Standard Principles for preventing hospital-acquired infections

Standard Principles provide guidance on infection control precautions that should be applied by all health care practitioners to the care of all hospital in-patients all the time. These recommendations are not detailed procedural protocols and need to be incorporated into local guidelines. The recommendations are divided into four distinct interventions:

1. hospital environmental hygiene;
2. hand hygiene;
3. the use of personal protective equipment;
4. the use and disposal of sharps.

These guidelines do not address the additional infection control requirements of specialist settings, such as the operating department.

Intervention 1

Standard Principles for Hospital Environmental Hygiene

Good hospital hygiene is an integral and important component of a strategy for preventing hospital-acquired infections

This section discusses the evidence upon which recommendations for the maintenance of hospital environmental hygiene are based. Hospital environmental hygiene encompasses a wide range of routine activities that are generally considered to be central to the prevention of hospital-acquired infection. They include:

- cleaning and decontamination, laundry and housekeeping;
- safe collection and disposal of general and clinical waste;
- kitchen and food hygiene.

Maintain a clean hospital environment

Our systematic review revealed little research evidence of an acceptable quality upon which to base guidance related to the maintenance of hospital environmental hygiene. However, there is a large body of clinical evidence, derived from case reports and outbreak investigations, which identifies links between poor environmental hygiene and the transmission of microorganisms causing hospital acquired infection.

Attention has been drawn to falling standards in the cleanliness of hospitals since the introduction of compulsory comprehensive tendering and the internal market. This has been addressed by the Infection Control Nurses Association and the Association of Domestic Managers, resulting in the adoption and publication by the Department of Health, of standards concerning hospital cleanliness. In addition, existing statutory regulations, specialist advice the Controls Assurance Standards and Clinical Governance provide a framework within which hospital environmental hygiene can be improved and monitored. More recently the NHS Plan included action to be taken to improve hospital cleaning.

1. The hospital environment must be visibly clean, free from dust and soilage, and acceptable to patients, their visitors and staff. Category 3
2. Where a piece of equipment is used for more than one patient, e.g., commode, bath hoist, it must be cleaned following each and every episode of use. Category 3
3. Statutory requirements must be met in relation to the safe disposal of clinical waste, laundry arrangements for used and infected linen, food hygiene and pest control. Category 3
4. All staff involved in hospital hygiene activities must be included in education and training related to the prevention of hospital-acquired infection.

Category 3

References

12. Microbiology Advisory Committee. Decontamination of equipment, linen or other surfaces contaminated with Hepatitis B and/or human immunodeficiency viruses. HC(91) 33 London: Department of Health 1991; 6.
Intervention 2

The following section provides the evidence for recommendations concerning hand hygiene practice. The difficulty of designing and conducting ethical, randomised controlled trials in the field of hand hygiene means that recommendations in these areas are based on expert opinion derived from systematically retrieved and appraised professional, national and international guidelines.

The areas discussed include:

- assessment of the need to decontaminate hands;
- the efficacy of hand decontamination agents and preparations;
- the rationale for choice of hand decontamination practice;
- technique for hand decontamination;
- care to protect hands from the adverse effects of hand decontamination practice.

Why is hand decontamination crucial to the prevention of hospital-acquired infection?

Evidence from two previous reviews\(^1-2\) clearly demonstrates that in outbreak situations contaminated hands are responsible for transmitting infections. Our systematic review\(^3\) indicates that effective hand decontamination can significantly reduce infection rates in gastro-intestinal infections\(^4,5\) and in high-risk areas, such as intensive care units.\(^6-8\)

Overviews of epidemiological evidence\(^9-11\) conclude that hand mediated transmission is a major contributing factor in the current infection threats to hospital in-patients. These include both methicillin-sensitive and methicillin-resistant *Staphylococcus aureus*, and multi-resistant Gram-negative aerobes and enterococci. However, there is some contention as to the benefits of hand hygiene as a primary prevention measure in routine clinical practice as distinct from high-risk areas.

The transmission of microorganisms from one patient to another via the hands, or from hands that have become contaminated from the environment, can result in adverse outcomes. *Primary exogenous infection* is a direct clinical threat where microorganisms are introduced into susceptible sites, such as surgical wounds, intravascular cannulation sites or catheter drainage systems. *Secondary endogenous infection* creates an indirect clinical threat where potential pathogens transmitted by the hands establish themselves as temporary or permanent colonisers of the patient and subsequently causes infection at susceptible sites.

Expert consensus groups agree that effective hand decontamination results in significant reductions in the carriage of potential pathogens on the hands and logically decreases the incidence of preventable HAI leading to a reduction in patient morbidity and mortality.\(^12-16\)

When must you decontaminate your hands in relation to patient care?

Decontamination refers to the process for the physical removal of blood, body fluids, and transient microorganisms from the hands, i.e., handwashing, and/or the destruction of microorganisms, i.e., hand antisepsis.\(^12\)

Our review of expert opinion suggests that, in deciding when it is necessary to decontaminate hands, four key factors need to be considered:\(^12-15\)

- the level of the anticipated contact with patients or objects;
- the extent of the contamination that may occur with that contact;
- the patient care activities being performed;
- the susceptibility of the patient.

Patients are put at potential risk of developing a hospital-acquired infection when a health care practitioner caring for them has contaminated hands. Hands must be decontaminated before every episode of care that involves direct contact with patients’ skin, their food, invasive devices or dressings. Current expert opinion supports the rationale that hands need to be decontaminated after completing an episode of patient care to minimise cross contamination of the environment.\(^12-15\)

5. **Hands must be decontaminated immediately before each and every episode of direct patient contact/care and after any activity or contact that potentially results in hands becoming contaminated.**

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Category 3
References


Is any one hand cleaning preparation better than another?

Our systematic review\(^1\) revealed 25 acceptable studies concerning the effectiveness of various preparations for the decontamination of hands.\(^2\)\(^–\)\(^{26}\) The preparations considered were: plain soap and water, antimicrobial handwashes, and alcohol handrubs. In general, the studies were complex in design, reliant upon laboratory conditions rather than “in use” conditions for their findings and based on small samples. Antimicrobial preparations are those that kill or inhibit microorganisms, e.g., alcohol, chlorhexidine. Overall there was no compelling evidence to favour the *general* use of antimicrobial handwashing agents over soap, or one antimicrobial agent over another.

When deciding which hand decontamination preparation to use, the practitioner must consider the need to remove transient and/or resident hand flora. Preparations with a residual effect are not normally necessary for everyday clinical practice but may be used for some invasive procedures and in outbreak situations. Practitioners need to be aware that research suggests that:

- Soap and water is as effective as handwashing preparations containing antimicrobial agents for decontaminating hands and removing *transient* microorganisms.\(^{27,28}\)
- Alcohol-based handrubs are not effective in removing physical dirt or soiling.\(^{27,28}\)
- Alcohol-based handrubs are more effective in destroying transient microorganisms than antimicrobial handwashing agents or soap and water, and give a greater initial reduction in hand flora.\(^8,9,21,24,26\)
- Handrubs containing alcohol alone as the active ingredient have no residual effect.\(^9,17\)
- Preparations containing antimicrobial agents are more effective in removing resident microorganisms than those without an antimicrobial agent.\(^1,2,3,11,13,14,22,23,26\)
- Preparations containing antimicrobial agents have different effects on specific microorganisms.\(^8,22,23,26\)
What is important is that health care practitioners use an appropriate preparation to decontaminate their hands. Our review of expert opinion suggests that the acceptability of agents and techniques is an essential criterion for the selection of preparations for hand hygiene. Acceptability of preparations is dependent upon the ease with which the preparation can be used in terms of time and access together with their dermatological effects.

Choice of decontamination: is it always necessary to wash hands to achieve decontamination?

Choosing the method of decontaminating hands will depend upon the assessment of what is appropriate for the episode of care, what is practically possible, available resources and, to some degree, personal preferences based on the acceptability of preparations or materials.

In general, effective handwashing with a liquid soap will remove transient microorganisms and render the hands socially clean. This level of decontamination is sufficient for general social contact and most clinical care activities. The use of an antimicrobial liquid soap preparation will reduce transient microorganisms and resident flora, and result in hand antisepsis. The effective use of alcohol-based handrubs on contaminated hands will also result in substantial reductions of transient microorganisms, although alcohol is not effective at removing dirt and organic material. However, alcohol handrubs offer a practical and acceptable alternative to handwashing when the hands are not grossly soiled and are increasingly being recommended for routine use.

6. Hands that are visibly soiled or potentially grossly contaminated with dirt or organic material must be washed with liquid soap and water.

7. Apply an alcohol-based hand rub or wash hands with liquid soap and water to decontaminate hands between caring for different patients, or between different caring activities for the same patient.

References


17. Aly R, Maibach HI. A comparison of the antimicrobial effect of 0.5% chlorhexidine (Hibistat) and 70% isopropyl alcohol on hands contaminated with Serratia marcescens. Clinical & Experimental Dermatology 1980; 5(2): 197–201.


Is hand decontamination technique important?

Investigations into the technique of hand decontamination are limited. Those identified for possible inclusion in our systematic review were generally descriptive, with small samples and did not meet our inclusion criteria. Recommendations are therefore based on existing expert opinion that the duration of hand decontamination, the exposure of all aspects of the hands and wrists to the preparation being used, the use of vigorous rubbing to create friction, thorough rinsing in the case of handwashing, and ensuring that hands are completely dry are key factors in effective hand hygiene and the maintenance of skin integrity.

Does hand decontamination damage skin?

Our systematic review found no consistent evidence to suggest that any product currently in use caused more skin irritation and damage than another. Skin damage is generally associated with the detergent base of the preparation and/or poor handwashing technique. However, the frequent use of hand preparation agents may cause damage to the skin. A recent study suggests that the normal hand flora is altered when skin has been damaged and this may result in increase carriage of pathogens responsible for hospital-acquired infection. In addition, the irritant and drying effects of hand preparations have been identified as one of the reasons why health care practitioners fail to adhere to hand hygiene guidelines. The introduction of preparations that contain emollients and moisturisers seeks to address this problem. Expert opinion agrees that hand care is an important factor in maintaining regular hand decontamination practices and assuring the health and safety of health care practitioners.

8. Remove all wrist and ideally hand jewellery at the beginning of each clinical shift before regular hand decontamination begins. Cuts and abrasions must be covered with waterproof dressings.
9. Effective handwashing technique involves three stages: preparation, washing and rinsing, and drying. Preparation requires wetting hands under tepid running water before applying liquid soap or an antimicrobial preparation. The handwash solution must come into contact with all the surfaces of the hand. The hands must be rubbed together vigorously for a minimum of 10–15 seconds, paying particular attention to the tips of the fingers, the thumbs and the areas between the fingers. Hands should be rinsed thoroughly prior to drying with good quality paper towels.

10. When decontaminating hands using an alcohol handrub, hands should be free of dirt and organic material. The handrub solution must come into contact with all surfaces of the hand. The hands must be rubbed together vigorously, paying particular attention to the tips of the fingers, the thumbs and the areas between the fingers, and until the solution has evaporated and the hands are dry.

11. Apply an emollient hand cream regularly to protect skin from the drying effects of regular hand decontamination. If a particular soap, antimicrobial handwash or alcohol product causes skin irritation, seek occupational health advice.

References


Intervention 3  
Standard Principles for the Use of Personal Protective Equipment

This section discusses the evidence and associated recommendations for the use of personal protective equipment by health care practitioners in general care settings and includes the use of aprons, gowns, gloves, eye protection, face masks. Where appropriate, in addition to the grade of the evidence underpinning the recommendations there is an indication of a Health and Safety (H&S) requirement.

Infection control dress code – protect your patients and yourself!

Expert opinion suggests that the primary uses of personal protective equipment are to protect staff and reduce opportunities for transmission of microorganisms in hospitals.\(^1,2\) A trend to eliminate the unnecessary wearing of aprons, gowns and masks in general care settings has evolved over the past twenty years due to the absence of evidence that they are effective in preventing HAI.\(^1\)

The decision to use or wear personal protective equipment must be based upon an assessment of the level of risk associated with a specific patient care activity or intervention and take account of current health and safety legislation.\(^3\)–\(^6\)

12. Select protective equipment on the basis of an assessment of the risk of transmission of microorganisms to the patient, and the risk of contamination of health care practitioners’ clothing and skin by patients’ blood, body fluids, secretions and excretions. Category 3/H&S

References


Gloves: their uses and abuses

Since the mid-1980s the use of gloves as an element of personal protective equipment has become an everyday part of clinical practice for health care practitioners.\(^1\)–\(^5\) Expert opinion agrees that there are two main indications for the use of gloves in preventing HAI.\(^1\)–\(^6\)

- to protect hands from contamination with organic matter and microorganisms;
- to reduce the risks of transmission of microorganisms to both patients and staff.

To glove or not to glove?

Gloves should not be worn unnecessarily as their prolonged and indiscriminate use may cause adverse reactions and skin sensitivity.\(^7\)–\(^15\) As with all items of personal protective equipment\(^15\) the need for gloves and the selection of appropriate materials must be subject to careful assessment of the task to be carried out and its related risks to patients and health care practitioners. Risk assessment should include consideration of:

- who is at risk (whether it is the patient or the health care practitioner) and whether sterile or non-sterile gloves are required;
- the potential for exposure to blood, body fluids, secretions and excretions;
- contact with non-intact skin or mucous membranes during general care and invasive procedures.
Gloves must be discarded after each care activity for which they were worn in order to prevent the transmission of microorganisms to other sites in that individual or to other patients. Washing gloves rather than changing them is not safe.16

**Gloves leak!**

Our systematic review17 identified six studies18–23 that provided evidence that gloves used for clinical practice leak when apparently undamaged. In terms of leakage, gloves made from natural rubber latex (NRL) performed better than vinyl gloves in laboratory test conditions. No in-use studies other than those conducted in the operating theatre were found. However, there was no direct evidence that gloves that leaked resulted in the transmission of infection. In the period following this research, revised standards relating to the manufacture of medical gloves for single use have been devised and implemented.24–26

Expert opinion supports the view that the integrity of gloves cannot be taken for granted and additionally, hands may become contaminated during the removal of gloves.1–5 Therefore, the use of gloves as a method of barrier protection reduces the risk of contamination but does not eliminate it. Hands are not necessarily clean because gloves have been worn.

13. **Gloves must be worn for invasive procedures, contact with sterile sites, and non-intact skin, mucous membranes, and all activities that have been assessed as carrying a risk of exposure to blood, body fluids, secretions and excretions; and when handling sharp or contaminated instruments.**

14. **Gloves should be worn as single use items. Put gloves on immediately before an episode of patient contact or treatment and remove them as soon as the activity is completed. Change gloves between caring for different patients, or between different care/treatment activities for the same patient.**

15. **Gloves must be disposed of as clinical waste and hands should be decontaminated following the removal of gloves.**

**References**

Making choices

Expert opinion is quite clear about when gloves must be used by health care practitioners in general clinical practice.1–6 Having decided that gloves should be used for a health care activity, the practitioner must make a choice between the use of:

- sterile or non-sterile gloves, based on contact with susceptible sites or clinical devices;
- surgical or examination gloves, based on the aspect of care or treatment to be undertaken.

NHS Trusts need to provide gloves that conform to European Community Standard (CE), and which are acceptable to health care practitioners.7–14 Gloves are available in a variety of materials, the most common being natural rubber latex (NRL) and synthetic materials. NRL remains the material of choice due to its efficacy in protecting against bloodborne viruses15–18 and properties that enable the wearer to maintain dexterity. The problem of patient or health care practitioner sensitivity to NRL proteins must be considered when deciding on glove materials.

A considerable body of evidence suggests that cornstarch powder, used to assist in the donning of gloves, is harmful and is associated with adhesions, latex allergy, and increasing risks of infection associated with invasive devices contaminated with cornstarch powder.19 As a consequence, expert opinion strongly advises that powdered gloves should not be used in health care.1,14

Synthetic materials are generally more expensive than NRL and due to certain properties may not be suitable for all purposes.1 Nitrile gloves have the same chemical range as NRL and may also lead to sensitivity problems. Vinyl gloves made to European Community standards provide the same level of protection as NRL.20 Polythene gloves are not suitable for clinical use due to their permeability and tendency to damage easily.21,22

16. Gloves conforming to European Community (CE) standards and of an acceptable quality must be available in all clinical areas. H&S

17. Alternatives to natural rubber latex (NRL) gloves must be available for use by practitioners and patients with NRL sensitivity. H&S

18. Powdered and polythene gloves should not be used in health care activities. Category 2/H&S

References


**Aprons or gowns?**

Our systematic review identified a variety of studies, including two randomised controlled trials, that focused on the use of gowns in special care units. None of the studies identified supported the routine use of gowns in general or specialist clinical settings.

However, expert opinion suggests that protective clothing should be worn by all health care practitioners when contamination with blood, body fluids, secretions, and excretions (with the exception of sweat), or when close contact with the patient, materials or equipment may lead to contamination of the clothing with microorganisms. Plastic aprons are recommended for general use. Full body gowns need only be used where there is the possibility of extensive splashing of blood, body fluids, secretions or excretions and should be fluid repellent.

19. *Disposable plastic aprons should be worn when there is a risk that clothing or uniform may become exposed to blood, body fluids, secretions and excretions, with the exception of sweat.* Category 3/H&S

20. *Full body, fluid repellent gowns should be worn where there is a risk of extensive splashing of blood, body fluids, secretions and excretions, with the exception of sweat, onto the skin of health care practitioners.* Category 3/H&S
21. **Plastic aprons should be worn as single use items for one procedure or episode of patient care and then discarded and disposed of as clinical waste.** Category 3/H&S

**References**


**When are a face mask, eye protection or other facial protection necessary?**

Our systematic review failed to reveal any robust experimental studies that suggested any clinical benefit from wearing surgical masks to protect patients during routine ward procedures such as wound dressing or invasive medical procedures.2–6

Personal respiratory protection is required in certain respiratory diseases, e.g., TB and where patients who are severely immunocompromised are at an increased risk of infection. In these instances, surgical masks are not effective protection and specialist respiratory protective equipment (RPE) should be worn.8,9

In our systematic review, one non-randomised crossover clinical trial of different protective eyewear indicated that they offered protection against physical splashing of infected substances into the eyes (although not on 100 percent of occasions). Despite heightened awareness of the background incidence of eye splashing, there was no statistically significant difference in health care practitioners’ use of eye protection on entry to the study and at its conclusion.

Expert opinion recommends that face and eye protection reduce the risk of occupational exposure of health care practitioners to splashes of blood, body fluids, secretion or excretions.4,11–13

22. **Face masks and eye protection should be worn where there is a risk of blood, body fluids, secretions and excretions splashing into the face and eyes.** Category 3/H&S

23. **Respiratory protective equipment should be used when clinically indicated.** Category 3/H&S

**References**


Intervention 4  Standard Principles for the Safe Use and Disposal of Sharps

This section discusses the evidence and associated recommendations for the safe use and disposal of sharps in general care settings and includes minimising the risks associated with sharps use and disposal and the use of needle protection devices. Where appropriate, in addition to the grade of evidence underpinning the recommendations, there is an indication of a Health and Safety (H&S) legislation requirement.

Sharps injuries – what’s the problem?

The safe handling and disposal of needles and other sharp instruments should form part of an overall strategy of clinical waste disposal to protect staff, patients and visitors from exposure to blood borne pathogens.¹ The incidence of injuries caused by sharps varies across clinical settings and is difficult to compare due to different denominators for data collection. In the United States of America (USA) it is estimated that 600,000 to 800,000 injuries occur per year.²³ United Kingdom (UK) audit data suggests that of the occupational injuries that occur in hospitals, 16 percent are attributable to sharps injuries.⁴ Furthermore, it is likely that these institutional reports provide an underestimate of actual injuries by 50 percent.³⁵⁻¹¹ In general clinical settings, sharps injuries are predominantly caused by needle devices and associated with venepuncture, administration of medication via intravascular lines and recapping of needles during the disassembly of equipment.²¹⁻¹⁸ All sharps injuries are considered to be potentially preventable.

The average risk of transmission of bloodborne pathogens following a single percutaneous exposure has been estimated to be:¹⁹

- Hepatitis B Virus (HBV) 33.3 percent (1 in 3)
- Hepatitis C Virus (HCV) 3.3 percent (1 in 30)
- Human Immunodeficiency Virus (HIV) 0.31 percent (1 in 319)

National and international guidelines, are consistent in their recommendations for the safe use and disposal of sharp instruments and needles.²⁰⁻²³ As with many infection prevention and control policies, the assessment and management of the risks associated with the use of sharps is paramount and safe systems of work and engineering controls must be in place to minimise any identified risks.²⁴ Any health care worker experiencing an occupational exposure to blood or body fluids needs to be assessed for the potential risk of infection by a specialist practitioner, e.g., physician, occupational health nurse, and tested and offered vaccination or chemoprophylaxis if appropriate.²⁵

24. Sharps must not be passed directly from hand to hand and handling should be kept to a minimum.  
25. Needles must not be bent or broken prior to use or disposal.  
26. Needles and syringes must not be disassembled by hand prior to disposal.  
27. Needles should not be recapped.  
28. Used sharps must be discarded into a sharps container (conforming to UN3291 and BS 7320 standards) at the point of use. These must not be filled above the mark indicating that they are full. Containers in public areas must not be placed on the floor and should be located in a safe position.

References


**Do needle protection devices reduce avoidable injuries?**

Expert advice encourages health care providers and their employees to pursue safer methods of working through considering the benefits of new safety devices. The incidence of sharps injuries has led to the development of needlestick-prevention devices in eleven different product groups. They are designed to minimise the risk of operator injury during venepuncture, intravenous therapy and injections, and so-called “downstream” injuries occurring following the disposal of sharps and often involving housekeeping or portering staff responsible for the collection of sharps disposal units.

Our systematic review failed to identify any convincing evidence that needlestick-prevention devices were responsible for any significant impact on injury rates. This was primarily due to the lack of well-designed, controlled intervention studies.

It would seem to be logical that where needle-free or other protective devices are used, there should be a resulting reduction in sharps injuries. However, some studies identify a range of barriers to the expected reduction in injuries, these include staff resistance to new devices, complexity of device operation or improper use, and poor training. A comprehensive report and product review conducted in the USA would seem to be logical that where needle-free or other protective devices are used, there should be a resulting reduction in sharps injuries. However, some studies identify a range of barriers to the expected reduction in injuries, these include staff resistance to new devices, complexity of device operation or improper use, and poor training. A comprehensive report and product review conducted in the USA
provides background information and guidance on the need for and use of needlestick-prevention devices in four clinical applications:2

- delivering intravenous (IV) medications;
- delivering intramuscular and subcutaneous medications;
- introducing IV catheters;
- collecting blood.

The report identifies that none of the devices evaluated are without limitations in relation to cost, applicability and effectiveness. Some of the devices available are more expensive, may not be compatible with existing equipment, and paradoxically, may be associated with an increase in bloodstream infection rates.10–12

In the USA, the Occupational Safety Health Administration (OSHA) and the National Institute for Occupational Safety and Health (NIOSH) suggest that a thorough evaluation of any device is essential before purchasing decisions are made.13,14 The evaluation should ensure that the safety feature works effectively and reliably, that the device is acceptable to health care practitioners and that it does not adversely affect patient care.

29. Consider the use of needlestick-prevention devices where there are clear indications that they will provide safe systems of working for healthcare practitioners.
   Category 3/H&S

30. Conduct a rigorous evaluation of needlestick-prevention devices to determine their effectiveness, acceptability to practitioners, impact on patient care and cost benefit prior to widespread introduction.
   Category 3

References