instructions;
- clean and dry surfaces before and after applying disinfectants;
- empty buckets after use, wash with detergent and warm water and store dry;
- mops should be cleaned in detergent and warm water then stored dry.

Chemical disinfectants are not recommended for routine cleaning, although chlorine releasing agents (CRAs) are still recommended and are widely used in circumstances during which significant risk of infection transfer may be identified, for example, treatment of spillage of contaminated exudates from infected patients - see spills management page 19.

Chlorine concentrations may decrease with time of storage, elevated temperature, and exposure to light. It has also been established that pH has a great influence on the antimicrobial activity of chlorine, with low activity at alkaline pH, and high activity at neutral pH.^{47,111} Where chlorine solutions are required, these should be made up daily or as required. Chlorine solutions are also corrosive to some metals, especially aluminium, and may not be appropriate in some situations. Table 7, page 80 lists some common disinfectants and their properties, including their range of activities (virucidal, bactericidal, mycobactericidal, sporicidal or fungicidal).

Disposable coverings, for example, plastic-backed single-use paper bench liners, may be used to reduce surface contamination. They are often a viable and economical alternative to surface disinfection but should be changed frequently and when visibly soiled or damaged. When liners are changed, the underlying bench surface should be cleaned as above, and disinfected if contaminated. Trays (which can be disinfected or sterilized according to need) to hold and carry instruments should also be used where possible to assist in reducing surface contamination.

Spills management

Health care establishments should have management systems in place for dealing with blood and body substance spills. Protocols for spills management should be included in procedural manuals, and emphasised in ongoing education or training programs. Standard Precautions apply where there is a risk of contact with blood or body substances - see page 11, and protective clothing (see page 46) should be worn.

The management of spills should be sufficiently flexible to cope with the circumstances in which the spill occurs, and may depend on a number of factors, including:

- the nature of the spill (e.g. sputum, vomit, faeces, urine, blood or laboratory culture);
- the likely pathogens that may be involved in these different types of spills (e.g. *Mycobacterium tuberculosis* in sputum);
- the size of the spill (e.g. spot, small or large spill);
- the type of surface (e.g. carpet or impervious flooring);
- the area involved (i.e. whether the spill occurs in a contained area such as a microbiology laboratory or in a public area such as hospital ward or outpatient area); and
- whether or not there is a likelihood of bare skin contact with the soiled surface.

Table 2 page 21 suggests a management protocol for blood or body substance spills in a health care setting.

In areas such as hospital wards, waiting rooms, or patient treatment areas, blood and body substance spills should be dealt with immediately. However, in operating rooms, or in circumstances where medical procedures are underway, spills should be attended to as soon as it is safe to do so.

Small spills can be easily managed by wiping the area immediately with paper towelling and then cleaning the area with water and detergent. Where there is a possibility of bare skin contact with the surface, for example on an examination couch, the area should be disinfected with a suitable disinfectant such as sodium hypochlorite containing 1000 ppm available chlorine. Small spots or drops of blood or body fluids can be removed immediately by wiping the area with a damp cloth, tissue or paper towelling. A disposable alcohol wipe can also be used.

Where large spills have occurred in a 'wet' area, such as a bathroom or toilet area, the spill should carefully hosed off into the sewerage system and the area flushed with water and detergent. After the area is cleaned and if there is a possibility of bare skin contact with the surface, the area should be disinfected as above with sodium hypochlorite (1000 ppm available chlorine) or other suitable (equivalent acting) disinfectant.

Large blood spills which have occurred in 'dry' areas (such as a hospital ward or patient treatment areas in office practice) should be decontaminated and the area of the spill contained. In these circumstances, and for the protection of health care workers involved in removal of a large spill, concentrations of 10 000 ppm available chlorine are usually recommended. Studies have indicated that formulations providing 10 000 ppm available chlorine may be ineffective for treatment of blood spills unless applied at a v/v ratio of 9 parts disinfectant to 1 part blood.²¹ Granular formulations which produce these high available chlorine concentrations and also contain the spilled material are therefore preferred. A scraper and pan should be used to remove the absorbed material. The area of the spill should then be cleaned with a mop and bucket of water and detergent. The bucket and mop should be thoroughly cleaned after use and stored dry. If contact with bare skin is likely, the area should be again disinfected with sodium hypochlorite (1000 ppm available chlorine) or other suitable disinfectant, as above.

Standard cleaning equipment, including a mop and cleaning bucket plus cleaning agents should be readily available for spills management and should be stored in an area known to all staff. This is particularly important in patient areas such as hospital wards or treatment areas. To facilitate management of spills in areas where cleaning materials may not be readily available, a disposable 'spills kit' could be used, assembled as follows:

- a large (10 litre) reusable plastic container or bucket with fitted lid, containing;
- a 5 litre impervious container (treated cardboard or plastic) with fitted lid for waste material;
- 2 large (10 litre) zip seal plastic bags for waste material;
- a disposable, sturdy cardboard scraper and pan (similar to a 'pooper scooper');
- 5 granular disinfectant sachets containing 10 000 ppm available chlorine or equivalent (each sachet should contain sufficient granules to cover a 10 cm diameter spill);
- disposable rubber gloves suitable for cleaning;
- eye protection (disposable or re-usable);
- a plastic apron;
- a mask (for protection against inhalation of powder from the disinfectant granules, or aerosols from high risk spills which may be generated during the cleaning process).

Disposable items in the spills kit should be replaced after each use of the spills kit.

With all spills management protocols, it is essential that the area is left clean and dry.

Table 2: Management of blood or body substance spills

Spot cleaning	Small Spills (up to 10 cm diameter)	Large Spills (greater than 10 cm diameter)
<p>Wipe up spot immediately with a damp cloth, tissue or paper towel. An alcohol wipe may also be used.</p> <p>Discard contaminated materials (tissue, paper towelling, alcohol wipe) in accordance with State/Territory regulations.</p> <p>Wash hands.</p>	<p>Collect cleaning materials and equipment (*Spills kit optional).</p> <p>Wear disposable cleaning gloves. Eyewear and plastic apron should be worn where there is a risk of splashing occurring.</p> <p>Wipe up spill immediately with absorbent material e.g. paper hand towelling. Place contaminated absorbent material into impervious container or plastic bag for disposal.</p> <p>Clean the area with warm water and detergent, using disposable cleaning cloth or sponge.</p> <p>Where contact with bare skin is likely disinfect area by wiping with sodium hypochlorite 1000 ppm available chlorine (or other suitable disinfectant solution) and allow to dry.</p> <p>Discard contaminated materials (absorbent towelling, cleaning cloths disposable gloves and plastic apron) in accordance with State/Territory regulations.</p> <p>Wash hands.</p> <p>Re-usable eyewear should be cleaned and disinfected before re-use.</p>	<p>Collect cleaning materials and equipment (*Spills kit optional).</p> <p>Wear disposable cleaning gloves, eyewear, mask and plastic apron.</p> <p>Cover area of the spill with granular chlorine releasing agent (10 000 ppm available chlorine) or other equivalent acting granular disinfectant and leave for 3-10 minutes, depending on formulation and labelling instructions.</p> <p>Use disposable (e.g. cardboard) scraper and pan to scoop up granular disinfectant and any unabsorbed blood or body substances. Place all contaminated items into impervious container or plastic bag for disposal.</p> <p>Wipe area with absorbent paper towelling to remove any remaining blood and place in container for disposal.</p> <p>Discard contaminated materials (scraper and pan, absorbent towelling, disposable gloves and plastic apron) in accordance with State/Territory regulations.</p> <p>Wash hands.</p> <p>Use ward cleaning materials to mop area with warm water and detergent.</p> <p>Where contact with bare skin is likely disinfect area by wiping with sodium hypochlorite 1000 ppm available chlorine (or other suitable disinfectant solution) and allow to dry.</p> <p>Clean and disinfect bucket and mop, dry and store appropriately.</p> <p>Re-usable eyewear should be cleaned and disinfected before re-use.</p>

- Notes:
1. Spill = a spill of blood or body substances.
 2. *Spills kit - see page 20.
 3. Where a spill occurs on a carpet, shampoo as soon as possible - do not use disinfectant.
 4. Hypochlorites are corrosive to metals - sodium dichloroisocyanurates are less corrosive to metals but it may be difficult or impossible to prepare concentrated solutions above 1000 ppm.
 5. Wash hands thoroughly after cleaning is completed.

Management of clinical and related waste

Clinical and related wastes are defined as wastes arising from medical, nursing, dental, veterinary, pharmaceutical, or similar practices, and wastes generated in hospitals or other facilities during the investigation or treatment of patients or in research projects. Management of clinical and related wastes will need to conform with relevant State and Territory regulations.

Arrangements for collection and disposal of solid clinical waste should depend on the location, size and existing infrastructure of each health care establishment. In hospitals or large health care establishments, there should be clear access to waste disposal facilities, including facilities such as sluices for disposal of large volumes of liquids, for example, 24 hour urine collections. In office practice, small volumes of blood, urine or faeces can be disposed of via the sewerage system, although disposal of any large volume of waste should follow local regulations.

NHMRC national guidelines for the management of clinical and related waste recommend that institutions generating such waste must ensure its safe identification, packaging, labelling, storage, transport, treatment and disposal, from the point of generation to the point of final disposal.⁹¹

Clinical and related wastes may include:

- sharps;
- infectious waste;
- human tissues;
- cytotoxic waste;
- pharmaceutical waste;
- chemical waste;
- radioactive waste;
- plastic waste; and
- general waste.

Waste should be segregated at the point of generation, using appropriately colour coded and labelled containers, as follows:

- infectious waste must be placed in yellow containers bearing the international black biohazard symbol, and marked 'Infectious Waste';
- cytotoxic waste must be placed in purple containers bearing the telophase symbol, and marked 'Cytotoxic Waste';
- radioactive waste must be placed in red containers with the black international radiation symbol and marked 'Radioactive Waste'.

A large proportion of clinical and related wastes is no more dangerous than domestic waste. Waste segregation at the source allows for supervised landfill as a viable alternative to incineration for the bulk of clinical and related wastes generated. Responsible clinical waste management require treatment of the waste before landfill disposal. Microbiological cultures should be rendered safe by autoclaving before they leave the control of laboratory personnel. Infectious waste may be disposed of by incineration or landfill. Where landfill disposal of clinical and related wastes is intended, identifiable body parts, pharmaceuticals, cytotoxic and radioactive wastes should be excluded at source. Where clinical and related wastes are landfilled the site must be confirmed as suitable.

Any clinical and related wastes can be deemed infectious by the relevant institutes or government authorities. Thus, whatever is designated as infectious waste should be treated accordingly.

Infectious waste usually includes the following categories:

- waste as specified by the institute's infection control guidelines;
- laboratory and associated waste directly involved in specimen processing;
- human tissues or animal carcasses which are contaminated or suspected to be contaminated by pathogenic organisms; and
- sharps.

The disposal of dental amalgam widely used in restorative dentistry may be subject to local regulations.

Standard Precautions should apply when handling infectious wastes. All waste should be handled with care to avoid injuries from concealed sharps (which may not have been placed in sharps containers). Gloves and protective clothing should be worn when handling infectious waste bags and containers. Personnel involved in the handling of such waste should be properly trained. Where possible, manual handling of waste should be avoided.

Infectious waste must be placed in appropriate leakproof bags or containers. These should not be overfilled, and must not be compacted by hand.

Trolleys used for transport of infectious or other hazardous waste should be clearly labelled as such, and used only for waste transport. They should be cleaned regularly (at least weekly), never overfilled, and fitted with drip trays to contain leaks or spills.

Protocols for waste disposal should follow national guidelines or codes of practice and must comply with State or Territory and local regulations. Although current categories and terminology may vary between States and Territories, it is hoped that every effort will be made to comply with terminology and labelling of waste as specified in the NHMRC national guidelines for the management of clinical and related waste.⁹¹

Table 3 page 26 is a general guide only for recommended identification for containment and disposal of waste. Government authorities should be contacted for more detailed information.

Handling and disposal of sharps

Sharps represent the major cause of accidents involving potential exposure to blood borne diseases. Sharps must be handled with care at all times. Methods of handling sharps during medical or dental procedures should be devised so as to minimise the risk of injury.

Sharp instruments **MUST NOT** be passed by hand between HCWs. Where possible, alternatives should be considered, including needleless IV systems, use of blunt needles for drawing up sterile solutions from ampoules, or retractable needle and syringe systems.

To prevent injury, needles should not be resheathed unless an approved recapping device is used. Needles should not be bent or broken by hand, removed from disposable syringes or otherwise manipulated by hand

All persons generating a sharp must be responsible for its safe disposal **IMMEDIATELY** following its use and **AT THE POINT OF USE**. Disposable needle-syringe combinations, needles, scalpel blades, single-use razors and other sharp items should be discarded in a clearly labelled, puncture-resistant container which must conform with Australian Standard AS 4031.

Reusable sharps must be placed in a puncture resistant container, especially kept and labelled for that purpose, which must conform with AS/NZS 4261. Reusable sharps containers must be cleaned before reuse. Reprocessing of used sharp instruments should be carried out in a way that minimises injury. See cleaning of instruments and equipment page 30.

Health care establishments should provide documented Standard Operating Procedures (SOPs) for safe handling of sharps, and ensure that HCWs are fully trained in the recommended techniques.

ANCA Bulletin No. 16 page 122, provides information on post exposure management of needlestick and blood accidents.

Linen and laundry services

Hospital or commercial linen services should have documented policies and procedures for the collection, transport, processing and storage of all linen.

Clean and soiled linen should be sorted, transported and stored separately. Used linen should not be rinsed or sorted in patient care areas, but should be placed in bags at the point of generation. Care should be taken to

ensure that there are no sharps or other objects inadvertently discarded into linen bags. Bags should not be overfilled, as this may prevent closure or increase the risk of rupture of the bags in transit.

Gloves should be worn when handling soiled linen. Linen which is heavily soiled with blood or body substances should be placed and transported in leakproof bags, in accordance with State/Territory health department guidelines.

Routine washing procedures using hot water and detergents are adequate for decontamination of most laundry items. Following neurosurgery, normal laundering and autoclaving is suitable for non disposable gowns which are not soiled with blood, CSF, brain or neural tissue. However, protective clothing or linen soiled with blood, CSF, brain or neural tissue, or where CJD contamination is suspected, may be incinerated - see CJD guidelines.⁸⁶

Australian Standard AS 4146 provides guidelines for correct laundry practice.

Food Services

Food preparation and handling should comply with relevant State and Territory health regulations.

In health care establishments, some patients (sick, elderly, immunocompromised) may be at increased risk of severe food borne illness, including *Salmonella* and *Listeria* infections - see pages 60 and 67.

Preparation and handling of food requires attention to hygiene, prompt delivery and need to maintain relevant temperatures in order to prevent multiplication of contaminating organisms. A Hazard Analysis of Critical Control Points (HACCP) approach to food preparation and handling should be mandatory, to identify any particular problems at any stage of the food preparation and handling chain.

Routine hot machine washing is adequate for cleaning cutlery and crockery used by patients.

Trolleys

In hospitals or large health care establishments, mechanical transport can make it easier to distribute equipment and also reduces the movement of people, thus minimising the spread of infection. Trolleys of suitable height to allow good visibility during use, and appropriate for the type of transport, should be enclosed or draped. Trolleys should be used only for the appointed purpose (clean linen, food, sterile equipment, waste products, dirty linen, etc.) and should be cleaned daily, or more frequently if contamination occurs.

Refrigerators

Medications and vaccines should be stored in accordance with the manufacturer's instructions. Vaccines (and other medications) requiring refrigeration should be stored in a refrigerator dedicated to vaccine storage. Blood and other clinical specimens requiring refrigeration should also have a dedicated refrigerator for storage.

Refrigerators used by staff for storage of food items should not be used for storage of contaminated material, including clinical specimens, nor for storage of medical products such as drugs, vaccines or blood, under any circumstance.

Transport and handling of pathology specimens

Laboratory specimens are mainly contagious via sharps and therefore Standard Precautions should be adequate when handling most pathology specimens. Where Additional Precautions apply, for example, if the specimen is from a patient diagnosed with CJD, the laboratory should be notified.

Conditions during transportation must ensure that the integrity of the specimens is preserved.

The National Association of Testing Authorities (NATA) / Royal College of Pathologists of Australasia (RCPA) accreditation scheme assesses laboratories to the standards developed by the National Pathology Accreditation Advisory Council (NPAAC). The NPAAC has also developed guidelines for the transport of pathology

specimens, including requirements for packaging, labelling, documentation and also courier systems, based on the International Air Transport Association (IATA) Dangerous Goods Regulations.




Requirements for specimen collection, transport and storage are detailed in the NATA/RCPA Medical Testing Requirements:1996, and in ANCA Bulletin No. 3 *Laboratory safety guidelines that take account of HIV and other blood borne agents*.

For transport within institutions, specimens of tissue, blood and body substances should be placed in a well-constructed, tightly sealed container. This should then be placed in a secondary leakproof container.

For transport between institutions, specimens should be placed in a sealed inner container surrounded by absorbent padding within a plastic bag or leakproof durable, sealable, outer container. Packaging should comply with standard postal or courier regulations, and with the International Air Transport Association (IATA) Dangerous Goods Regulations.

The Royal College of Pathologists of Australasia, and relevant State and Territory or National postal authorities may provide further advice on transport of pathology specimens.

Table 3: Categories of waste and recommended containment and disposal.

Symbol	Waste	Container Colour	Disposal
	General	Black, buff, green, white	Landfill Consider recycling (Confidential waste to be shredded or incinerated)
	Infectious/medical		Licensed Contractor
	Sharps	Rigid yellow coloured	Incineration
	Non sharps	Yellow bag	Incineration or steam sterilization (autoclaving) then supervised landfill
	Cytotoxic	Purple	Licensed Contractor High temperature incineration
	Radioactive	Red	Licensed Contractor Monitor before disposal by incineration or supervised land fill dilute isotopes may be disposed of via sewerage system in accordance with relevant guidelines
Coded for chemicals	Chemicals Hazardous liquid Dental amalgam waste	Appropriately labelled	Licensed Contractor Disposal subject to local regulations - do not incinerate

Note: Any waste, contaminated with or stored with another waste requiring a higher level of destruction MUST be classified at the higher level.

1.4 Sterility of instruments and equipment

Sterility

Any micro-organisms introduced into sterile body sites can establish infection. Micro-organisms are always present on skin and are likely to be carried through the air on dust particles. Micro-organisms can contaminate instruments, medications and solutions which are intended to be sterile. In order to achieve sterile conditions during procedures, attention must be given to all potential sources of contamination.

All instruments, materials and medications introduced into normally sterile tissue **MUST** be sterile. Instruments and equipment used for injection or penetration of skin or mucous membrane should be single-use only, or if the items are designed for multi-use, must be cleaned and sterilized - see Table 5 page 41.

Sterility is required for all instruments and equipment used in critical sites where penetration or entry into sterile tissue, cavity or bloodstream occurs. Sterility is preferred in semi-critical sites where there is contact with intact mucosa. These recommendations apply to office practice as well as to larger health care establishments.

Sterility is optimally achieved by steam sterilization (autoclaving). Where steam sterilization is not suitable, for example, with fiberoptic scopes, other sterilization systems, such as ethylene oxide (EO), automated chemical sterilization systems (peracetic acid systems), or hydrogen peroxide plasma systems may be used. Hot water disinfection does not kill all bacterial spores and therefore, by definition, does not sterilize instruments. It does, however, provide a high level of disinfection when instruments are boiled for the prescribed time.

Instruments used in hospital operating theatres must be sterilized in accordance with AS 4187 and with the National Co-ordinating Committee on Therapeutic Goods *Standard for the operation of sterile supply/services in health care facilities*.

Sterilization and disinfection is discussed further on page 31 and in Special issues Nos. 1 and 2.

Single-use instruments and equipment

Single-use sterile equipment minimises the risk of cross infection and should be used where possible. Items labelled for single-use should not be re-used unless it can be assured that these items may be safely cleaned and sterilized without damage. Any institution engaging in the re-use of medical devices labelled as single-use must maintain proper records for device tracking at both the patient and operational unit levels, and this must be part of licensing requirements. All institutions engaging in re-use of devices must provide full patient information to allow informed decision making on the part of the patient.⁸⁹

Injecting apparatus, including hypodermic syringes, needles, dental local anaesthetic cartridges and dental needles, IV lines and giving sets, must be sterile and single-use only. A new cannula must be used for each attempt at IV cannulation. Syringes used to hold single-use anaesthetic cartridges should be steam sterilized (autoclaved) between patients. Incompletely used anaesthetic cartridges must be discarded after each patient use.

Dressings, suture materials, suture needles, scalpels, intra-cranial electrodes (or any probe used in intra-cranial examinations), pins or needles used for neurological sensory testing, spatulas and disposal razors, including razor blades on electric clippers, should be used only once.

Any single-use article or instrument that has penetrated the skin, mucous membrane or other tissue must be discarded immediately after use or at the end of the procedure, whichever is more appropriate.

Single-dose vials

Medications or solutions applied to normally sterile tissue must be sterile. The most effective way to avoid cross infection via injection of sterile medication or solution is through the use of single-dose vials or ampoules and single-use sterile injecting equipment. Single-dose vials or ampoules, or prefilled syringes, should be used wherever these are available.

Multi-dose vials and multi-use products

Injectable products packaged in multi-dose vials should not be used except in particular cases, for example, where products such as insulin and human growth hormone are intended solely for use by an individual patient. Where there is no alternative to using a multi-dose vial, great care must be taken to ensure there is no possibility of injecting contaminated material or fluid into the vial.

The Australian Drug Evaluation Committee (ADEC), at its meeting in December 1995, made recommendations with regard to multi-use products (Resolution No. 5914) as follows:

- registration of multi-dose vials or ampoules will not be recommended by the ADEC unless the sponsor has provided a justification for this, or the product is intended for multiple use in an individual patient. If a multi-dose vial or ampoule is registered, the contents must be withdrawn aseptically using separate sterile needles and syringes. These must be discarded immediately after use in each patient receiving a dose from the multi-dose vial or ampoule. In the case when the multi-use vial is intended for a single patient, for example, insulin or human growth hormone, specific protocols should be in place to ensure that the product is used in that individual only.
- medical and dental practitioners and paramedical staff should be aware of situations where cross-contamination from multi-use products may occur during routine medical or dental procedures. Protocols for infection control in these circumstances should be developed. Examples include the use of topical lubricants in proctoscopy and/or vaginal examination, and local anaesthetics in throat procedures.
- the sponsors of multi-use products through which cross-contamination during routine medical procedures may occur, should be encouraged to register single-use products that will minimise the risk.

Cryotherapy

Use of liquid nitrogen during cryotherapy procedures should not allow contamination of the canister, as viruses or bacteria may survive immersion in liquid nitrogen. Where liquid nitrogen is used for routine removal of warts, decant sufficient liquid nitrogen into a styrofoam cup and use a fresh cotton-tipped applicator for each application. Discard any residual or remaining contents of the cup. Similar precautions should apply with carbon dioxide and other cryotherapy systems used in the treatment of skin conditions.

Skin disinfectants

Skin disinfectant are used prior to surgery, cannulation, catheterisation or intubation, to diminish infectivity of skin or mucosal tissue. Disinfectants must be dated when opened, and discarded after its designated use-by date (as indicated on the manufacturer's label).

Prior to use, sufficient disinfectant for each patient's individual use should be decanted into a sterile disposable container. The container and any fluid remaining in the container at the end of each procedure must be discarded - see multi-use products, page 28.

Skin disinfectant should be applied at least two but preferably five minutes prior to commencing any aseptic or surgical procedure.⁵³

The following preparations may be used but should be appropriate for the nature and site of the procedure:

- 70-80 per cent v/v ethyl alcohol;
- 60-70 per cent v/v isopropyl alcohol;
- alcoholic (isopropyl and ethyl) or aqueous formulations of chlorhexidine (0.5 to 4 per cent w/v); or
- 10 per cent w/v aqueous or alcoholic povidone-iodine (1 per cent w/v available iodine).

Note: 4 per cent w/v chlorhexidine is widely used as a bacterial skin cleanser for hygienic and surgical hand washing.⁵³ 0.5 per cent w/v aqueous chlorhexidine is recommended for use on facial skin. Weaker solutions (0.02-0.05 per cent w/v) may be used for application to mucous membranes, for example, during bladder

irrigation.⁵³ Where disinfectant is used during dental procedures, oral membranes should be dried/isolated to prevent dilution of the disinfectant with saliva.

Recent studies indicate that 2 per cent aqueous chlorhexidine is more effective than 10 per cent povidone iodine or 70 per cent alcohol for cutaneous disinfection before insertion of an intravascular device and for post insertion care, and can substantially reduce the incidence of device-related infection.⁷⁵

However, there are some situations where chlorhexidine is contraindicated. It should never be used in surgery on the middle ear because it may cause sensorineural deafness.¹⁹ Corneal toxicity, including transient epithelial defects, chronic corneal ulceration and corneal oedema has been observed following ocular exposure to Hibiclens, where chlorhexidine is the active ingredient.^{126,129}

An alcohol wipe (70 per cent w/w ethyl alcohol or 60 per cent v/v isopropyl alcohol) can be used prior to venous blood collection, injection or insertion of acupuncture needles to reduce the bacterial load on the skin, and thus lessen the risk of infection. Currently there is no evidence to suggest a minimum waiting time is required to effect skin disinfection prior to venous blood collection, injection, or acupuncture.

Alcohols are flammable and should be used with caution. They should not be used for skin disinfection prior to electric cautery or laser.

1.5 Processing of re-usable instruments and equipment

Instruments and equipment intended for use on sterile tissue (critical site), on intact mucous membranes (semi-critical site) or on intact skin (non-critical site) must be cleaned and processed to a level appropriate for their use. Cleaning is a crucial first step prior to sterilization or disinfection and has been demonstrated to be the vital link in the chain of infection control.

The nature of the processing required for a particular instrument will depend on the particular application, for example, the same instrument may be used on either a critical or semi-critical site. Instruments for re-use on critical sites MUST be sterile (steam sterilization is preferred). Wherever possible, instruments for re-use on semi-critical sites should also be sterilized, preferably by steam sterilization. Cleaning alone is generally sufficient for items which come in contact with intact skin (non-critical sites).

Australian Standard AS 4187-1994 and Amendment No. 1 provides detailed information on the procedures for cleaning, disinfecting and sterilizing reusable medical and surgical instruments and equipment.

All items must be stored to maintain the level of processing to which they have been subjected. Dry, sterile, packaged instruments and equipment should be stored in a clean, dry environment and protected from sharp objects which may damage the sterile packaging. This is essential for instruments and equipment which are intended for use on critical sites and which MUST therefore be sterile.

The minimum levels of processing and storage requirements for re-usable instruments and equipment are shown in Table 5, page 41.

Instruments and equipment which need special processing, including endoscopes, respiratory and anaesthetic apparatus, and diagnostic ultrasonic transducers are discussed on pages 37-39. In addition, further information on processing of GI endoscopes is detailed in *Infection and Endoscopy*, 3rd edition, 1995, and summarised in Special issues No. 4, page 91.

Immediate handling after use

Immediately after use, instruments and equipment should be immersed in warm water and detergent or proteolytic enzyme cleaner, prior to routine cleaning and processing. This will prevent fats congealing or solidifying and will reduce the risk of cross-infection. Instrument cassette trays can be used to reduce handling of sharp instruments.

Staff dedicated to cleaning of instruments and equipment should be adequately trained in cleaning techniques. In situations where this support is not available, it must be the responsibility of the health care worker undertaking the procedure to ensure that instruments and equipment are properly cleaned and processed as soon as possible after use.

Cleaning of instruments and equipment

Care should be taken to ensure that safe work practices are implemented. Ultrasonic cleaning and automated washing appliances which reduce the handling of instruments are recommended. Studies indicate that the only techniques which eliminate all traces of contamination are pre-soaking, followed by ultrasonic or automatic dishwashing cleaning with thorough rinse cycles.¹¹²

Thorough cleaning of all items should commence as soon as practicable after use, to remove any particulate matter which may harbour infectious material. Cleaning in warm water and detergent assists in the mechanical removal of soil, thereby reducing the bioburden. All channels or bores of instruments or equipment such as rigid or flexible endoscopes must be cleaned thoroughly. Cleaning procedures and suitable cleaning agents are discussed in AS 4187-1994 and Amendment No. 1.

The importance of thorough cleaning prior to any disinfection or sterilization regimen should be emphasised in infection control education programs. Failure to achieve adequate cleaning may result in ineffective disinfection or sterilization of instruments or equipment.

Instruments which are washed manually should be rinsed and cleaned in a sink or bowl specifically for that purpose:

- when cleaning instruments and equipment manually, wear general purpose utility gloves and face protection (eyewear or spectacles and mask or face shield). Plastic aprons should be used. Take care to prevent splashing of mucous membranes or penetration of the skin by sharp instruments;
- remove gross soiling by carefully rinsing in warm water;
- fully disassemble instruments and immerse in warm water and detergent or proteolytic enzyme;
- remove all visible soil by scrubbing with a small, clean brush, working low in the sink, or while immersed, to limit the generation of aerosols during scrubbing. A light grade nylon or similar non-abrasive scouring pad or non-linting cloth may also be used;
- complete this procedure before any further reprocessing takes place to maximise the effectiveness of disinfection or sterilization;
- rinse instruments in warm water;
- dry;
- check instruments and equipment visually to establish cleaning has been adequate before further processing or storage;
- cleaning brushes should be specified for cleaning only and should be washed and rinsed after use, heat disinfected if possible and stored dry.

Instruments and equipment should be thoroughly cleaned and either disinfected or sterilized (autoclaved where possible) before being sent for servicing.

Ultrasonic cleaners

Ultrasonic cleaners must comply with AS 2773. Ultrasonic cleaners do NOT disinfect instruments. They can be used to assist with cleaning of jointed and serrated stainless steel instruments. Internal surfaces of cannulated instruments, plastics and other similar materials cannot be successfully cleaned by this method. Cemented glass syringes and lenses will be damaged if repeatedly subjected to this process. Dissimilar metals should not be processed together, as they are prone to electrolytic corrosion. The fine mechanical shaking can also blunt fine points by impaction. To minimise handling of sharp instruments, a cassette system, compatible with ultrasonic cleaning baths, could be used.

Ultrasonic cleaners work by subjecting instruments to high frequency, high energy sound waves, causing soil to be dislodged from instruments and drop to the bottom of the tank, or be sufficiently loosened, to be removed during the rinsing process.

The tank must be filled with water before the addition of detergent approved by the manufacturer and the lid closed before operation. Items to be processed must be rinsed free of visible soil before immersion in the ultrasonic cleaner. Ultrasonic cleaners should not be operated without a close fitting lid in place, as the high sound frequency may cause damage to hearing and allow potentially infective vapours to escape from the unit. OPERATORS SHOULD NOT SUBMERGE ANY PART OF THEIR BODY IN THE ULTRASONIC CLEANING UNIT DURING ITS OPERATION.

Following ultrasonic cleaning, the items should be inspected and cleaned manually if required, then rinsed in clean hot water and dried prior to further processing. Care should be taken in the disposal of the bath liquid. The efficiency of the ultrasound cleaner should be tested regularly, according to the manufacturer's handbook, and documented. Consult AS 4187 for further details on the use of ultrasonic cleaners.

Sterilization of instruments and equipment

All equipment or instruments used in procedures involving contact with normally sterile areas of the body must be cleaned and sterilized before being re-used on another patient.

Sterility of instruments and equipment can only be achieved by:

- steam sterilization under pressure (autoclaving) at 121°C-134°C;
- dry heat at 160°C or higher;

- large scale irradiation systems;
- ethylene oxide sterilization systems;
- low temperature hydrogen peroxide plasma sterilization systems;
- automated peracetic acid systems or other chemical treatment.

Australian Standard AS 4187-1994 and Amendment No. 1 includes information on all of the above methods of sterilization.

Ultraviolet light units, microwave ovens, domestic ovens and pressure cookers are NOT capable of sterilizing instruments, and should not be used for this purpose.

Steam sterilization under pressure

The most efficient and reliable form of sterilization of instruments and equipment is by steam under pressure (autoclaving) and is the preferred method of sterilization in office practice. All steam sterilizers must meet the requirements of relevant Australian Standards (AS 2192-1991, AS 2182-1994) and be operated according to AS 4187-1994 and Amendment No. 1.

The microbiocidal effect of steam sterilization is due to latent heat of condensation being transferred to the load causing it to heat rapidly. This process results in coagulation of microbial protein structures in cases where cleaning may not have completely removed contaminating micro-organisms.

Correct processing and packaging of items to be sterilized as well as loading of the autoclave is essentially for maximum efficiency. Items used in invasive procedures must be packaged prior to steam sterilization (autoclaving) and must be dried before removal from the autoclave chamber.

Regular monitoring of the sterilization process is essential. Time, temperature and pressure should be checked at least once each day. The sterilizer should be calibrated at least once a year by a qualified service technician. See Special Issues No. 2, page 83, for further information.

In hospitals and larger health care establishments, Central Sterile Supply/Service (CSS) units are responsible for provision of sterile items within the establishment. The National Co-ordinating Committee on Therapeutic Goods has developed guidelines titled *Standard for the operation of sterile supply/services in health care facilities*.⁸² It is possible that CSS units may also provide this service for smaller establishments, including office practice, on a contractual basis.

The NHMRC Pituitary Hormones Task Force has prepared a report titled, *Creutzfeldt-Jakob Disease and other Human Transmissible Spongiform Encephalopathies: Guidelines on patient management and infection control*.⁸⁶ This report recommends a range of decontamination procedures depending on the level of risk - Group 1 (high risk), and Group 2 (low risk), and includes a warning that normal autoclaving (121°C) is not adequate for completely inactivating CJD infectivity. Single-use equipment should be used wherever possible. For low risk groups, re-usable instruments which can withstand steam sterilization should be autoclaved at 134°C for 18 minutes or for 6 separate 3 minute cycles. Instruments contaminated with blood or neurovascular tissue from Group 1 (high risk) patients should be incinerated.

Dry heat sterilization

Dry heat sterilization by means of hot, dry air, destroys micro-organisms by the process of oxidation. Manufacturer's instructions for effective and safe use of dry heat sterilization must be followed. The door of the sterilizer must not be opened during the sterilizing cycle. Australian Standard AS 2487 specifies requirements for dry heat sterilizers.

Dry heat sterilization is used for anhydrous items and items sealed within impermeable containers which cannot be sterilized by steam under pressure, but can withstand a temperature of 160°C for a minimum of 60 minutes plus penetration time. Dry heat sterilizers work on mechanical convection, which provides forced air circulating, resulting in uniform temperature distribution throughout the chamber. Some materials and instruments, particularly those with moving parts, may suffer damage or loss of lubrication through dry heat sterilization and practitioners should check with the manufacturer about the suitability of dry heat sterilization for specific items.

Dry heat, because of the control processes and the period of time required to achieve sterilization, is more appropriate for use in sterile supply departments in hospitals than for office practice. However, orthodontists may prefer this method to sterilize special orthodontic pliers that have inlaid tips of different metal content, that could be damaged by corrosion if autoclaved.

Large scale irradiation systems

Gamma radiation is performed at sites other than health care facilities.

Ethylene oxide sterilization systems

Ethylene oxide (EO) can be used for sterilization of articles that are made partly or entirely from heat-sensitive rubber or synthetic materials, or that contain electronic components, telescopes and lamps. Sterilization is achieved by alkylation of the protein in the microbial cell. Processing time is dependent on the temperature and gas concentration and can only be effective if the gas can penetrate the packaging and reach all surfaces of the articles requiring sterilization. The process generally takes 12 hours, which includes the time needed for aeration to rid the articles of any residual gas. Due to its high toxicity, the use of EO in health care facilities is restricted.

Low temperature hydrogen peroxide plasma sterilization systems

Low temperature glow plasma sterilizers utilise low temperature hydrogen peroxide plasma to achieve low temperature, low moisture sterilization, usually within a 75 minute cycle. The system requires the use of non-woven (non-cellulose) polypropylene wraps.

Automated peracetic acid systems or other chemical treatment

Automated chemical processing systems using peracetic acid at 0.2 per cent concentration in an environmentally sealed chamber is an effective sterilant when used in accordance with manufacturer's instructions. The process generally achieves moist, low temperature sterilization within 30 minutes.

To achieve sterilization with aldehyde based products such as glutaraldehyde, a contact time of three to ten hours is necessary depending on the formulation and labelling. It should be noted that AS 4187 and Amendment No. 1 states endoscopes and accessories which are soaked for a short period of time in a chemical disinfectant (less than ten hours in alkaline glutaraldehyde) prior to use cannot be considered sterile.

High level disinfection of instruments

High level disinfection should not be used for semi-critical items where sterilization or use of single-use items is possible.

Methods of high level disinfection include:

- thermal disinfection - hot water disinfectors or boilers; or
- chemical disinfection - currently only glutaraldehyde is recommended for high level chemical disinfection of re-usable items.¹¹⁶

Thermal disinfection (hot water disinfectors or boilers)

Thermal disinfection must NOT be used for instruments which are to be used in critical sites - see Table 5, page 41.

However, if items can withstand heat and moisture and do not require sterilization, thermal disinfection (boiling/pasteurisation), using heat and water at temperatures and times that destroy pathogenic, vegetative organisms is the simplest, most efficient and cost-effective method of high level disinfection (see Table 4). Thermal disinfection should be used in preference to chemical disinfection wherever this is appropriate.

Table 4: Minimum surface temperature/time relationship for effective thermal disinfection.

Surface temperature °C	Minimum disinfection time (minutes)
≥ 80	2
75	10
70	15

Note: Allow at least five minutes uninterrupted boiling to ensure disinfection has been achieved.

To achieve high level thermal disinfection:

- clean items by either manual or mechanical means - see page 30;
- immerse instruments in rapidly boiling water. Maintain boiling without interruption for at least five minutes. Commence timing after the last instrument has been added, and the water has returned to the boil; commence timing after the last instrument has been added, and the water has returned to the boil;
- remove from the boiling water and place onto a prepared surface and allow to cool.

Providing that heat reaches all surfaces during the prescribed boiling time, this process will inactivate all non spore forming micro-organisms. However, it is difficult to validate the accuracy of boiling times as hot water disinfectors or boilers are not automated and timing devices are often inaccurate or absent. Additional items should not be added during the timed boiling period.

Equipment used for thermal disinfection requires careful maintenance and attention to the quality of the water used. The use of distilled, pre-boiled or deionised water may be necessary in some areas.

Chemical disinfection

All instruments and equipment must be cleaned prior to chemical disinfection - see page 30.

There are many chemical disinfectants available with a broad spectrum of activity against a range of micro-organisms. These may be variously classed as bactericidal, sporicidal, mycobactericidal, fungicidal or virucidal - see Table 7, page 80.

Chemical disinfectants which claim to be virucidal, mycobactericidal, fungicidal or sporicidal, are now regulated under the Therapeutic Goods Act, allowing a greater degree of confidence in manufacturers' claims of efficacy.

High level chemical disinfection is required for instruments or equipment to be used on semi-critical sites - see Table 5, page 41 - and is suitable for items which come into contact with intact skin or mucosa.

High level chemical disinfection should ONLY be used when:

- steam under pressure (autoclaving) is unsuitable;
- low temperature chemical sterilization (e.g. automated peracetic acid, hydrogen peroxide or ethylene oxide systems) is either unavailable or is not recommended by the instrument manufacturer; or
- thermal disinfection (boiling) is unsuitable for the device, but high level disinfection is required

At the time of writing, **glutaraldehyde** is the only chemical recommended by Australian Standard AS 4187 for high level disinfection of re-useable items that cannot be heat sterilized, such as fiberoptic endoscopes. However, glutaraldehyde is an intense irritant and should only be used where other methods of high level disinfection or sterilization are not practical. From January 1996, with the introduction of the Therapeutic Goods Administration (TGA) regulations for disinfectants, there may be more products available which meet the TGA Standard (Therapeutic Goods Order No. 54) for high level disinfectants.

Glutaraldehyde formulations should be used with caution, and in accordance with the manufacturer's directions. Damage to the patient, user, the instruments and the environment will result if proper precautions are not taken. All HCWs should know the risks involved with using glutaraldehyde and how to use this chemical safely and correctly.

Times for achieving high level disinfection with glutaraldehyde depend on factors such as concentration, formulation, temperature of both the room and the solution as well as the procedures for which the instrument is to be used, and likely contaminating micro-organisms. Atypical *Mycobacterium spp.* are relatively resistant to most chemical agents including aldehydes.⁴⁰ Although there has never been a proven case of transmission of tuberculosis by GI endoscopy, a number of transmissions by flexible bronchoscopy have been reported.⁴⁰ For this reason, longer soaking times are recommended for bronchoscopes - see page 37.

Glutaraldehyde should only be used in a well-ventilated area as defined by Worksafe Australia and in an approved fume cupboard. Appropriate personal protective equipment should be worn in accordance with Worksafe Australia guidelines. This should include gloves (approved for use with glutaraldehyde), gown, plastic apron, eye and facial protection. Full face shields provide the greatest protection against splashing. An eye rinse system must be available in case of accidents. Where there is any doubt as to the efficacy of control measures, Occupational Health and Safety personnel should be contacted.

Procedures for manual soaking of instruments in glutaraldehyde are summarised below:

- instruments must be thoroughly cleaned (glutaraldehyde can fix proteinaceous material), rinsed and dried prior to immersion in the glutaraldehyde solution;
- immerse clean instruments in 2 per cent w/v glutaraldehyde for the recommended soaking time, usually ten minutes. This will normally disinfect heat sensitive instruments, including most GI endoscopes, provided they are clean and free of all organic material (see special requirements for bronchoscopes on page 37).
- after soaking, instruments should be thoroughly rinsed. Instruments intended for use in sterile cavities in immuno-compromised patients, or in invasive procedures such as ERCP, should be rinsed with either sterile or 0.2 micron filtered water in an aseptic manner.¹¹⁶ (Note: tap water may introduce contaminants such as *Pseudomonas*);

Glutaraldehyde should be discarded in accordance with State/Territory waste regulations.

1.6 Instruments and equipment requiring special processing

Flexible endoscopes

All flexible endoscopes (bronchoscopes, gastroscopes, duodenoscopes, flexible sigmoidoscopes, colonoscopes) and accessories require thorough cleaning and high level disinfection where sterilization is not practical.

Flexible endoscopes present special problems in cleaning and disinfection. The instruments are honeycombed with fine channels which are difficult to clean; a visual inspection cannot be made of the channels to ensure complete cleaning. In addition, a variety of accessories require dismantling and specialised cleaning techniques.

It is essential that the scope is cleaned and disinfected by a person skilled and knowledgeable in the techniques required. The endoscope **MUST NOT** be allowed to dry prior to cleaning.

Standard Precautions should be implemented for manual cleaning of endoscopes, and appropriate protective clothing (gloves, gowns, plastic aprons, mask, eye and face protection) should be worn.

Manual cleaning and disinfection procedures are summarised below:

- immerse disassembled endoscope in warm water and proteolytic enzyme cleaner. Wash out the outside with disposable sponges or swabs, and brush the distal end with a small toothbrush;
- remove valves, clean and disinfect or sterilize (autoclave) where appropriate;
- brush clean the biopsy-suction channel;
- rinse all parts thoroughly and dry;
- totally immerse the scope in 2 per cent glutaraldehyde for the recommended soaking time, usually 10 minutes, to achieve high level disinfection;
- rinse thoroughly with filtered or sterile water, as required;
- if the instrument is to be re-used immediately, purge all rinsing water from the channels, and dry exterior surfaces with a soft lint-free cloth, and reassemble for use;
- at the end of the day, rinse channels with 70 per cent alcohol and dry carefully with compressed air, using low pressure to avoid damage to the instrument;
- store the endoscope (disassembled) in a well ventilated storage cupboard which allows the endoscope to be hung full length on appropriate support structures;
- accessories that breach the mucosa, such as biopsy forceps, should be mechanically cleaned as above and then steam sterilized (autoclaved) after each use.¹¹⁵

Automated peracetic acid based chemical processing systems offer highly effective systems of endoscope disinfection/sterilization, they have a very high capital cost and ongoing costs per cycle. Use of these systems does NOT remove the necessity to pre-clean instruments and equipment. Where automated systems are used, the system must be regularly monitored for efficacy and performance.

With rapidly evolving technologies and the dynamic nature of product development in the area of infection control, instruments that can be easily dismantled and steam sterilized (autoclaved) should become widely available in the future. This will confer major advantages.

Special issues No. 4, page 91 provides further discussion on infection control in endoscopy, including quality management routines. Readers should also refer to:

- AS 4187 - 1994¹¹⁶ and Amendment No. 1 (Appendix C), on care and handling of flexible and rigid endoscopes and accessory equipment; and
- *Infection and Endoscopy* (3rd Edition)⁴⁰, published jointly by the Gastroenterological Society of Australia (GESA) and the Gastroenterological Nurses Society of Australia (GENSA), which also provides current advice on cleaning and disinfection of endoscopes, as well as advice on microbiological testing requirements, and antibiotic prophylaxis.

ERCP and duodenoscopes

Endoscopic Retrograde Cholangiopancreatography (ERCP) is the only endoscopic procedure which has been associated with a consistently significant rate of procedure induced infection.⁴⁰ Infections have almost invariably been with *Pseudomonas* or similar organisms (including *Proteus spp.*) These are resident hospital pathogens which colonise almost any damp surface, including channels within the endoscope itself. Because of the risk of residual dampness allowing proliferation of remaining organisms, all duodenoscopes must always undergo full disinfection prior to the commencement of a list.⁴⁰

Inadequate cleaning and disinfection of the forceps raising channel, and contamination of the water feed system has been linked to infection.⁴⁰ The water bottle and connecting tube must be sterilized (autoclaved) before the commencement of each ERCP session. Sterile water must be used. Routine bacteriological surveillance of duodenoscopes and accessories is strongly recommended - see page 93.

Bronchoscopes

The Thoracic Society of Australia and New Zealand (TSANZ) currently recommend that, after appropriate cleaning, bronchoscopes should be soaked in 2 per cent glutaraldehyde for at least 20 minutes to eradicate *Mycobacterium tuberculosis*. After disinfection, the instrument should be rinsed thoroughly with sterile or bacteriologically and virally filtered water, followed by rinsing with 70 per cent alcohol and drying with compressed air. Bronchoscopes should be sterilized where possible.

Laparoscopes and arthroscopes

Laparoscopes and arthroscopes are generally used in critical sites and MUST be sterile at the time of use. They should be thoroughly cleaned prior to sterilization, as indicated in Table 5, page 41.

Respiratory and anaesthetic apparatus

Items of equipment which are introduced into the patient's airway can provide direct access to potential pathogens. Aerosol transmission of microbial infection has been documented via respiratory equipment, including spirometry or pulmonary function testing apparatus⁵⁹ and anaesthetic apparatus.⁶⁸ Moist air and gases can transport micro-organisms along breathing circuits and nebulisers can harbour micro-organisms. Transmission of infection may also occur with use of resuscitation and analgesic equipment used in hospitals, (intensive care units, accident and emergency departments, labour wards), medical and dental practices, ambulances, and first aid areas.

Respiratory, anaesthetic, resuscitation and similar apparatus, and ventilators used in anaesthesia and in intensive care units, are generally classed as semi-critical (i.e. items that are in direct contact with the patient's intact mucosa) - see Table 5, page 41.

Semi-critical items, including breathing circuits, carbon dioxide absorbers, self inflating bag assemblies, endotracheal and laryngeal tubes, pharyngeal airways, suckers, and equipment necessary to introduce such equipment, such as laryngoscopes and introducers, must be cleaned and either high level disinfected (or steam sterilized if possible) before re-use, or discarded after each patient's use. Demand and inhalation valves used in resuscitation and analgesic equipment should be carefully dismantled, cleaned and sterilized after each patient's use. Single-use sachets of lubricant should be used on tubes for insertion into the patient's airway.

The efficacy of filters has not been clearly demonstrated, particularly for forced respiratory manoeuvres used with respiratory function equipment.⁴² However, in-line filters and non-return valves may be used in breathing circuits to limit the potential for contamination. If a filter is used, it must be discarded after each patient's use and the part of the breathing circuit between the patient and the filter must be discarded or cleaned and sterilized after each patient's use. The remainder of the anaesthetic breathing circuit, including the carbon dioxide absorber, must be discarded or cleaned and disinfected at the end of each procedure list. Where there is a potential for patient-to-patient transmission of infection such as tuberculosis or hepatitis C, or where a patient is immunocompromised, a disposable breathing system should be used for each patient or all parts of the breathing system (including the carbon dioxide absorber) should be cleaned and disinfected or sterilized as appropriate,

before re-use. If the anaesthetic breathing circuit does not use a filter, the breathing circuit (including the carbon dioxide absorber) must be discarded or cleaned and disinfected after each patient's use.

In respiratory function laboratories, semi-critical items include re-usable mouthpieces, one-way breathing valves, pneumotachograph screens, mouth shutters and oesophageal balloons. These items must be disassembled and thoroughly cleaned in warm water and detergent; manufacturer's instructions should be followed. Tubing distal to a breathing valve or pneumotachograph is not generally considered semi-critical but should be cleaned daily to remove particulate matter and moisture.⁴²

Non-critical items or equipment coming in contact with intact skin but not in contact with intact mucosa, for example, anaesthetic armboards and stethoscopes, or which do not come into direct contact with patients, for example, the surface of the anaesthetic machine or resuscitator, should be cleaned regularly - see Table 5, page 41.

Anaesthetic and respiratory decontaminators which comply with AS 2711 can be used to process anaesthetic and respiratory equipment which is not required to be sterile - see AS 4187 for details.

Whilst there may be an additional cost factor in sterilizing semi-critical components of the breathing system, the use of disposable circuitry and the incorporation of filters, this extra cost should be balanced against the risk of cross infection.

Further information may be obtained from the Australian and New Zealand College of Anaesthetists (ANZCA), the Australian Society of Anaesthetists (ASA), and the Thoracic Society of Australia and New Zealand (TSANZ).

Asthma management (spacers used with metered dose inhalers)

Deep inhalation of medication from spacer devices used with metered dose inhalers in the management of asthma could result in transmission of infection, particularly if the spacer is used regularly during a respiratory infection.

Ideally, spacers should be single-patient use only. They should be made of material which can withstand disinfection by boiling and this should be confirmed by contacting the manufacturer (or manufacturer's instructions if available) prior to purchase of a spacer device.

Spacers should be washed daily in warm water and detergent, rinsed thoroughly and allowed to drain dry. Small volume spacers should NOT be disassembled prior to cleaning. At least weekly, or more frequently if used during a respiratory infection, the spacer should be boiled (if possible) for at least 5 minutes to ensure disinfection - see page 33.

Asthma is very common in Australian schoolchildren. Wherever possible, children who suffer from asthma and who use a spacer device should have a spare spacer, and preferably their own medication, kept at school for their individual use. The school should be consulted about these arrangements.

For emergency situations at school a spacer should be used to administer asthma medication to a child. A spacer which is used communally (i.e. not kept for individual use) should be cleaned and dried as above, and preferably boiled for at least 5 minutes after each child's use. Where boiling is not possible the spacer device should be thoroughly washed, rinsed and dried. The spacer, including the mouthpiece, should then be wiped with 70 per cent alcoholic chlorhexidine or 70 per cent alcohol.

Metered dose inhalers which are used in emergency situations in schools should only be used in conjunction with a spacer device which has been adequately cleaned and disinfected, preferably by boiling.

Resuscitation manikin facepieces and accessories

Manikin facepieces and accessories, as used in first aid training, should be thoroughly cleaned with warm water and detergent, rinsed and dried prior to disinfection with an appropriate intermediate level disinfectant, such as

70 per cent alcoholic chlorhexidine (0.5 per cent chlorhexidine in 70 per cent ethanol) or 70 per cent ethanol (for at least 2 minutes). The pieces must be dry before immersion in disinfectant to ensure that the disinfectant solution is not diluted, as this would result in inadequate disinfection over the 2 minute contact period. Bleach is not recommended for disinfection of manikin face pieces as any residue remaining on the surface could be harmful to the manikin user.

St. John Ambulance and the Australian Resuscitation Council of Australia should be contacted for further advice - see Appendix C, page 147.

Diagnostic ultrasound transducers

Diagnostic ultrasound transducers are used in many high risk (critical) situations, including intra-operative demonstration of brain and spinal lesions, for renal, hepatic and hepato-biliary studies, for the review of vascular surgical repairs, and for some gynaecological operations. Instruments which are to be used in sterile/critical sites, including diagnostic ultrasound transducers used in this way, must be sterile and only ultrasound transducers which are capable of being sterilized should be used. New sterilizing technologies suitable for processing heat sensitive items, such as ultrasound transducers, include the peracetic acid (PAA) automated system (Steris System 1) and hydrogen peroxide plasma sterilization system (Sterrad 100) - see page 33. Manufacturers' instructions regarding sterilization should be followed.

Instruments which are to be used in semi-critical sites, for example, in contact with mucous membranes, usually require either sterilization (if possible) or high level disinfection with glutaraldehyde - see page 34, in accordance with manufacturers' instructions. However, for transvaginal, transrectal and transoesophageal ultrasound procedures the probe is protected from direct contact with mucous membranes by use of a disposable plastic cover. In this case it is essential that, for each new procedure, the cover should be either sterile or appropriate for use in a semi-critical site.

The disposable cover should be of sufficient thickness to resist tearing or perforation during use. Suitable covers include water repellent polyethylene surgical drape (preferably at least 38 micron thickness), a condom or latex surgical glove. Polyethylene surgical drape has the advantage of being able to be cut to size, and therefore is less likely to be over-stretched and tear, as condoms or gloves may do. Surgical drape is also easier to remove, thus reducing the risk of contamination of the probe during removal of the cover.

At the end of each procedure the cover should be removed and discarded, taking care not to contaminate the surface of the instrument. After removing all the gel from the transducer, the instrument should then be cleaned with warm water and detergent, in accordance with manufacturers' instructions. A small brush may be used for crevices or angles on the instrument, depending on its design.

Although use of a disposable cover reduces the level of risk of cross-infection or contamination, covers can be perforated or contain small unrecognised defects. For this reason, after thorough cleaning in warm water and detergent, the transducer should be soaked for 2 minutes in sodium hypochlorite solution (concentration should be at least 500 ppm available chlorine and should be made freshly each day). After disinfection the instrument should be thoroughly rinsed and dried before it can be re-used (with a new cover).

Abdominal ultrasound examination is generally considered to be a low risk procedure where this involves contact with intact skin (non-critical). However, there is a potential for bacterial transmission (such as *Staphylococcus aureus*) to occur particularly in a patient with an abdominal wound. In cases where there is an open wound, a disposable cover should be used. The cover should be discarded and the probe thoroughly cleaned after each use with warm water and detergent, then rinsed, dried and disinfected by soaking the instrument in sodium hypochlorite as described above. Probes used on intact skin should be routinely wiped with 70 per cent alcohol between patients.

Gel used in ultrasound procedures can also be a potential source of infection and care should be taken to ensure there is no risk of contamination of the gel used during these procedures. For surgical use, gel should be sterile. In procedures where gel containers are re-used, they should be thoroughly washed and dried prior to re-filling.

Standard Precautions - see page 11 - should always apply where there is a potential for contact with blood or body substances, non-intact skin or mucous membranes and should therefore be used with transvaginal and

transrectal ultrasound procedures. Gloves should be worn for these procedures and care must be taken that contaminated gloves do not contact the ultrasound control panel or exposed transducer cable. Hands should be washed thoroughly with soap and water before and after each procedure.

Further information on infection control procedures for ultrasound devices may be obtained from the Australasian Society for Ultrasound in Medicine - see Appendix C, page 147.

Thermometers

Oral thermometers should be single-patient use and should be adequately disinfected before use on other patients. Thermometers should be cleaned with water and detergent then disinfected with alcohol and stored dry. For home visits, thermometers may be transported in a carry case - this should be either disposable or should be cleaned and disinfected with the thermometer before re-use.

The use of a disposable cover for thermometers used in body cavities, including the mouth, vagina or rectum, should be encouraged. However, cleaning and disinfection as above is still required as covers may be defective or become damaged during use.

Thermometers used in sterile body cavities should be sterile.

Table 5: Level of processing required for specific items and procedures.

Level of Risk	Application	Process	Storage	Example
Critical	Entry or penetration into sterile tissue, cavity or blood stream	Sterilization by steam under pressure (autoclaving)	Sterility must be maintained: - packaged items should be allowed to dry before removal from the sterilizer; - the integrity of the wrap must be maintained.	Instruments used in *invasive surgical and dental procedures e.g. arthroscopes, laparoscopes, oral surgical instruments Acupuncture needles (re-usable)
#Semi-critical	Contact with intact mucosa (or non-intact skin)	Steam sterilization (autoclaving) is preferred where possible	Store to protect from environmental contamination.	Breathing circuits Vaginal speculae Instruments for routine dental procedures
#Semi-critical	Contact with intact mucosa (or non-intact skin)	If the equipment will not tolerate steam sterilization, use high level chemical disinfection or automated chemical processing systems	Store to protect from environmental contamination	Fibre optic scopes: sigmoidoscopes gastrosopes colonoscopes bronchoscopes
#Semi-critical	Contact with intact mucosa (or non-intact skin)	If the equipment will not tolerate steam sterilization, use high level chemical or thermal disinfection	Store to protect from environmental contamination	Bufs used in dental laboratory Non-invasive acupuncture devices
Non-critical	Contact with intact skin	Clean as necessary with detergent and water Clean then disinfect with 70 per cent alcohol or other suitable disinfectant as required	Store in a clean dry place	Stethoscopes Sphygmomanometers Blood pressure cuffs Mercury thermometers Abdominal ultrasound

* An invasive procedure is defined as surgical entry into tissues, cavities, or organs or repair of traumatic injuries. Invasive dental procedures include placement of matrix retaining bands, orthodontic bands, copper bands as well as root canal procedures.

These categories reflect current practice - sterilization is preferred where possible. Processing standards should evolve to accommodate changes in equipment design and emerging technologies in sterilization processes.

Note: To preserve the surfaces and composition of the instruments, separate dissimilar metals before cleaning. Avoid use of abrasive materials. Do not store instruments in disinfectant before or after any form of processing.

1.7 Implementing Standard and Additional Precautions

As an approach to infection control, Standard Precautions - described on page 11 - are essential because:

- infectious patients may not manifest any signs or symptoms of infection that would be detected in the course of routine history and medical assessment;
- infectious status is often determined only by laboratory tests that cannot be completed in time to provide emergency care;
- patients may be infectious before laboratory tests are positive or signs of disease are manifested (window period); or
- HCWs and patients may be placed at risk of cross infection from those who are asymptomatic but infectious.

Implementation of Standard Precautions is the primary strategy for successful control of nosocomial or iatrogenic infection.

Additional Precautions - described on page 11 - should be used where there is an established risk of transmission of infection (via the air borne or droplet route) regardless of the nature of the procedure being undertaken, or where the procedure itself carries an established risk, for example, risk of aerosolation, or of blood accident or staff/patient injury. Additional Precautions should also be used where patients are colonised with epidemiologically important pathogens, such as *Staphylococcus aureus*, which can be transmitted via the contact route. Additional Precautions are not required for patients with blood borne viruses such as HIV, hepatitis B or hepatitis C, unless there are complicating factors present, such as pulmonary tuberculosis.

Additional Precautions should be used to contain specific infectious diseases associated with patients with specific conditions, and are particularly relevant where staff care for young children or intellectually impaired patients. A single room with toilet facilities or a dedicated toilet may be required to prevent transmission of infections that are transmitted primarily by contact with faecal material, such as for patients with infectious diarrhoea or gastroenteritis caused by enteric bacteria or viruses.

Where patients are similarly infected, co-location (cohort placement) should be considered. Where Additional Precautions are required (transmission via the air borne or droplet route), a private room with separate facilities and appropriate ventilation may be necessary. Restricted movement of both patients and staff is advisable in these circumstances. Staff attending to patients in respiratory isolation should wear a well fitting mask (1 micron filtration is recommended for Tuberculosis). Ventilation must be appropriate, for example, monitored negative air pressure in relation to surrounding areas - see page 16.

In office practice, or in hospital outpatient waiting rooms, Additional Precautions for air borne dissemination may require placement of a patient, for example, a child with RSV, ahead of others in the waiting room, to minimise time of exposure to other patients.

Additional Precautions are also recommended for Creutzfeldt-Jakob disease (CJD) and other 'Prion' diseases. A NHMRC report titled *Creutzfeldt-Jakob Disease and other human transmissible spongiform encephalopathies: Guidelines on patient management and infection control* recommends steam sterilization at 134°C with holding times of 18 minutes or six separate 3 minute cycles.⁸⁶

Testing

Situations where laboratory testing is required as a component of infection control are outlined in Part 2 - see page 61 (HBV), page 63 (HCV), page 65 (HIV), and page 70 (*Staphylococcus*), and also in Part 3 - see Special issues No.10 page 106, No. 14 page 118, No. 16 page 122 and No.19 page 133.

Special circumstances requiring Additional Precautions

Standard Precautions including aseptic techniques, barrier protection and the appropriate reprocessing of instruments and equipment should reduce the risk of cross infection, even in high risk situations.

However, Additional Precautions may be advised in some circumstances, such as:

- operative procedures on patients with known or suspected Creutzfeldt-Jakob disease (CJD), or other infectious conditions where Standard Precautions are not sufficient;
- procedures on patients with aerosol or air borne disseminating conditions, such as tuberculosis or chickenpox;
- unusual manifestations of sepsis, including MRSA;
- patients who may be immunocompromised (e.g. immune suppression induced by chemotherapy)
- patients in high level of care units, such as in renal dialysis, burn units or bone transplant units;
- patients who may be gross disseminators of micro-organisms (e.g. patients with large areas of infected skin, or large, open or discharging purulent wounds should be placed in a single room.

Exclusion from office practice

The principles of infection control should apply equally for medical procedures undertaken in either the hospital operating room or in office practice. However, invasive procedures that are undertaken in office practice should not pose a significant risk of major blood accidents (excluding venipuncture) or easily create risk exposure situations. Before any invasive procedure is undertaken in office practice, the practitioner must specifically assess the risk and the ability of the practice to comply with infection control standards.

Specific situations which should be excluded from office practice include:

- endoscopic procedures, for example upper GIT and colonoscopy;
- respiratory therapy and respiratory function testing on patients with active pulmonary tuberculosis;
- dental procedures on patients with active pulmonary tuberculosis;
- procedures or circumstances where there is a high risk of major blood accident (excluding venipuncture);
- invasive procedures (medical or dental) on patients who may be infected with the agent causing Creutzfeldt-Jakob disease (CJD).

Triage policy

At the time of patient admission to hospital or presentation at an outpatient/casualty unit, a sufficiently detailed patient history should be taken to identify infectious patients, such as patients with a chronic cough who may have tuberculosis. A triage 'checklist' is recommended to assist risk assessment and prioritisation of patients requiring urgent attention or treatment. Prior to hospital admission for elective surgery, the treating doctor should advise the clinician in charge of admission of any known infectious conditions of the patient, so that the triage policy may be implemented.

Special patient accommodation

Special patient accommodation may be required to prevent transmission of highly contagious or virulent organisms that may be spread by both air borne and contact transmission. Special patient accommodation is not required for patients with blood borne viruses such as HIV, HBV, HCV unless accompanied by complicating factors such as pulmonary tuberculosis, nor is it required for CJD patients.

Respiratory precautions are required for patients with infectious pulmonary tuberculosis. These patients should be placed in a separate room with appropriate negative pressure air flow and ventilation standards. A minimum of six air changes per hour is recommended.²⁶ Staff attending to infectious patients should wear a well fitting particulate mask or respirator with 95 per cent efficiency in filtering one micron particles and providing face seal leakage of under 10 per cent.²⁶

Respiratory precautions should also be considered for paediatric hospital patients with acute respiratory infections, pharyngitis, pneumonia or measles.

If possible, a single room with toilet facilities should be made available for patients with highly transmissible infections or colonisations that are spread primarily by close and direct contact and which therefore require

Additional Precautions. Impermeable gowns or aprons and gloves should be worn by all people entering the room, and should be appropriately discarded on leaving the room.

Special accommodation should be considered for newborns with gonococcal conjunctivitis; for patients with herpes simplex infections or staphylococcal infections; for any patient with cutaneous diphtheria or with disseminated herpes simplex; for infection or colonisation by multiple drug-resistant bacteria; and for patients with major skin infections which are discharging and which cannot be adequately covered with dressings.

Special patient accommodation is more difficult to arrange in waiting areas in office practice and hospitals. Nevertheless, a triage policy and process should be established for waiting rooms in office practice and hospitals so that unwell and potentially infectious patients are able to be identified and separated from others in the waiting room as soon as possible.

Quarantine

Certain diseases are quarantinable. These include yellow fever, cholera, plague, rabies and four viral haemorrhagic fevers (*Crimean-Congo*, *Lassa*, *Marburg* and *Ebola* viruses). The Commonwealth has legislated responsibility for human quarantine. Under the Human Quarantine Program, the Commonwealth develops policy on diseases of quarantine importance and, in collaboration with the States and Territories, co-ordinates the national response to outbreaks of quarantinable diseases. State and Territory Health Departments must be notified in the event of a quarantinable disease being diagnosed.

Antibiotic resistance

Acquisition of resistance to antimicrobials is more common in hospitals than in the community due to the selective pressure exerted by high drug use, and facilitated transfer of organisms between staff and patients. However, the same principles apply in both the hospital and community or office practice setting. In hospitals and office practice, antibiotics should be used in accordance with the policies and procedures outlined in the Australian Antibiotic Guidelines.¹³⁰

Restraint in prescribing and adherence to the principles of antibiotic use is essential to avoid the danger of emerging drug resistance.

Successful implementation of antimicrobial policies requires that hospital drug committees should:

- formulate prescribing strategies appropriate for their institution;
- audit microbial use;
- organise appropriate educational measures; and
- recognise the forces influencing doctors' prescribing.

Antibiotic resistance, including methicillin resistant *Staphylococcus aureus* (MRSA) is discussed further on page 68.

Occupational Health and Safety

Employers have a responsibility to provide a safe work environment without risks to the health of their employees. In the health care setting this responsibility involves the provision of adequate staff training, protective clothing and equipment (including first aid kits and eye wash stations), and arrangement of workplace conditions and structures so as to minimise potential hazards. Employees also have a responsibility to comply with safety standards and procedures set by health care establishments, and should ensure that their work practices do not jeopardise the health and safety of themselves or any other person. It is the responsibility of both employer and employees involved in health care to agree on infection control policies.

The specification of protective measures, education and monitoring of implementation are key features of safety, quality assurance and occupational health for all health care establishments, and each health care establishment should have a written program of instructions (Standard Operating Procedures) for infection control to ensure that appropriate measures are effectively implemented. This should be easily accessible and readily available to all staff.

Readers should refer to Worksafe Australia's *National Code of Practice on HIV and hepatitis B in the workplace*⁹⁴

Needlestick and sharps injuries

Handling and disposal of sharps is discussed on page 23. The potential for transmission of blood borne viruses is greatest when needles, scalpels and other sharp instruments or devices are used. Special care must be taken to prevent injuries during procedures which involve exposure to sharps (including teeth and spicules of bone).

There are four important aspects that should be addressed in order to minimise the risk of sharps injuries:

- equipment design, systems of operating and instrument handling should minimise the chances of a penetrating injury. Safety features of equipment should be considered prior to selection and purchase. The use of dental style local anaesthetic cartridge systems is recommended.
- mechanical cleaning processes which minimise handling of sharps should be encouraged.
- receptacles for disposal of sharps (as specified in AS 4031 and AS/NZS 4261) must be available at the point of use - see page 23.
- maintaining records of accidents, reviewing the circumstances of injury and applying improvements are key aspects of infection control and are integral to quality assurance and occupational health and safety.

ANCA Bulletin No. 16¹⁰ outlines a recommended course of action to be taken in the event of needlestick or blood accident.

1.8 Protection for health care workers

Uniforms

Uniforms should be comfortable to wear and suitable for the type of work to be undertaken. Soiled uniforms should be changed as soon as possible. The use of protective clothing (gowns or plastic aprons) worn over uniforms will avoid undue contamination where staff are exposed to blood or body substances.

Protective clothing and equipment

Protective clothing and equipment should be readily available and accessible in each health care establishment and may include:

- gloves;
- eye and/or facial protection (glasses, goggles or face shields);
- masks;
- gowns and aprons;
- adequate footwear; and
- provision of safe needle handling systems.

The particular type of protective clothing required will vary according to the nature of the procedure, the equipment used and the skill of the operator and is a matter of individual professional judgement. Professional organisations - see Appendix C page 147 - may also provide advice on the level of protection required.

In determining the type of protective barriers to employ for any given procedure, the following should be considered:

- the probability of exposure to blood and body substances;
- the amount likely to be encountered;
- the type of body substance involved; and
- the probable route of transmission.

Full protective wear, including double gloves, protective eye/face shields, and foot wear, and impermeable gown or apron, is recommended for operating room procedures. Self-contained space suits may be required if exposure to highly infectious air borne agents is anticipated. See Special issues No 6, page 95.

Appropriate respiratory protection should be worn by HCWs potentially exposed to *Mycobacterium tuberculosis*, particularly where negative pressure ventilation is not available.

Gloves

Gloves should be worn wherever there is a risk of exposure to blood or body substances. However, wearing gloves does NOT replace the need for hand washing, as gloves may have defects which are not immediately obvious, or may become damaged during use. Hands should be washed before AND after use of gloves - see Table 1, page 15.

Types of gloves worn should be appropriate to the task:

- sterile gloves: for procedures requiring a sterile field, involving normally sterile areas of the body;
- non-sterile gloves: for procedures other than the above; and
- general purpose utility gloves: for housekeeping chores including cleaning.

Single-use (sterile) rubber surgical gloves must comply with requirements for Australian Standard AS 4179-1994, while examination and procedural gloves for general medical and dental use must comply with requirements for Australian Standard AS 4011-1995.

Single-use gloves must be changed and discarded:

- as soon as they are damaged (torn or punctured);
- after contact with each patient, and when performing separate procedures on the same patient;
- on completion of a any task not involving patients but requiring the use of gloves; and
- before answering telephones or recording patient notes.

Sterile or procedural gloves should be removed carefully to avoid contamination of hands or other surfaces. They must NOT be washed or re-used.

Sterile gloves are not required for most dental procedures. However, where invasive procedures are anticipated, such as incision into soft tissue or surgical procedures, sterile gloves should be worn.

In operating rooms, surgeons should wear double sterile gloves.¹⁰⁸ Requirements for surgeons are outlined in Special issues No. 6 page 95.

Some HCWs may develop allergy or sensitivity to rubber gloves. This is likely to be due to contact with latex proteins which may not have been adequately removed during the manufacturing process. In the presence of sweat or moisture, these proteins may become adsorbed onto lubricant powder used in the rubber gloves. Latex gloves that are powder free, or alternatives to latex, for example, neoprene should be used by HCWs who develop sensitivity or allergy to latex.

Utility gloves may be re-used but should be washed in detergent after use, stored dry, and replaced if torn, cracked, peeling or showing signs of deterioration.

Protective eye wear and face shields

Protective eye wear or face shields must be worn during procedures where splashing, splattering or spraying of blood or other body substances may occur. This includes most dental procedures, most operating room procedures, dermabrasion and manual cleaning of instruments and equipment. Dental patients should also be offered eye protection.

Protective eyewear should comply with AS 1337, and must be optically clear, anti-fog and distortion free, close fitting and should be shielded at the side. Eyewear should be either re-usable after cleaning and disinfection, or single-use.

Masks

Masks must be worn where there is a likelihood of splashing or splattering of blood or other body substances, or where air borne infection may occur.

Criteria for selection of the type of mask depends on the body substances likely to be encountered, and the nature of the activity. For example, a fluid-repellent deflector mask should be used when aerosolation or splattering of blood is probable. A particulate mask capable of filtering one micron particles and best possible fit should be worn when attending patients with infectious pulmonary tuberculosis. Masks must always be worn in the operating theatre.

Investigators have demonstrated that dental procedures can generate large quantities of aerosols of 3 microns or less, and therefore dental staff should wear masks or facial barriers that block particles of this size³⁵ and masks should be changed after 20 minutes in aerosol environments.⁴¹

Masks must:

- be worn and fitted according to the manufacturer's instructions;
- not be touched by hand while being worn;
- be removed after 20 minutes continuous exposure to aerosols or as soon as practicable after they become moist or visibly soiled;
- be removed by touching the strings and loops only; and

- not be worn loosely around the neck, but removed and discarded as soon as practicable after use.

Gowns and plastic aprons

Gowns and plastic aprons or covers should be worn to protect the wearer's clothing or skin from contamination with blood and body substances. Where there is a risk of large amounts of blood or body substances splashing the worker's clothing, impermeable or fluid resistant gowns should be worn. Sterile pre-packed gowns must be used in all aseptic procedures requiring a sterile field. Theatre clothing should not be worn outside the operating room environs. Special issues No. 6 page 95 provides further information on operating room gowns and other theatre clothing.

Clothing contaminated with blood or body substances should be removed as soon as possible and bagged for laundering or disposal - see page 23. If skin has been contaminated with blood or body substances, staff should wash their hands and body after removal of protective clothing, as soon as practicable.

Footwear

Footwear should be enclosed and capable of protecting health care workers from injury or contact with sharp objects, for example, if sharps are accidentally dropped.

Immunisation of health care workers

The NHMRC *Immunisation Procedures Handbook (5th edition)*⁸³ provides detailed information on immunisation schedules and vaccines. Health care establishments should initiate staff vaccination programs in accordance with these Procedures, whilst acknowledging that there may be some circumstances which require special consideration prior to vaccination, for example, where staff may have predisposing health conditions, or be pregnant - see Special issues No. 9 page 103 and No. 15 page 120.

HCWs, particularly those with potential exposure to blood or body substances, should be offered hepatitis B vaccination, with post vaccination testing to identify non-responders, as soon as possible prior to or after commencing employment. Education programs should support the establishment's vaccination strategy and seek compliance. Special issues No. 10 page 106 discusses the need for hepatitis B vaccination.

HCWs should also maintain adequate vaccination against diphtheria, tetanus, pertussis, measles, mumps, rubella (MMR) and polio, in accordance with the NHMRC recommended immunisation schedule. Influenza vaccination, particularly during outbreaks, should also be considered.

The NHMRC Working Party on Tuberculosis is reviewing recommendations for HCWs, including Mantoux screening prior to employment unless there is documentation of a positive Mantoux test, and regular surveillance with Mantoux testing for staff working in high risk areas if previous tests are negative. BCG vaccination is of uncertain value but can be offered to Mantoux negative staff at high risk but must not be given to staff who are HIV infected, pregnant or immune suppressed - see Special issues No. 9 page 103, No. 11 page 113 and page 71.

Providing staff have been fully informed of the need for vaccination and they then refuse, the health care establishment is not likely to be held negligent if staff subsequently contract infection. However, the health care establishment should implement systems of work which ensure compliance with infection control standards together with appropriate deployment of staff and continuing education.

Immunisation/health screening records

A nationally endorsed health screening card for health care workers, indicating their vaccination status (in accordance with the recommended NHMRC immunisation schedule) should be considered.

Health care establishments should maintain and regularly update immunisation/health screening cards for all HCWs during the period of each HCW's employment, and for a reasonable period thereafter, for example, 10 years. Confidentiality must be ensured. HCWs should have access to their individual medical screening records on request. In addition, these records should be transferable within health care establishments whenever HCWs change their place of employment.

On commencement of employment, staff should be informed of the institution's health screening policies, and should be counselled about appropriate work placement in accordance with these policies. An overview of staff screening is provided in Special issues No. 14, page 118.

1.9 Protection for patients

Patients' rights

Patients' rights must be considered when applying infection control standards. Infectious patients should be adequately informed about the risks of transmission of their infection to others and their cooperation with these measures encouraged. Where additional precautions such as special patient accommodation, for example, single rooms for respiratory isolation, or additional barrier protection are needed, a sensitive explanation of the reasons for the precautions should be provided before these precautions are implemented.

Standard Precautions

Standard Precautions benefit patients as well as HCWs, as implementation of these work practices will minimise the risk of cross infection from HCW to patient, from patient to HCW, and from patient to patient.

Standard Precautions should be implemented for all patient contact and in particular for patients undergoing invasive procedures including catheterisation, cannulation or intubation. Health care establishments undertaking these procedures should provide detailed information and outline standard operating procedures in their respective procedural manuals and protocols.

Additional Precautions

Additional Precautions are designed to interrupt transmission of infection which can be readily transmitted via the respiratory or air borne route, droplet transmission, direct or indirect contact with dry skin or with contaminated surfaces, or via any combination of these routes - see page 11 - and should be considered for patients with these conditions.

Children in hospital may have special considerations or pose additional challenge in maintaining infection control standards. Very young children or babies may be at special risk of nosocomial infection, due to their general lack of exposure to common diseases in the community, and perhaps due to their current state of immunity.

Immunocompromised patients are generally at increased risk from both endogenous and exogenous sources. They may vary in their susceptibility to nosocomial/iatrogenic infections, depending on the severity and duration of immunosuppression. These patients may be particularly susceptible to environmental contaminants, such as Legionnaires' disease or aspergillosis. Where invasive medical or dental procedures are involved, it would be reasonable to place immunocompromised patients at the start of the operating schedule.

Equipment used routinely on patients

Items in contact with the patient's intact skin, such as stethoscopes, sphygmomanometers and blood pressure cuffs should be used for patients similarly infected or colonised wherever this is possible. These and similar items should be cleaned with warm water and detergent as required.

Urinals and bed pans should be cleaned thoroughly after use with warm water and detergent.

Thermometers should be for individual patient use only - see page 40.

Patient's toiletry items (toothbrushes, combs, razors) must be for personal use only.

1.10 Quality management/quality improvement

Quality management in health care embraces all the multiple and various functions and activities which together are required to ensure continuous improvement of quality of care and services in health care establishments. A quality management program is an organised coherent range of activities designed to reach the objective of quality improvement, in accordance with implicit or explicit practice policies or standards of care. Quality improvement also implies interventions to correct deficiencies in performance once they have been determined.

To be effective, infection control should be an integral part of a comprehensive quality management program. The success of an infection control program in a health care establishment depends to a large extent on having an effective, properly managed quality management program in that establishment. The program should begin with a comprehensive procedure manual - see below.

An infection control program should specify:

- how the program is run;
- what documentation is required;
- hygiene standards;
- procedural standards;
- standards for equipment operating and instrument processing;
- the work environment;
- education standards (including minimum hours and level of education to be achieved);
- what infection control outcomes are desired; and
- what interventions (corrective actions) are required.

Policies and procedures

Policies and procedures should be consistent with national minimum standards and infection control principles outlined in these and other relevant national guidelines. They should be practical, workable, necessary, and sufficiently flexible to ensure their implementation. Policies and procedures should identify infection control indicators and desired outcomes. They should include some basis for risk assessment of each procedure - see Special issues No. 18, page 132, and where Additional Precautions are warranted, these should be clearly identified.

Health care establishments should develop specific documented policies and procedures (Standard Operating Procedures) which are relevant for that establishment and for specific procedures undertaken by that establishment. A comprehensive procedure manual should establish standards for performance in all aspects of infection control and recommend action to be taken when work practices are not in accord with these standards.

Performance standards should be communicated to health care workers through regular inservice training. Staff should be informed of any changes to present policy/procedures, as well as the formulation and implementation of new policy/procedures. New policy should be carefully monitored and should include staff feedback, with appropriate responses made to this process.

A comprehensive procedure manual should specify performance standards for:

- hygiene and hand washing procedures;
- safe handling and transport of pathology specimens;
- handling and cleaning of contaminated linen;
- handling and disposal of infectious waste;
- handling and disposal of sharps;
- cleaning and decontamination procedures for surfaces and equipment;
- tracking procedures (documentation requirements) for cleaning, disinfecting and sterilizing processes;
- listings of equipment to be monitored and measures to ensure reproducible and accurate performance;
- validating, calibrating and monitoring of the sterilizer and sterilization process;
- sterility tests;
- correct loading/unloading of sterilizers;

- monitoring of the packaging process (checking packages and seals, labelling and colour change of chemical indicators);
- regular review of storage facilities for sterile packs;
- monitoring of storage of biological items such as blood, drugs and vaccines, in accordance with manufacturer's instructions;
- use of protective clothing and equipment;
- procedures for occupational exposure to blood and body substances;
- procedures for managing spills or accidents with infectious substances;
- recording and evaluation of incidents or any breakdown in infection control procedures;
- monitoring of infections and notification of infectious diseases; and
- periodical evaluation of skills of all workers and ongoing training of HCWs.

The manual should be concise, readable and readily available.

Special issues No. 3a, page 87 discusses protocols for medical and dental procedures in office practice. (see also No. 3b page 88 - Special requirements in dental practice).

Education and training

Universities and training colleges which offer undergraduate courses in health related areas should ensure that the curriculum includes adequate and current information on infection control. They should also inform students prior to course admission of any requirement for undertaking exposure prone procedures, and implications of this, for example, inability to complete course requirements, for students who may be infected with a blood borne virus - see page 111.

Managers of all health care establishments should provide a specific program of education and training on infection control principles, policies and procedures relevant to their establishment, for all staff and students. Managers should also emphasise the importance of continuing education and training (internal and/or external) for all staff. New employees should be offered an orientation program to increase their awareness and to assist in their understanding of the institutional policies and programs for infection control. Education and training programs should be flexible to encourage staff participation, and should be relevant for staff from non-English speaking backgrounds or for those with other learning impediments. Accreditation of health care establishments should include demonstration of an acceptable education program.

Education and training programs should explain and emphasise:

- basic microbiology and modes of disease transmission;
- infection control principles, including;
- Standard and Additional Precautions;
- risk identification, assessment and control;
- the importance of good hygiene (hand washing in particular);
- the importance of thorough cleaning prior to disinfection or sterilization procedures;
- disinfecting and sterilizing techniques (including packaging items and correct loading of the sterilizer, as well as storage of processed items);
- importance of monitoring, validation and calibration of sterilizers;
- need for documentation of equipment decontamination processes;
- occupational health and safety issues, including;
- use of protective clothing and equipment;
- how to deal with spills;
- safe handling and disposal of sharps;
- accident reporting and management of occupational exposure (what to do in the event of needlestick or sharps injury);
- safe handling of pathology specimens;
- waste disposal (and any special arrangements for field situations);
- staff health issues (including vaccination and health screening programs);
- antibiotic policy and practice;

- quality management; and
- legal and ethical issues.

Workplace education and training should utilise a variety of techniques such as peer educators and group sessions which involve the active participation of employees. Organisations which provide support and care for people affected by infectious diseases such as HIV/AIDS should be invited to provide speakers to help improve HCW's understanding of the impact of these diseases.

Professional organisations - see Appendix C, page 147 - may also provide assistance with educational aids (videos, publications, etc.).

Compliance and accreditation

National infection control guidelines should be incorporated into the standards that apply to health care establishments, and demonstrated compliance with infection control standards should be a requirement for accreditation.

Appropriate professional organisations such as the Australian Council on Healthcare Standards (ACHS), the Royal Australian College of General Practitioners (RACGP), the Australian Medical Association (AMA), the Australian Dental Association (ADA), the Royal Australasian College of Surgeons (RACS), and the Australian Infection Control Association (AICA) should be consulted on accreditation requirements relating to infection control. See Appendix C, page 147 for contact details of national organisations.

The South Australian Branches of the Australian Medical Association and Australian Dental Association have successfully trialed a quality management program (AMADA Program) for office practice which could be a useful model for accreditation of office practice. In addition, the Royal Australian College of General Practitioners has revised its draft entry standards for General Practice which define standards to be applied in any accreditation process.

1.11 Surveillance

Iatrogenic/nosocomial infection may be acquired as a result of a particular surgical procedure or medical treatment. In hospital or similar health care establishments the risk of infection may also be due to the patient's intrinsic risk factors, contact with other infectious patients or contact with staff involved in patient treatment and care, including contract staff and health care students.

Systems of surveillance for iatrogenic/nosocomial infection should be in place in all health care establishments so that any problems or breakdown in infection control can be quickly identified. This will allow timely investigation and control and provide feedback for future preventive action.

Surveillance of hospital acquired infection is essential for the prevention of infection in hospitals. Surveillance in a hospital setting consists of defining the events to be surveyed as precisely as possible; collecting the relevant data in a systematic way; tabulating the data into meaningful arrangements; analysing and interpreting the data; and finally communicating the findings to all relevant people.

Surveillance is required to determine base-line information regarding the frequency and type of hospital-acquired infections so that problems can be recognised and investigated. Appropriate infection control measures can then be instituted to minimise transmission of infection to other patients and hospital staff. Significant changes in rates of infection can also be used to evaluate the effects of infection control policies and procedures and patient care practice.

Although iatrogenic infection may be difficult to identify in office practice, practitioners should be encouraged to review infection control procedures and make modifications to their practice where problems are identified.

National systems of surveillance should incorporate occupational exposure to blood and body fluids.

Defining what data are to be collected

The surveillance systems in health care establishments will vary depending on the type and size of the establishment and the facilities/resources available. Systems may include laboratory based surveillance of 'alert organisms' such as methicillin-resistant *Staphylococcus aureus* (MRSA) or of 'alert conditions' such as food poisoning and suspected legionellosis; results of microbiology on blood cultures and cerebrospinal fluid such as utilised in the Victorian Hospital Pathogens Surveillance Scheme; microbiology results on post-operative wound swabs or of samples from intensive care units etc.

Regardless of the surveillance system used the important items of information that need to be collected include name, age, sex, hospital record number, ward or location in the hospital, the consultant and/or unit, date of admission, date of onset of infection, site of infection, the organisms isolated, and the antibiotic sensitivity patterns of the organisms - see Special issues No. 7, page 100.

With regard to monitoring occupational exposures to blood and body fluids among health care workers, important items of information to be collected include the extent of the exposure (refer to ANCA Bulletin No. 16), whether the injury was percutaneous or a mucous membrane exposure, the location in the health care establishment (ward or other location), the activity or procedure, the implement causing the injury, the infectious agent involved, any prophylaxis initiated and the outcome of the injury. These items are also relevant for recording potential transmission from an infected health care worker to a patient.

Role of the Infection Control Nurse and Infection Control Committee

The Infection Control Committee (ICC) of hospitals and similar health care establishments should be responsible for all aspects of surveillance of iatrogenic/nosocomial infections. There should be at least one Infection Control (IC) Nurse for every 200-250 beds for each establishment. The role of the IC Nurse is to facilitate the implementation of policies established by the IC Committee and to:

- monitor clinical indicators;
- be responsible for collection and evaluation of surveillance data;
- report to the ICC; and

- participate in the evaluation of the IC Committee's policies.

The ICC should authorise the distribution of this data to relevant people within the establishment.

The IC Nurse should review case notes, laboratory and radiology reports, autopsy reports, outpatients clinic records and records of staff infections, and should establish a close working relationship with the hospital microbiologist.

Outbreak investigation and control

Hospital surveillance systems should facilitate the early detection of outbreaks. In some instances the occurrence of an outbreak would be obvious, such as when a number of patients and staff develop gastrointestinal symptoms. However, in other more insidious outbreaks the situation may progress for some time before infection control staff become aware of it.

The existence of an outbreak should be brought to the immediate attention of the Infection Control Committee of the establishment, the hospital administration and where necessary the relevant health authority. An outbreak control team may need to be formed and this should ideally consist of the Infection Control Nurse, an infectious disease physician, the clinician in charge of the unit concerned, a hospital administrator, a microbiologist and where necessary, a State/Territory public health specialist. Other experts such as hospital engineers may need to be involved depending on the circumstances.

One person should be delegated responsibility for coordinating all control activities which should include active surveillance for future cases.

Action taken may include isolation of cases, surveillance of contacts, investigation of possible sources of infection, restriction of admissions or closure of wards depending on the circumstances.

There should be regular communication with patients, contacts, hospital administration, health authorities and if necessary the media.

Hospital Infection Control Committees should develop protocols for action to be taken in the event of an outbreak. This should include lists of contacts with after hours telephone numbers and pager numbers - see Special issues No. 8, page 102.

Part 2

Infectious diseases in the health care setting

2.1 Acute respiratory viral infections

Acute respiratory viral infections, including influenza, occur with the same frequency in health care workers as in the community. Virus excretion is limited to the period of symptomatic illness. Those health care workers with an upper respiratory tract infection (URTI) or influenza-like illness should be given sick leave or redeployed (depending on the circumstances).

Influenza is a severe systemic disease spread by the respiratory route.

During epidemics in the community there is an increased risk of infection to hospital staff and patients. Infected staff may transmit the virus to debilitated patients who may die as a consequence. Epidemics of influenza can occur irregularly and the vaccine may not be fully effective.

Because the formulation of influenza vaccine varies from year to year, it is more difficult to make firm recommendations on its use than for other vaccines. Currently available influenza vaccines confer about 70 per cent protection for about one year. To provide continuing protection, annual vaccination with vaccine containing the most recent strains is necessary.⁸³

Recommendations

- Influenza vaccine should be offered to health care workers in accordance with NHMRC recommendations.⁸³
- In the event of a major outbreak, advice should be sought from State/Territory Health Departments.

2.2 CJD - Creutzfeldt-Jakob Disease (Subacute spongiform encephalopathy)

Creutzfeldt-Jakob Disease (CJD) is a rare degenerative disorder of the central nervous system which occurs sporadically at an annual rate of about 1 case per million people. It is one of several fatal neurodegenerative diseases (also known as transmissible spongiform encephalopathies) occurring in humans and animal species, and is characterised by microscopic vacuoles in the brain, astrocytosis and loss of neurones. It appears that a modified form of the normal host protein (PrP protein) is the major, if not sole, component of the infectious agent.⁸⁶

Iatrogenic transmission of CJD, although rare, has been reported following the administration of human pituitary-derived hormones, neurosurgical procedures and tissue transplantation.

Human to human transmission of CJD was first reported in 1974 following a corneal transplant from an infected donor. More recently three cases have been reported following the use of commercially available cadaveric dura mater transplants that had been lyophilised and irradiated. Contaminated stereotactic EEG electrodes were the source of infection in two reported cases; contaminated surgical instruments used in intracranial neurosurgery were the source in four other cases reported. The incubation period in these patients following cranial surgery or corneal transplantation was much shorter than that after hormone injections and ranged from 18 to 33 months. Human pituitary hormone administration, tissue transplantation, ocular surgery and intracranial neurosurgery would thus appear to be risk factors for the iatrogenic transmission of CJD. There is no evidence of human to human transmission following close contact, sexual contact, transplacental transmission from mother to baby or by aerial spread.

In view of the resistance of the CJD agent to routine methods of decontamination, operations and in particular neurosurgical procedures in patients harbouring CJD may pose a special risk for other patients exposed to the same instruments. Support for this mode of transmission is provided by a Japanese study of 60 patients with sporadic CJD studied during 1975 and 1977.⁷⁰ In this study there was a significant association between the development of CJD and prior surgical operations: 26 per cent of male patients with CJD and 24 per cent of female patients had a surgical operation during the past five years compared with only 8 per cent of male controls and 10 per cent of female controls during the same period. With an incubation period of 10 to 20 years

the reservoir of infection in the asymptomatic pre-clinical cases may be as great as 10 to 20 times the clinical incidence.

An NHMRC working party (Pituitary Hormones Task Force) has prepared a report on infection control guidelines for CJD⁴⁰, which includes stringent precautions for sterilization of instruments (autoclaving at 134°C for 18 minutes single cycle or for six separate 3 minute cycles).

2.3 Cytomegalovirus

In most healthy adults CMV infection is subclinical, but occasionally CMV produces a glandular fever-type illness. If pregnant women become infected there is a possibility of foetal damage. CMV in the immunosuppressed patient (especially primary infection) can cause severe and life threatening problems. About 40-60 per cent of the adult population is immune.¹⁸

CMV is likely to be encountered both in the community and in hospitals. Transmission of CMV from infants to adults and cross-infection between children in day care centres have been recorded.¹ Studies of CMV infection rates amongst hospital workers have generally not convincingly demonstrated an increased risk for workers in new-born nurseries or on paediatric wards.^{136,4,46} However, one study⁵² describes a significantly higher seroconversion rate among nurses working in an intensive care unit in a children's hospital.

It is difficult to identify all patients who shed CMV because it is a latent virus infecting about half of the community and it may be reactivated in the course of various illnesses, for example, cancer.

New born infants may be heavy shedders of CMV if congenitally infected. Most neonatal infections are asymptomatic and are acquired perinatally from the birth canal.

The risk of transmission of CMV is low except in circumstances where there is intimate contact or transfusion. CMV is present in blood and secretions of infected individuals. Standard Precautions, including the use of gloves when exposed to blood and body secretions and thorough hand washing will minimise the risk of acquisition of infection.

It is not considered reasonable to screen all patients. This is because of the practical problems of identifying CMV excretors, the apparent minimal risk of CMV spread to hospital staff or from staff to patients, and the effectiveness of hygiene in preventing cross-infection.

In the case of pregnant staff it would seem wise to avoid direct and prolonged contact with CMV infection, for example, where a person is known to be excreting CMV. However, it is not practicable to identify all such patients as only a small proportion of antibody-positive patients will excrete virus. Detection by culture takes many days and is relatively insensitive.

Because of the special risks to pregnant staff, they should be counselled about hygiene and given an opportunity to have their susceptibility to CMV determined. CMV seronegative women who care for children over the age of 2 years have a lower risk of infection.^{1,3} Redeploying seronegative pregnant employees to care for older children may further minimise the risk to carers working in high risk areas.^{1,3}

Recommendations

- CMV is excreted by many patients with debilitating illnesses, by some pregnant women, and by some neonates. Because there are difficulties in detecting excretors, and because simple hygiene and Standard Precautions will prevent acquisition of infection by staff and patients, the emphasis for control should be placed on education in hygiene rather than on screening of patients.
- Pregnant staff and staff who work in child care units should be informed of the risks of CMV infection and provided with an opportunity of determining their susceptibility (by antibody testing). They should be counselled about hygiene and permitted, but not required to minimise contact with known CMV-infected patients. Redeploying seronegative pregnant employees to care for older children may further minimise the risk to carers working in high risk areas.^{1,3}

2.4 Diphtheria

Diphtheria is an acute illness caused by toxigenic strains of *Corynebacterium diphtheriae*. Disease primarily affected the upper respiratory tract but the skin can be involved. It is characterised by an inflammatory exudate which forms a greyish membrane in the upper respiratory tract and which can cause acute severe respiratory obstruction. A toxin produced by the diphtheria bacillus can cause neuropathy and cardiomyopathy and can be fatal. The introduction of diphtheria antitoxin in the 1890s reduced the death rate to about 10 per cent.

Effective protection against diphtheria is achieved by active immunisation with diphtheria vaccine. Diphtheria has been almost eliminated from Australia since vaccination programs have been introduced, but sporadic cases continue to occur in unimmunised individuals. A high vaccination rate must be maintained to protect the population from a resurgence of the disease, as an increase in the prevalence of infections from toxigenic strains could follow the introduction of cases or carriers from overseas or from local emergence of a virulent strain.

2.5 Gastroenteritis and enteric pathogens

Gastro-intestinal infections (G-I) are relatively common in the community. Staff may carry pathogens asymptomatically, sometimes for long periods.

The most likely source of infection in health care establishments is other patients, especially paediatric patients and food - see food handling page 24. Frequent screening of food handlers is not practicable. Asymptomatic excretors of G-I pathogens are unlikely to transmit disease if standards of hygiene are high and methods of food preparation and storage prevent incubation of pathogens.

Salmonella and *Campylobacter* are present in 'normal' poultry and other animals. Possible contamination from both human and non-human sources must be considered when developing food preparation procedures. Education of staff who handle food is the most effective method of reducing the risk of food borne infections in health care establishments.

Gut pathogens such as *Shigella* spp, *Salmonella* spp (including *S. typhimurium*), *Campylobacter* spp and enteric viruses may be acquired by staff caring for patients with diarrhoea. In addition, hepatitis A may be acquired from a patient during their infectious period.

Clostridium difficile is a common cause of diarrhoea in patients especially those who have received recent antibiotics. This organism produces spores which are highly resistant to inactivation. Cross infection can occur with spread from patient to patient, both from a contaminated environment and via the hands of staff.

Recommendations

- Outbreaks of gastro-intestinal infections should be investigated. Routine screening of staff for G-I pathogens is not recommended.
- If staff caring for patients diagnosed with gastro-intestinal infections become ill, they should be assessed for gut pathogens where appropriate, and infection control procedures should be re-examined.
- Patients suffering from suspected or confirmed gastro-intestinal infections (including *C. difficile*) should be nursed in a separate room with facilities (including toilets) that are not shared with other patients (where available). Adequate hand washing facilities for staff and patients are essential.
- Staff with bacterial diarrhoea should not return to work until faecal cultures for the causal organism are negative. In the case of viral infection staff should not return to work until it is expected they have ceased to shed the virus. A viral gastroenterologist should be consulted on this matter.
- Staff who handle food should not be working if they have acute diarrhoea, but may return to work 48 hours after symptoms have disappeared.

- Known carriers of *Salmonella* should not work in food preparation areas without assessment of the premises and individual work practices.

2.6 Hepatitis A

Preliminary *CDI*³⁸ data for 1995 indicates there were 1,563 new cases of hepatitis A reported from 1 January to 23 December 1995.

Hepatitis A is caused by an enterovirus which is transmitted by the faecal-oral route. Person to person spread is the usual method of transmission, but outbreaks can occur from contaminated food or drink. Sexual transmission can also occur.⁸³

Hepatitis A vaccine is recommended for those staff at high risk of exposure, such as child day care staff caring for young children too young to be toilet trained, staff and residents of residential facilities for the intellectually disabled, HCWs in remote Aboriginal and Torres Strait Islander communities and HCWs in contact with paediatric patients and infectious diseases wards.

The *NHMRC Immunisation Procedures Handbook*⁸³ and *Staying healthy in child care*⁹³ should be consulted.

2.7 Hepatitis B (HBV)

Preliminary *CDI*³⁸ data indicates there were 339 new cases of hepatitis B reported from 1 January to 23 December 1995.

Hepatitis B infection is caused by the hepatitis B virus (HBV) which is present in the blood, tissues and body secretions of infected persons. HBV causes an acute hepatitis after an incubation period that ranges between six weeks and six months.

Following acute infection, most people recover, but as many as 10 per cent may continue to carry the virus in their blood for a long period of time, even a lifetime. These chronic carriers become a potential source of infection to others. Certain population groups have a higher-than-normal frequency of the carrier state: injecting drug users, chronic haemodialysis patients, and those with chronic debilitating illness, for example, auto-immune disease and lymphoma, are more likely to become chronic carriers after acute infection than are immunocompetent people. Between 25 per cent and 40 per cent of carriers do not belong to recognised risk groups. Following the introduction of blood-donor screening and vaccination for hepatitis B, the frequency and risk of infection is beginning to diminish. At the present time, chronic carriers of HBV will be regularly encountered in health care establishments and specific provision is required to protect staff. HCWs should be vaccinated for hepatitis B in accordance with the NHMRC schedule, outlined in the *Australian Immunisation Procedures Handbook*⁸³ - see also page 61.

All HCWs, particularly those staff who may be exposed to blood or body substances, should be vaccinated against hepatitis B. HBV poses a considerable risk to HCWs and is transmitted to staff by way of accidental exposure to infected blood, tissue or secretions. The risk of transmission of HBV to non-immune HCWs after a needlestick injury depends on the titre of virions in the contaminant and correlates with the presence or absence of hepatitis B e antigen (HBeAg) in the source patient. Estimates of infectivity range from 2 per cent (HBeAg absent) to 40 per cent (HBeAg present).^{6, 55, 131} Blood from infected patients with titres of hepatitis B surface antigen (HBsAg) below the threshold of laboratory detection is rarely infectious.^{7, 55}

Transmission of blood from staff to patient occurs only if an injury to the operator causes bleeding during a surgical or dental procedure. It has been estimated that about 1 per cent of surgeons are infected with hepatitis B virus, and although transmission from surgeons to patients is uncommon, a recent study indicated a surgeon who was HBeAg positive, and with a high serum HBV DNA concentration, infected 19 of 144 susceptible patients whilst performing surgery between July 1991 to July 1992, despite apparent compliance with infection control practices.⁵⁸

The risk of transmission from carrier mothers to neonates, patients to health care worker via needlestick injuries and amongst sexual partners in households is related to the presence of HBV DNA in serum and this is probably the case in transmission from health care workers to patients.

The determination of infection and immunity with HBV is based on laboratory tests that are able to identify 'markers' associated with stages of infection and immunity. The markers that are relevant to this document are outlined below:

HBV	Hepatitis B virus (or Dane particle).
HBsAg	Hepatitis B surface antigen is present on the surface of the infectious agent and also on separate (non-infectious) smaller particles that are present in blood and tissues in high concentrations. A positive test for HBsAg indicates that the person is actively infected and therefore potentially infectious. For occupational health purposes this test is performed on transmitters of blood (source individual or affected person) in blood accidents to determine whether the source of blood is likely to be infectious for hepatitis B. A person who is positive for HBsAg will not benefit from vaccination (with hepatitis B vaccines).
HBV DNA	The HBV contains double-stranded DNA inside the core structure. Detection of HBV DNA provides a measure of how much HBV is present in a sample and is therefore a direct marker of infectivity.
HBeAg	Hepatitis B 'e' antigen is considered to be a measure of infectivity. Persons with 'e' antigen pose a greater risk of infection to contacts than those who are HBsAg positive but HBeAg negative. Hepatitis B 'e' antigen has been recommended as a means of identifying infectious individuals; however HBeAg does not reliably identify all infectious people. HBV-DNA is a more sensitive marker of infectivity.
Anti-HBs	Antibody to HBsAg is considered to be a protective antibody. This test becomes positive in most persons who have recovered from acute infection with HBV and also in persons who have been successfully vaccinated with the hepatitis B vaccine.
Anti-HBc	Antibody to hepatitis B core antigen develops shortly after HBsAg in the course of infection. This test can be used to identify a small number of HBV infections that are negative for both HBsAg and anti-HBsAg. Persons who are anti-HBc positive do not require vaccination.

There are two hepatitis B vaccines approved for use in Australia - see *NHMRC Immunisation Procedure Handbook*.⁸³ The vaccines are derived from genetically engineered *Saccharomyces cerevisiae* yeast cells which carry the hepatitis B surface antigen gene (HBsAg). A course of three vaccinations over six months stimulates immunity in over 90 per cent of persons vaccinated. The need for a booster dose of hepatitis B dose is still unclear because of a lack of pertinent data on infection in persons at different intervals after vaccination. In the interim, individuals at high risk should consider a single booster dose after five years.

Health care workers should be offered hepatitis B vaccination as soon as possible on commencement of employment and should be tested for seroconversion to anti-HBs positivity one to three months after the third dose of vaccine. Those who do not respond should be offered a fourth dose of vaccine. Persistent non-responders should be informed about the need for hepatitis B immunoglobulin (HBIG) within 48 hours of parenteral exposure to HBV. Some patients, such as those on renal dialysis should also be protected by vaccination.⁸³

All health care establishments should have hepatitis B vaccination strategies in place for both staff and patients, as well as policies (Standard Precautions) that minimise the risk of blood accident .

ANCA Bulletin No. 16 provides advice on the management of staff who are accidentally exposed to blood or body fluids.

Special issues No. 10 page 106 provides information on health care workers (including students) infected with hepatitis B and other blood borne viruses.

Recommendations

- A comprehensive hepatitis B vaccine program for all staff, particularly category A and C staff, should be developed and monitored. One to three months after the completion of vaccination all staff should have

protective antibody levels measured, to identify non-responders. Those with non-protective levels of antibody should be revaccinated. Those with no antibody should be assessed for presence of chronic infection and counselled accordingly. Vaccination should be encouraged through appropriate counselling and provision of information about hepatitis B vaccination.

- Patients at risk of infection e.g. haemodialysis patients, should be offered hepatitis B vaccination.
- Standard Precautions should be implemented to minimise risk of exposure to hepatitis B.
- Needlestick injuries and other accidents involving exposure to blood and body substances should be investigated and procedures established that will reduce the incidence of such accidents.
- A clear protocol for management of staff involved in blood accidents should be available and its effectiveness regularly reviewed.
- HCWs who perform exposure prone procedures have an ongoing responsibility to know their HBV infectious status.
- HCWs should not perform exposure prone procedures if they are HBV DNA or hepatitis B 'e' antigen (HBeAg) positive. Individuals who test positive for hepatitis B surface antigen (HBsAg) should only perform exposure prone procedures on the advice of a State/Territory health and/or professional advisory board. HBeAg positive individuals should not perform exposure prone procedures, as persons with the 'e' antigen pose a higher risk of infection to contacts than those who are HBsAg positive but HBeAg negative.

2.8 Hepatitis C (HCV)

The hepatitis C virus (HCV) was conclusively identified in 1989 and subsequent serological surveys found that HCV was responsible for approximately 90 per cent of all transfusion related cases of non-A, non-B (NANB) hepatitis. Although acute hepatitis C is frequently asymptomatic, and fulminant HCV infection is rare, HCV causes chronic hepatitis in a high proportion of those infected which may ultimately result in the development of chronic liver disease, cirrhosis and hepatocellular carcinoma.⁶⁴

A routine diagnostic laboratory test for HCV has been available since 1990. It is estimated that there are at least 100 000 chronic HCV carriers in Australia. Preliminary *CDI*³⁸ data indicates there were a total of 9,529 cases of hepatitis C reported from 1 January to 23 December 1995. Of these, 88 were new (incident) cases. However, the number of HCV seropositive test reports almost certainly reflects the availability of testing, the introduction of laboratory based notification (in 1990), an increased awareness of this disease by doctors and the public, and the detection of infections which were acquired many years ago, rather than a real increase in the transmission of the virus.

Of the existing pool of past hepatitis C infections, about 75 per cent are thought to have a history of injecting drug use (IDU), with less than 20 per cent having had a blood transfusion prior to mid February 1990, when screening was introduced. Occupational exposure and unsterile tattooing practice account for small proportions. The only population based information which estimates prevalence of HCV infection in Australia is that which is available from potential blood donors. This indicates that 0.2-0.4 per cent of this section of the community have been infected. However, this is a selected population and risk group screening prior to blood collection could make this percentage unreliably low.⁸⁸

The infection rate is much higher amongst particular groups at risk. For example, one study showed that 40 per cent are infected after 2 years of injecting drug use, and this approaches 100 per cent after 8 years of IDU. The infection rate for sex workers is about 5-8 per cent, but this is likely due to concomitant injecting drug use. Prior to 1990 and the introduction of screening, regular recipients of pooled blood products, for example, Factor VIII, had a substantial risk (85-90 per cent) of having been infected with HCV. People born overseas also have a greater prevalence of HCV antibodies than those people born in Australia. One possible source of infection for such people was the use of unsterilized needles in medical clinics in their countries of origin, as well as unsterile tattooing, scarification and folk medicine. The prevalence is higher in those born from Mediterranean and Eastern European countries, Asia, South America, Africa and the Middle East.⁸⁸

Health care workers and patients may be exposed to HCV through contact with blood and other body fluids. The risk of HCV transmission to HCWs following needlestick injury from source patients with HCV antibody range from 2-10 per cent^{69,80}. There has also been one case report of HCV transmission from a blood splash to the

conjunctiva.¹¹³ An episode of nosocomial infection involving 5 patients who had undergone surgery in one session was reported in NSW recently. It was proposed that transmission had occurred through blood in respiratory secretions via anaesthetic circuitry.¹⁰⁰ There has been a reported case of a cardiothoracic patient in the UK who developed HCV infection following surgery. The probable source of infection was an infected HCW.¹⁰⁵ A cardiac surgeon with chronic hepatitis C may have transmitted HCV to five of his patients during open heart surgery between 1988 and 1993.⁴⁸

Transmission by blood and blood products is known to occur. Transplanted organs and tissues may also transmit this infection. Therefore, the parenteral route is the mode of transmission of importance in the health care setting.

The presence of antibody does not necessarily equate with active infection or infectivity, for example, it may represent a recovery phase. In addition, infectivity cannot be inferred by a positive test for anti-HCV antibodies as it may represent past (inactive) infection or a false positive test. Current tests do not clearly differentiate past or current HCV infection. Newer tests, for example, polymerase chain reaction - PCR, are being developed to assess infectivity.

Active immunisation is not available, and there is no evidence that passive immunisation is effective. However, it is likely that adherence to Standard Precautions should provide adequate protection for HCWs.

In the case of needlestick injury or blood accident, assessment of the source individual for HCV is warranted because the injured party may benefit from therapies that are the subject of current clinical trials and the study of such accidents will provide more precise data on the risks - see ANCA Bulletin No. 16.¹⁰

Special issues No. 10 page 106 provides information on health care workers (including students) infected with hepatitis C and other blood borne viruses.

Recommendations

- Standard Precautions are recommended as the principal means of preventing occupational spread of HCV.
- Blood accident assessment should include a review of the hepatitis C status of the source individual and if positive the affected person. Refer to ANCA Bulletin No. 16.¹⁰
- HCWs who perform exposure prone procedures have an ongoing responsibility to know their HCV infectious status. However, current tests for hepatitis C are unreliable as a basis for diagnosis. A positive or indeterminate antibody test might not necessarily indicate infection; elevated liver enzymes, such as ALT, do not specifically indicate hepatitis C infection; and a negative polymerase chain reaction (PCR) test does not necessarily rule out infection. HCWs with indeterminate test results should not be excluded on the basis of test results alone. If test results are positive or indeterminate, HCWs should be clinically assessed by an experienced physician, over a reasonable period of time, for any sign of active infection. Where there is insufficient evidence of active infection, the treating doctor, or the individual concerned, should seek the advice of an advisory panel or professional board. HCWs should not perform exposure prone procedures if there is evidence of current/active HCV infection, as in this situation there is a reasonable risk of transmission of infection.
- Routine screening for anti-HCV antibodies in order to determine infectivity is not recommended for patients or staff until tests are available that can reliably identify infectious persons.

2.9 Herpes simplex virus

Infectious virus is shed from active (vesicular) herpetic lesions. Neonates and immunocompromised patients can acquire herpes simplex infection from staff and suffer major illness, but this is a rare occurrence. Traditionally, staff with active herpes have been excluded from contact with neonates, and excluded from the operating theatre if a member of the scrub team.

Herpetic whitlow is more likely to transmit infection than oro-labial herpes. Genital herpes does not pose a risk providing normal hygiene and hand washing are observed.

Covered lesions present minimal risk.

Recommendations

- If Category A (see Special issues No.13) staff have herpetic whitlow they should wear gloves or some other effective occlusive dressing when the lesions are vesicular (virus is not shed from crusted lesions).
- When vesicles cannot be covered (as in oral herpes), direct contact with neonates and/or immunocompromised patients should be avoided. Staff should be redeployed until the lesion has crusted over.
- Staff should wear gloves whenever contact is made with any herpetic lesion and also for contact with any area where the virus may be excreted asymptotically (e.g. the mouth and saliva)

2.10 Human immunodeficiency virus (HIV/AIDS)

Australian HIV surveillance data from 1 April to 30 June 1995 indicates there were 215 people newly diagnosed with HIV infection, 116 people newly diagnosed with AIDS and 102 died following AIDS. Cumulative totals to 30 June 1995 indicate that there have been 19 087 diagnoses of HIV infection, 6 035 diagnoses of AIDS and 4 309 deaths following AIDS.⁸¹

The human immunodeficiency virus (HIV) is a blood borne virus, first recognised in 1981. HIV may be transmitted by direct contact with blood or other body substances, through non-intact skin or through inoculation.

HIV can cause a severe, life threatening condition known as acquired immune deficiency syndrome (AIDS). This syndrome represents the late clinical stage of infection with HIV, which most often results in progressive damage to the immune and other organ systems, especially the CNS. Within 2-3 weeks or up to several months following infection, seroconversion may result in an acute self-limited illness, similar to mononucleosis, lasting for a week or two. Infected persons may then be free of clinical signs or symptoms for many months to years before other clinical manifestations, including opportunistic infections and constitutional and neurological symptoms appear.¹⁸

The concentration of HIV in the blood stream is high in the early stages of infection including the 'window' period between acquisition of HIV and the seroconversion illness that typically occurs 8–12 weeks after contact. During this period the antibody test is negative. In the latent phase of infection HIV is present only in low concentrations in the blood. As AIDS develops the virus titre may rise again when blood is presumably more infectious.

At the time of writing, there have been no known cases of HIV transmission from HCW to patient in Australia. Internationally, there has been only one documented case of HIV transmission from HCW to patient. This occurred in the United States, where six patients became infected with HIV from a Florida dentist. This transmission was considered to be the result of a lapse in infection control procedures.

The risk to health care workers of acquiring HIV in the course of their employment is very small. Firstly, blood is the single most important source of HIV infection. Secondly, exposure to blood through the percutaneous route is significantly more likely to transmit HIV than is mucous membrane or cutaneous contact.³³ For a health care worker the average risk for HIV infection after a percutaneous needlestick injury with HIV-infected blood is estimated to be 0.3 per cent.⁶⁰ Also because health care workers are more likely than patients to experience contact with blood in the health care setting, the risk for transmission of HIV from patient to health care worker clearly exceeds that of health care worker to patient.¹⁵ The risk to patients is exceedingly low as all blood for transfusion in Australia has been tested for HIV antibody since 1985 and there have been no cases of transfusion acquired HIV since that time.

A comprehensive retrospective case-control study²⁴ of HIV seroconversion in health care workers after percutaneous exposure to HIV-infected blood, from January 1988 to August 1994, investigated factors that influence the risk for HIV infection. In this study, case-HCWs had a documented occupational percutaneous exposure to HIV-infected blood, HIV seroconversion temporally associated with the exposure and no other concurrent exposure to HIV. Control-HCWs had a documented occupational percutaneous exposure to HIV-infected blood, and were HIV seronegative at the time of exposure and at least six months later. Results

indicated that for case-HCWs 94 per cent of exposures were needlestick and 7 per cent involved other sharp objects. For control-HCWs 91 per cent exposures were needlestick and 9 per cent involved other sharp objects. The findings in this study indicate that an increased risk for HIV infection following percutaneous exposures to HIV-infected blood was associated the following factors. The risk increased:

- if the exposure involved a larger quantity of blood, indicated by visible contamination of the device, a procedure that involved a needle directly placed in a vein or artery, or a deep injury;
- if exposed to blood from source with terminal illness.

In the case of needlestick injury or blood accident, the stage of infection of the source individual may influence infectivity. The treatment provided to persons involved in blood accidents may also influence outcomes. Simple measures such as washing blood out of eyes/mouth after accidental exposure may curtail infection. Zidovudine (ZDV), also known as azidothymidine (AZT), or other drugs which are available for this purpose, can be administered to those who are deemed to be at high risk following accidental exposure, such as sub-cutaneous inoculation of blood from a known HIV positive source individual. Refer to ANCA Bulletin No. 16¹⁰ in Special issues No. 16, page 122.

The side-effects of zidovudine are common: many recipients develop nausea or lassitude, muscle-pains and sometimes muscle weakness. In the case of a pregnant woman suffering a significant exposure, the risks of prophylactic treatment to mother and foetus should be carefully considered against the benefit of this antiviral drug. On the basis of animal studies, it is generally considered likely that if zidovudine is going to have any prophylactic benefit it should be given within 1-2 hours of the injury.⁶⁶ Recent data suggests the use of ZDV post-exposure may be protective for health care workers, with the risk reduced by approximately 79 per cent.²⁴ The decision to use zidovudine should be made promptly, in conjunction with a specialist HIV physician, and with fully informed consent of the affected person.

Risk reduction strategies aimed at reducing exposure to blood and body fluids or contaminated sharps can be successful. The implementation of Standard Precautions and/or Additional Precautions where required, for example, where complicating factors such as infectious pulmonary Tuberculosis are present, will substantially diminish the general risk to staff. Accident analysis should be part of occupational health programs. Such analysis can be a way of identifying risk exposure situations where special provisions can be applied, for example, the use of special equipment.

Special issues No. 10 page 106 provides information on health care workers (including students) infected with HIV and other blood borne viruses.

Recommendations

- All health care establishments should implement Standard Precautions as the primary basis for preventing occupational HIV transmission, and should provide staff with appropriate facilities and information about the risks of HIV transmission.
- Health care establishments should develop their own guidelines for testing and preventing HIV transmission, based on the recommendation in these guidelines. The nature of the treatment provided, the health status of staff, especially in relation to skin conditions, and the rights of patients (informed consent) and confidentiality must all be taken into account.
- Routine testing of staff or patients for unidentified HIV is not recommended. Testing should be undertaken only on the basis of clinical assessment or where it is in the interests of both patients and staff. The provisions of confidentiality, privacy and informed consent for testing should be applied equally to patients and staff.
- HCWs undertaking exposure prone procedures have an ongoing responsibility to know their HIV status and, on the basis of confirmed test results, should not perform any procedure where there is a risk of HIV transmission. Where there is any uncertainty about the level of risk involved, individuals should be assessed by an advisory panel on a case-by-case basis to determine their continuing participation or modification of work practices.

2.11 Infectious mononucleosis

A proportion of staff particularly those in the 18–25 year age group is susceptible to Epstein Barr virus (EBV) infection. EBV is present in saliva and may be excreted during or for a prolonged period following symptomatic or asymptomatic infection. Any severely ill patient may excrete virus. Close contact is usually required to transmit infection. About 80 per cent of young adults are immune, having previously acquired infection asymptomatically.

Recommendation

- As the risk to staff is small no specific action is required.

2.12 Leprosy

Although mode of transmission has not been clearly identified, prolonged close contact or household contact appear to be important modes of transmission. Nasal secretions and cutaneous ulcers in untreated lepromatous patients shed large numbers of bacilli. Respiratory, percutaneous and transplacental transmission is presumed likely.¹⁸ Thorough hand washing is essential.

2.13 Listeria

Listeriosis is a bacterial disease (*Listeria monocytogenes*) usually manifested as a meningoencephalitis and/or septicaemia. Those at highest risk are pregnant women, neonates, the elderly, and individuals rendered immunodeficient by drugs (including alcohol) and disease. Outbreaks of listeriosis have been reported associated with ingestion of unpasteurised milk and cheese and contaminated vegetables: some sporadic cases may also be due to food borne transmission. Hospitals should ensure food handling practices which minimise the chance of contamination with *Listeria monocytogenes*.

2.14 Measles and mumps

Susceptible staff are at significant risk, particularly male HCWs, as mumps may adversely affect the male reproductive system. Screening by history of either infection or previous immunisation will identify most susceptible staff. When considering vaccination against mumps, and/or measles, consideration should be given to the use of the combined measles/mumps/rubella (MMR) vaccine. Pre vaccination screening by history has been shown to be cost effective.⁵¹

Recommendation

- Staff with these illnesses should not be in contact with patients.
- Staff caring for patients likely to have measles or mumps should be screened by history for immunity to these diseases and offered vaccination if indicated. It should also be recognised that some staff may have had subclinical measles and mumps and would not have been aware that they had been infected.
- MMR should be offered to non-immune HCWs. Mantoux testing should not be carried out for at least one month after the administration of MMR.

2.15 Meningococcal infection

Meningococcal meningitis is an acute bacterial disease characterised by sudden onset with fever, intense headache, nausea and vomiting, stiff neck and, frequently, a petechial rash with pink macules, or very rarely, vesicles. Delirium and coma often appear. With early diagnosis, modern therapies and supportive measures, the case fatality rate should be <10 per cent¹⁸.

Meningococcal disease affects mainly younger children and adolescents. It can kill previously healthy children within several hours of onset. An increasing incidence of disease and of outbreaks has been associated with the spread of virulent clones of both serogroup B and C meningococci. In Australia, the incidence of meningococcal disease has been increasing over the last decade. The NHMRC has currently (1995) established a working party to develop guidelines for the control of meningococcal disease in Australia.

With the advent of the Hib vaccine, *Neisseria meningitidis* is now the major cause of childhood meningitis in Australia. It is spread by direct contact, including respiratory droplets from nose and throat of infected persons.

Meningococcal infection has sometimes been a concern to hospital staff in contact with these cases. The risk of acquisition of infection by hospital staff is negligible unless they are in prolonged direct contact with the patient or they undertake mouth to mouth resuscitation of infected patients. This situation is unlikely to arise in a hospital after a patient is diagnosed and treated. Once treatment is initiated in acute meningococcal infection, the infectivity decreases rapidly.

Routine vaccination with current meningococcal vaccines is not recommended, as the risk of meningococcal disease in Australia is relatively low. However, the vaccine may be used to control outbreaks caused by serogroup A, C, W135 or Y.⁸³

A NHMRC working party is currently reviewing meningococcal guidelines.

Recommendation

- Antibiotic prophylaxis with rifampicin, 600 mg twice daily for two days (10 mg/kg for children up to a 600mg dose) should be offered to all home contacts and other persons with very close contact with the untreated patients, as well as the index case. The side effects of rifampicin should be explained. Alternatively, where rifampicin is considered unsuitable, a single intramuscular dose of ceftriaxone (5 mg/kg to a maximum of 250 mg), or a single oral dose of ciprofloxacin (500 mg), is appropriate. (Note: manufacturers warn that the use of ciprofloxacin in prepubertal children or during pregnancy is not recommended.)

2.16 Multi-antibiotic resistant organisms

Organisms with multi-antibiotic resistance are common in many hospitals. Examples include methicillin resistant *Staphylococcus aureus* (MRSA) and gentamicin resistant gram negative rods (some *Klebsiella* spp.). Many of these bacteria are selected by the use of broad spectrum antibiotics and may then colonise patients and sometimes staff. These organisms do not appear to be more virulent than sensitive strains but because of their resistance patterns are more difficult to treat if infection occurs.

High morbidity and mortality is associated with hospital acquired MRSA. The major route of spread within institutions is thought to be via the hands of staff, usually associated with inadequate hand washing. Antiseptic lotions may help to reduce the skin carriage of staphylococci. All staff should comply with infection control policies and procedures to prevent worsening of the resistance problem.

Patients with MRSA should be moved to single rooms with ensuite facilities, and the need for Additional Precautions should be assessed. Antibiotic regimes should be applied in accordance with the *Antibiotic Guidelines*.¹³⁰

Recommendations

- Identification by clinical assessment of those patients with presumptive infections by these organisms should be made. The risk of transmitting infection is much lower with colonisation than with active infective lesions because of the much higher numbers of organisms present in the latter situation. Routine laboratory screening for colonisation is not normally warranted.
- Patients with MRSA infections should be nursed in a separate room with ensuite facilities.

- Staff should wear gloves and a clean gown when dressing wounds or lesions infected with MRSA. Masks should be worn by staff in contact with patients whose respiratory secretions are colonised by these organisms, particularly if patients are coughing or having suction or manipulation of their airway.
- Where fomite transmission is likely, for example, with MRSA, equipment used continuously should remain in the room. All equipment must be thoroughly cleaned and decontaminated before re-use on other patients.
- Adequate hand washing facilities for staff and patients are essential. Hands must be washed prior to leaving the room.

2.17 Parvovirus

Human parvovirus B19 causes Fifth Disease, a rubella-like illness in children with a distinctive facial rash - the 'slapped cheek' syndrome. Community and school outbreaks occur at irregular intervals and a significant proportion of adult contacts are susceptible and may become infected.

In adults arthritis is often observed and may persist for weeks or even months. Both the rash and arthritis are due to circulating immune complexes of the virus and antibody. The incubation period is about 10-14 days. Natural transmission is via the respiratory route, but the virus is very resistant in the environment and in biological materials such as blood or plasma. The virus grows in the erythroid progenitor cells in the bone marrow and in patients with haemolytic anaemia B19 infection causes aplastic anaemia which may be severe, but resolves once the patient is convalescent. Immunosuppressed patients may be unable to clear the virus and persistent anaemia ensues. Administration of normal pooled immunoglobulin may assist the patient eliminate the virus.

Infection early in pregnancy may affect the foetus, causing aplastic anaemia which later becomes manifest as mid-semester hydrops foetalis. Intra-uterine transfusion has been used successfully in the management of this condition. Nosocomial outbreaks of B19 involving infection of patients and staff including pregnant health care workers have been reported.

Diagnosis is by serology and/or virus DNA detection. At present there is no vaccine.

2.18 Pertussis

Pertussis (whooping cough) is a serious, sometimes fatal, respiratory infection caused by the Gram negative coccobacillus, *Bordetella pertussis*. It is a highly infectious disease, spread by respiratory droplets. The incubation period is 7-10 days. Individuals may be infectious from 7 days after exposure to 3 weeks after the onset of typical paroxysms. The initial catarrhal stage of the illness has an insidious onset and is the most infectious period. The cough becomes paroxysmal usually within 1-2 weeks and often lasts 1-2 months or longer. Refer to *NHMRC Immunisation Procedures Handbook*.⁸³

At present only whole-cell pertussis vaccine is available in Australia. The vaccine is usually given to infants as a trivalent vaccine (DTP). ADT should be administered after 8 years of age. An NHMRC working party is currently reviewing guidelines for pertussis.

2.19 Polio

Poliomyelitis is an acute illness following gastro-intestinal infection by one of the three types of poliomyelitis virus. Transmission is through faecal-oral spread. The infection may be clinically unapparent. If symptoms occur, they may include headache, gastro-intestinal disturbance, malaise and stiffness of the neck and back, with or without paralysis. The incubation period ranges from 3-21 days. The last notified cases of poliomyelitis in Australia occurred in 1978 (2 cases) and 1986 (1 case).

Live oral polio vaccine (OPV) is routinely used for immunisation in Australia in accordance with National Health and Medical Research Council (NHMRC) guidelines.⁸³

2.20 Rubella

Rubella infection is readily transmitted by droplets and close contact with infected patients. In general, females in the reproductive age group are now immune because of community vaccination programs, but males remain at risk. Rubella in males may cause significant debility (one to two weeks away from work) and infected male staff can transmit infections to patients and other staff.

Vaccination will reduce the likelihood of staff acquiring rubella. Prevaccination screening by history has been shown to be cost effective.⁵¹

Recommendation

- In health care establishments where rubella is likely to be encountered or where the consequences of an outbreak may be serious, for example, in obstetric units, all category A and B staff should be immune. A check of antibody status prior to vaccination is regularly practised but is not essential. Consideration should be given to the vaccination of staff in paediatric units with combined measles, mumps and rubella vaccine.

2.21 Staphylococcal infection

Staphylococcus aureus is present on the skin and noses of approximately 30-50 per cent of the general population. In hospital staff the carrier rate may be 60-80 per cent. Nasal secretions contain large numbers of bacteria which will contaminate the hands. Staphylococci can penetrate into the deeper layers of the skin, where they live and multiply in the pores and hair follicles. Hands infected in this way may be washed and scrubbed without removing the organisms. Antiseptic lotions may help to reduce the skin carriage of staphylococci.

The risk of transmitting organisms from HCW to patient depends on the underlying medical conditions of the patient, on the extent of skin shedding by the staff member and on the extent of contact between the two. These infections are relatively common amongst patients who may sometimes be carriers and heavy shedders of these micro organisms.

Staff with exfoliative skin conditions are at increased risk of both acquiring and transmitting infection. Staff carriers, including asymptomatic nasal carriers, who maintain high standards of hygiene, implement Standard Precautions, and who do not have either an exfoliative skin condition or overt sepsis, for example, paronychia, are unlikely to transmit significant numbers of staphylococci. Sinusitis is a particular infection that may be associated with heavy shedding.

Measures to protect patients from staphylococcal infections are best directed at identifying heavy shedders. Contamination of food with enterotoxin producing *S. aureus* can cause food poisoning. Staphylococcal sepsis on the hands of staff preparing or handling food is the most likely source.

Methicillin resistant *Staphylococcus aureus* is discussed on page 68, see Multi-antibiotic resistant organisms.

Recommendations

- Identification by clinical assessment of those patients with presumptive staphylococcal sepsis should be made. Routine laboratory screening for colonisation is not warranted.
- Identification (by history and examination) of staff with conditions which predispose them to heavy shedding should be made. The degree of shedding by culturing sites of potential carriage (for example, skin lesions, anterior nares, axilla, groin) should be assessed but routine laboratory screening for colonisation is not warranted. If an outbreak occurs, selective screening may be necessary.
- Provision of a roster system and/or treatment program for heavy shedders should be made. Heavy shedders should not be rostered to work in high risk areas, but should be suitably redeployed.

- Preclude persons with sepsis from Category A staffing and food preparation unless lesions can be fully covered.
- Staff with pre-disposing conditions should be rostered away from patients known to be infected with *Staphylococcus aureus* or *Streptococcus pyogenes*.
- Gloves must be worn when contact is made with infected areas.
- Hands must be thoroughly washed before and after significant patient contact.

2.22 Streptococcal infection

Streptococcus pyogenes can cause severe illness in patients. Streptococcal infections are easily treated with antibiotics which quickly control infection.

Recommendations

- Acute septic lesions (impetigo, cellulitis, paronychia) and acute pharyngitis should be assessed for pathogenic streptococci.
- Category A staff with streptococcal lesions should cover those lesions and be given systemic and local treatment. Similarly, staff with acute streptococcal pharyngitis should receive antibiotic treatment and should be rostered off duty for at least the first 24 hours.

2.23 Tuberculosis

Tuberculosis is caused by bacteria of *Mycobacterium tuberculosis* complex. Lung disease is the most common form although disease in other organs is frequent and may cause even greater morbidity. Most individuals infected with *M. tuberculosis* remain asymptomatic, but a small proportion develop clinical illness, sometimes many years after the original infection. Infants, the elderly, patients rendered immunodeficient by drugs (including alcohol) or disease and some young immigrants are more prone to rapidly progressive or generalised infection. About 1000 cases of tuberculosis are notified to Australian health authorities each year.⁸³

Patients with untreated tuberculosis pose a considerable risk to staff. The greatest risk to staff arises from contact with undiagnosed cases of pulmonary tuberculosis.

A persistent, productive cough can be a sign of tuberculosis. There is a risk in immunocompromised patients, and especially those infected with HIV, of re-activation of previously quiescent tuberculosis. If BCG-vaccinated staff are exposed to patients with active tuberculosis, they should be followed up in the same way as unvaccinated staff.

An NHMRC working party is currently reviewing guidelines for controlling tuberculosis disease in Australia. Special issues No. 9 page 103, No. 11 page 113, and No. 12 page 114 provide further information.

Recommendations

- Each health care institution should develop its own infection control policy for tuberculosis which is appropriate to its estimated risk of nosocomial infection.
- All health care workers should undergo an initial two-step Mantoux tuberculin test prior to commencing employment. Regular Mantoux screening should be offered to staff only if previous tests are negative. Mantoux negative high risk staff should undergo re-screening at least annually.
- BCG vaccination is of uncertain value but can be offered to Mantoux negative staff at high risk. This situation is under review. BCG vaccination must not be given to those who are HIV positive or immune suppressed.

- Whenever a patient is diagnosed with active pulmonary tuberculosis, staff with high risk of exposure should be investigated. Their Mantoux status, nature of exposure and other factors associated with active infection should be assessed.
- Mantoux positive staff should be followed up with a chest x-ray and clinical review.

2.24 Varicella zoster virus (chickenpox and shingles)

Varicella (chickenpox) in adults can occasionally be a debilitating illness, particularly during pregnancy - see Special issues No. 9 page 103. Pregnant staff should not have direct contact with patients infected with Varicella Zoster Virus unless they have a history of previous chickenpox or shingles. Susceptible staff may acquire varicella (chickenpox) from patients who have either varicella or zoster (shingles) which occurs frequently in persons with HIV infection or immunosuppression due to other causes, for example, disseminated malignancies. Varicella Zoster Virus is readily transmissible. Transmission occurs from person to person by direct contact, droplet or air borne spread of virus from either the respiratory tract or vesicle fluid. Precautionary measures such as masks are only partially effective in preventing transmission to susceptible persons.

Recommendations

- In high-risk situations (oncology, organ transplants) it is desirable to ascertain Varicella Zoster Virus immune status prior to rostering staff into these areas. Screening by history is recommended.
- If susceptible staff are in contact with Varicella Zoster Virus they should be assessed medically during the incubation period and precluded from contact with susceptible and/or immunocompromised patients. Zoster immune globulin prophylaxis should be considered. Acyclovir treatment may be indicated if lesions develop.
- Staff (especially pregnant staff) should not have direct contact with patients infected with Varicella Zoster Virus unless they have a definite history of previous chickenpox or serological evidence of previous infection.
- Paediatric staff with patient contact should be asked prior to commencing employment or placement in paediatric wards if they recall suffering VZ infection. Those who give a positive response may be considered immune, but all other staff should have their immune status assessed by EIA at the earliest opportunity.⁵⁰
- When varicella vaccine becomes available it should be offered to seronegative HCWs in categories A and B - see Special issues No. 14 page 118.

2.25 Viral haemorrhagic fevers (VHF) — Lassa, Marburg, Ebola

There has been no instance of these viruses being diagnosed in Australia. Standard Precautions should be effective in prevention of nosocomial transmission. Advice on management of suspected VHF infections should be sought from the State/Territory Health Departments.

Table 6: Precautions for preventing transmission of infectious diseases

Disease	Mode of transmission	Recommended Precautions	Precautions for Pregnant Staff	Vaccination, screening, and testing
CJD	Contact with infected CNS or neurological tissue - iatrogenic transmission has occurred via corneal graft, dura mater grafts, neurosurgical instruments and from CJD contaminated human pituitary hormones	Additional Precautions High temperature sterilization (134°C) of neurosurgical instruments for a minimum of 18 minutes single cycle or six separate 3 minute cycles. ⁸⁶	NA	NA
CMV	Mucosal contact with infectious tissues, secretions and excretions	Standard Precautions Basic hygiene	Inform of risks. Redeploy seronegative pregnant staff to care for children over the age of 2 years	Screen category A staff
GI pathogens	Contact (oral faecal route)	Additional precautions - a single room with ensuite toilet is desirable	NA	NA
HAV	Contact (oral faecal route)	Standard Precautions Additional Precautions for incontinent patients	NA	Vaccinate staff at high risk
HBV	Blood borne virus - direct contact with blood or body substances	Standard Precautions	NA	Vaccinate all staff, particularly category A and C ¹ EPP testing protocol ² Blood accident testing protocol Patients may be screened on basis of clinical management
HCV	Blood borne virus - direct contact with blood or body substances	Standard Precautions	NA	¹ EPP testing protocol ² Blood accident testing protocol Patients may be tested on basis of clinical management
HIV	Blood borne virus - direct contact with blood or body substances	Standard Precautions. Additional Precautions may be		¹ EPP testing protocol

Disease	Mode of transmission	Recommended Precautions	Precautions for Pregnant Staff	Vaccination, screening, and testing
		required where complicating conditions (e.g. Tuberculosis) are present	In cases of needlestick injury counsel pregnant staff about ZDV	² Blood accident testing protocol Patients may be tested on basis of clinical management
Infectious Mononucleosis (EBV)	Contact with saliva - via oropharyngeal route	Standard Precautions and basic hygiene	NA	NA
Influenza	Respiratory - Air borne and droplet spread	Additional Precautions - single room or cohort placement in cases of outbreaks, particularly for children and elderly patients	NA	Vaccine available
Herpes Simplex	Contact (via saliva or contact with infected lesions)	Standard Precautions. Cover lesions - exclude staff from contact with neonates or vulnerable patients	NA	Screen category A staff
Listeria	Usually via contaminated foods	Standard Precautions - ensure hygienic food handling practices are maintained	Pregnant staff should avoid contact with potentially infective materials and foods - eat only properly cooked foods and pasteurised dairy products	NA
Measles	Air borne by droplet spread, direct contact with infected throat or nasal secretions - highly communicable	Additional Precautions - single room for infected patients during infectious period Infected staff should not be in contact with patients	Screen	MMR vaccine Screen by history
Meningococcus	Respiratory via droplet from nose or throat of infected persons	Standard Precautions once treatment is initiated Rifampicin for close contacts	NA	Routine vaccination not recommended for staff, except in case of outbreaks
Mumps	Air borne - droplet spread and direct contact with saliva of infected person	Additional Precautions - single room for 9 days after onset of swelling/parotitis	NA	MMR vaccine Screen by history
Pertussis (whooping cough)	Respiratory - air borne or droplet spread	Additional precautions - single room for known cases for at least five days after commencing antibiotic treatment. Exclude	NA	Vaccine available (ADT for non-immune staff)

Disease	Mode of transmission	Recommended Precautions	Precautions for Pregnant Staff	Vaccination, screening, and testing
		suspected case from the presence of young children and infants, particularly those not immunised.		
Rubella	Droplet spread or direct contact	Additional Precautions - single room	Risk to pregnant staff (congenital deformities in foetus)	Vaccine available (MMR) Screen by history
Staphylococcus	Contact	Standard Precautions Additional Precautions for MRSA (single room)	NA	Routine screening not warranted Screen staff with skin conditions that predispose to heavy shedding
Streptococcus	Droplet	Standard Precautions. Cover lesion and treat category A (antibiotics)	NA	NA
Tuberculosis	Air borne	Additional Precautions Single room - see State and Territory Tuberculosis guidelines.	NA BCG not usually administered during pregnancy	Pre-employment screening (2-step Mantoux test recommended). Mantoux screening for those staff previously negative. BCG of uncertain value but may be offered to Mantoux -ve Staff
Varicella Zoster (chickenpox)	Air borne/Contact	Additional precautions Single room. Preclude non-immune exposed staff from working in areas with susceptible patients	Avoid contact unless immune	Screen by history

NA = no particular precautions necessary for pregnant staff.

¹EPP = Exposure prone procedures - see page 94 and 111.

²Blood accident testing protocol - see ANCA Bulletin No. 16 page 122.

Part 3

Special issues

No. 1: Chemical disinfection and sterilization

Cleaning is an essential pre-requisite for all disinfection or sterilization processes, as organic residue may prevent heat or steam penetration, required for effective disinfection or sterilization. Instruments and equipment used in critical sites must be sterile, and where used in semi-critical sites must be either sterile or high level disinfected - see Table 5, page 41.

Disinfection is a process that inactivates non-spore-forming micro-organisms, using either thermal (heat and water) or chemical means. Thermal disinfection at temperatures that destroy pathogenic, vegetative organisms, for example, boiling water at approximately 100°C or pasteurisation at 60 - 80°C, is the simplest, most efficient and most cost-effective method of disinfection - see Table 4, page 34. Heat is conducted readily (by water and by most metals) and thus is able to penetrate and achieve disinfection more efficiently than chemicals. The action of heat can be compromised by inadequate cleaning, but to a lesser extent than with chemical disinfectants.

Chemical disinfectants act by impairing the structure or metabolism of micro-organisms. The ability of chemical disinfectants to achieve effective kill rates depends on a number of factors, including initial number of organisms present, temperature (usually 25°C is the optimal temperature), pH and concentration. Organic material which is not removed by cleaning prior to disinfection can bind and inactivate many chemical disinfectants. Some disinfectants such as glutaraldehyde and alcohol fix protein, and thus may create a physical barrier of denatured protein that can protect organisms coated by organic material. A disinfectant cannot be effective against micro-organisms it cannot reach, and thus thorough cleaning prior to disinfection is essential. Items should be thoroughly rinsed after cleaning with soap or detergent, as any soap or detergent residue may render the disinfectant less effective. Items to be disinfected should be dried prior to immersion in disinfectant solution to avoid dilution of the disinfectant, rendering it less effective over the required time for achieving disinfection.

Disinfecting agents need to kill all forms of bacteria, such as gram positive and gram negative bacteria, mycobacteria, viruses (both the more sensitive lipid coated viruses such as HIV and relatively resistant viruses such as the polio virus), fungi (for example *Candida*), and protozoa (for example *Giardia*). High level disinfectants should be able to kill the more resistant forms of microbial life such as bacterial spores and cysts, usually with prolonged contact times (sometimes over 10 hours). From January 1996, the Therapeutic Goods Administration (TGA) will assess products as high level disinfectants or sterilants on the basis of stringent conditions outlined in *Therapeutic Goods Order No. 54*.

Sterilization is a term describing the use of a physical or chemical procedure to remove or destroy all microbiological life, including bacterial spores, with an acceptably low probability of survival (the sterility assurance level for a terminally sterilized item is 10⁻⁶ for medical and dental items). Major sterilizing processes include steam sterilization under pressure (steam sterilization), dry heat, ethylene oxide gas, peracetic acid microprocessor controlled systems, and more recently, sterilization by low temperature glow plasma systems (low temperature hydrogen peroxide plasma) which achieve low temperature, low moisture sterilization. These systems are discussed on page 33.

A number of chemical products are also capable of achieving sterilization if used for prolonged periods, but this process cannot be validated and is user dependent. To achieve sterilization with aldehyde based products, a contact time of 3-10 hours, depending on formulation and labelling, is required.

No chemical sterilizing or disinfecting agent works instantaneously - they all require sufficient contact times, in accordance with manufacturers' instructions. There is no specific soaking time that will guarantee all the agents present are killed by a chemical disinfectant.

The ability to achieve complete killing of micro-organisms is dependent on a number of factors including the number of organisms present, the presence of inactivating compounds (for example, organic material, soap or detergent residues), the pH, the temperature, the concentration of the disinfectant and the relative resistance (and therefore kill rate) of the organism involved.

There is an exponential effect (log kill) with time. Therefore the higher the number of organisms present, the longer it will take to achieve complete kill, or acceptable reduction (log six) in the number of these organisms. This is another

reason why cleaning is the critical step in disinfection. A log five reduction or more in the number of organisms present can be achieved by cleaning.

Temperature is also an important factor in the effectiveness of chemical disinfection. In general the higher the temperature the faster the chemical disinfectant works. Most of the in vitro testing of these agents has been done at 25°C. Therefore, with manual disinfection at room temperature, (particularly if the disinfectant is left overnight in winter and the temperature drops to 15°C or lower) it may take more than twice as long to achieve the same reduction in the number of organisms killed than if the agent was at 25°C. However, increasing the temperature above 25°C increases the amount of fumes given off, and thus at high temperatures, chemical agents may be inactivated. In contained systems, such as the peracetic acid automated system, this consideration is not an issue, and in fact, at elevated temperatures of 50-55°C, peracetic acid is a powerful biocidal agent.

The concentration of a chemical disinfectant is also important. In general, the lower the concentration of the agent, the longer it will take to kill the same number of organisms. This is important as disinfectants may become diluted with rinse water if items are not dried prior to immersion in the disinfectant solution. The concentration of a chemical disinfectant, for example 2 per cent glutaraldehyde, may be diluted with use (depending on the number of uses and the degree of moisture residue on the instrument prior to immersion) and thus the activity of the disinfection process significantly compromised.

The pH is equally important, and contact times, particularly for aldehyde based products, will depend on the formulation and labelling of the product. Hypochlorites are most effective at neutral pH values, and should be buffered accordingly.¹¹¹

In Australia the only readily, currently available high level chemical disinfectant for manual use is 2 per cent glutaraldehyde. This chemical has been the subject of a variety of tests and published research has demonstrated activity against an appropriate range of viruses and bacteria. Automated chemical processing systems based on peracetic acid and high concentration hydrogen peroxide (glow plasma) appear to achieve sterilization within a reasonable period of time, (30 minutes and 75 minutes respectively). However, these systems have a high capital cost and relatively high consumable costs, and are therefore less suitable for sterilization in office practice.

Ethylene oxide achieves sterilization with prolonged contact time. Gas sterilization with ethylene oxide however is subject to the same limitations as liquid chemical disinfectants, and is usually restricted to use in Central Sterilizing Units.

Halogens such as chlorine and iodine are high level disinfectants at high concentrations. Quaternary ammonia compounds are low level disinfectants and are ineffective against many bacteria, for example, *Pseudomonas* and *Mycobacterium*. They have little or no activity against viruses. Alcohols are good intermediate level disinfectants - see Table 7, page 80.

Chemical disinfectants should not harm instruments or equipment. Compatibilities of materials and various chemical disinfectants should be considered prior to use. Chemical disinfectants should never be mixed. They should be used according to the manufacturer's instructions, at the recommended strength and at recommended soaking or exposure times, and should not exceed their use by dates. Disinfectant solutions should be decanted as needed to avoid contamination of the stock solution, discarded after use, and even if not used, should not be returned to the stock container.

Material Safety Data Sheets (MSDS) for disinfectants should be consulted prior to use. Gloves and eye protection should be worn when working with concentrated or corrosive disinfectant solutions. A plastic apron should also be worn to prevent splashes soaking onto clothing and coming into contact with skin. Ventilation should be adequate when using concentrated or volatile chemicals.

From January 1996, chemical disinfectants are to be regulated under the *Therapeutic Goods Act* and will be approved as either a high, low or intermediate level disinfectant, depending on manufacturers' claims and in accordance with *Therapeutic Goods Order No. 54*.

Table 7, page 80 identifies categories of disinfectants and mode of action.

Table 7: Categories of disinfectants and range of activities

Disinfectant Group	Activity Range	Other Properties/Comments
Alcohol	<p>Good: bactericidal fungicidal mycobactericidal</p> <p>Variable: virucidal</p> <p>Poor: not sporicidal</p>	<p>Ethanol:</p> <p>70 per cent w/w ethanol is rapid acting and dries quickly 90 per cent w/w ethanol useful as a virucide 100 per cent ethanol is not an effective disinfectant ethanol is less effective against non-enveloped (HBV) viruses than against enveloped (HIV) viruses</p> <p>Isopropanol:</p> <p>isopropanol is effective at 60-70 per cent v/v but has variable mycobactericidal activity for isopropanol - not an effective virucide</p> <p>General properties of alcohols:</p> <p>does not penetrate organic matter well - acts as a fixative, prior cleaning required.</p> <p>flammable on skin</p> <p>can be combined with other bactericidal compounds for skin disinfection</p>
Aldehydes	<p>Good: bactericidal fungicidal virucidal sporicidal (slow)</p> <p>Variable: mycobactericidal</p>	<p>highly irritant</p> <p>acts as a fixative, prior cleaning required</p> <p>penetrates organic material slowly and usually not inactivated by inorganic materials</p> <p>usually non-corrosive to metals</p> <p>buffered alkaline solutions activated prior to use with limited shelf-life</p> <p>Acidic solutions are more stable but are slower acting; glycolated (mildly acidic) solutions have shorter kill times</p> <p>instrument disinfectant when used for short periods (10-20 minutes)</p> <p>instrument sterilant when used for 3-10 hours, depending on formulation and labelling - ineffective for CJD</p> <p>slow acting against atypical mycobacteria</p>
Chlorhexidine	<p>Good: Gram-positive organisms</p>	<p>low toxicity and irritancy</p>

Disinfectant Group	Activity Range	Other Properties/Comments
	<p>Less active against Gram-negative organisms</p> <p>Variable: virucidal fungicidal (subject to species variation)</p> <p>Poor: not mycobactericidal not sporicidal</p>	<p>inactivated by organic matter, soap and anionic detergents</p> <p>useful for skin and mucous membrane disinfection but is neurotoxic (must not contact middle ear) and may cause corneal damage</p>
Hypochlorites	<p>Good: bactericidal fungicidal virucidal</p> <p>Variable: sporicidal (pH 7.6 buffer) mycobactericidal (5000 ppm)</p>	<p>fast acting inactivated in presence of organic matter at low concentrations</p> <p>incompatible with cationic detergents</p> <p>high concentrations corrosive to some metals diluted form unstable</p> <p>decomposed by light, heat, heavy metals</p> <p>chlorine gas released when mixed with strong acids</p> <p>carcinogenic reaction product when mixed with formaldehyde</p> <p>useful in food preparation areas and virology laboratories</p> <p>Available chlorine requirements for:</p> <p>blood spills - 10000 ppm (1 per cent); laboratory discard jars - 2500 ppm (0.25 per cent); clean environmental disinfection - 1000 ppm (0.1 per cent); disinfection of clean compatible instruments - 500 - 1000 ppm (0.05 - 0.1 per cent).</p>
Peracetic Acid	<p>Good: bactericidal fungicidal virucidal sporicidal mycobactericidal</p>	<p>peracetic acid is highly irritant</p> <p>corrosive to some metals/instruments</p> <p>reduced activity in presence of organic matter</p> <p>usually contain detergent</p> <p>useful for small spills</p> <p>may be used as an instrument disinfectant if compatible</p>

Disinfectant Group	Activity Range	Other Properties/Comments
other peroxygen compounds	Variable: sporicidal mycobactericidal	may be used as an instrument sterilant under specified conditions if compatible hydrogen peroxide and potassium monoperoxygen sulfates have low toxicity and irritancy
Phenolics	Good : bactericidal mycobactericidal fungicidal Variable: virucidal Poor: non-enveloped viruses	avoid contact with skin/ mucous membranes stable in presence of organic matter incompatible with cationic detergents not for use on food preparation surfaces/equipment detergent usually included absorbed by rubber and plastics diluted form unstable useful for mycobacteria on surfaces
Sodium dichloroisocyanurate (SDIC)	Similar to hypochlorites	less corrosive than hypochlorite more resistant to inactivation in presence of organic matter stable in dried form; unstable in solution

Sources:

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 Gardner JF, Peel MM. Introduction to sterilization, disinfection and infection control. 2nd edition. Melbourne: Churchill Livingstone, 1991.
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No. 2: Sterilization in office practice - principles and practice

Sterilization by steam under pressure (autoclaving) is the most reliable and cost effective method to ensure destruction of micro-organisms. It is the most widely used method of sterilization for critical and semi-critical items which can withstand steam, and is the preferred method of sterilization in office practice.

The microbiocidal effect of steam sterilization is due to latent heat of condensation being transferred to the load, causing it to heat rapidly. This process results in coagulation of microbial protein structures in cases where cleaning may not have completely removed contaminating micro-organisms.

Benchtop (portable) autoclaves which comply with Australian Standard AS 2182 (Sterilizers - Steam - Portable) are the most efficient and reliable sterilizing units for use in office practice. They are suitable for sterilization of small quantities of relatively simple items, both packaged and unpackaged. Items which are not packaged should be used immediately following sterilization. Packaged items should only be processed in an autoclave which has a built-in drying cycle - see AS 4187-1994 and Amendment No. 1. **Although current basic benchtop models do not usually have a built-in drying facility it is anticipated that by the year 2000, all benchtop autoclaves used in office practice should have built-in drying cycles as well as print out facilities for monitoring temperature and pressure (as applicable) and holding time.**

For group practices, the greater volume of instruments required may justify the use of more sophisticated larger steam sterilizers. These larger sterilizers should conform to Australian Standard AS 1410 (Sterilizers - Steam - Prevacuum) and/or AS 2192 (Sterilizers - Steam - Downward displacement).

When purchasing an autoclave for use in office practice, consideration must be given to staff training and quality control (see AS 4187) as well as running costs. Such ongoing expenditure may make the use of an external service (hospital or commercial) a more practical and cost effective alternative for smaller practices.

Autoclaves must be used in accordance with the manufacturer's instructions. It may be necessary to contact relevant State/Territory Occupational Health and Safety authorities regarding registration and inspection of steam sterilizers.

Australian Standard AS 4187-1994 (and Amendment No. 1) sets out procedures and process development which can be validated for the cleaning, disinfection and sterilization of reusable medical and surgical instruments and equipment, and maintenance of associated environments in health care establishments.

Processing items prior to autoclaving

Before processing any item for autoclaving:

- ensure that it can be sterilized by steam under pressure (autoclaving); and
- clean thoroughly prior to autoclaving - see page 30.

Packaging of instruments

The purpose of packaging and wrapping items prior to autoclaving is to provide an effective barrier against sources of potential contamination in order to maintain sterility after removal from the autoclave and during storage, and to permit aseptic removal of the contents of the pack.

There are a number of packaging and wrapping materials suitable for use in benchtop sterilizers (see Table 8). Cotton and cotton polyester wraps are not effective barriers to microbiological contamination, and are not generally used.

Table 8: Packing and wrapping materials suitable for use in general practice with benchtop steam sterilizers and dry heat sterilizers (modified from Australian Standard AS 4187).

Type of material	Steam sterilizers	Dry heat sterilizers
Woven textile wraps as specified	Yes	No
Paper bags and wraps	Yes	Yes but prone to embrittlement during sterilization
Packing system - cellulose based	Yes	No
Packing system - porous non-cellulose based	Yes	No
Cellulose based, non-woven wraps	Yes	Yes but prone to embrittlement during sterilization
Non-cellulose based, non-woven wraps	Yes	No
Aluminium foil	No	Yes

Loading and unloading the autoclave

Correct loading is essential (see AS 4187-1994 and Amendment No. 1). When loading the autoclave, ensure that the steam can circulate effectively, that there is no entrapped air in containers (stand upright) and that all surfaces are accessible and exposed to the steam. Packaged items may need suitable racks to separate packs. When unloading sterile instruments, check that packaged items are dry (to avoid contamination with micro-organisms). Items that have been dropped, torn, have broken seals or are wet are no longer sterile and must be re-processed.

Temperature, pressure and holding time

Ensure that the manufacturer's recommended temperature-pressure-holding time for the item to be sterilized is reached whenever the sterilizer is used - see Table 9, page 85.

The NHMRC Pituitary Hormones Task Force has prepared a report titled, *Creutzfeldt-Jakob Disease and other Human Transmissible Spongiform Encephalopathies: Guidelines on patient management and infection control*.⁸⁶ This report recommends a range of decontamination procedures depending on the level of risk - Group 1 (high risk), and Group 2 (low risk), and includes a warning that normal autoclaving (121°C) is not adequate for completely inactivating CJD infectivity. Single-use equipment should be used wherever possible. For low risk groups, re-usable instruments which can withstand steam sterilization should be autoclaved at 134°C for 18 minutes or for 6 separate 3 minute cycles. Instruments contaminated with blood or neurovascular tissue from Group 1 (high risk) patients should be disposed of by incineration.

Table 9: Recommended temperatures, pressures and holding times for sterilization using steam under pressure (modified from Australian Standard AS 4187).

Temp (°C)	Pressure		Holding time (mins) plus safety factor
	kPa	psi	
121	103	15	15
126	138	20	10
132	186	27	4
134	206	30	3
*CJD134	206	30	*18 minutes or 6 separate 3 minute cycles

Note: Holding time (minimum time required at a given temperature) does not include the time taken for heating the load to the desired temperature (penetration time).

*CJD - see *Creutzfeldt-Jakob Disease and other human transmissible spongiform encephalopathies: Guidelines on patient management and infection control*⁸⁶

Monitoring of the sterilization process

If the temperature of the steam inside the autoclave is higher than it should be, or the pressure of the chamber is lower than it should be, the steam will not be able to condense and the latent heat of condensation will not be transferred to the load in the chamber. Sterilization will not occur. It is vital that the sterilization process is checked on a regular basis.

Autoclaves should be fitted with physical monitors to measure time, temperature and pressure, and these should be checked periodically to comply with the manufacturer's specifications. The temperature and pressure (as applicable) and the holding time must be checked and recorded at least once each day. If the autoclave has a facility to provide a print-out, the information should be checked at the end of each cycle to verify that correct cycle parameters have been met. In the event of a fault, the temperature control should be reset and a biological test, and if necessary, recalibration, carried out as a matter of urgency. **It is anticipated that all benchtop autoclaves should have a print-out facility by the year 2000.** Practices intending to purchase new benchtop autoclaves at this time should therefore check that a print-out facility is featured.

At least once a year each autoclave must be calibrated by a qualified service technician using a thermocouple approved by the National Association of Testing Authorities (NATA).

Colour change strips (**chemical indicators**) are used on packages to indicate that the package has been through the sterilizer. These strips do not indicate sterility, but may assist in detection of certain procedural errors and equipment malfunction. A positive result is required for each load, and must be recorded. A negative result must also be recorded and the load re-sterilized.

Each week the actual killing power of the sterilizer must be tested with bacterial spores (**biological indicator**). A number of calibrated bacterial spore tests are available commercially for this purpose. A sample of spores should be placed with the load to be sterilized, then is incubated with a control unsterilized spore sample according to the manufacturers' instructions. In the event of a negative test, the sterilizer should be serviced as soon as possible. Biological indicators must be used during installation, for routine testing and after repairs.

Documented evidence of commissioning, on-going maintenance, calibration and daily procedures must be maintained.

Drying cycle

Some benchtop autoclaves, as well as most larger units, have a built-in drying cycle which dries packaged sterile instruments before unloading. The advantages of packaged or wrapped instruments are that they are easier to unload without contamination and do not have to be used immediately.

Australian Standard AS 4187-1994¹¹⁶ recommends that benchtop autoclaves which do not have a built-in drying cycle are only appropriate for the sterilization of unwrapped items. However, if a benchtop autoclave in current use does not have a built-in drying cycle, a small number of well spaced (to allow adequate air circulation) sealed packages can dry adequately by radiant heat from the metal surface of the autoclave chamber after the door is slightly opened ('cracked') to allow steam to escape. In suggesting this alternative, it is acknowledged that if the packaging is not completely dry prior to opening the door then it is possible for contamination to occur through the wet packaging. Cracking is not advised for large loads.

It is anticipated that all benchtop autoclaves should have a built-in drying cycle by the year 2000. Practices intending to purchase new benchtop autoclaves at this time should therefore check that a built-in drying cycle is featured.

Storage

All packaged and wrapped sterile instruments should be stored in a clean dry place to ensure sterility is maintained and that the packaging is not damaged by contact with sharp objects.

Pressure cookers

A pressure cooker must NOT be used for sterilization and is NOT a suitable alternative to an autoclave because the pressure and temperature cannot be accurately monitored, air removal is usually incomplete and there could be uneven distribution of heat. However, it is still a useful means of disinfection in that it is likely to kill all but the most resistant of micro-organisms, such as tetanus spores - see thermal disinfection page 33.

Dry heat sterilizers (hot air ovens)

Dry heat sterilizers have had limited application in office practice - see page 32. Often there are shortcomings in the design of many small dry heat sterilizers in relation to accurate time and temperature measurement and control of temperature within the chamber space.

Lubricants

Lubricants should only be used in accordance with manufacturers' instructions. The use of oil based lubricants may inhibit the sterilization process and may also introduce contamination if lubricant is applied after sterilization.

Note: Ultraviolet light units, microwave ovens, domestic ovens and pressure cookers are NOT capable of sterilizing instruments, and should not be used for this purpose.

No. 3a: Protocols for office practice (medical and dental)

Most dentistry and a range of minor surgery is carried out in an office practice environment. The principles of infection control apply equally for surgical procedures in both the hospital and office situation, as well as for mobile health (including dental) clinics.

Office spaces and facilities will vary. It is recommended that each practice develops a manual of the protocols to be carried out during all procedures. These protocols should be developed co-operatively with all the health care workers involved in the delivery of the service. They should demonstrate clearly to HCWs, patients and regulatory bodies that the principles of infection control are understood and practised.

The protocol should define:

- methods of hand washing - routine and surgical;
- personal protective equipment requirements;
- the setting up of the office space in preparation for a patient visit;
- the defined areas of contamination which require draping and cleaning between patients;
- clean-up procedures between patients;
- management of blood or body fluid spills;
- handling and disposal of sharps;
- waste disposal;
- management of blood/body fluid exposure;
- processing of re-usable items - cleaning, packaging, sterilization, or disinfection and storage;
- quality control mechanisms - documentation of maintenance and monitoring programs for equipment; and
- staff immunisation requirements.

No. 3b: Special requirements in dental practice

In addition to the general requirements for office practice, there are some special considerations and requirements for dental practice.

Protective apparel

Protective clothing and equipment is discussed on pages 46-48.

Dentists and their assistants should wear adequate eye and face protection where aerosols are likely to be generated. Patients must also be offered protective glasses.

Integrity of the operating field

The integrity of the operating field should be maintained during dental procedures. Appropriate use of rubber dam, high-velocity air evacuation and proper patient positioning should minimise the formation of droplets, splatter and aerosols during treatment.

Barrier draping using either plastic wrap, sterile drape or pre-formed plastic tubing, may apply to the following:

- any hand-operated control in the operating field, the operating light handle, the x-ray head, the suction tubing and the cradles they rest in;
- any intra-oral light source e.g. fiberoptic illuminators, intra-oral cameras, the polymerizing light and the handle of its light shield;
- the bracket table and its handle.

Pre-dispensing of materials should be routine. However, retrieval of additional instruments and materials from outside the operating field during dental procedures is inevitable. In these circumstances:

- Gloves must be removed and hands washed to dispense materials from their containers into the field. Alternatively, over gloves can be used.
- Drawers must be opened by elbow touch, de-gloving or a suitable no touch technique (eg use of transfer tweezers or single-use barriers on handles).
- Retrieval of instruments or materials from drawers must be by transfer tweezers which are kept on a separate drape to the other instruments.
- transfers tweezers may be picked up by a gloved hand only or an ungloved hand only but not by both.
- Pre-cut supplies of some materials (eg floss, cellulose acetate strips, gingival retraction cord and articulating paper) which can be stored in the drawers can reduce the need to deglove.

All articles within the operating field should be deemed contaminated by the case in progress, and must be removed, cleaned and disinfected or sterilized before the next case can commence.³²

Intra-oral dental handpieces

It is difficult to monitor the sterilization process within a dental handpiece. All dental handpieces, including ultrasonic tips, should be disassembled if possible for cleaning and sterilization between patients. Follow manufacturers' instructions. Dental units supplying water to intra-oral dental handpieces should have non-return (ant-retraction) valves.

The manufacturer's instructions regarding the choice of lubricants should be followed and care taken to choose a lubricant that does not interfere with the sterilization process. If the handpiece is relubricated after sterilizing, then the lubricant system should be used solely for this purpose, and should not re-contaminate the instrument. It is strongly recommended that automatic flush through and lubricant systems are used.

Aspiration into water lines

Air and water lines should be flushed for a minimum of 2 minutes at the start of the day and for 30 seconds between patients. All dental equipment which supplies water to the oral cavity should be fitted with anti-retraction valves. Routine maintenance of antiretraction valves is necessary to ensure their effectiveness; manufacturers should be consulted to establish an appropriate maintenance routine.

Water warmer units

Water warmer units should comply with AS 3666 and follow local regulatory authority regulations.

Dental materials

The efficacy of disinfection of dental materials is still undetermined. The most important step is the thorough decontamination of material that has contacted oral tissues, for example, impressions. Thorough rinsing with cold running water followed by the application of diluted detergent and further rinsing should continue until all visible contamination is removed.

Implantable items must be sterile.

The dental laboratory

All materials transported to and from dental laboratories should be decontaminated, disinfected, and placed into a sealed container. In each case, the method of disinfection should be noted on the laboratory form.

1. Receiving area

- Standard Precautions should apply when handling dental materials. An area should be set aside to receive incoming cases. The laboratory request form should be checked for details of what decontamination procedures have been done.
- When opening the work, wear appropriate safety and protective apparel such as disposable gloves, apron, eye protection or a facial shield. A mask should be worn where there is a risk of aerosolation or air borne transmission of infection. If required, items should be rinsed in the decontamination sink in cold running water, detergent applied and rinsed again until all traces of blood, debris and body fluids are removed. After drying, the items should be disinfected.
- Dispose of all packing materials and waste according to the waste regulations of State/Territories health and environmental authorities. Reusable containers should be cleaned with detergent and disinfected.
- The receiving area should be cleaned with detergent between cases. The placement of a single-use impenetrable barrier (i.e. plastic, plastic-backed paper) on the surface is recommended.

2. Working area

- Prostheses/appliances which have already been inserted in the mouth require special attention. Any instruments attachments and materials which contact these prostheses should be cleaned and disinfected between cases. A small amount of pumice should be dispensed for individual use and discarded. Clean the splash guard between cases.
- Polishing buffs and ragwheels should be washed and either autoclaved (where possible) or disinfected after each case.
- Persons working on such appliances should wear a clean uniform or laboratory coat, disposable gloves, protective eyewear or face shield, and a mask if necessary. Strong exhaust air evacuation near the work area is recommended.
- Always wash hands before leaving the work area and do not eat or drink when in the working area.

3. Outgoing cases

- On completion of the work, items should be rinsed, dried and then disinfected. This procedure should be documented prior to returning the material to the dental practice.

No. 4: Infection control in endoscopy

Introduction

The modern endoscope is built of material unable to withstand heat and many chemicals. The endoscope is honeycombed with multiple small channels, some with blind endings, none of which can be adequately inspected following cleaning. It is physically delicate, difficult to dry and difficult to adequately sample microbiologically.

Despite all these difficulties clinical infections due to endoscopic procedures have been very uncommon with the exception of those associated with endoscopic retrograde cholangiopancreatography (ERCP). With careful manual cleaning and adequate disinfection, endoscopically transmitted infections can and should be extremely rare.

The Gastroenterological Society of Australia (GESA) and the Gastroenterological Nurses Society of Australia (GENSA) have recognised the importance of adequate disinfection of Fibre optic endoscopes and have jointly published a set of guidelines - *Infection and Endoscopy (3rd Edition) 1995* which covers the topic in depth. A copy of the guidelines can be obtained from the GESA office - see contact details Appendix 3.

Mechanisms of endoscopic infection

- Clinical infections associated with endoscopy may occur because infective agents are transmitted from one patient to the next via the endoscope or its accessory equipment.
- Hospital pathogens may contaminate the endoscope or its accessories and be introduced into the patient during examination. Contamination may be from the general hospital environment, from the water supply or from disinfecting machines. This type of cross infection is more of a potential problem for ERCP in particular.

Risk factors

The important risk factors are:

- the number and type of infecting organisms present on or in the endoscope, its water-feed system and accessories;
- the particular type of endoscopic procedure to be undertaken and whether tissue penetration or disruption occurs, for example, with procedures such as dilatation and polypectomy;
- patient factors including immune status, endovascular integrity, indwelling foreign material such as prostheses, and the presence of infective foci.

The Infecting organisms

The infecting organisms may include:

- bacteria such as *Salmonella* and related species, *Mycobacteria*, *Serratia marcescens*, *Helicobacter pylori*, *Clostridium difficile* and *Pseudomonas* spp.. Since *Pseudomonas* may be present in hospital water supplies, there is always the potential for infection with the organism at endoscopy, although in practice this has only been a problem at ERCP and also endoscopy in severely immunocompromised patients where tissue disruption has occurred;
- viruses such as Human Immunodeficiency Virus (HIV) and hepatitis B and C. When HIV is protected within a dried protein coagulum some chemical disinfectants such as 1 per cent glutaraldehyde will fail to

inactivate the virus within five minutes. This emphasises the necessity to ensure that scrupulous manual cleaning removes all trace of blood and proteinaceous material without delay after the procedure is complete. Despite the high infectivity of hepatitis B there is only a single well documented case of transmission by endoscopy in the literature;

- other infectious agents such as fungi, protozoa and other bacteria and viruses could be transmitted potentially by endoscopy. In practice organisms such as *Cryptosporidia* only pose a significant threat to immunocompromised patients;

The patient with increased susceptibility to infection

A variety of clinical circumstances may increase the danger of infection associated with endoscopy, including:

- compromised immune status such as HIV infection, neoplastic disease, cancer therapy, transplantation and advanced systemic disease, for example, liver or renal failure;
- procedurally induced tissue damage such as oesophageal dilation, polypectomy, and sphincterotomy at ERCP;
- intrinsic sources of infection such as diverticulitis or abscess, cholangitis or infected pancreatic pseudocyst;
- increased risk of bacterial lodgement such as cardiac valve prosthesis, rheumatic heart disease, or indwelling devices such as Hickman catheters. Septic arthritis of prosthetic joints has been reported only rarely after endoscopic procedures.

Decontamination protocol

Full explanation and details of the cleaning and disinfecting processes can be found in the GESA/GENSA guidelines⁴⁰ and in AS 4187¹¹⁶ and Amendment No. 1. The major points for consideration are summarised below:

- endoscopy should not be undertaken in centres where adequate facilities for cleaning and disinfection are not available;
- the most important step in the process of endoscope decontamination is scrupulous manual cleaning prior to disinfection;
- all endoscopes are supplied with appropriate cleaning adaptors and accessories and personnel need to be conversant with manufacturers' instructions;
- it is recognised that hospital tap water may be contaminated with a variety of micro-organisms including *Pseudomonas* and *Mycobacteria*. The risk to patients is only likely to be a problem where there is extensive disruption of tissue or where sterile cavities are entered. GI endoscopes should be rinsed with filtered water after mechanical cleaning and after disinfection. Duodenoscopes and endoscopes used in ERCP should be rinsed in water which is filtered through 0.2 micron filters, or with sterile bottled water;
- a minimum of 150ml of filtered or sterile water in each channel is required to remove all traces of glutaraldehyde;
- glutaraldehyde (2 per cent) is the only acceptable chemical disinfectant which can be used for high level disinfection in unsealed systems. It is recommended that 10 minutes soaking in 2 per cent glutaraldehyde at 20°C should follow mechanical cleaning;
- peracetic acid (in an automated micro-processor controlled closed system) may be used as an alternative to 2 per cent glutaraldehyde;
- after effective cleaning and disinfection the instrument must be adequately dried prior to storage.

Quality management

Particular attention needs to be paid to occupational health and safety with respect to handling of infectious material and hazardous chemicals. Education programs should address these issues, and ensure adequate training in manual cleaning procedures. Only fully trained staff should undertake manual cleaning of endoscopes.

At present there is no reliable way of verifying that the cleaning and disinfection process has been successfully completed. It is therefore recommended that microbiological testing is instituted for duodenoscopes on a monthly basis. For gastroscopes and colonoscopes testing is performed less frequently and according to patient load, but at least 4-6 monthly or whenever changes have occurred in the cleaning and disinfection process (including staff and equipment changes). Routine culture will provide early warning of any detected fault in the equipment such as fine leaks into the internal structure of the scope as well as providing a quality control check on the cleaning and disinfection process.

Microbiological testing protocols are included in detail in the GESA/GENSA guidelines.⁴⁰

No. 5: Exposure prone procedures

Invasive procedures include any surgical entry into tissue, body cavities or organs, or repair of traumatic injury. 'Exposure prone procedure' is considered to be a subset of 'invasive procedure'. It is a term usually characterised by the potential for direct contact between the skin (usually finger or thumb) of the health care worker (HCW) and sharp surgical instruments, needles, or sharp tissues (spicules of bone or teeth) in body cavities or in poorly visualised or confined body sites (including the mouth).

In the broader sense, and for the purpose of these guidelines, an exposure prone procedure is considered to be any situation where there is a potentially high risk of transmission of blood borne disease from HCW to patient, or vice versa, during medical or dental procedures.

Health care workers who engage in exposure prone procedures and who have positive or indeterminate test results for hepatitis B, hepatitis C or HIV should be individually assessed by an expert panel (State/Territory health and/or professional advisory board) - see Special issues No 10, page 106.

Risk assessment

Exposure prone procedures can be classified according to the level of perceived risk - see Table 10. The level of risk is different for a 'patient exposure' than for a 'HCW exposure'. Risk minimisation strategies may include either alteration of clinical procedural techniques, or, if this is not possible, prevention of the infected HCW from carrying out the procedure. Where there is uncertainty as to whether certain procedures are classified as 'exposure prone', or uncertainty about the level of risk associated with those procedures, the matter should be referred to a State health advisory and/or professional board, for individual assessment.

Table 10: Suggested level of risk associated with a particular procedure.

<p>High risk [critical site]</p>	<p>any sub-mucosal invasion with sharp, hand held instruments, or procedure dealing with sharp pathology/ bone spicules, usually in a poorly visualised or confined space (e.g. orthopaedic surgery, trauma, internal cavity surgery)</p>
<p>Indeterminate risk (may need to consult advisory and/or professional board) [semi-critical site]</p>	<p>minor dental procedures (excluding examination), routine dental extractions internal/instrument examination/biopsy (e.g. endoscopy, vaginal examination, laparoscopy) minor skin surgery</p>
<p>Low risk [non-critical site]</p>	<p>interview consultation, dental examination non-invasive examinations or procedures (aural testing, ECG, abdominal ultrasound) intact skin palpation (gloves not required, no pathology) injections/venipuncture (gloves required)</p>

No. 6: Surgical and operating room procedures

Introduction

The principles of surgical asepsis, which is the prevention of access of micro-organisms to an operative field, must be used for all operating room procedures. This is achieved by methods which destroy bacteria and viruses (sterilization) or which prevent them from contaminating objects which come in contact with the surgical field (use of barrier protection).

Modern surgery is aseptic in the use of sterile instruments, sutures and dressings and in the wearing of sterile gowns and gloves by the operating team.

All articles used in an operation must be sterile.

All members of the operating team who are 'sterile' must touch only sterile articles; persons who are 'unsterile' must touch only unsterile articles.

Precautions should be taken to reduce microbiological risks (including the risk of transmission of hepatitis and Human Immunodeficiency Virus - HIV) to patients and personnel during all procedures in the operating theatre. To achieve this, the principle of 'confine and contain' applies at all times for all patients. Each patient and each operation should be considered as a potential source of contamination/infection. Therefore, it is essential that theatre staff demonstrate their knowledge of potential risks by ensuring that a 'confine and contain' approach is implemented for every procedure.

All staff in the surgical team should be vaccinated for hepatitis B - see page 61. It has been estimated that about 1 per cent of surgeons are infected with hepatitis B virus, and although transmission from surgeons to patients is uncommon, a recent study indicated a surgeon who was HBeAg positive, and with a high serum HBV DNA concentration, infected 19 of 144 susceptible patients whilst performing surgery between July 1991 to July 1992, despite apparent compliance with infection control practices.⁵⁸ In another study, a cardiac surgeon with chronic hepatitis C may have transmitted HCV to 5 of his patients during open heart surgery between 1988 and 1993.⁴⁸

The surgeon in charge of the patient, the anaesthetist, and the scrub nurse should be responsible for ensuring that all members of the operating team know the operating room procedures and current infection control precautions that are to be taken, including any Additional Precautions that may be required. Staff involved in cleaning and sterilizing instruments and equipment used in the operating theatre should also be informed of the need for any Additional Precautions.

Each health care establishment undertaking surgery should have a specific protocol for operating room procedures. This should include specific requirements for surgical hand washing routines.

Pre-operative

- Patients should inform their doctor of their infectious status, particularly in regard to blood borne diseases and any complicating factors, to ensure that appropriate care and treatment is provided, and so that the need for any Additional Precautions can be identified.
- Pre-operative testing of a patient for infectious agents should be on the basis of clinical indication, and medical practitioners should exercise their professional judgement in ordering any clinically relevant test, with the patient's informed consent. In the case of elective surgery, any testing considered relevant should be completed prior to admission.

- Discretion and patient confidentiality must be maintained in all circumstances.
- Surgery lists should be scheduled on the basis of clinical urgency, and in such a way as to allow ample time for adequate infection control procedures to take place. The patient's infectious or immune status should be considered in determining the patient's order on the operating list to allow appropriate clinical management, which may include the need for Additional Precautions - see page 99. Operating room and anaesthetic staff who may be exposed to infectious material in the course of their duty should be informed of the patient's infectious status prior to surgery.
- Pre-operative shaving should be avoided. Clipping should be used as the standard process for hair removal. Depilatory cream may also be used for hair removal. If shaving is required, this should be undertaken in the operating room immediately prior to surgery.

Personnel

- Surgical staff should not perform exposure prone procedures if they are actively infectious with HIV, hepatitis B or hepatitis C - see Special issues No. 5 page 94 and No. 10 page 106.
- Personnel with skin abrasions, dermatitis or wounds of the skin should be excluded from the operating team.

Barrier protection:

- Outside clothing must be changed for clean laundered theatre attire of closely woven material.
- An impermeable, cuffed wrist, sterile gown should be worn by scrub staff. Theatre gowns should be made of waterproofed fabric with ability to 'breathe' and should be comfortable to wear. Alternatively, plastic aprons should be worn under gowns and should be of sufficient length to overlap with protective footwear.
- Open footwear must never be worn in the operating room. Calf length, waterproof overboots should be worn where gross contamination is likely.
- Double sterile gloving, ie a double glove with the larger size glove on the inside, is recommended for all surgeons involved in operating room procedures.
- If a glove is torn or a needlestick or other injury occurs, the gloves should be removed and hands washed when safety permits and new gloves worn promptly. The needle or instrument involved in the incident must also be removed from the sterile field. Needlestick and mucous membrane exposures are to be attended to immediately safety permits, and reported to appropriate authorities.
- Caps should cover the hair completely.
- Masks, protective goggles, glasses or full-face shield or surgical helmet system should always be worn in the operating theatre. Masks should be tied securely to cover the nose and mouth, and should be changed frequently - see page 47.
- Full ventilated total body suits (stretcher suits) may be *used* where there is a high level of risk of exposure to infectious aerosols.
- In the event of any 'strike through' of theatre clothing by body fluids, the surgeon or nurse concerned should remove the contaminated clothing, shower and re-dress. The clothing should then be disposed of as described for contaminated linen.
- Personnel who attend the patient should not leave the operating room until their outer gown, gloves, masks, and protective face shields are removed.
- Theatre clothing should not be worn outside the operating theatre environs.

- Sterile drapes used in the operating theatre should be impervious. Drapes should incorporate systems for the containment of blood and irrigation fluids.

Operating room procedures and surgical techniques

- The team should be limited to essential members, but with sufficient support staff to tend to the patient's needs without cross contaminating the operating team. The roles of 'circulating nurses' and theatre personnel should be clarified to prevent contact between potentially contaminated items and the surgical team. The number of students allowed to attend the operation should be limited.
- Surgical hand washing routines should be specified. Hand, nails and forearms should be washed thoroughly and an antimicrobial skin cleanser applied. Suitable preparations include 4 per cent w/v chlorhexidine, detergent-based povidone-iodine containing 0.75 per cent available iodine, or an aqueous povidone-iodine solution containing 1 per cent available iodine).⁵³ The first wash for the day should be for a minimum period of 5 minutes and subsequent washes for 3 minutes. Hands should be dried carefully using sterile towels. Care should be taken to ensure there is no hand contact with any non-sterile object.
- Suitable skin disinfectants for use prior to surgery include aqueous chlorhexidine (0.5 to 1.0 per cent w/v for skin , or 0.02-0.05 per cent w/v for application to mucous membranes; and 10 per cent w/v aqueous or alcoholic povidone-iodine (1 per cent available iodine).⁵³
- Prior to any surgical or operating procedure, the surgeon and scrub nurse should decide on the routine for passage of sharp instruments during the procedure. This may entail the designation of a 'neutral zone'.
- The surgeon must avoid placing his/her less dexterous hand in potential danger.
- The diathermy and suction should be placed on the opposite side of the table to the surgeon, thereby ensuring the assistant does not reach across the table between the surgeon and nurse.
- Sharp instruments should not be passed by hand. A specified puncture resistant sharps tray must be used for the transfer of all sharp instruments. Only one sharp must be in the tray at one time. If two surgeons are operating simultaneously, for example, varicose veins operation on both legs, each surgeon needs his/her own sharp tray.
- All theatre staff, including surgeons, must be responsible for safe handling of sharp instruments.
- Hand held straight needles should not be used.
- Needles must never be picked up with the fingers, nor the fingers used to expose and increase access for the passage of a suture in deep tissues. When suturing, forceps or a needle holder should be used to pick up the needle and draw it through the tissue.
- Surgeons may use a sterile thimble on the index finger of the less dexterous hand for protection when suturing.
- Where practical, suture needles should be cut off before knots are tied to prevent needlestick injury. The sharp point of the needle should be sheaved in the jaws of the needle holder prior to being cut off.
- Hands of assisting staff must not be used to retract the wound on viscera during surgery. Self retaining retractors should be used or a swab on a stick instead of fingers.
- Certain instruments should be avoided unless essential to the procedure, for example, sharp wound retractors such as rake retractors and skin hooks.
- Wire sutures should be avoided where possible because of the high injury rate to the surgeon. Following a surgical procedure the skin should be closed with staples whenever possible.

- Where practical, blunt needles should be used to close the abdomen.
- Where appropriate, wound dressings with an impervious outer covering that will contain wound exudate should be used.
- Closed wound drainage systems should be used.
- Care should be taken that blood soaked sponges and swabs are kept in a sterile bowl on the surgical set up and carefully counted into a plastic bag when five have accumulated.
- All blood should be cleansed from the patient's skin after the operation, [using aqueous solutions of 0.05 per cent w/v Chlorhexidine or 0.5 per cent Cetrimide.

Lasers and dermabrasion

- The generation of a potentially infected aerosol plume during laser therapy requires purpose-designed plume-suction which must safely be vented. The plume extractor must be as close as possible to the area of skin being worked on.
- The generation of air borne particulate matter and blood spray during dermabrasion requires the use of shielding to cover the entire face of all staff in the work area; caps to protect the hair from such debris must be worn by all personnel. As much as possible of the area in the vicinity of the procedure should be covered with either disposable or sterilizable drapes.

Instruments and equipment

- Re-usable instruments and equipment used on sterile sites must be sterile, and should be processed accordingly.

Cleaning of the operating room and instruments

- In order to minimise the risk of spread of infection to other patients, adequate time must be allowed at the end of each case to allow for thorough cleaning of the operating theatre and the appropriate disposal of clinical waste.
- **Instruments** - as soon as possible after use, instruments for re-use should be immersed in warm water and detergent to prevent congealing or solidifying of blood and fatty materials, and must be thoroughly cleaned in the designated clean-up area prior to sterilization. Where practical, used instruments should be washed mechanically rather than by hand.
- **Scalpel blades and needles** - and all other non-re-usable sharps should be placed in a designated puncture proof sharps container (disposable containers must comply with AS 4031, whilst re-usable containers must comply with AS/NZS 4261). The container should be sealed, and removed from the operating room for appropriate disposal.
- **Clinical waste** -infectious waste, excluding sharps, should be placed in a yellow 'infectious waste' plastic bag, sealed, and removed from the operating room. Disposal of infectious waste must comply with State/Territory regulations.
- **Linen** - should be handled in accordance with the linen service policy, with State and Territory health department guidelines, and with Standards Australia guidelines for correct laundry practice (AS 4146).
- **Blood and other body fluid spills** - should be cleaned up immediately, using absorbent material such as paper towelling, which should then be discarded into the infectious waste bag. Gloves must be worn. The area should then be cleaned with warm water and detergent. The area may be treated with sodium hypochlorite (1 per cent or 10 000 ppm available chlorine) or other appropriate disinfectant, in accordance

with the institution's spills management protocol. Disinfectant solutions should not be allowed to pool or remain on surfaces for longer than is required to effect disinfection, usually 10 minutes.

- **Operating table, instrument table, equipment used & the floor** - all surfaces should be carefully cleaned using warm water and detergent. Disinfectant such as sodium hypochlorite (0.1 per cent or 1000 ppm available chlorine) may be used after removal of gross soil. Surfaces should be cleaned and dried after applying disinfectants.
- At the end of the day, after spot cleaning with sodium hypochlorite solution, the operating lights, all the furniture and equipment, including diathermy, suction, anaesthetic equipment and the operating table should be cleaned with warm water and detergent and dried thoroughly. The floor should be mopped with warm water and detergent after spot cleaning with 0.1 per cent sodium hypochlorite solution.

Additional operating room precautions

- Additional Precautions may be required where the transmission of infection might not be contained by Standard Precautions, (for example, where CJD, pulmonary Tuberculosis, MRSA or any aerosolised pathogens are involved), or where there is an established risk of transmission regardless of the nature of the procedure being undertaken, or where the procedure itself carries an established risk of blood accident or staff/patient injury. The nature of Additional Precautions that are implemented will also depend upon the mode of transmission such as via aerosols; the type of micro-organism, for example, CJD compared to *Staphylococcus*; and the procedure itself, for example, where this carries an established risk of accidental injury.
- Additional Precautions may include the use of experienced surgeons and operating room staff to minimise the likelihood of accidents and complications, the use of special protective equipment, for example, full face visors, and the appropriate scheduling of patients on operating lists to ensure that the required Additional Precautions can be efficiently applied and infection of following patients avoided.
- Where Additional Precautions are required, and in order to minimise surface contamination from aerosolised infectious material, patients may be anaesthetised in the operating room rather than the anaesthetic room.
- Where Additional Precautions are required, and where it is possible, single-use equipment should be used, e.g. suction tips, bottles, tubing, drapes, gowns and sigmoidoscopes.

Modified from : 'Infection Control in Surgery Management of Aids (HIV) and Hepatitis B - 1994' produced by the Royal Australasian College of Surgeons (pages 21-25)

No. 7: Surveillance of hospital acquired (nosocomial) infection

Surveillance of nosocomial infection is an essential component of the prevention of infection in hospitals. It consists of the routine collection of data on infections among patients and staff, and analysis and dissemination of the resulting information to relevant staff, so that appropriate action can result.

The main objectives of surveillance are:

- the early detection of outbreaks in order to allow timely investigation and control;
- monitoring infection levels over time in order to determine the need for, and measure the effect of, preventive and/or control measures; and
- improving quality of care.

Surveillance should be objective and where possible prospective, to enable appropriate interventions as necessary.

Analysis of surveillance data will provide some measure of the effectiveness of an infection control strategy, but more importantly, will help in identifying work practices or procedures which need further modification or refinement. It will also assist management to identify risks of infection and allocate priorities for infection control activities.

It is essential that surveillance is seen as part of the routine infection control program and is carried out in partnership with clinical staff. A multi-disciplinary infection control committee should be established to undertake this task, and to maintain ongoing review of infection control policies and practices.

The surveillance methods used should depend on the objectives set by the health care establishment, in line with national objectives.

Hospital based surveillance may include:

- laboratory based ('alert organism') surveillance;
- surveillance of surgical wound infections and/or intravenous devices;
- sterile site surveillance; and
- prevalence and targeted surveillance (e.g. point prevalent studies, pro-active targeting of areas of concern such as Intensive Care Units and Spinal Units, national tracking of multi-resistant organisms)

All surveillance methods should have the following key components:

- data collection using standard case definitions and methodology;
- confidentiality of the database must be maintained;
- collation, analysis and interpretation/evaluation of data; and
- provision of relevant information (feedback) to the patient and staff involved in the treatment and care of that patient. Feedback data is also essential for future development of the surveillance system.

Data collection

Data recorded may depend on local needs and surveillance objectives. However, there should be national agreement on minimum data requirements, and ultimately collection of nationally integrated data.

Data required may include:

- patient identifier (coded to maintain confidentiality);
- age;
- sex;
- location (hospital ward);
- date of admission;
- date of onset of symptoms or signs of infection;
- site of infection;
- organisms isolated (including their antibiotic sensitivities);
- dates and types of invasive procedures (including catheterisation, and date of removal of catheter or other indwelling device); and
- date of discharge.

Case definitions

Case definitions should be clear and simple. All stakeholders, including professional associations of those involved in the surveillance of nosocomial infection, should be consulted in the development of case definitions. National agreement on case definitions would also facilitate implementation of a national nosocomial surveillance strategy.

Analysis and evaluation of data

At the local level, surveillance data should be carefully examined (daily if possible) to detect unexpected clustering of infections in time and space. Daily, monthly or quarterly analysis of rates of infection may depend on the size of the establishment, and patient turnover.

One component of the analysis of surveillance data is the calculation of infection rates. This requires both denominator data (admissions, discharges and deaths; patient days and use of indwelling devices) and numerator data (number of infected patients or number of infections, as some patients may have multiple infections).

Analysis and review of infection control outcomes should be ongoing through the peer-review process, and through audit of health care establishments.

Provision of information (feedback)

In any surveillance system the feedback of information to appropriate medical and nursing staff is an essential component of the process. Studies indicate that this feedback generally leads to a reduction in infection rates.

Hospital surveillance reports should be made regularly to the hospital's infection control committee. These reports should include brief descriptions of important incidents, and should identify any problems which may have arisen, as well as any lessons which can be learnt from past events.

Feedback data and analysis of these data is also essential for predicting longer term trends, and for developing future prevention and control activities.

No.8: Investigation of outbreaks

Summary

When investigating an outbreak consider the following ten steps:

1. Confirm the diagnosis, and develop a case definition.
2. Prove an outbreak exists (are current rates higher than pre-outbreak rates?).
3. Institute temporary control measures and emphasise the importance of washing hands thoroughly.
4. Perform a literature search.
5. Maintain a diary of key events.
6. Undertake the descriptive epidemiology.
7. Review medical records of infected patients, collect data on potential risk factors, and identify any previous testing for the infectious disease in an attempt to pinpoint possible exposure times.
8. Formulate hypotheses about the likely reservoir/s and mode/s of transmission. Consider the following:
 - (a) Testing of health care workers involved in any suspected sessions, such as surgery; and
 - (b) Testing of patients who had procedures in the same session as the case (if case a patient), and previous/following sessions.
9. Perform an analytical study to develop epidemiologic evidence and confirm a hypothesis.
10. Monitor efficacy of control measures by continued surveillance, and change policy and procedures, if necessary.

No. 9: Infection control guidelines for pregnant health care workers

Introduction

Many infections pose some risks to either a pregnant woman or her offspring. Pregnant health care workers (HCW) will encounter patients with a variety of infections. In general, adherence to Standard Precautions and maintaining high standards of general hygiene in the workplace will provide staff with the necessary protection against acquisition of infection.

The following information relates to infections which are both significant in pregnancy and have some possibility of being acquired through patient care. It is not meant to be a comprehensive account of all infections having relevance to pregnant women.

For this reason, infections due to herpes simplex virus, *Toxoplasma gondii*, *Trepanoma palladium*, *Neisseria gonorrhoea*, *Chlamydia trachomatis*, *Listeria monocytogenes* and human papilloma virus are not considered since these are likely to represent incidental infections rather than those acquired through patient contact.

Rubella (German measles)

Confirming rubella immunity is part of routine antenatal screening. However, serious congenital abnormalities most commonly follow rubella infection occurring in the first trimester. For this reason, rubella antibody status should be checked in all female HCW of child-bearing age at employment. If rubella antibody is absent or below protective levels, then the HCW should be offered vaccination on commencement of employment. Rubella vaccination should be avoided in early pregnancy and conception should be avoided for 2 months following vaccination, although no case of congenital rubella syndrome has been reported following inadvertent vaccination shortly before or during pregnancy.

Hepatitis B

Routine antenatal screening to determine Hepatitis B immune status is commonly performed, and this should be on the basis of informed consent.

If a HCW has not been vaccinated or is not known to be immune to Hepatitis B, then Hepatitis B immunoglobulin should be offered following a sharps injury involving blood from a known Hepatitis B carrier or an unknown source.

Pregnancy is not a contraindication to administration of Hepatitis B immunoglobulin, routine Hepatitis B vaccination or booster doses of Hepatitis B vaccine.

Human Immunodeficiency Virus (HIV)

Pregnant women at risk of HIV infection should discuss the need for HIV antibody testing with their doctor. Advances in treatment mean that, where a woman is HIV positive, there is an opportunity for intervention to prevent transmission to the unborn child. Women continuing with the pregnancy should be offered anti-retroviral therapy as a means of reducing the risk to the unborn child.

In the health care setting, transmission of HIV or hepatitis has followed contaminated sharps injury or substantial blood spill over areas of open skin wounds. Careful work practices including correct handling and disposal of sharps and the use of Standard Precautions offer staff, including pregnant staff, the best protection against occupationally acquired HIV infection.

In caring for HIV infected patients, pregnant HCWs should be aware that these patients may persistently shed CMV in saliva, urine and stool and that appropriate care should be taken when handling these substances, such as using gloves and regular hand washing.

Cytomegalovirus (CMV)

Infection of staff is largely preventable by applying Standard Precautions, including the use of gloves and regular hand washing.

40-60 per cent of women of child-bearing age in Australia will be seronegative for CMV and thus susceptible to primary CMV infection in pregnancy.

Generally, CMV infection in health care workers (HCWs), even those working in high risk areas such as Neonatal Units (NNU), transplant units and caring for HIV positive patients, is not significantly more common than that in the general community.

After primary infection, young children excrete CMV in urine and saliva in larger amounts and longer periods than do adults. There is a high incidence of asymptomatic excretion of CMV among infants and toddlers. For this reason, isolation of children known to be excreting CMV is not recommended. To avoid CMV infection, washing hands after all patient contact and after contact with urine and saliva is essential. Avoidance of direct contact with saliva, for example, kissing toddlers on the mouth, is also important.

Pregnant HCW or those contemplating pregnancy should be counselled regarding mode of transmission of CMV and safe work practices.

Routine antenatal screening is not recommended even in HCW in high risk areas but can be offered on an individual basis.

If a screening test is performed then the implications of the result should be clearly explained. It should be stressed that evidence of past CMV infection does not exclude the possibility of congenital infection since re-activation of a past infection can occur during pregnancy. However, it almost excludes symptomatic infection or congenital defects in the infant.

Conversely, if a HCW is antibody negative, avoidance of high risk work areas will not eliminate the risk of primary CMV infection during pregnancy, especially if the HCW has close contact with children or other sources outside work.

CMV seronegative women who care for children over the age of 2 years have a lower risk of infection.^{1,3} Redeploying seronegative pregnant employees to care for older children may further minimise the risk to carers working in high risk areas.

Varicella Zoster Virus (VZV) - chickenpox and shingles

Varicella infection in adults is generally more severe than in children. There is a small amount of evidence that the infection may be more severe in pregnant than in non-pregnant women. The most dangerous time to acquire chickenpox is actually at term or immediately after term, as there is a high chance that the newborn infant may be exposed and may have little or no immunity. For these reasons non-immune pregnant women should not nurse patients who are infectious, such as patients with chickenpox or shingles.

Primary infection with VZV causes chickenpox. Less than 5 per cent of women of childbearing age lack immunity to VZV. Even individuals who cannot recall having had chickenpox have an 80 per cent chance of having had varicella zoster.

The infection is highly contagious and is spread via the respiratory route or by direct contact with skin vesicles. The contagious period extends from 2 days prior to approximately 5 days after the onset of rash. Crusted vesicles are no longer infectious.

Re-activation of VZV infection (shingles) can occur, usually decades after the initial infection. Re-activation takes the form of a cluster of vesicles involving a single dermatome. Blister fluid from the vesicles is infectious and contact can result in primary varicella infection (chickenpox) in a non-immune contact.

If chickenpox occurs during the first 20 weeks of gestation, intra-uterine foetal infection and occasionally, foetal damage can occur. The foetal varicella syndrome is rare (2-3 per cent of affected pregnancies) and clues to its presence can be found at a 20 week ultrasound scan.

A blood test is now available which reliably detects the presence of antibodies to varicella. If a staff member has a history of clinical chickenpox, testing is not necessary since they will be immune. If the staff member is unsure whether or not they have had chickenpox and they are pregnant or contemplating pregnancy then they may have their varicella antibody status checked. Pregnant staff who are not immune should not care for patients with chickenpox or zoster. If inadvertent exposure occurs then VZIG may be given to the pregnant employee within 96 hours of exposure to the virus.

Acyclovir is available for the treatment of acute VZV infection.

Tuberculosis

There is no evidence that pregnancy increases susceptibility to primary infection with tuberculosis. However, pregnancy may predispose to re-activation of tuberculosis if untreated or inadequately treated in the past.

Measures to prevent transmission of tuberculosis from patient to staff should be just as effective for pregnant staff as for non-pregnant staff - see page 71.

Mantoux testing is safe and interpretation of the result is not affected by pregnancy. BCG vaccine, which consists of a live attenuated strain of *Mycobacterium bovis*, and for which the efficacy is uncertain, should not generally be administered during pregnancy.

If active tuberculosis occurs during pregnancy, standard anti-tuberculosis therapy ie isoniazid, rifampicin and ethambutol can be used safely. There is no evidence of increase in congenital malformations in these pregnancies.

Parvovirus

Human parvovirus B19 is usually transmitted via the respiratory route, but the virus is very resistant in the environment and in biological materials such as blood or plasma - see page 69 for further information.

Diagnosis is by serology and/or virus DNA detection. At present there is no vaccine.

Nosocomial outbreaks of B19 involving infection of patients and staff including pregnant health care workers have been reported. Infection early in pregnancy may affect the foetus, causing aplastic anaemia which later becomes manifest as mid-semester hydrops foetalis. Pregnant staff should therefore avoid contact with patients who are infected with human parvovirus.

No.10: Health care workers (and students) infected with a blood borne virus

Introduction

Community concern about the risk of acquiring human immunodeficiency virus (HIV) in a health care setting has generated an urgent review of infection control policies and procedures, and has identified the need for national guidelines for HCWs who may be infected with HIV, hepatitis B (HBV), hepatitis C (HCV), or other blood borne virus.

Transmission of blood borne viruses from health care worker (HCW) to patient in the health care setting is extremely rare. However, all reasonable measures must be taken to ensure that patients in the health system are protected from the risk of acquiring life threatening infections as a consequence of their treatment, and that HCWs have a safe working environment.

Part 2 - Infectious diseases in the health care setting (pages 61, 63, 65) provides information on HBV, HCV and HIV. Reports that there are other hepatitis viruses, for example, hepatitis G (HGV) associated with persistent viraemia and needlestick injury suggest that blanket rules are likely to create numerous administrative and practical dilemmas. Individual case assessment by expert panels established by State/Territory health authorities is therefore recommended.

Implementation of Standard Precautions and adoption of nationally recommended procedures for sterilization and disinfection will minimise the risk of transmission of blood borne viruses in the health care setting. Additional Precautions may be required where there are complicating circumstances, such as HIV positive patients with infectious pulmonary tuberculosis.

Definition of terms

In the context of these guidelines, health care workers (HCWs) are defined as 'persons, including students and trainees, involved in contact with patients or with blood or body substances from patients'.

The term, 'blood borne virus', as used in these guidelines, includes the human immunodeficiency virus (HIV), hepatitis B (HBV), and hepatitis C (HCV). It may also include new or emerging viruses which are considered to be transmissible by blood or other body fluids.

Invasive procedures include any surgical entry into tissue, body cavities or organs, or repair of traumatic injury. 'Exposure prone procedure' is a term usually characterised by 'the potential for direct contact between the skin (usually finger or thumb) of the HCW and sharp surgical instruments, needles, or sharp tissues (spicules of bone or teeth) in body cavities or in poorly visualised or confined body sites (including the mouth).⁹⁸ In the broader sense, and for the purpose of these guidelines, an exposure prone procedure is considered to be any situation where there is a potentially high risk of transmission of blood borne disease from HCW to patient, and vice versa, during medical or dental procedures.

Summary of issues

Testing and reporting

At the time of writing, there is no legal or mandatory requirement for testing. However there is a strong emphasis on professional and ethical obligations of HCWs who perform exposure prone procedures to know their infectious status in regard to blood borne diseases.

The *National HIV/AIDS Strategy*^{36,37} emphasises a voluntary, co-operative approach to HIV testing and reporting, rather than a coercive, punitive approach which is likely to lead to concealment and secrecy. The Australian Health Ministers, in April 1992, also stated that mandatory testing 'is not an appropriate response to the issue of HIV infected HCWs', and that 'mandatory reporting of an HCW's HIV status to their registration board or like authority is not supported, but any action should be consistent with the reporting requirements for illnesses or impairments likely to affect professional practice'.

Testing, although commonly perceived as a means of identifying the level of risk, does not diminish the risk, and is not a substitute for infection control. HIV testing does not take into account the problem of the window period for HIV, when a patient may be infectious, but this is not detected by testing. Although the window period for HIV is usually 3 months, a delayed seroconversion was reported 8 months after a needlestick injury was sustained by a hospital cleaner in France.⁷⁹

Routine screening has other disadvantages. For HIV testing, false positive results will occur much more frequently than true positive results in the Australian population which has a very low prevalence of unidentified HIV-infected persons. In addition, reliance on testing can diminish emphasis on more important strategies that prevent cross-infection such as Standard Precautions.

Mandatory testing and notification could increase the risk of discrimination against those HCWs who may be infected with a blood borne virus, without significantly decreasing the risk of patient infection. There have been proposals by some Universities to exclude HIV, HBV or HCV infected students from course admission. In addition, widespread or routine testing of all HCWs for blood borne diseases would lead to a potentially huge cost and administrative burden, and, with the possible exception of HBV, is not justified given the very low risk of transmission from HCW to patient when Standard Precautions for infection control are adhered to.

It has also been suggested that mandatory testing of HCWs in areas where there is a high risk of HIV, HBV or HCV transmission, whilst not as expensive as testing all HCWs, has many of the same disadvantages, and could generate a demand for testing of surgical patients.⁹⁷ Pre-operative testing of a patient for infectious agents should be on the basis of clinical indication, and medical practitioners should exercise their professional judgement in ordering any clinically relevant test, with the patient's informed consent.

However, HCWs who engage in exposure-prone procedures have an ethical and professional duty to consider their own potential blood borne virus status and should be encouraged to seek routine testing if they believe they are at risk from occupational or other exposures. Competent counselling services should be made available to assist this decision making process.

Legal concerns have also been identified. If a patient becomes infected as a result of a breach in infection control guidelines, whether this can be proven or not, the patient may argue that it was negligent for a hospital or other health care establishment not to determine the HIV/HBV/HCV status of its HCW employees, and to exclude infected workers from patient contact. The outcome of such a case would depend on the court's view of the evidence, and a sympathetic jury might well decide in favour of the plaintiff. Recommendations on the compensation of all patients suffering medical misadventure will be made by the Professional Indemnity Review.¹²⁷ There is a danger that the approach which health care establishments take to the employment of HIV-infected health care workers will be driven by fear of legal liability rather than a realistic assessment of the risk of transmission of blood borne viruses from a health care worker to patient.⁹⁶

The NSW Health Department has recently reviewed its policy on HIV and hepatitis B infected HCWs and infection control and recommends that all HCWs should assess their individual risk of exposure to HIV and

HBV and seek voluntary testing where appropriate. In addition HCWs who have completed their full course of hepatitis B immunisation should seek post hepatitis B testing to identify poor responders.^{98,99}

At the time of writing, the NSW policy excludes HCV but states that HCWs who perform exposure prone procedures must be aware of their HIV and HBV status by seeking testing if:

- untested and presently performing exposure prone procedures;
- about to commence performing exposure prone procedures;
- involved in a significant occupational exposure to blood or body substances;
- involved in a significant non-occupational exposure to blood or body substances (including needle sharing or unprotected sexual intercourse with an individual infected with HIV or HBV with a person at increased risk of HIV); and/or
- 12 months has elapsed since the last test.

A significant exposure includes needlestick injuries when deep penetration through skin or mucous membrane, injection of blood or large bore hollow needles are involved. Other exposure such as superficial needlesticks, mucosal exposure and contamination of non-intact skin should be assessed by a clinician to determine if the exposure is considered significant.

Responsibilities of HCWs infected with a blood borne virus

HCWs infected with a blood borne virus should be assessed in consultation with their treating medical practitioner to assess that they are capable of performing their tasks adequately to the accepted professional standard, that they practice recommended techniques, that they comply with Standard Precautions and that they adhere to approved recommendations for sterilization and disinfection. HCWs should note that they have an obligation to care for the safety of others in the workplace (this includes fellow workers and patients) both under the *Occupational Health, Safety and Welfare Act, 1986* and at common law.

HCWs infected with a blood borne virus should undergo frequent medical follow-up with a medical practitioner with the appropriate experience with the particular blood borne virus. This practitioner should make a recommendation in regard to the continued involvement of the HCW in direct patient care. The HCW and/or the medical practitioner may seek confidential advice from a relevant professional or advisory board.

For procedures which are not high risk, routine disclosure to patients of a HCW's infectious status (with a blood borne virus) is not recommended because patients (like HCWs) are best protected by adoption of appropriate infection control practices and because there is no onus of confidentiality on the patient. In the absence of any clear exposure to blood or body substances, patients are at an extremely low risk of acquiring blood borne infections. In addition a policy of providing a right for a patient to be informed of the HCW's status misleads the public concerning the risk of transmission of blood borne viruses between care-giver and patient. The risk of transmission is very small, and significantly smaller than other risks which patients accept when undergoing invasive procedures.

HCWs should respond to questions about their own health by stating that infection control procedures are in place to protect both HCWs and patients and that HCWs with a blood borne virus are not excluded from employment or functions they can safely perform under policies in place in the facility. Such questions could also be dealt with by referral to designated institutional personnel, such as infection control staff.

Responsibilities of medical practitioners caring for infected HCWs

To conform with present Acts of Parliament medical practitioners are legally required to bring to the attention of the appropriate Registration Board (medical, nursing, dental etc.) any registered professional person who is unable to practise competently and/or poses a threat to public safety.

Decisions about the working practices of an HCW infected with a blood borne virus are complex. Treating doctors may seek expert opinion to assist them by requesting the relevant State/Territory health department to convene an expert panel. This panel should comprise medical practitioners who have relevant experience with patients with the particular blood borne virus as well as an expert in infection control and a HCW from the same profession as the infected worker who is familiar with the work practices the HCW is engaged in. The treating

medical practitioner may describe the medical and occupational context to the panel to gain advice but should not identify the infected HCW.

Confidential advice may also be sought from the relevant professional board although the identity of the HCW should only be formally notified to this board where it is established that the HCW is placing patients at risk of infection with a blood borne virus. In the case of HCWs that are not covered by a professional board, treating doctors should direct general enquiries to an appropriate authority (usually the Medical Board).

Treating medical practitioners must not notify employers of the blood borne virus status of the HCW unless the HCW gives their informed consent for this to occur. When appropriate, treating doctors should counsel the infected HCW so that the HCW makes appropriate choices about employment. The treating medical practitioner should also take into account the psycho-social needs of the HCW and refer as appropriate for specialist counselling and support.

Responsibilities of health care organisations toward HCWs

Health care organisations should have comprehensive occupational health programs in place to manage HCWs with functional impairment from any cause. Such programs should evaluate workers' fitness for duty based on competence, ability to perform routine duties and compliance with established guidelines and procedures. Confidentiality must be maintained. HCWs may prefer to consult a medical practitioner outside their workplace, in order to separate occupational health and documentation of clinical care. Confidentiality for the HCW infected with a blood borne virus not only safeguards personal rights, but is also in the public interest. The right to confidentiality will encourage HCWs to seek appropriate testing, counselling and treatment and to disclose their serologic status.

For their own protection HCWs with significant immunodeficiency from any cause should not be involved in the care of patients with certain communicable diseases, for example, tuberculosis, varicella-zoster, and CMV. The medical practitioner caring for the HCW who may be immunodeficient should determine when the level of immune compromise is significant and should maintain a high index of suspicion for the appearance of opportunistic infection in the HCW. Immunodeficient HCWs should also be advised on the possible risks of live vaccines, including BCG, that are available for staff in health care establishments.

Management of patients exposed to a blood borne virus during receipt of health care

Patients exposed to known infected blood should be informed of the exposure by a designated professional, retaining confidentiality about the individual source of the blood. Baseline serum should be collected from the patient and expert counselling regarding the implications of the event, post-exposure prophylaxis and appropriate long term follow up offered. Should the patient refuse both testing and serum storage, he/she should sign a form to that effect. In the event of seroconversion all reasonable attempts should be made to confirm that the virus strain transmitted is identical in both patient and the source of the infected blood.

Recommendations

The rights of both the patient (to know the HIV/hepatitis B/ hepatitis C status of their HCW) and HCW (right to privacy) need to be carefully considered. Measures to protect patients and HCWs should be compatible with existing protection available to citizens under legislation and the common law. These measures must also give due consideration to the training and expertise of HCWs infected with a blood borne virus.

The following recommendations attempt to provide a balanced perspective on some of the complex legal and ethical issues which relate to compulsory testing and management of HCWs and HCW students who may be infected with HIV, hepatitis B or hepatitis C.

Vaccination

- All HCWs should be offered hepatitis B vaccination, with post-vaccination testing to identify non-responders.

Testing and exposure prone procedures

- HCWs undertaking exposure prone procedures have an ongoing responsibility to know their infectious status for HIV, hepatitis B and hepatitis C and should not perform exposure prone procedures where there is established evidence of a risk of transmission of infection from HCW to patient. HCWs who engage in exposure prone procedures should be encouraged to seek routine testing if they believe they are at risk of occupational or other exposures. If there is any uncertainty about the level of risk involved, the matter should be referred to an expert panel established by relevant State health authorities for individual assessment.
- Individuals with HIV test results which have been confirmed positive by a State Reference Laboratory should not perform any procedure where there is a risk of HIV transmission. Where there is any uncertainty about the level of risk involved, individuals should be assessed by a State health and/or professional advisory board on a case-by-case basis to determine their continuing participation or modification of work practices.
- HCWs should not perform exposure prone procedures if they are HBV DNA or hepatitis B 'e' antigen (HBeAg) positive. Individuals who test positive for hepatitis B surface antigen (HBsAg) should only perform exposure prone procedures on the advice of a State health and/or professional advisory board. HBeAg positive individuals should not perform exposure prone procedures, as persons with the 'e' antigen pose a higher risk of infection to contacts than those who are HBsAg positive but HBeAg negative.
- HCWs with hepatitis C viraemia (current infection) should not perform exposure prone procedures, as in this situation there is a reasonable risk of transmission of infection. Individuals with indeterminate hepatitis C (HCV) test results should not be excluded from performing exposure prone procedures on the basis of test results alone. If test results are positive or indeterminate, HCWs should be clinically assessed by an experienced physician, over a reasonable period of time, for any sign of current/active infection. Where there is insufficient evidence of current/active infection, the treating doctor, or the individual concerned, should seek the advice of a State health and/or professional advisory board.
- The situation should be reviewed once further information becomes available about the real risk of inoculation injury of surgeons performing 'exposure prone' and the risks to patients if infected health care workers perform exposure prone procedures.
- It is the responsibility of the HCW's employer (including self-employed), in consultation with professional boards or health department advisory panels, to ensure staff have access to appropriate testing, counselling and vaccination programs, consistent with the principles of informed consent. Relevant documentation, including written consent, must be maintained for specific screening and immunisation activities.

Counselling and treatment

- Counselling should be offered pre- and post-testing. Infected HCWs should have a treating physician who may consult with an advisory board (anonymous to ensure confidentiality). Treating physicians should counsel the infected HCW so that the HCW makes appropriate choices about employment, particularly in regard to the continued involvement of the HCW in direct patient care. The treating physician should also take into account the psycho-social needs of the HCW and refer as appropriate for specialist counselling and support.

Reporting

- Following confidential clinical assessment and counselling, infected HCWs should be encouraged to report their infectious status to their employer and to their professional or advisory boards. Routine disclosure of the blood borne status of HCWs to patients is not recommended, because patients, like HCWs, are best protected by adoption of appropriate infection control practices, and because there is no onus of confidentiality on the patient.

- Medical practitioners are legally required to bring to the attention of the appropriate Registration Board (medical, dental, nursing etc.) any registered professional person who is unable to practise competently and/or who poses a threat to public safety.

Confidentiality

- Confidentiality for the HCW infected with a blood borne virus not only safeguards personal rights, but is in the public interest. The right to confidentiality will encourage HCWs to seek appropriate testing, counselling and treatment and to consider disclosure of their serologic status to their employers.

Assistance for HCWs who have occupationally acquired a blood borne virus

- HCWs whose work practices have been modified because of infection with a blood borne virus should be provided, where practical, with opportunities to continue appropriate patient care activities in either their current position or in redeployed positions, or to obtain alternative career training. Health care establishments should consider whether the redeployed post should be 'equivalent' to the previous position and if so in what respects.
- Health care establishments should address the question of when (or if) treated HCWs who become PCR negative should be allowed to return to work.
- Compensation for infected HCWs should consider the actual grounds for compensation or the level of proof of occupational exposure to be applied to either new cases or to retrospective cases which are revealed by current testing.
- VMOs and agency nurses who become infected due to occupational exposure should be eligible for assistance under the same conditions as permanent employees.

'Look-Back Investigations' of patients of HCW's infected with a blood borne virus

- Selective 'look-back investigations' should be considered when there is evidence of significant violation of standard infection control practices (such as the presence of exudative dermatitis) during the time the health care worker was probably infected with the blood borne virus to ensure the treated public were not placed at risk. Evidence indicates that such investigations are of no benefit in other circumstances and should not be performed.

Compliance

- States and Territories should have systems in place to ensure compliance with these recommendations.

Recommendations for HCW students

- Training establishments should ensure that all HCW students are adequately vaccinated (in accordance with the NHMRC recommended immunisation schedule) to ensure protection against infections that are likely to be encountered in the course of their training.
- Students should not be placed in risk-exposure situations. Strategies should be developed that enable students to acquire clinical skills without risk to patients or themselves.
- Screening for hepatitis B, hepatitis C and HIV should not be undertaken in order to exclude students from courses of study.
- Training establishments should have policies or procedures in place for counselling students who may be inhibited from completing any requirement of the course because of disability or impairment, including

infection with a blood borne virus. They should inform students of these policies and implications of potential disability or impairment (risks to themselves and their patients) **prior to course admission.**

- Support and counselling services, including processes for dealing with illness, impairment or disability which occurs during the course, should be established.
- Current training requirements which involve performance of exposure prone procedures should be assessed and an attempt made to provide alternative programs for infected students.
- Courses of instruction which provide training in careers that involve invasive procedures should include information, counselling, opportunities for testing, and career advice. This inclusion should be a requirement for course accreditation.
- If necessary students undertaking modified programs should have suitable limitations (conditional registration) placed on their subsequent registration. This may require an undertaking that exposure prone procedures will not be performed by those persons who are proven to be infected with HIV, hepatitis B or hepatitis C.
- Urgent discussions should be instituted between the Universities, teaching hospitals and the various Registration Boards to define and implement policy in this matter.
- Health care trainees should be subject to the same infection control and professional conduct requirements as qualified staff.

No. 11: Health Care Workers and tuberculosis

Australia has been particularly fortunate in its low prevalence of tuberculosis. As a result, few young health care workers (HCWs) have been exposed in childhood and as a group they are particularly vulnerable to infection. However, the prevalence of tuberculosis in trainee HCWs is likely to rise as a higher proportion of immigrants from Asia and the Pacific participate in the workforce. In addition, an increase in tuberculosis and in particular drug resistant cases is reported worldwide and it is likely that this will be reflected in an increase of cases amongst HCWs generally.

There has been controversy about the strategic advantage of BCG vaccination in protecting HCWs and trainees, and indirectly in reducing the risk that they will infect patients. The alternatives of regular staff Mantoux testing and/or chest x-ray surveillance are no longer implemented on a wide scale, even though early case finding and treatment would greatly reduce the risk of transmission to contacts. There is little up to date information about the prevalence of tuberculosis in HCWs, nor is there uniformity of institutional approach to pre-employment screening by either Mantoux test or chest x-ray.

A more vigorous approach to monitoring tuberculosis in staff is therefore required together with more uniform protocols for the management and return to work of infected individuals.

Part 2: Infectious diseases in the health care setting (page 71-72) provides information on screening and BCG vaccination.

A NHMRC Working Party is currently reviewing guidelines on Tuberculosis which will include recommendations for HCWs.

No. 12: Fundamentals of TB infection control

An effective tuberculosis (TB) control program requires early detection, isolation, and treatment of persons with active TB. The primary emphasis of the TB infection control plan should be achieving these three goals. In all health-care facilities, particularly those in which persons who are at high risk for TB work or receive care, policies and procedures for TB control should be developed, periodically reviewed, and evaluated for effectiveness to determine the actions necessary to minimise the risk of TB transmission.

The TB control program should be based on a hierarchy of control measures. The first and most important level of the hierarchy is the use of administrative measures to reduce the risk of exposure to persons with infectious TB. This includes developing and implementing effective written policies and protocols to ensure the rapid detection, isolation, diagnostic evaluation, and treatment of persons likely to have TB, as well as implementing effective work practices by persons working in the health-care facility.

The second level of the hierarchy is the use of engineering controls to prevent the spread and reduce the concentration of infectious droplet nuclei. This includes:

1. direct source control using local exhaust ventilation;
2. control of direction of air flow to prevent contamination of air in areas adjacent to the infectious source;
3. dilution and removal of contaminated air via general ventilation; and
4. air cleaning via air filtration or ultraviolet germicidal irradiation (UVGI).

The first two approaches minimise the number of areas in the health-care facility where exposure to infectious TB may occur, and reduce, but do not eliminate the risk in those few areas, for example, TB isolation rooms and treatment rooms where cough-inducing procedures are performed, where exposure may still occur. Because persons entering patients' and treatment rooms may be exposed to *M. tuberculosis*, the third level of the hierarchy is the use of a well fitting particulate mask (1 micron filter) or respiratory protective equipment where there is a relatively higher risk.

Specific measures to reduce the risk of TB transmission include the following:

- assigning supervisory responsibility for the design, implementation, and maintenance of the TB infection control program to specific persons in the health-care facility;
- conducting a risk assessment to evaluate the risk of TB transmission in all parts of the health-care facility, developing a written TB control program based on the risk assessment, and periodically repeating the risk assessment to evaluate the effectiveness of the TB infection control program;
- developing, implementing, and enforcing policies and protocols to ensure early detection of patients who may have infectious TB.
- providing prompt triage and appropriate management of patients who may have infectious TB in the outpatient setting.
- promptly initiating and maintaining TB isolation, diagnostic evaluation, and treatment for persons who may have infectious TB and who are admitted to the in-patient setting.
-
- developing, installing, maintaining, and evaluating ventilation and other engineering controls to reduce the potential for air borne exposure to *M. tuberculosis*.

- developing, implementing, maintaining, and evaluating a respiratory protection program.
- using appropriate precautions for cough-inducing procedures.
- educating and training HCWs about TB, effective methods for prevention of TB transmission, and the benefits of medical screening programs.
- developing and implementing a program for routine periodic screening of HCWs for active TB and TB infection .
- promptly evaluating possible episodes of transmission of TB in health-care facilities, including HCW Mantoux skin test conversions, clusters of cases in HCWs or patients, and contacts of TB patients who were not promptly detected and isolated.
- coordinating activities with the local public health department, emphasising reporting, adequate discharge follow-up and ensuring continuation and completion of therapy.

Source: US Federal Register/Vol 58, No 195/ Tuesday October 12 1993/Notices/p 52183.

No. 13: Categories of staff according to risks

The infectious hazards to particular types of workers often vary between and within health care establishments. For example, clerical staff in a paediatric outpatient clinic may more frequently encounter viral infections than clerical staff in a pay office.

In later sections of this document, the risks to employees and strategies for controlling infectious hazards to them are considered in four categories which are determined by the degree of potential contact with infectious agents. The examples given are not comprehensive and do not necessarily represent the category that should be assigned to employees in similar positions in other health care establishments. These categories are useful in targeting education programs and establishing vaccine protocols.

Category A — Direct contact with blood or body substances

This category includes all persons who have physical contact with, or potential exposure to blood or body substances.

Examples include:

- dentists, medical practitioners, nurses, allied health practitioners;
- emergency personnel (fire, police, ambulance and volunteer first aid workers);
- maintenance engineers who service equipment;
- central sterile supply staff;
- mortuary technicians; and
- cleaning staff responsible for decontamination and disposal of contaminated materials.

Laboratory workers are considered separately in Category C.

Category B — Indirect contact with blood or body substances

This category includes workers in patient areas but who rarely have direct contact with patients or with blood or body substances.

These employees may be exposed to infections spread by droplet, such as rubella, but are unlikely to be at risk from blood borne diseases.

Examples include:

- catering staff; and
- ward clerks.

Category C — Laboratory staff

Laboratories contain special risk factors because of the equipment used, for example, centrifuges, and the possibility of exposure to high concentrations of micro-organisms generated by culture procedures. The major risk to laboratory staff occurs in the handling of blood and blood products.

The strategies for controlling infectious hazards in laboratories to create a safe working environment are covered in laboratory manuals and in AS/NZS 2243.3:1995 *Safety in laboratories Part 3: Microbiology*. An example of a detailed protocol is the *Code of safe practice in clinical laboratories*, Health Commission of New South Wales.

Category D — Minimal patient contact

In many health care establishments, clerical staff, gardening staff and numerous other occupational groups have no greater exposure to infectious diseases than does the general public. These employees do not need to be included in vaccination programs or other programs aimed at protecting category A, B and C staff.

No. 14: Overview of staff health screening

The following procedures are proposed for screening and assessment of health care staff.

Routine assessment for susceptibility to infection or presence of infection

- HCWs should be screened by history - see Table 11, page 119. Non-immune staff should be tested where this is relevant.

Screening prior to working in specific areas

- Screening may be more appropriately directed to category A staff working in specific areas, for example, women of child bearing age working in neonatal/oncology or intensive care units.

Outbreaks

- Routine screening for staphylococcal, streptococcal and salmonella carriers is not recommended. It is preferable to initiate screening when an epidemic occurs. Hygienic carriers of these bacteria should not normally transmit infection.

Vaccination

- Polio, tetanus and diphtheria vaccination should be offered to Category A, B, C, D workers. (See Special issues No. 13, page 116)
- Rubella vaccination (MMR) should be offered to all staff in Category A and B.
- Hepatitis B vaccination should be offered to all HCWs and is essential for staff in Categories A and C.
- Hepatitis A vaccine is recommended for those staff at high risk of exposure in accordance with the *NHMRC Immunisation Procedures Handbook*.⁸³

Informed consent/decision making must be obtained prior to screening. The information must be regarded as confidential.

Table 11: Screening of health care staff by patient contact category for risk factors indicated

Risk condition	Patient contact category of health care establishment staff				Comment
	A	B	C	D	
Screen by history*					
Tuberculosis	X	X	X	–	Screen all categories
Exfoliative skin conditions	X	X	X	X	
Measles, mumps, chickenpox		X	X	X	
Vaccinations	X	X	X	–	
Medication	X	–	–	–	
Immune disorder	X	X	–	–	
Herpes simplex	X	–	–	–	
Hepatitis B, C	X	–	X	–	Following occupational exposure
HIV infection	X	–	–	–	Following occupational exposure
Screen by laboratory tests					
PPD test [∞]	X	X	X	–	If not already known
Rubella immunity	X	X	X	–	Prior to vaccination

Notes

* Physical or other examination of health care workers for these conditions is not recommended unless there is a significant history indicating that this should be carried out.

Risk of assessment of categories A, B, C staff for screening conditions should be made by questionnaire at the time of joining the health care establishments or upon their deployment to patient areas.

X Denotes screening for the condition should be undertaken for that category of health care establishments worker.

∞ Purified protein derivative of *Mycobacterium tuberculosis* (Mantoux screening) see page 71.

No. 15: Staff health issues

Health status of staff which affect susceptibility to infection or colonisation

There are certain medical conditions of staff that increase predisposition to infection should they be placed in situations where they come into contact with certain infectious patients. Conditions which are listed below are not infectious per se unless they are secondary to an underlying infection. There are many areas within health care establishments where staff with these conditions can safely work and there are few tasks that such staff are unable to perform safely. Health care establishments have a responsibility to manage and supervise such staff in ways that both acknowledge their right to work, yet safeguard the welfare of patients. This responsibility includes the need to identify such staff and inform them of the problems they are likely to encounter in particular circumstances.

Immune status of staff

Although other factors may also have an effect, substantial depression of immune function is required to predispose a person to infection. People who are immunosuppressed to this extent would normally be unable to work, but are quite likely to acquire hospital-associated infections if employed as category A workers. Examples of pre-disposing conditions include:

- neutropenia (less than 1000 x 10⁹ w.b.c./L) which is often associated with cancer chemotherapy;
- disseminated malignancy;
- infection which produces immune deficiency (e.g. HIV).

Skin conditions (non-infectious)

Staff with either shedding and/or weeping skin conditions or damaged skin may readily be colonised by hospital-associated micro-organisms. These staff may not be harmed by the acquisition of such micro-organisms but may disseminate them widely. For example, placement of such staff in wards containing patients with multi-resistant staphylococci is not recommended. These employees should be advised of the problems posed by their condition.

Examples of non-infectious skin conditions include:

- allergic eczema;
- psoriasis; and
- exfoliative dermatitis.

Pregnancy

Some micro-organisms which cause congenital abnormalities are more commonly encountered in some hospitals than in the community. It may be that pregnant women as a group are more susceptible to some infections, although not to the same extent as immuno-compromised individuals.

In health care establishments where pregnancy is a condition which increases the hazard to staff, it is the responsibility of the employer to advise pregnant or potentially pregnant women in these situations of the special risks associated with pregnancy and to give them an opportunity to avoid patients with specific infections.

Medications

A few drugs either cause considerable immunosuppression or create situations which favour super-infection with nosocomial pathogens. Staff treated with these drugs should be counselled about the risks of infection and allocated alternative tasks. Examples include:

- steroids (greater than 20 mg/day prednisolone); and
- cytotoxic agents.

No. 16: Needlestick and blood accidents

ANCA AUSTRALIAN NATIONAL COUNCIL ON AIDS

BULLETIN No. 16

NEEDLESTICK AND BLOOD ACCIDENTS

MANAGEMENT OF EXPOSURE TO BLOOD/BODY FLUIDS CONTAMINATED WITH BLOOD, INCLUDING NEEDLESTICK/SHARPS INJURIES, WITH A POTENTIAL FOR HUMAN IMMUNODEFICIENCY VIRUS (HIV), HEPATITIS B (HBV), HEPATITIS C (HCV) OR OTHER BLOOD BORNE INFECTIONS

This Bulletin describes the recommended course of action to be taken by all persons who are exposed to blood or body fluids contaminated with blood.

Treatment for exposure to an HIV positive source should commence as soon as possible after the exposure.

Part A applies to the affected person.

Part B applies to the affected person's supervisor, manager and occupational health and safety officer.

Part C applies to medical practitioners and nurses providing care to the affected person.

Note: Confidentiality of employee and source individual records must be maintained.

Definitions

Affected person	The person exposed to blood or body fluid.
Source individual	The person whose blood or body fluid was inoculated or splashed onto the affected person. The source individual may sometimes not be identifiable, for example, when an affected person has been injured by a needle/instrument and it is not known on whom it was used.
Exposure	Contact with blood (or body fluids contaminated with blood). Exposure should be categorised in the following manner:

- **Non-parenteral exposure**

- Intact skin visibly contaminated with blood or body fluid.

- **Doubtful parenteral exposure**

- Intradermal ('superficial') injury with a needle considered not to be contaminated with blood or body fluid;
- A superficial wound not associated with visible bleeding produced by an instrument considered not to be contaminated with blood or body fluid;
- Prior wound or skin lesion contaminated with a body fluid other than blood and with no trace of blood eg urine.

The following exposures should be taken seriously and appropriate care and follow up provided.

- **Possible parenteral exposure**

- Intradermal ('superficial') injury with a needle contaminated with blood or body fluid.
- A wound not associated with visible bleeding produced by an instrument contaminated with blood or body fluid.
- Prior (not fresh) wound or skin lesion contaminated with blood or body fluid.
- Mucous membrane or conjunctival contact with blood.

- **Definite parenteral exposure**

- Skin penetrating injury with a needle contaminated with blood or body fluid.
- Injection of blood/body fluid not included under 'Massive Exposure'.
- Laceration or similar wound which causes bleeding and is produced by an instrument that is visibly contaminated with blood or body fluid.
- In laboratory settings, any direct inoculation with human immunodeficiency virus (HIV) tissue or material likely to contain HIV, hepatitis B virus (HBV) or hepatitis C virus (HCV) not included above.

- **Massive exposure**

- Transfusion of blood.
- Injection of large volume of blood/body fluids (>1ml).
- Parenteral exposure to laboratory specimens containing high titre of virus.

The risk of serious illness can be reduced by following the guidelines in Part A, B and C below:

Part A - Information for the affected person

Immediate action

- If skin is penetrated wash the area well with soap and water (alcohol based hand rinses or foams 60-90 per cent alcohol by weight should be used when water is not available);
- If blood gets on the skin, irrespective of whether there are cuts or abrasions, wash well with soap and water;
- If the eyes are contaminated, rinse the area gently but thoroughly with water or normal saline, while the eyes are open; and
- If blood gets in the mouth, spit it out and then rinse the mouth with water several times.

Then report IMMEDIATELY to your supervisor or occupational health officer. Complete an accident report form which includes:

- date and time of exposure;
- how the incident occurred; and
- name of the source individual (if known).

Incidents which did not occur at work should be reported to your doctor or the Accident and Emergency (Casualty) Department at the nearest hospital.

Regardless of the status of the source individual, the affected person should immediately be evaluated and the risk assessed, preferably by a physician or trained health care worker with experience in the management of these situations. Prophylaxis should be offered on the basis of the risk of infection associated with the injury/exposure.

Part B - Information to supervisors, managers and occupational health and safety officers

If an employee has suffered a **possible parenteral, definite parenteral or massive exposure** it is important that you make sure that immediate steps are taken to reduce the risk to the employee of contracting a serious illness.

- Ensure that the exposed area has been washed thoroughly.
- Arrange for blood to be taken from the employee as soon as possible (See Part C).
- Find out whether a known source individual is involved in the incident and if so, contact a medical officer to organise for blood to be taken from the source individual to be tested for:
 - HIV antibody;
 - Hepatitis B surface antigen (HBsAg); and
 - Hepatitis C antibody (Anti-HCV).

The source blood should be collected and processed immediately after the incident. Remember, informed consent with appropriate counselling is required.

- **When the source individual is known to be positive for either HIV antibody, HBsAg or anti-HCV, ensure that a physician with experience in the management of these infections (eg from a major teaching hospital or STD clinic) has been contacted.**
- Ensure that an incident report form has been correctly completed and includes:
 - the date and time of the incident;
 - how the incident happened; and
 - nature of exposure eg whether the affected person had been stabbed by a syringe or other sharp or been splashed in the eye or other mucosal contact.
 - source information eg patient medical record numbers, or blood bank case donor number.
- Arrange for the employee to visit one of the following:
 - the Occupational Health Department;
 - the Infection Control Department;
 - the Accident and Emergency (Casualty) Department; or
 - their own doctor ;

for the treatment outlined in this document as quickly as possible.

- Reassure the employee that only a small proportion of accidental exposure to blood results in infection.

The risk of infection with HIV following one needlestick exposure to blood from a patient known to be infected with HIV has been reported as 0.3 per cent (Annals Int Medicine 1990; 113: 740-46). The risk may vary according to the stage of infection of the source individual - low risk in asymptomatic and higher risk with symptomatic HIV infection (AIDS). This rate is considerably lower than for HBV. If the source is HBV positive, then immediate treatment of the affected person can prevent possible complications.

- Provide support and counselling and advise that further counselling can be arranged with Occupational Health Nurses, Infection Control Nurses, Infectious Diseases Physicians or HIV Liaison Officers at teaching hospitals or STD clinics.

Ideally, persons nominated to provide support to affected persons should have an appropriate knowledge base of factors concerning transmission of HIV, HBV and HCV, and have counselling expertise. Where this is not possible (e.g. rural and remote areas), then a person with appropriate knowledge of disease transmission should be used.

- Investigate the circumstances of the accident and take measures to prevent recurrence. This may include changes to work practices, changes to equipment, and/or training.
- All health care establishments should develop their own infection control guidelines for communicable diseases including HIV infection. These guidelines should include clear instructions on the appropriate course of action in the event of an incident involving an HIV positive individual, that is:
 - the physician to be contacted;
 - the laboratory which will process emergency specimens; and
 - the pharmacy which stocks prophylactic medication (e.g. zidovudine).

Note: It is most important that confidentiality of employee and source individual records be maintained.

Part C - Protocol for the medical practitioner treating the exposure

Immediate management

Affected person

The affected person should be examined to confirm the nature of exposure and counselled about the possibility of transmission of blood borne disease.

If the accident involved **non-parenteral or doubtful parenteral exposure** then no further testing or examinations are required apart from the possibility of further counselling. This should be determined according to the individual circumstances.

If the accident involved **massive, definite or possible parenteral exposure** then the following should occur:

- take immediate steps to identify status of the source individual;
- take blood from the affected person (the types of tests undertaken will depend upon the status of the source); and
- make arrangements for follow-up assessments of the affected person when the status of the source individual is confirmed.

Source individual

In the case of **massive, definite or possible** parenteral exposure then the source individual should be investigated.

If the status of the source individual is unknown at the time of the accident, then tests should be undertaken to ascertain the source's infectious status for HIV, HBV and HCV. Blood samples may already be in the laboratory and available for immediate testing.

The following tests should be undertaken on the source:

- HIV antibody;
- HBsAg; and
- Anti-HCV.

Blood tests for HIV and HBV should be undertaken urgently so that prophylactic treatments can be given to achieve best outcomes.

The source individual (if accessible) should be appropriately counselled and informed consent should be obtained prior to undertaking the tests. If consent to undertake these specific tests is refused, testing can be undertaken only in accordance with legal provisions within the State or Territory concerned and urgent consultation with the nominated institutional authority or regional health authority should be undertaken to resolve the situation.

The status of the source individual may be known at the time of the accident. In this case the affected person should be managed as below.

Management of the affected person

Source negative for HIV, HBV, HCV

Apart from counselling and collecting blood from the affected person, no further action is required. Tests that are undertaken on blood from the affected person will depend upon the circumstances of the incident.

- Where results of blood tests from the source are available and are negative, and if the source is NOT considered to be in a 'window period', then no testing is required immediately. The blood may be stored for future testing if required.
- If the affected person is considered to be working in a risk exposure situation then they should be offered the opportunity of ascertaining their status by testing (with counselling and consent).
- Where the affected person and their employer jointly agree to ascertain status as a basis for assessing workers compensation, then tests may be undertaken.

Note: Vaccination status of the affected individual should be reviewed.

Source HIV positive

The exposure should be IMMEDIATELY evaluated by a physician with experience in the management of HIV infection.

- Baseline testing for HIV antibody should be undertaken.

- Post-exposure prophylaxis with zidovudine (ZVD), also known as azidothymidine (AZT), or with other drugs available for this purpose, should be offered to the affected person when the risk of transmission is considered to be significant.

Optimal therapy for HIV infection is now emerging as a combination of 2 or 3 drugs, including AZT, ddI or ddC and 3TC. Consideration should be given to providing prophylaxis with such combination therapy when there is a likelihood of HIV transmission and/or AZT resistance is likely. Refer to current therapeutic guidelines for specific dosages. In addition:

- the risk of prophylactic treatment to mother and foetus should be carefully considered against the benefit of this antiviral drug in a pregnant woman who has had a significant exposure.
 - prophylaxis should be commenced only after counselling the affected person, informing them of the relative efficacy, toxicity and safety of the drugs available for this purpose.
 - prophylactic treatment should be at no cost to the affected person.
 - treatment should begin as soon as possible after the exposure (**preferably within two hours**).
 - suggested dose of zidovudine - 200 mg orally five times per day or 250 mg four times a day for six weeks. The recommended dosage may cause intolerable side effects, particularly in women, and a dosage reduction to 500 mg/day may be necessary.
 - 500 mg/day is effective therapy in HIV treatment.
 - doctors should stress to the affected person the importance of strict compliance with the treatment regimen and describe the potential side-effects and the appropriate course of action if these are experienced.
 - State/Territory health authorities should widely publicise details on obtaining access to zidovudine in remote and rural areas. Combination therapies can only be accessed through nominated HIV treatment centres.
- The affected person should be followed up to ascertain any febrile illness that occurs within three months after exposure. Such an illness - particularly one characterised by fever, rash or lymphadenopathy - may indicate primary infection with HIV.
 - The affected person who is initially seronegative should be retested for HIV antibody at 3 weeks and finally retested 3 months after exposure.
 - The affected person should be offered counselling, and informed about the risk of transmission, especially during the first 3 months by which time most infected persons are expected to have developed HIV antibody. Specialised care is required at the early stages after exposure and early testing for p24 antigen and antibody may be useful.

During the period of surveillance (i.e. 3 months):

- do not **donate** plasma or blood, body tissue, milk or sperm until approved by the evaluating physician;
- **protect sexual partners** from contact with blood, semen or vaginal fluids by using condoms;
- **avoid pregnancy** until HIV status is known, and
- consider **work practices** for health care workers.

Source at high risk of HIV (but HIV antibody negative)

- This refers to rare situations where it is suspected that the source individual is in the 'window' period of HIV infection, for example, during seroconversion illness. In these situations the source individual should be followed for up to three months to ascertain whether they develop HIV antibodies.
- The affected person should have baseline testing for HIV antibody and may be tested for HIV antibody at 3 weeks and finally repeated at 3 months in the event that the source is identified as HIV positive.
- If necessary, further information, support and counselling should be arranged.

Source HBV positive (HBsAg positive)

The affected person should be investigated to determine the nature of protection that should be provided. The approach to investigation is modified according to whether or not the affected person has received a course of hepatitis B vaccine.

- If the affected person **has been vaccinated**:
 - take blood for estimation of hepatitis B surface antibody (Anti-HBs) to confirm that vaccine immunity is being maintained. Antibody titres may fall below protective levels some years after vaccination (non-protective levels <10 IU/L).
- If the affected person **has not been previously vaccinated for hepatitis B**:
 - take blood for estimation of hepatitis B core antibody (Anti-HBc), Anti-HBs or other test such as HBsAg that is available in your local laboratory to determine previous infection.

These tests will indicate whether the affected person has previously been infected with hepatitis B. If the affected person has previously been infected, then no further action is required.

- Where the affected person has not been infected with hepatitis B and is **negative** for Anti-HBs or has levels which are **non-protective** (<10 IU/L), hepatitis B immunoglobulin (HBIG) should be given within 48 hours of injury when:
 - the source individual is HBsAg positive;
 - the source individual is unknown; or
 - the results of tests on the source individual and affected person are unavailable within 48 hours.

Persons eligible for HBIG should commence a vaccination course at the same time. Three vaccinations at 0, 1 and 6 months are required.

- When the affected person is immune (Anti-HBs positive), consider checking antibody levels or providing booster vaccination if previous course was completed > 5 years ago.

Source Anti-HCV positive

- The risks and some mechanisms of HCV transmission in health care settings are not firmly established.
- At present, apart from thorough washing (as for HIV and HBV) at the time of injury there is no known treatment that can alter the likelihood of transmission.
- The reasons for following up affected persons are to ascertain whether HCV infection occurs and to provide support and treatment.
- The affected person should be tested for Anti-HCV at 0 and 3 months.
- Follow-up should be undertaken by a specialist with knowledge of HCV infection.

Source unknown

Reasonable efforts should be made to identify the source. If the source remains unknown, appropriate follow-up should be determined on an individual basis depending on:

- the type of exposure;
- the likelihood of source being positive for a blood pathogen; and
- the prevalence of HIV, HBV and HCV in the community from which the instrument or needle comes.

Appropriate follow-up should also determine the risk of tetanus. Depending on the circumstances of the exposure, the following may need to be considered:

- tetanus immunoglobulin;
- a course of adult diphtheria and tetanus (ADT); or
- ADT booster.

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No. 17: Infection control in midwifery and obstetric procedures

Work practices in labour wards should be specifically designed to ensure safe performance of midwifery and obstetric procedures during:

- prenatal period;
- management of labour;
- postnatal care.

Standard Precautions are necessary where any blood or body fluids are involved. It is important that midwifery and obstetric staff have access to appropriate training and professional counselling services. This training should enable them to anticipate and manage situations in which they may be exposed to infectious organisms.

Prenatal period

Procedures performed during the prenatal period which may expose HCWs to blood or body fluids are:

- pap-smear;
- treatment of a threatened miscarriage and premature labour;
- amniocentesis;
- foetoscopy (to gain foetal blood).

All vaginal loss/secretions should be treated as being potentially infectious.

Management of labour

The following procedures performed during the management of labour may expose HCW to blood and other body fluids:

- lumbar epidural, where contact with cerebro-spinal fluid may occur;
- rupturing of the membranes;
- spontaneous rupture of the membranes.

Postnatal

- Personal protective equipment should be worn to protect health care workers from contact with colostrum and/or breast milk when assisting expressing. Cracked nipples may bleed.
- When conducting postnatal checks, HCW must wear personal protective equipment.
- When cutting the umbilical cord, two clamps should be used to clamp the proximal and distal ends of the umbilical cord. Once clamps are in place, absorbent material should be placed over the site and the cutting instrument. This is to prevent spurting or blood during cutting.
- If practicable, the umbilical cord should be cut when pulsation has ceased. Cord blood should be taken prior to the delivery of the placenta by releasing the cord clamp and allowing blood to drain when pressure in the cord is less.

- Placentae should be carefully examined with gloved hand and discarded into a plastic bag for incineration. Sink disposal units should **not** be used for the disposal of placentae because of the risk of generating droplets and aerosols.
- Used needles and other disposable sharp instruments should be discarded immediately after use into an approved sharps container. - see page 23.
- Gross soiling should be rinsed from instruments in the operating room and cleaning should proceed as described on page 30.
- Gloves should be worn when handling newborns until their first bath and all blood contamination has been removed.
- Used pads should be placed into approved leak-proof bags and disposal should be in accordance with waste management procedures - see page 22.
- Mothers should be taught about hygiene practices associated with vaginal loss in the shower. All vaginal losses should be treated as a 'spill' and cleaned and decontaminated is appropriately - see page 19.

Information modified from Worksafe Australia. *Infectious disease control: midwifery services and obstetric procedures*. Sydney: Worksafe Australia.

No 18: Risk assessment and infection control

Risk identification:

The purpose of risk identification is to identify the activities and tasks in the workplace which put employees at risk. Risk identifications requires:

- consultation with employees;
- direct workplace observation;
- analysis of exposure reporting schemes.

Risk assessment

Risk assessment requires analysis of:

- the nature of the risk;
- frequency of exposures;
- nature and circumstance of exposure;
- workplace layout and practices;
- potential health effects;
- assessment of knowledge and training;
- adequacy of and need for control measures.

Risk control

The purpose of risk control is to minimise employee exposures to blood or body fluids in the workplace. Risk control can be achieved by:

- elimination of risk;
- modification of work practices;
- employing engineering controls;
- applying principles of infection control for safe work practices;
- providing information/education and training;
- correct use of personal protective equipment.
- **Monitoring and evaluation**

On an ongoing basis:

- monitor and evaluate infection control procedures.

No. 19: Ethics, rights and responsibilities

Sections:

- Ethical and legal considerations
- Developing and implementing policy and procedures
- Assessment of risk
- Isolation policies
- Duty of care - emergency care
- Referral
- Informed decision making
- Pre-operative testing
- Decision to undergo testing for non-urgent/elective hospital admissions
- Decision to undergo testing for emergency/urgent hospital admissions
- Staff screening/testing
- Privacy and confidentiality
- Anti-discrimination
- Responsibilities of health care establishments
- Staff responsibilities
- Patient responsibilities

Ethical and legal considerations

Ethical and legal considerations arise out of the possibility of conflict between the rights and interests of the infected individual to privacy and confidentiality and the duty of care incumbent upon health care establishments to protect patients and staff from infection.

There is a substantial overlap between the legal and ethical obligations of health care establishments and health care workers and professionals. Most ethical obligations are also legal obligations, although it must be emphasised that ethical imperatives are not always and not necessarily defined by the law. It does not necessarily follow that complete compliance with the law will ensure that all one's actions are ethically sound.

The fundamental moral obligation of all persons to avoid causing harm to others is reflected in common law which imposes a duty of care to avoid injury to others in a sufficiently proximate relationship. The law specifies that the standard of care will vary according to the seriousness of the risk and the foreseeability of the injury.

Due consideration should also be given to ethical decision making concerning work and career choices for health care workers who may be infected with a blood borne virus so as to minimise emotional, psychological and financial harm for the infected health care worker.

In the context of these guidelines, civil liability for damages to a patient or a health care worker may arise where care of a sufficiently high standard has not been taken to prevent transmission of infection or breach of confidentiality.

There is also presently, in each State, legislation which concerns the spread of infectious diseases and under which liability for damages may arise. (See Report of Intergovernmental Committee on AIDS Legal Working Party April 1992). Both the common law and the legislation will respond to meet changing needs in a changing environment and both reflect the minimum boundaries of acceptable social interaction.

In the past it has been uncommon for persons who spread disease negligently to be charged with criminal offences. In most jurisdictions the present criminal law needs no amendment to deal with the more serious cases of the spread of infectious diseases. If a person, health care worker, patient or otherwise, infects another person negligently and causes serious illness, he or she can be charged with an offence of causing grievous bodily harm by negligent act. If someone dies as a result of a negligent act the person responsible can be charged with manslaughter. If the act of spreading the infection is deliberate, the appropriate charge is assault or murder.

Liability would depend on the conduct amounting to criminal negligence as opposed to civil negligence. It is conceivable, although unlikely to occur in practice, that medical administrators could be charged with such offences if they were to permit the spread of infectious diseases in the health care establishments under their authority, either deliberately or negligently. In addition, under legislation in each jurisdiction, there are additional specific transmission of disease related offences. Such offences deal with those individuals who infect another person with a notifiable disease, or in some jurisdictions, merely engage in conduct such as to be likely to risk spreading a disease.

Developing and implementing policy and procedures

In the legal and ethical context, health care establishment should implement policies and procedures which take account of their specific circumstances. This is because the prevalence of disease will vary according to population groups and regions, and also because the risk to staff or patients will vary according to a number of factors, including the prevalence of disease, the nature of treatment provided and the skills and experience of staff. Health care establishments should consider the potential risk of spread of infectious diseases and formulate clear guidelines for patients and staff in their own particular circumstances.

In developing and implementing policies, health care establishments should recognise the rights of and the need for individual professionals to make judgments within their professional competence and in accordance with clinical circumstances. It is important, however, that professionals making such decisions are aware of the health care establishment's policies in relation to legal and ethical obligations and the relationship which exists between the health care establishment and that professional.

Health care workers should ensure that the minimum standard of care they provide and the minimum standard of protection they adopt is sufficient to prevent transmission of any iatrogenic/nosocomial infection or occupational acquisition of infection.

Assessment of risk

Only a few situations in health care establishments present significant risk of transmitting serious infections - see Special issues No. 5, page 94, No. 13 page 116 and No. 18 page 132.

Health care establishments should take account of health care workers with conditions predisposing themselves and others to infection (such as weeping and shedding skin conditions), and of situations where less experienced or less skilled personnel may be exposed to risk.

Health care establishments have a legal and ethical responsibility to provide staff and other patients with:

- risk assessment guidelines;
- adequate protection;
- effective instruction and ongoing education;
- appropriate facilities and equipment;
- occupational health services, and
- health screening programs.

Isolation policies

The implementation of unnecessarily restrictive isolation policy and procedures or screening programs may be unethical if they infringe individual rights and freedom. For example, the routine screening of patients for nasal carriage of *Staphylococcus aureus* and the confinement of positive patients is unnecessary because normal standards of professional conduct and implementation of Standard or Additional Precautions will minimise cross infection. Effective antibiotics are available to treat the consequences of cross infection, although this should be in accordance with antibiotic guidelines to minimise potential for drug resistance. In the case of HIV infection and hepatitis, implementation of Standard Precautions is the most appropriate means of preventing infection.

Duty of care - emergency care

Health care establishments and their staff generally have an ethical and, in some cases, a legal responsibility to provide care to all patients seeking emergency treatment. Failure to provide appropriate care in an emergency may constitute a breach of duty of care for patients. In addition, a health professional who fails to provide care to a patient in an emergency may be exposed to professional and/or institutional disciplinary action. Health care establishments must also provide staff with appropriate protective equipment and instructions for its use for safe emergency care. Failure to do so constitutes a breach of duty of care for staff.

Provision of emergency care involves exposure to infectious risks which cannot be identified accurately at the time care is provided. These infectious risks to staff should be minimised by implementing Standard or Additional Precautions and preventing direct contact with blood and body fluid secretions.

Staff who perceive themselves to be at risk and seek to withhold their services should be assessed by a medical practitioner with a sound knowledge of infection control to determine if the perceived risk is real or not. They should be counselled accordingly, and redeployed if necessary. It is important that staff are educated in the incidence of risk associated with the care of patients with particular infectious diseases.

Referral

Referring practitioners are ethically bound to advise the patient that to effect referral, it is necessary to provide relevant clinical information, including information about any infectious condition or likelihood thereof, which would affect clinical management of the person being referred or of the staff sustaining occupational exposure from accidents involving patients tissues.

Referral to another practitioner should only occur with the patient's full knowledge and consent and must take into account the confidential nature of the information. Any additional treating practitioner or health care establishment to which an infectious patient is referred is equally bound by a duty of confidentiality regarding that patient.

Informed decision making

There are two important components that are necessary if decision making is to be adequately informed. First, all relevant information should be provided to the patient. Secondly, it is essential that this information be communicated satisfactorily to the patient in such a way as best to ensure that the patient understands. If appropriate information is not adequately communicated, patients cannot make a proper decision regarding a course of treatment. A sound decision requires the patient's full knowledge about any procedures involved in their care and treatment. This includes procedures designed to obtain information which is normally considered private.

Both the information provided and the manner in which it is communicated will be influenced by patient characteristics and ethnic background. Informed decision making should take into account language and jargon barriers to ensure that a patient fully understands the nature of any risk that they may incur. Health care establishments should provide access to independent trained interpreters, ideally in person, or via the telephone interpreting service if this is not possible.

Provision of information for the purpose of obtaining consent to testing should involve explanation of the requirements for the test, what the resulting test results may mean, and should include pre-test counselling as is required by law in some states and post-test counselling, regardless of the test result.

Valid consent (free and voluntary) must be obtained before taking a blood sample to test for any purpose. Antenatal HIV testing without the patient's informed consent is unethical and unnecessary. Specific consent should be obtained for all tests that a patient's blood may be subjected to. In addition, the patient must be provided with relevant information concerning the purpose of a blood test and any specific tests performed. Long and short term consequences of test results should also be discussed with the patient. In some jurisdictions, there are legislative requirements for pre- and post-test counselling as to the consequences of a positive result. The ethical indications for such counselling are likely to have broader applicability than existing legal requirements.

This is especially so in the case of patients from non-English speaking backgrounds. It is not reasonable to assume a uniform level of comprehension when counselling patients about possible consequences of testing.

Individuals have a right to be informed when the results of tests have consequences beyond the particular disease under treatment. Health care establishments and their staff have a duty to warn about foreseeable consequences. This applies especially to notifiable infectious diseases where the outcome of performing the test may be the compulsory notification of authorities, with the possible subsequent restriction of the patients' freedom, or perhaps a change in the manner in which medical care is provided (that is, the patient may be subjected to isolation procedures).

When a patient has been provided with relevant information concerning procedures involved in their care and treatment, including information concerning blood tests, this may protect a health professional or health care institution from liability for assault, damages for breach of contract, breach of confidentiality, discrimination and negligence. Where a patient decides to be subject to a particular procedure, this authorizes only action taken for the patient's benefit and does not justify action for the benefit of the health care establishment or its staff. For example, if a patient consents to a sample of blood being taken to test for the presence of *Legionella* to determine appropriate treatment, the consent does not allow testing the sample for HIV or hepatitis B antibodies.

Pre-operative testing

Pre-operative testing of a patient for infectious agents should be on the basis of clinical assessment and with the patient's full knowledge and decision to participate. Medical practitioners should exercise their professional judgement in ordering any clinically relevant test. In non-emergency situations patients who are unable to make a decision or who refuse to undergo testing should be managed as if they are infectious, applying Standard or Additional Precautions as required. In emergency situations, where the patient is unable to make decisions, the doctor should perform any test which is clinically relevant for the management of that patient. In both emergency and non-emergency situations, the emphasis at all times should be on maintaining high standards of infection control, regardless of whether or not a patient is known to be infectious. Standard and Additional Precautions should enable procedures to be performed on all patients with minimal risk of transmission of infection.

Decision to undergo testing for non-urgent/elective hospital admissions

Any decision by a patient to undergo testing prior to hospital admissions must be made voluntarily and must not be subject to duress. For non-urgent admissions, and where testing is clinically relevant, patients should be considered infectious pending the results of a test or if they refuse to be tested. If this is impracticable, and provided immediate care is not required, admission or treatment may be deferred until it becomes practicable or consent is given.

Decision to undergo testing for emergency/urgent hospital admissions

Where testing is clinically relevant an attempt should be made to facilitate the making of an informed decision in relation to testing by either the patient or legally appointed guardian in the case of disabled patients. If it is not possible to obtain such a decision, or if there is a refusal to be tested, the patient should be considered infectious and managed according to Standard and Additional Precautions.

Staff screening/testing

In establishing health screening policies and procedures the relevant State and Federal anti-discrimination legislation should be consulted to ensure no illegal discrimination occurs. It should not automatically be assumed that compliance with this legislation replaces any need to consider the ethical aspects of further screening.

Staff health screening is recommended in only a few situations - see Special issues No 14, page 118. In each of these situations appropriate advice including that relating to the consequences of a positive test result, should be provided to staff and valid consent obtained and relevant information provided for specific screening activities. Education programs should emphasise the importance of regular routine screening for staff in high risk situations, such as when caring for patients with infectious pulmonary TB.

A general consent to health screening as a condition of employment is not a practical option because it can be withdrawn at any time, even orally. Staff may also initiate a request for health screening prior to commencement of employment. The ethical status of screening of staff may vary considerably with the specific situation. To require screening for an infectious condition that poses little risk to patients or other staff would be unreasonable: to omit screening when a high risk is present may amount to a breach of the legal and ethical duty of care to these groups. Screening to ascertain specific immunity could legitimately be an ethical requirement if a new employee is to work in a laboratory or clinical situation imposing high risk of serious infection to which they are susceptible. A decision by a prospective staff member not to undergo screening or not to accept immunisation in those circumstances could be the basis for legitimate exclusion from a particular employment position. The existence of a severe depression of the immune system, either as a result of disease or as a consequence of medical treatment, could legitimately be information which requires consideration before an individual is introduced into a particular work situation. Whilst access by a prospective employer to this information may constitute an invasion of privacy, if the prospective employee, having been adequately informed of the risks, declines to reveal relevant information on his or her immune status and wishes to accept the position, an employer may be failing in its ultimate duty of care to other staff and patients if the appointment proceeds despite strong and reasonable grounds for suspicion.

In the presence of an immunosuppressed condition, or the strong presumption of its presence, an employer may be imposing an unreasonable risk on a prospective employee by introducing them into a workplace that carries a substantial risk of serious infection. Screening may, in some situations, offer a useful insurance to a new employee by providing a baseline indication that a specific condition was not present when employment commenced. Consequently, an employer could be in breach of its duty of care to new employees if they were to be potentially exposed to an infectious agent, in the course of employment, which might not become apparent for years after cessation of that employment. Unavailability of pre-employment screening would seriously weaken the former employee's chance of establishing that the condition was acquired in the course of employment for the purposes of a worker's compensation claim or action in negligence. Finally, legislative proscriptions against gender discrimination notwithstanding there may be specific situations in laboratory practice in which the placement of non-immune female employees at risk of exposure to infectious agents with the capacity to damage an embryo or foetus would be to ignore the employer's reasonable duty of care.

Health care students should also be offered health screening, prior to any clinical contact with patients and should be required to review their immune status in regard to diseases which are preventable by vaccination.

Privacy and confidentiality

Privacy and confidentiality are important considerations in the patient/professional health care worker relationship, and must be observed to the extent that this does not obstruct the health care establishments' ability to prevent the spread of infection.

Staff involved in the treatment and care of patients for whom Additional Precautions are required should be informed of the infection control procedures to be implemented. However, access to confidential medical information should be strictly limited to relevant staff who may need to access the information for the better clinical treatment of the patient.

Procedures for disciplinary action for abuses of confidentiality must be clearly formulated and adhered to.

Anti-discrimination

Specific legislation at both the Federal and State/Territory level prohibits discrimination on a number of grounds including impairment, which includes physiological, psychological and intellectual disabilities. Precedents have been established which identify infectious diseases as constituting a physiological disability. Although differential treatment of persons with infectious disease or particular susceptibility to infectious disease constitutes discrimination, the law recognises that, in some circumstances, discrimination may be necessary. Ultimately, it becomes necessary to strike a balance between private and public health interests when, for instance, some form of discrimination may be reasonably necessary to protect public health. When developing protocols dealing with infectious diseases, relevant State and Federal anti-discrimination legislation should be consulted to ensure that no illegal discrimination occurs.

Independent Health Complaints Units exist as statutory bodies in most States and Territories. Where these are not available, equivalent units exist at departmental level. Health care workers and professionals can be victims or perpetrators of discrimination, but should be aware that there are sanctions against individuals who act in a discriminatory manner to another. Appropriate steps should be taken to allow all staff to work and to acquire experience in the normal range of activities associated with a position to which he/she has been appointed without being subject to discrimination. Any staff member who believes that he/she cannot act in a non-discriminatory manner should report the position to the health care establishment's administration.

Any patient management which could be construed as discriminatory should be properly documented. For example, the protocol for isolation of persons suspected of having an infectious disease must be documented and the patient's infectious classification recorded in the clinical notes.

The health care establishment should inform its staff of its anti-discrimination policy and require adherence to such principles. An adequate monitoring program and complaints-handling protocol should also be established and made known to staff and patients.

Responsibilities of health care establishments

Maintenance of a safe environment for patients and staff is a complex matter that requires coordination between management, health care professionals and support services.

Coordination of clinical and non-clinical services is required to minimise the hazards of the spread of infection. In this regard, management of each health care establishment has a general responsibility to prevent transmission of infections in the clinical environment. Specific aspects of this general responsibility are to:

- institute appropriate measures to prevent the transmission of infection between staff and patients;
- maintain adequate physical facilities and equipment to control the spread of harmful micro-organisms;
- maintain surveillance for infections which may spread amongst patients and staff;
- establish and practise infection control procedures which take account of the pathogens relevant to the particular clinical situation whilst paying due regard to the psycho-social welfare of the patient, and enlisting their support and co-operation;
- provide education in hygiene including specific advice about hand washing and the special requirements applicable to the area where staff are working;
- inform and educate staff about the infectious hazards they face in the course of their employment. This information should be provided both at the time of appointment and prior to any deployment to particularly hazardous areas. At times patients may present special or unusual hazards, for example, tuberculosis in a general medical ward. Staff at risk in the area should be acquainted with the situation and appropriate control measures should be initiated;
- maintain awareness of new vaccines becoming available to protect staff and initiate procedures to ensure those at risk are fully vaccinated. An appropriate vaccine strategy is one which identifies the agents likely to be encountered by staff at risk and offers vaccination programs under circumstances that encourage compliance by providing full information about the vaccine;
- ensure that staff are adequately informed of the rights and responsibilities of the patient;
- take positive measures to implement appropriate infection control. Health care establishments should then advise any staff of their situation if they refuse reasonable requests for their vaccination, or if they fail to comply with infection control procedures. Such advice and refusal to comply should be documented. Should such staff subsequently develop work related infections, it is most likely that the health care establishment would not be found to be in breach of its duty of care to its staff. Nevertheless, staff would be entitled to workers' compensation under present legislation;

- ensure that there is access to appropriately experienced counselling services for those staff who may become anxious about their health as a result of exposure to a potential hazard, whether true or perceived.

Staff responsibilities

Staff undertaking exposure prone procedures have an ongoing responsibility to know their infectious status with regard to blood borne viruses such as hepatitis B, hepatitis C and HIV, and should be encouraged to undergo voluntary testing after being provided with relevant information about the specific tests to be performed. Testing should be offered following any occupational exposure to blood or body substances, for example, needlestick injury - see ANCA Bulletin No. 16, page 122.

Health care staff who are infected with a blood borne virus have a professional and ethical responsibility to advise their employer of any infectious status of which they are aware. To facilitate this process, the employer should ensure that adequate mechanisms are in place to protect the confidentiality of such information. Infected health care staff should seek appropriate medical care from a doctor qualified to manage infectious diseases. Where there is a risk of transmitting infection to a patient, or other member of staff, staff who are infected with a blood borne virus as well as staff who have any other transmissible infection or predisposing skin conditions should be counselled about their work options, and either deployed appropriately or provided with information and facilities to enable them to continue to provide care in a safe manner.

Special issues No 10, page 106 provides further discussion on management of health care workers, including students, who may be infected with a blood borne virus.

Patient responsibilities

Although there is no specific requirement for persons who know they are infectious to declare their infectious status to health care establishments, there is a responsibility for patients to declare any infectious status if there is a known risk to others associated with their treatment. In addition, as is the case with any other members of the community, patients who know, or have reason to believe that they are infectious, may be exposed to both civil and criminal liability (see introductory comments above).

Patients should be informed of their responsibilities in this regard, and encouraged to acknowledge that responsibility. At the time of patient admission to hospital or presentation at an accident and emergency unit, patients should be encouraged to provide any relevant information regarding their infectious status to assist in triage management. Admission forms should be designed to facilitate provision of this information.

Patient co-operation in providing relevant information is more likely to be achieved if the risk of transmission of infection is explained in simple terms. Similarly, patient co-operation in providing relevant information is likely to be facilitated by the existence of satisfactory mechanisms within the institution to ensure the confidentiality of such information and by the provision of information regarding the institution's policy and practice in this regard. Health care establishments should promote a spirit of co-operation and participation of affected communities and seek to identify procedures or practices that would discourage this spirit of co-operation. Further, if a situation arises in a treatment program (such as a sharps/blood accident) where there is a need to know the infectious status of a patient, the patient has a responsibility to provide information or consent for testing which enables the health care establishment or responsible health professional to ensure the safe management of the injured staff. In obtaining consent, it is necessary to advise the patient of the types of tests that may need to be undertaken and to outline the consequences to the patient of doing such tests through adequate pre-test counselling, with post-test counselling as required or if a positive result is obtained.

Appendix A. List of submissions received

stage one

A K Thomas Pty Ltd
 Allan Perceval and Association, Infection control Consultant
 AusMed Pty Ltd
 Australasian Society of Infectious Diseases, President
 Australian and New Zealand College of Anaesthetists, Registrar
 Australian and New Zealand College of Anaesthetists, Councillor
 Australian Dental Association Inc, Executive Director
 Australian Hospital Association, Research Officer
 Australian Infection Control Association, National President
 Australian Medical Association Ltd, Acting Director
 Australian Nurses Federation (ANF), Acting General Secretary
 Curtin University of Technology, Lecturer, School of Nursing
 Department of Health and Community Services (NT), Chief Health Officer
 Department of Health and Community Services (Vic), Director of Public Health
 Health Department of Western Australia, Director, Disease Control Branch
 Health Department of Western Australia, Chief Health Officer
 Medical and Ophthalmic Design Co.
 Medical Board of the NT, Registrar
 Medical Council of Tasmania, Assistant Secretary
 Montgomery Street Clinic
 National Centre in HIV Epidemiology and Clinical Research, Deputy Director
 Prince Charles Hospital, Director of Microbiology
 Professional Tattooing Association of Australia, President
 Queensland Department of Health, Director of Microbiology
 Queensland Department of Health, Epidemiologist
 Queensland Department of Health, Infectious Diseases Physician
 Queensland Positive People
 Royal Australasian College of Surgeons, Executive Director for Surgical Affairs
 Royal Australasian College of Surgeons, Professor of Surgery
 Royal Australian College of General Practitioners, Secretary General
 Royal College of Nursing Australia
 Royal College of Pathologists of Australasia, Honorary Secretary
 SA Health Commission, Executive Director
 St John Ambulance, NSW District Surgeon
 St John Ambulance Australia, Chief Surgeon
 Standards Australia, Group Manager
 Sterilisation Research Council of Australia, President
 Wickham, Mr F

Appendix B. List of submissions received stage two

ACT Pathology, Infectious Diseases Physician and Microbiologist, Dr Peter Collignon
 AIDS Council of NSW Inc, Executive Director, Don Baxter
 AP & Associates, Mr Allan Perceval
 Australian Acupuncture Association Ltd, Administration/Research Officer, Judy James
 Australian Council on Healthcare Standards, Manager Development Unit, Marjorie Pawsey
 Australian Defence Department, Headquarters, Captain F J Parkes RAN for Director General Clinical Services
 Australian Dental Association, Dr John Matthews
 Australian Dental Association Inc, Executive Director, Dr Robert Butler
 Australian Dental Association (Qld Branch), Infection Control Committee, Dr J McAdam
 Australian Funeral Directors Association, Executive Director, Robert Richardson
 Australian Health Ethics Committee, Chairperson, Professor Donald Chalmers
 Australian Hospital Association, Deputy Director, Prue Power
 Australian Infection Control Association, President, Mrs Madeleine McPherson
 Australian Institute of Environmental Health, Executive Officer, Bob Langdon
 Australian Medical Association Ltd, Health Services, Assistant Director, Phillip Taylor
 Australian Medical Council, Executive Officer, Ian Frank
 Australian Medical Students' Association, National Coordinator, Andrew Eakin
 Australian Nursing Homes & Extended Care Association, President, Mr G Croft
 Australian Physiotherapy Association, National Professional Development Coordinator, Maureen Webb
 Bard Australia Pty Ltd, Regulatory Affairs Manager, Heather Winslade
 Cabrini Hospital (VIC), Infectious Diseases Physician, Dr Robert Baird
 Canberra Liaison Pty Ltd, Allan Scroope
 Central Sydney Area Health Service (NSW), Chief Executive Officer, Dr Diana Horvath
 Clinical Services and Planning, Hunter Health (NSW), Director, Dr R Porter
 Community & Health Services (TAS), Clinical Nurse Specialist Infection Control, Nancy Gillam
 Community & Health Services (TAS), Director of Environmental and Public Health, Dr Mark Jacobs
 Community & Health Services (TAS), Occupational Health & Safety Southern Region, Infection Control Co-ordinator, Mrs Cynthia Bryce
 Curtin University of Technology (WA), School of Nursing, Associate Professor and Head, Dr Robin Watts
 Dental Board of Victoria, Registrar, Dr Vincent Amerena
 Department of Employment, Vocational Education, Training and Industrial Relations (QLD), Division of Workplace Health & Safety, Workplace Health & Safety Adviser, Patricia Coward
 Department of Health & Community Care (ACT), Dr Doris Zonta, Chief Health Officer & Elaine Graham, Clinical Nurse Consultant Woden Valley Hospital
 Department of Human Services and Health, General Practice Branch, Strategic Planning Section, Acting Director, Gillian Bellas
 Department of Human Services and Health, Health Services Outcomes Branch, Assistant Secretary, Chris Sheedy
 Device Technologies Australia, Director of Sales and Marketing, Kevin Ryan
 Drake, Celia
 Gastroenterological Nurses Society of Australia, Honorary Secretary, Mrs Dianne Jones
 Gastroenterological Society of Australia, Endoscopy Committee, Dr Tony Speer
 Goodin, Ms Gai
 Health & Community Services (VIC), Committee Infection Control, Chair, Dr Noel Bennett
 Health & Community Services (VIC), Gippsland Region, Regional Environmental Health Officer, Ray Goudey
 Health Department of Western Australia, Chief Health Officer, Dr Andrew Penman
 Health Department of Western Australia, Director of Disease Control, Dr Jag Gill
 Health Consumers Council WA, Executive Director, Michele Kosky
 Infection Control Association NSW Inc, Vice President, Cathryn Murphy
 Keogh, Barbara

Komesaroff, Dr David
 La Trobe University, School of Physiotherapy, Valma Robertson
 Launceston General Hospital (TAS), Erika Cox
 Lyell McEwin Health Service (SA), Infection Control Co-ordinator, Alison Grierson
 McGeorge, Dr Bruce
 Medical Board of ACT, Registrar, Mr B Bradford
 Medical Industry Association of Australia, Chief Executive Officer, Mr W S Vallance
 Mid-North Coast Health Service (NSW), District General Manager, Dr P Scown
 Mornington Peninsula Hospital (VIC), Clinical Microbiologist, Dr Sheena Broughton
 Mornington Peninsula Hospital (VIC), Jacqueline Kennon
 Nambour General Hospital (QLD), Dr David Sowden, Infectious Disease Physician & Ms F Birrell, CNC
 Infection Control
 National Association of People Living with HIV/AIDS, Convenor, Mark Counter
 National Centre in HIV Epidemiology & Clinical Research, Deputy Director, Professor John Kaldor
 National Centre in HIV Social Research, Associate Professor Susan Kippax, Director & Dr Elizabeth Herdman,
 Research Fellow
 National HIV Reference Laboratory, Director, Elizabeth Dax
 Northern Sydney Area Health Service: Public Health Unit (NSW), Clinical Nurse Consultants Infection Control,
 Gay Rixon, Jo Winchcombe & Judy Sakker
 NSW Red Cross Blood Transfusion Service, Assistant Director, Dr Mark Dean
 NSW Police Service, Personnel, Director, Antoinette Dorio
 Princess Alexandra Hospital (QLD), Infection Control & Sexual Health, Director Infectious Diseases, Michael
 Whitby
 Professional Tattooing Association, Mr Peter Davidson
 Public Health Association of Australia, Executive Director, Margaret Conley
 QLD Nurses Union of Employees, Nursing Officer, Roy Drabble
 Qual-Med Pty Ltd, Managing Director, Lionel Wilson
 Rourke, Dr Jeremy
 Royal Adelaide Hospital, Clinical Nurse Consultant, Jacqui McLean
 Royal Australasian College of Surgeons, President, Mr John Royle
 Royal Australian College of General Practitioners, Assistant Secretary General, Dr Michael Crampton
 Royal Brisbane Hospital (QLD), Director of Microbiology, Dr J Faoagali
 Royal College of Nursing, Executive Director, Elizabeth C Percival
 Royal Darwin Hospital, Pathology Department, Dr Brian Dwyer
 Royal Perth Hospital (WA), Clinical Nurse Specialist Infection Control, Chen Anderson
 SA Health Commission, Head Communicable Diseases Unit, Dr A S Cameron
 SA Health Commission, HIV/AIDS Programs Unit, Co-ordinator Policy and Evaluation, Sally Gibson
 Schering-Plough Pty Ltd, Senior Regulatory Affairs Associate, Ms S Lam
 Sintec Australia Pty Ltd, Director, Paul Shepherd
 Sir Charles Gairdner Hospital (WA), Department of Clinical Microbiology, Infection Control, Helen
 Cadwallader, Clinical Nurse Specialist & Anne Dyson, Clinical Nurse
 South Eastern Sydney Area Health Service, Director, Dr Mark Ferson
 SOUTHPATH (NSW), Director of Microbiology, Dr E Reiss-Levy; & Judy Bowmaker, Clinical Nurse
 Consultant
 St John Ambulance Australia (ACT), Priory Secretary, C A Campbell
 St Vincent's Hospital, Department of Anaesthetics, Brian Horan
 Standards Australia, Standards Operations, General Manager, Peter Walsh
 Streeton, Dr Jonathon
 The Australian Nurses in AIDS Group Inc., President, Maggy Tomkins
 Therapeutic Goods Administration, Australian Drug Evaluation Committee, Secretary, Beverly David
 Therapeutic Goods Administration, Compliance Branch, GMP Auditing and Licensing Section, Acting Chief
 GMP Auditor, David R Buckley
 Thoracic Society of Australia and New Zealand (NSW), Education and Research Subcommittee, Chair, Christine
 Jenkins
 Tonti-Filippini, Nicholas
 University of Melbourne, Department of Pathology, Professor Colin Masters
 University of Melbourne, Microbiological Diagnostic Unit, Principal Microbiologist, Dr Margaret Peel
 University of Technology (Sydney), Department of Health Science, Associate Lecturer, Jennifer Wyndham
 Walsh, Dr D J

Warrnambool & District Base Hospital (VIC), Infection Control Nurse, Shirley Lindsay
Western Australia Centre for Pathology & Medical Research, Head Department of Microbiology and Infection
Diseases, David Smith
Westmore, Mr David
Worksafe Western Australia, Dr K C Wan

Appendix C. List of national organisations

Australasian Society for Ultrasound in Medicine (ASUM)
2/181 High Street
WILLOUGHBY NSW 2068
Telephone (02) 958 7655
Facsimile (02) 958 8002

Australasian Society of Infectious Diseases
145 Macquarie Street
SYDNEY NSW 2000
Telephone (02) 256 5458
Facsimile (02) 252 3310

Australian Acupuncture Association Ltd (AAA)
PO Box 578
INDOOROPILLY QLD 4068
Telephone (07) 378 9377
Facsimile (07) 378 9798

Australian and New Zealand College of Anaesthetists
'Ulimaroa'
630 St Kilda Road
MELBOURNE VIC 3004

Australian Council on Healthcare Standards (ACHS)
PO Box 95
WATERLOO NSW 2017
Telephone (02) 662 2311
Facsimile (02) 662 6370

Australian Association of Neurologists
Department of Neurology
Westmead Hospital
WESTMEAD NSW 2145
Telephone (02) 633 6793
Facsimile (02) 633 3272

Australian Dental Association Inc (ADA)
PO Box 520
ST LEONARDS NSW 2065
Telephone (02) 906 4412
Facsimile (02) 906 4676

Australian Drug Evaluation Committee (ADEC)
Therapeutic Goods Administration
PO Box 100
WODEN ACT 2606
Telephone (06) 239 8444
Facsimile (06) 239 8420

Australian Funeral Directors Association (AFDA)
PO Box 291
KEW EAST VIC 3102
Telephone (03) 9859 9966
Facsimile (03) 9819 7390

Australian Health Ethics Committee (AHEC)
NHMRC
GPO Box 9848
CANBERRA ACT 2601
Telephone (06) 289 6992
Facsimile (06) 289 7802

Australian Hospital Association (AHA)
PO Box 54
DEAKIN WEST ACT 2600
Telephone (06) 285 1488
Facsimile (06) 282 2395

Australian Infection Control Association (AICA)
Contact via State Branches

Australian Institution of Environmental Health (AIEH)
C/- Yarra House
PO Box 65
FAIRFIELD VIC 3078
Telephone (03) 9280 2972
Facsimile (03) 9280 2889

Australian Medical Association Ltd (AMA)
PO Box E115 Queen Victoria Terrace
PARKES ACT 2600
Telephone (06) 270 5400
Facsimile (06) 270 5499

Australian Medical Council (AMC)
PO Box 293
WODEN ACT 2606
Telephone (06) 285 1633
Facsimile (06) 285 2943

Australian National Council on AIDS (ANCA)
Department of Health and Family Services
GPO Box 9848
CANBERRA ACT 2601
Telephone (06) 289 7767
Facsimile (06) 289 8098

Australian Nursing Federation (ANF)
373-375 St Georges Road
NORTH FITZROY VIC 3068

Australian Nurses in AIDS Group Inc
PO Box 833
DARLINGHURST NSW 2010
Facsimile (02) 361 2090

Australian Nursing Homes & Extended Care Association (ANHECA)
PO Box 7
STRAWBERRY HILLS NSW 2012
Telephone (02) 212 6922
Facsimile (02) 212 3488

Australian Physiotherapy Association
PO Box 6465
MELBOURNE VIC 3004
Telephone (03) 9534 9400
Facsimile (03) 9534 9199

Australian Society of Anaesthetists
PO Box 600
EDGECLIFF NSW 2027
Telephone (02) 327 4022

Australian Society for Microbiology
Unit 23, 20 Commercial Road
MELBOURNE VIC 3004
Telephone (03) 9867 8699
Facsimile (03) 9867 8722

Dental Hygienists Association Australia (DHAA)
GPO Box 10030
Gouger Street
ADELAIDE SA 5000

Gastroenterological Nurses Society of Australia (GENSA)
PO Box 302
CLEVELAND QLD 4163
Telephone (07) 3821 1623
Facsimile (07) 3886 3430

Gastroenterological Society of Australia (GESA)
145 Macquarie Street
SYDNEY NSW 2000
Telephone (02) 256 5455
Facsimile (02) 241 4586

Medical Industry Association of Australia Inc (MIAA)
Post Office Box 497
ROSEVILLE NSW 2069
Telephone (02) 415 1151
Facsimile (02) 415 2130

National Centre in HIV Epidemiology and Clinical Research
The University of NSW
374 Victoria Street
SYDNEY NSW 2010
Telephone (02) 332 4648
Facsimile (02) 332 1837

National Centre in HIV Social Research
School of Behavioural Sciences
Macquarie University
SYDNEY NSW 2109
Telephone (02) 850 8046
Facsimile (02) 850 8112

National HIV Reference Laboratory (NRL)
Fairfield Hospital
Yarra Bend Road
FAIRFIELD VIC 3078
Telephone: (03) 280 2400
Facsimile: (03) 482 4352

Public Health Association of Australia (PHA)
GPO Box 2204
CANBERRA ACT 2601
Telephone (06) 285 2373
Facsimile (06) 282 5438

Royal Australasian College of Surgeons (RACS)
College of Surgeons' Gardens
Spring Street
MELBOURNE VIC 3000
Telephone (03) 9662 1033
Facsimile (03) 9663 4075

Royal Australasian College of Physicians (RACP)
145 Macquarie Street
SYDNEY NSW 2000
Telephone (02) 256 5444
Facsimile (02) 252 3310

Royal Australian College of General Practitioners (RACGP)

PO Box 906
ROZELLE NSW 2039
Telephone (02) 555 8177
Facsimile (02) 555 8508

Royal College of Nursing, Australia

1 Napier Close
DEAKIN ACT 2600
Telephone (06) 282 5633
Facsimile (06) 282 3565

Royal College of Pathologists of Australasia (RCPA)

Durham Hall
207 Albion Street
SURRY HILLS NSW 2010
Telephone (02) 332 4266

Royal College of Radiologists (RCR)

Level 9/51 Druitt Street
SYDNEY NSW 2000
Telephone (02) 264 3555
Facsimile (02) 264 7799

St John Ambulance Australia

PO Box 3275
MANUKA ACT 2603
Telephone (06) 295 3777

Standards Australia

PO Box 1055
STRATHFIELD NSW 2135
Telephone (02) 746 4700
Facsimile (02) 746 8450

Sterilisation Research Council of Australia

c/o Mercy Pte Hospital
159 Gray Street
EAST MELBOURNE VIC 3002

Therapeutic Goods Administration (TGA)

PO Box 100
WODEN ACT 2606
Telephone (06) 239 8444
Facsimile (06) 239 8420

Thoracic Society of Australia and New Zealand (TSANZ)

145 Macquarie Street
SYDNEY NSW 2000
Telephone (02) 256 5457
Facsimile (02) 241 4162

Worksafe Australia
92 Parramatta Road
CAMPERDOWN NSW 2050
Telephone (02) 565 9555
Facsimile (02) 565 9202

Glossary

Additional Precautions: are used for patients known or suspected to be infected or colonised with epidemiologically important or highly transmissible pathogens that can be transmitted by air borne or droplet transmission or by contact with dry skin or contaminated surfaces. Additional Precautions are designed to interrupt transmission of infection by these routes and should be used in addition to Standard Precautions when transmission of infection might not be contained by using Standard Precautions alone. Additional Precautions may be specific to the situation for which they are required, or may be combined where micro-organisms have multiple routes of transmission. Additional Precautions are used for patients with MRSA, CJD or active pulmonary tuberculosis, or where there is an established risk of transmission of infection regardless of the nature of the procedure being undertaken, or where the procedure itself carries an established risk of aerosolation, blood accident or staff/patient injury. Additional Precautions are not required for patients with blood borne viruses such as HIV, hepatitis B or hepatitis C, unless there are complicating factors present, such as pulmonary tuberculosis, or unless the procedure itself performed on these patients has a known high risk, such as generation of aerosols.

Anti-sepsis: the prevention of infection by topical application of bacteriostatic agents to tissues.

Antiseptic: a substance that is recommended by its manufacturer for dermal application; or application to the mucous membrane of a person or animal to kill micro-organisms; or cause clinical infection; and that is not represented to be suitable for internal use.

Asepsis: the prevention of microbial contamination of living tissues or sterile materials by removal, exclusion or destruction of micro-organisms.

Aseptic technique: is one in which the instruments, the drapes and the gloved hands of the surgical team are sterile, but also the entire operating room and the air are free of viable micro-organisms

Biological indicator: a preparation of standardised bacterial spores on, or in, a carrier which is packaged in such a manner that the integrity of the inoculated carrier is maintained, and which is used to monitor a sterilizing process.

Body substance: includes any human bodily secretion, excluding sweat, or substance other than blood.

Chemical indicator: dye, which can be impregnated into materials or contained within a device, and which changes colour when subjected to a sterilizing process.

Cleaning: the removal of all foreign material from objects, for example, soil/organic material, and the reduction in the number of micro-organisms from a surface. Cleaning is normally done with water, mechanical action and detergents. Cleaning must precede disinfection and sterilization.

Clinical and related waste: wastes arising from medical, nursing, dental veterinary, pharmaceutical or similar practices, and wastes generated in hospitals or other health care facilities during the investigation of patients or in research projects.⁹¹ Clinical and related waste must be disposed of in accordance with Federal guidelines and State/Territory regulations.

Contaminated waste: see **Clinical and related waste**.

Contamination: the introduction of micro-organisms into sterile material or living tissue, or the presence of an infectious agent on skin, tissue or articles, solutions and substances.

Critical site: entry or penetrations into sterile tissue, cavity or blood stream. The instruments used must be sterile.

Disinfectant: a substance that is recommended by its manufacturer for application to an inanimate object to kill a range of micro-organisms; and that is not represented by the manufacturer to be suitable for internal use.

Disinfection: the inactivation of non-sporing micro-organisms using either thermal (heat alone, or heat and water) or chemical means. See High level disinfectant.

Exposure prone procedures: are considered to be a subset of 'invasive procedures'. It is a term usually characterised by the potential for direct contact between the skin (usually finger or thumb) of the health care worker (HCW) and sharp surgical instruments, needles, or sharp tissues (spicules of bone or teeth) in body cavities or in poorly visualised or confined body sites (including the mouth).

In the broader sense, and for the purpose of these guidelines, an exposure prone procedure is considered to be any situation where there is a potentially high risk of transmission of blood borne disease from HCW to patient during medical or dental procedures.

Health care establishments: a hospital, nursing home or other facility/institution which provides health care services not covered by the term office practice - see also **Office practice**.

Health care setting: any place where health care is provided to patients on a commercial or public health basis - see **Health care establishments** and **Office practice**.

Health care workers (HCWs): persons, including students and trainees, involved in contact with patients or with blood or body substances from patients.

High level disinfectant: a disinfectant that kills all microbial pathogens, except large numbers of bacterial endospores, when used as recommended by its manufacturer. Exposure time is generally specified, and is shorter than time required for sterilization. High level disinfectants used in Australia must comply with Therapeutic Goods Order Number 54 - *Standard for composition, packaging, labelling and performance of disinfectants and sterilants*.

High level disinfection: is the minimum treatment recommended for reprocessing a semi-critical device which cannot be sterilized.

Holding time: for sterilization by steam under pressure or by dry heat, the holding time is the minimum time for which the load must be held at the selected sterilizing temperature.

Iatrogenic infection: resulting from the activity of physicians, originally applied to disorders induced in the patient by autosuggestion based on the physician's examination, manner, or discussion. The term is now applied to any adverse condition in a patient occurring as the result of treatment by a physician or surgeon.

Infectious waste: see **Clinical and related wastes**

Intermediate level disinfectant: a disinfectant that kills all microbial pathogens except bacterial endospores, when used as recommended by the manufacturer. It is bactericidal, tuberculocidal, fungicidal against asexual spores but not necessary dried chlamydo spores or sexual spores), and virucidal.

Invasive procedure: any procedure that pierces skin or mucus membrane or enters a body cavity or organ. This includes surgical entry into tissues, cavities, or organs or repair of traumatic injuries. Exposure prone procedures form a subset of invasive procedures.

Low level disinfectant: a disinfectant that rapidly kills most vegetative bacteria as well as medium sized lipid containing viruses, when used according to labelling. It cannot be relied upon to destroy, within a practical period, bacterial endospores, mycobacteria, fungi or all small non-lipid viruses.

Non-critical site: contact with intact skin. Instruments should be cleaned and disinfected if necessary.

Nosocomial infection: pertaining to or originating in a hospital.

- Office practice:** the provision of health care services in sites outside routine hospital in-patient and operating theatre settings; such sites include private consulting rooms, health clinics, including mobile health clinics, ambulatory day care centres and out-patient departments - see also **Health care establishments**.
- Patient:** includes (but is not limited to) a person who is accessing medical or health services, or who is undergoing any medical or health care procedure.
- Penetration time:** for sterilization by steam under pressure or by dry heat, is the time required for every part of a load to reach the selected sterilizing temperature after that temperature has been reached in the sterilizing chamber.
- Re-useable item:** an item designated or intended by the manufacturer as suitable for reprocessing and reuse. It is not a device that is designated or intended by the manufacturer for single use only.
- Semi-critical site:** contact with intact mucosa or non-intact skin. Instruments should be sterilized where possible, or high level disinfected.
- Sharps:** any objects capable of inflicting penetrating injury, and includes needles, scalpel blades, wires, trocars, auto lancets, stitch cutters and broken glassware.
- Skin disinfectant:** an antiseptic that is intended for application to intact, healthy skin to prevent the transmission of transient or resident skin bacteria from person to person or from a surgical operation site to underlying tissue. Skin disinfectants include anti-microbial and antiseptic soaps, hygienic hand washes, hygienic hand rubs, surgical hand rubs and surgical hand washes.
- Soil:** visible dirt or debris which may protect, harbour or assist the growth of micro-organisms. Includes organic matter, organic substances, residual soil, inorganic matter, blood and body substances.
- Standard Precautions:** are work practices required for the basic level of infection control. Standard Precautions are recommended for the treatment and care of all patients, and apply to all body fluids, secretions and excretions (excluding sweat), regardless of whether they contain visible blood (including dried body substances such as dried blood or saliva), non-intact skin and mucous membranes. Standard Precautions include good hygiene practices, particularly washing and drying hands before and after patient contact, use of protective barriers which include gloves, gowns, plastic aprons, masks eye shields or goggles, and appropriate handling and disposal of sharps and other contaminated or infectious waste and the use of aseptic techniques.
- Sterilant:** a chemical agent, other than a gas, which is used to sterilize critical medical devices. A sterilant kills all micro-organisms with the result that the sterility assurance level of a microbial survivor is less than 10^{-6} .
- Sterility assurance level:** the acceptable sterility assurance level (SAL) for a terminally sterilized product is 1 in a million or 10^{-6} . This means that of a million products being sterilized by the same method you may statistically expect 1 to be unsterile. For aseptically manufactured products, for example, aseptically filtered heat labile antibiotics, the acceptable SAL is 10^{-3} or one in a thousand.
- Sterilization:** complete destruction of all micro-organisms, including spores.
- Sterilization time:** the total time of the sterilization stage after the sterilizing chamber has reached the sterilizing temperature (penetration time plus holding time).
- Universal Precautions:** previously applied to work practices which require everyone to assume that all blood and body substances are potential sources of infection, independent of perceived risk. The terms 'Standard Precautions' and 'Additional Precautions' are used in these guidelines, replacing the term 'Universal Precautions'. See **Standard Precautions**.
- Validation:** a programmed series of checks and challenges, repeated periodically, and carried out using a documented protocol which demonstrates that the process being studied is both reliable and repeatable for the purpose for which it is being used.

Window period: the period immediately after a person is infected with an agent, during which the infection is not detectable by laboratory tests, although the person may be infectious.

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