epic2: Updating Department of Health guidelines for preventing healthcare-associated infections

The Department of Health has recently updated the guidelines for preventing healthcare-associated infections in hospital. Although these are general guidelines, they are equally applicable to the care of infants as to any other patient in an acute care situation. This article describes the standard principles for preventing infections that need to be applied by all healthcare practitioners to the care of every infant.

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Keywords

infection; hand hygiene; gloves; hospital environment hygiene; sharps disposal; education; guidelines

Key points

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1. The hospital environment is a potential source of infection, but cleaning will not completely eradicate micro-organisms from environmental surfaces, reinforcing the importance of hand hygiene.
2. Hands should be decontaminated before every episode of direct patient contact.
3. The decision to wear gloves should be based on the level of risk associated with a care activity and gloves should not be worn unnecessarily.
4. The use of needlestick-prevention devices should be considered to reduce the incidence of sharps injuries.

Infants and young children are vulnerable to acquiring infections as a result of healthcare (HCAI), like all other patients. To minimise this risk, the Department of Health commissioned national guidelines to promote evidence-based (EB) practice in infection control (epic) which were published in 2001[1]. These guidelines are systematically developed broad statements (principles) of good practice and are incorporated into detailed local infection prevention and control protocols. This ensures that all practitioners have access to the best available research evidence on which to base clinically effective infection prevention strategies. The evidence base for these guidelines has recently been updated and new guidelines have been published in January 2007, known as **epic2** national EB guidelines for preventing HCAI in NHS Hospital in England[2]. They include recommendations which describe standard principles for preventing infections and further recommendations for preventing infections associated with medical devices, e.g., urinary catheters and central venous access devices.

Methodology

The epic2 guidelines were developed by a nurse-led team of researchers, based in the Richard Wells Research Centre, Thames Valley University, working alongside senior infection control nurses and a Director of Microbiology and Infection Prevention and Control in a large NHS Teaching Hospital Trust.

The process for the systematic review matched that used by the National Institute of Health and Clinical Excellence (NICE). Electronic databases were searched for national and international guidelines and research studies published during the period 01 January 1999 to 31 August 2005, to coincide with the date of the previous review[1]. The following databases were searched:

- Medline
- Cumulated Index of Nursing and Allied Health Literature
- Embase
- The Cochrane Library

Reviewers identified all studies where the title or abstract addressed one or more of the review questions; identified primary research or systematically conducted secondary research; indicated a theoretical/clinical/in use study. A full-text version of the studies was retrieved and independently assessed by two experienced reviewers who used inclusion criteria to identify studies for quality assessment. Included studies were appraised by an experienced critical appraiser and checked by a second experienced reviewer. Evidence tables were constructed from the quality assessments and the studies summarised in the evidence reports and evidence grades assigned. The tables were presented to the guideline development team for discussion after which a recommendation was agreed and graded. The draft guidelines were circulated to national and professional stakeholders for comment after which the guideline development team reviewed the comments and agreed changes.

Standard principles for infection prevention

These principles are divided into four distinct interventions:

1. Hospital environmental hygiene
2. Hand hygiene
3. The use of personal protective equipment
4. The safe use and disposal of sharps

They should be applied by all healthcare staff in all situations, including the care of neonates. Each set of guidelines follows an identical format, which consists of:

- a resume of the systematic review process
- the intervention heading
- a headline statement describing the key issues being addressed
- a synthesis of the related evidence and corresponding evidence grade
- an economic opinion, where appropriate
- guideline recommendation(s) with the corresponding recommendation grade(s)

A full list of references can be found at the back of the guidelines. Finally, at the end of each section there is a description of areas for further research and suggested audit criteria.

FIGURE 1 Domestic cleaning around sink.

Intervention 1: Hospital environmental hygiene

The initial review found very little evidence upon which to base guidelines. However, since then there has been an increasing focus on hospital hygiene, particularly the perceived fall in standards of cleaning. The NHS Code of Practice on the Prevention and Control of Healthcare Associated Infection came into effect in October 2006[3]. The purpose of this Code of Practice is to help NHS bodies plan and implement strategies for the prevention and control of HCAI. It sets out criteria by which managers of NHS organisations and other healthcare providers should ensure that patients are cared for in a clean environment, where the risk of HCAI is kept as low as possible. The Code will become part of the annual health check for NHS Trusts in England from 2007 and failure to comply with the Code may result in the issue of an Improvement Notice[3].

There is new evidence highlighting that the hospital environment becomes contaminated with microorganisms responsible for HCAI. However, whilst the presence of the same strain of microorganism in the environment as those infecting/colonising patients demonstrates that the environment becomes contaminated with microorganisms from patients, it does not provide confirmation that the environment is responsible for contamination of patients. Transmission of microorganisms from the environment to patients may occur through direct contact with contaminated equipment, or indirectly as a result of touching by hands. However, cleaning will not completely eliminate microorganisms from environmental surfaces and reductions in their numbers will be transient. This reinforces the importance of decontaminating hands before every patient contact.

Some evidence suggests that routine cleaning methods (**FIGURE 1**)may not be sufficient to eliminate surface contamination with methicillin resistant *Staphylococcus aureus* (MRSA)[4,5]. Disinfectants have been recommended for cleaning the hospital environment but a systematic review failed to confirm a link between disinfection and the prevention of HCAI, though contamination of detergent and inadequate disinfection strength could have been an important confounder[6]. The use of hypochlorite for cleaning has been associated with a reduction in incidence of *Clostridium difficile* infection in one study but this was in the absence of a detectable change in environmental contamination when either detergent or hypochlorite was used[7]. In laboratory tests a combination of cleaning with detergent followed by hypochlorite was required to consistently eliminate norovirus from surfaces and prevent cross contamination[8]. In a further study, dusting and cleaning using detergent was reported to have no effect on the number of MRSA organisms isolated from the hospital environment, but the organism was virtually eliminated by exposure to hydrogen peroxide vapour[4].

There is some evidence demonstrating that shared clinical equipment becomes contaminated with pathogens. One study found that more than 50% of commodes tested were contaminated with *Clostridium difficile*[7]. A systematic review identified a number of studies demonstrating that pathogens can be recovered from a range of non-invasive clinical equipment, including stethoscopes, lifting equipment, and ultrasound probes[9]. Whilst none of these studies demonstrated a link between the contamination of equipment and infection in a patient, it is essential that equipment is decontaminated after each use with detergent and water or as recommended by the manufacturer. In some outbreak situations hypochlorite and detergent should be considered (**TABLE 1**).

Intervention 2: Hand hygiene

Hand hygiene is the primary intervention for preventing and controlling healthcare associated infections. Since the publication of the original guidelines in 2001 there have been a number of initiatives aimed at increasing adherence to hand hygiene. The updated guidance draws on evidence from non-randomised controlled trials (NRCT),

quasi experimental studies and expert opinion derived from evidence-based national and international guidance.

The transmission of pathogenic micro-organisms from one infant to another via a carer's hands, or from hands that have become contaminated from the environment (either staff or parents' hands), may result in adverse outcomes for infants. Primary exogenous infection poses a direct clinical threat to infants where pathogens are introduced into susceptible sites such as the lungs during pulmonary ventilation, intravascular cannulation sites, enteral feeding systems and surgical wounds. Epidemiological evidence from outbreak situations conclude that contaminated hands are responsible for transmitting infections and that effective hand decontamination can significantly reduce infection rates in gastrointestinal infections and in high risk areas such as neonatal and adult intensive care units[1]. A recent case controlled study, conducted during an outbreak of *Klebsiella pneumoniae* in a neonatal intensive care unit, demonstrated an association between being cared for by a nurse who wore false nails and who had positive hand cultures for the outbreak strain, and infants developing infection or colonisation[10].

Descriptive studies of the dynamics of bacterial hand contamination (**FIGURE 2**) demonstrate an association between patient care activities that involve direct patient contact and hand contamination[11,12]. The association between hand decontamination and reductions in infection has been demonstrated by a range of NRCT and descriptive research[13-16]. Current national and international guidance consistently conclude that effective hand hygiene results in significant reduction in hand carriage of micro-organisms and leads to a decrease in preventable HCAI. Infants are put at risk of developing a HCAI when parents or healthcare workers caring for them have contaminated hands.

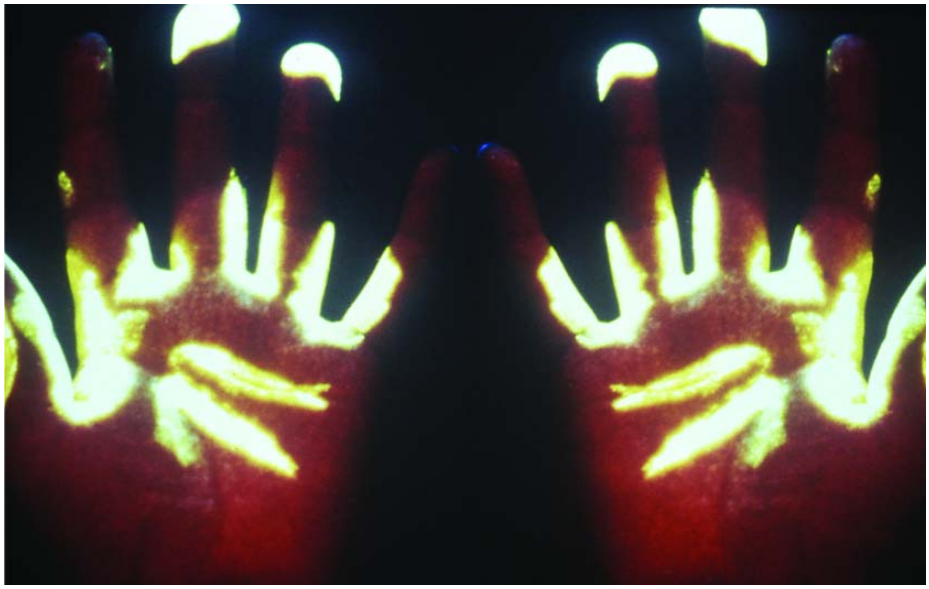

FIGURE 2 UV light highlights the areas which are most missed when handwashing.

Current national and international guidelines consider the effectiveness of various preparations for the decontamination of hands using liquid soap and water, antiseptic handwash agents and alcohol-based handrubs. There is no compelling evidence to favour the general use of antiseptic handwash agents over soap and water, or one antiseptic agent over another. Recent studies of the use of alcohol handrubs suggest that these are acceptable to staff, result in effective decontamination, cause less skin irritation and in some cases result in a reduction in rates of infection[17-22]. However, alcohol preparations are not effective against microorganisms such as *Clostridium difficile*, will not remove dirt and organic material and may not be effective in some outbreak situations[23,24].

The standard principles recommendations identify:

- when hands need to be decontaminated in relation to patient care activities
- when hands need to be washed or an alcohol-based preparation applied
- the effective technique for washing hands or using an alcohol based preparation.

Key points from these recommendations are given in **TABLE 2**.

- The hospital environment must be visibly clean, free from dust and soilage and acceptable to patients, their visitors and staff.
- Increased levels of cleaning should be considered in outbreaks of infection where the pathogen concerned survives in the environment and environmental contamination may be contributing to spread.
- The use of hypochlorite and detergent should be considered in outbreaks of infection where the pathogen concerned survives in the environment and environmental contamination may be contributing to spread.
- Shared equipment used in the clinical environment must be decontaminated appropriately after each use.

TABLE 1 Key points for hospital environmental hygiene.

- Hands must be decontaminated immediately before each and every episode of direct patient contact.
- Hands must be washed if they are visibly or potentially contaminated with dirt or organic material.
- Alcohol based hand rub should be used routinely to decontaminate hands between caring for different patients and different caring activities for the same patient.
- Hands should be washed with liquid soap and water after several consecutive applications of alcohol handrub. Local infection control guidance may advise an alternative product in some outbreak situations.
- False nails must not be worn and arm and hand jewellery should be removed before a clinical shift begins.

TABLE 2 Key points for hand hygiene.

Intervention 3: Personal protective equipment

The primary use of personal protective equipment (PPE) is to protect healthcare workers and reduce the opportunities for transmission of microorganisms. The decision to use or wear PPE should 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.

The most commonly used PPE is gloves and these should not be worn unnecessarily as their prolonged and indiscriminate use may cause adverse reactions and skin sensitivity[1,25]. Gloves must be discarded after each care activity for which they were worn in order to prevent the transmission of micro-organisms to other sites in that individual or to other patients. Washing gloves rather than changing them is not safe[1].

The previous systematic review provided evidence that gloves used for clinical practice may leak when apparently undamaged[1,25]. In terms of leakage, gloves made from natural rubber latex (NRL) performed better than vinyl gloves in laboratory test conditions. Revised standards (BSI 2000) relating to the manufacture of medical gloves for single use have been devised and implemented[26-28]. These standards require gloves to perform to the same standard regardless of material.

Expert opinion supports the view that the integrity of gloves cannot be taken for granted and furthermore, that hands may become contaminated during the removal of gloves[1,25]. An additional study provided evidence that vancomycin resistant enterococcus (VRE) remained on the hands of healthcare workers after the removal of gloves[29]. Therefore, the use of gloves as a method of barrier protection reduces the risk of contamination but does not eliminate it and hands are not necessarily clean because gloves have been worn.

New studies demonstrated the potential for uniforms to become contaminated during clinical care, although none established an association between contaminated uniforms and HCAI[30-32]. A further study demonstrated high levels of contamination of gowns, gloves and stethoscopes with VRE following examination of patients known to be infected[33].

A systematic review of eight studies reporting outcomes of 3,811 babies to assess the effects of gowning by attendants and visitors in newborn nurseries, found no evidence to suggest that overgowns are effective in reducing mortality, clinical infection or bacterial colonisation in infants admitted to newborn nurseries[34]. One quasi-experimental study investigated the use of gowns and gloves as opposed to gloves only in preventing the acquisition of VRE in a medical intensive care unit setting[35]. A further prospective observational study investigated the use of a similar intervention in a medical intensive care unit[36]. These studies suggest that the use of gloves and gowns may minimise the transmission of VRE when colonisation pressure is high. The key points relating to PPE are summarised in **TABLE 3**.

- Selection of protective equipment must be based on an assessment of the risk of transmission of microorganisms to the patient or to the carer, and the risk of contamination of the healthcare practitioners' clothing and skin by patients' blood, body fluids, secretions or excretions.
- Gloves must be worn for invasive procedures, contact with sterile sites, and non-intact skin or 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.
- Gloves must be worn as single use items. They are put on immediately before an episode of patient contact or treatment and removed as soon as the activity is completed. Gloves are changed between caring for different patients, or between different care/treatment activities for the same patient.
- Gloves must be disposed of as clinical waste and hands decontaminated, ideally by washing with liquid soap and water after the gloves have been removed.
- Disposable plastic aprons must be worn when close contact with the patient, materials or equipment is anticipated and when there is a risk that clothing may become contaminated with pathogenic microorganisms or blood, body fluids, secretions or excretions, with the exception of perspiration.
- Plastic aprons/gowns should be worn as single-use items, for one procedure or episode of patient care, and then discarded and disposed of as clinical waste. Non-disposable protective clothing should be sent for laundering.

TABLE 3 Key points for personal protective equipment.

- Sharps must not be passed directly from hand to hand and handling should be kept to a minimum.
- Needles must not be recapped, bent, broken or disassembled after use.
- Used sharps must be discarded into a sharps container (conforming to UN3291 and BS 7320 standards) at the point of use by the user. These must not be filled above the mark that indicates the bin is full.
- All sharps bins should be positioned out of the reach of children at a height that enables safe disposal by all members of staff. They should be secured to avoid spillage.
- Consider the use of needlestick-prevention devices where there are clear indications that they will provide safe systems of working for healthcare practitioners.

TABLE 4 Key points for the safe use and disposal of sharps.

Intervention 4: Safe use and disposal of sharps

In acute clinical settings sharps injuries are predominantly caused by needle devices and associated with venepuncture, administration of medications via intravascular lines and recapping needles during the disassembly and/or disposal of equipment.

The safe handling and disposal of needles and other sharp instruments forms part of an overall strategy of clinical waste disposal to protect staff, patients and visitors from exposure to bloodborne pathogens[37]. In 2003 the National Audit Office found that needlestick injuries ranked alongside other occupational injuries[38]. In its most recent report of occupational exposures of healthcare workers to bloodborne viruses the Health Protection Agency comment that preventable exposures continue to occur in healthcare settings and report a prevalence of 76% percutaneous injuries (1,664/2,140) in the period from 1996-2004[39]. The average risk of transmission of bloodborne viruses[40,41] following a single percutaneous injury has been estimated to be:

- hepatitis B virus (HBV) – 33.3% (1 in 3)
- hepatitis C virus (HCV) – 1.8 -1.9% (1 in 50)
- human immunodeficiency virus (HIV) – 0.3% (1 in 300)

The revised guidelines reiterate that 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. All healthcare workers must be aware of their

responsibility in avoiding needle stick injuries.

The incidence of sharps injuries has led to the development of needlestick-prevention devices in many different product groups[41] (**FIGURE 3**). They are designed to minimise the risk of operator injury during needle use as well as so-called 'down-stream' injuries that occur after disposal, often involving the housekeeping or portering staff responsible for the collection of sharps disposal units. The evidence considered in the revised guide-lines included recent studies that showed significant reductions in injuries associated with the use of safety devices in cannu-lation[42,42], phlebotomy[44-46] and injections[47].

It would seem 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, including staff resistance to using new devices, complexity of device operation or improper use, and poor training[1]. In the UK, the National Health Service Purchasing and Supply Agency identifies that meaningful evaluations are paramount in assessing user acceptability and clinical applicability of any needle safety devices[48]. The evaluation should ensure that the safety feature works effectively and reliably, that the device is acceptable to healthcare practitioners and that it does not adversely affect patient care.

Standard principles recommend the consideration of needlestick-prevention devices where there are clear indications that they will provide safe systems of working for healthcare practitioners. **TABLE 4** summarises the recommendations.

The implications for staff development and practice

If these new guidelines are to successfully reduce the incidence of HCAI, they need to be read and incorporated into practice by all members of staff. Many of the recommendations will reflect current practice and they need to be adapted and integrated into local protocols in order to be relevant to local circumstances. It is also important for neonatal intensive care units and special care baby units to have in place an education programme for parents regarding prevention of transmission of infection.

The suggested audit criteria at the end of each section can be used to test compliance

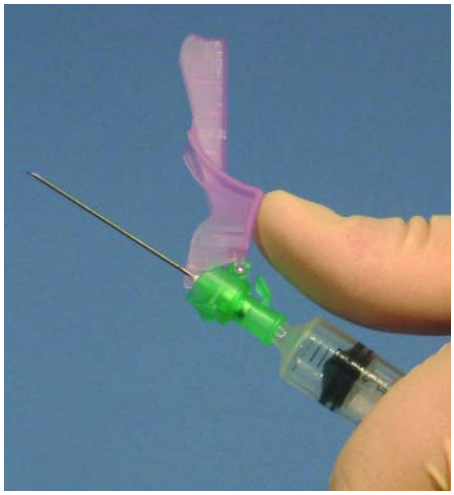

FIGURE 3 The BD Eclipse™ safety injection needle features a safety cover which can be locked over the needle protecting the operator from accidental injury. *Photo courtesy of Becton Dickinson.*

with the guidelines and where deficits are found, they can be the focus of practice improvement and continuing education programmes for staff. Ongoing education and training in preventing HCAI for all staff is a requirement of the Code of Practice[3]. To assist in this process, there is a national blended e-learning programme on preventing HCAI for both clinical and non-clinical staff which is available free of charge at: www.infectioncontrol.nhs.uk. The full version of the epic2 guidelines is available at: www.dh.gov.uk and www.richardwellsresearch.com

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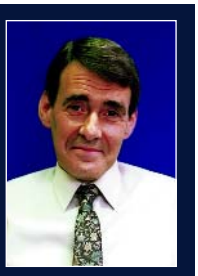
Barry Dawkins



It is with great sadness that I have to announce the death of Barry Dawkins in January this year.

Barry was the Advertisement Manager on *Infant Journal* and also worked in the same capacity on the Journal of Neonatal Nursing for many years. Many of you will have spoken to him when booking a display ad, a job vacancy, a conference ad or sorting out a subscription query but few people realised that he was seriously ill with emphysema. Barry played an integral part in the success of *Infant Journal* and he will be sorely missed.

Mark Ranger will be deputising for Barry for the foreseeable future. Mark can be contacted on 01279 714509 or mark@infantgrapevine.co.uk

Christine Bishop

BLISS BABY CHARTER NEONATAL AWARDS 2006

Here is a picture of the full James Cook University Hospital team from Middlesbrough, who won the BLISS Neonatal Unit Team Award. The picture includes Deborah Firth (left) who was inadvertently left out of the picture which accompanied the report of the awards in the January issue of *Infant Journal*. Sorry Deborah!