Healthcare-Associated Infections: What all doctors must know and do

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The Importance of Healthcare-Associated Infections 1(a–d)

Healthcare associated infections (HCAIs) are infections patients acquire during the course of receiving healthcare treatment for other conditions. They cause significant morbidity and mortality. HCAIs are an important public health problem in contemporary medicine, and are encountered in many healthcare settings and not just in the acute hospital.

In Ireland, approximately one out of every twenty hospitalised patients will acquire a HCAI. Factors which contribute to the development of HCAIs are outlined in Table 1.

<table>
<thead>
<tr>
<th>Table 1: Contributing factors to the development of HCAIs</th>
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<tr>
<td>Increased vulnerability of patients</td>
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<tr>
<td>Greater use of indwelling medical devices</td>
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<td>Caring for patients with a wide variety of illnesses in the same facility, eg emergency and elective surgery</td>
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<tr>
<td>High bed occupancy and inadequate isolation facilities</td>
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<td>Frequent intra/inter hospital transfers</td>
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<tr>
<td>Poor environmental conditions and hygiene</td>
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<tr>
<td>Poor compliance with professional best practice, eg hand hygiene</td>
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<td>Excessive and inappropriate use of antibiotics</td>
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The most common types of HCAIs are summarised in Table 2. 2-3

<table>
<thead>
<tr>
<th>Table 2: Common Types of HCAIs</th>
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<tr>
<td>Urinary tract infections including those associated with catheters</td>
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<tr>
<td>Surgical site infections (SSI)</td>
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<tr>
<td>Pneumonia</td>
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<tr>
<td>Blood stream infection</td>
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The consequences of HCAIs are summarised in Table 3.

<table>
<thead>
<tr>
<th>Table 3: Consequences of HCAIs</th>
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<tr>
<td>A longer hospital stay (delay in discharge)</td>
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<tr>
<td>Additional investigations and treatments</td>
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<td>Increased costs</td>
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<tr>
<td>Patient inconvenience and hardship</td>
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<tr>
<td>Poor public perception of the organisation (and healthcare staff)</td>
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<tr>
<td>Death</td>
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Prevention of HCAIs

Attention to the prevention of HCAIs in healthcare settings is essential, using best practice guidelines and evidence based solutions. Wherever patient care is provided, adherence to infection prevention guidelines is obligatory to ensure safe patient care. By incorporating and practising a few simple rules of infection prevention and control, every doctor can contribute to reducing HCAI. Patients now also have a greater knowledge and awareness of HCAI and expect practices that minimise all infections.

Many infection prevention and control interventions have been shown to significantly reduce rates of HCAIs but are often overlooked in clinical practice, e.g. hand hygiene. By reducing HCAIs, this lessens the need for antibiotic use which in turn reduces the risk of antibiotic resistance and contributes to improving the efficacy of antibiotics given to patients who do acquire infections.

All healthcare staff, including medical doctors, must be educated about core infection prevention and control principles such as standard precautions as up to 50% of HCAIs are preventable. A patient’s susceptibility to infection can be modified to a limited extent but their risk can be ameliorated by the following:

- Performing all procedures according to best professional practice where a procedure is warranted. Breaching the skin by cannula insertion or an incision predisposes to infection.
- Removal of peripheral cannulae and central lines as soon as no longer needed.
- Avoiding unnecessary antibiotics to minimise colonisation and infection with resistant organisms or infections caused by *Clostridium difficile* and fungi.

The main approaches to reducing HCAIs are outlined in Table 4.

<table>
<thead>
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<th>Table 4: Main Approaches to Reducing HCAIs</th>
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<tr>
<td>Maintain meticulous hand hygiene</td>
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<tr>
<td>Know when, why and how to isolate patients</td>
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<tr>
<td>Prevent infections related to catheters and devices</td>
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<tr>
<td>Careful use of antibiotics</td>
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<tr>
<td>Ensuring effective decontamination of equipment used between patients</td>
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Hand Hygiene

The hands of healthcare staff are a major source of cross transmission of microorganisms in hospitals. Poor hand hygiene is also a significant factor in spreading resistant microorganisms. For this reason, hand decontamination/hygiene is considered to be the most important measure to reduce HCAIs. However, compliance with hand hygiene guidelines is typically no more than 50%, but is often lower amongst doctors. Hand hygiene techniques include:

1. Washing with soap and water.
2. Decontamination with a detergent containing an antiseptic, such as chlorhexidine gluconate.
3. Using an antiseptic hand rub, such as alcohol gel or alcohol solution containing an antiseptic.
4. Surgical hand antisepsis or ‘surgical scrub’.

The first three reduce the superficial transient microbial skin flora, which tends to include more virulent organisms. Surgical hand antisepsis is the most thorough approach to hand hygiene, eliminating most transient flora and reducing the resident skin flora.

Washing with soap and water removes dirt and reduces the transient flora that is loosely adherent. This includes bacterial spores such as *C. difficile*. Frequent hand washing is unpopular because it is time consuming and may damage the skin when performed repeatedly. Washing hands with a detergent containing an antiseptic agent reduces bacterial colonisation more effectively than plain soap and water and may have a residual disinfectant action. However, it has the same drawbacks as washing with soap and water.

Alcohol-based solutions reduce bacterial counts more than hand washing and their use is less time consuming with faster action. Skin irritation is rare and is further reduced if staff use emollients and moisturising creams for the skin. However, alcohol based hand rubs have low activity against bacterial spores and non-enveloped viruses such as norovirus, rotavirus, rhinovirus and hepatitis A virus. Importantly, hands must be washed if visibly dirty before the use of alcohol hand gels or hand rubs.
How to Perform Hand Hygiene Correctly

The recently developed World Health Organisation (WHO) Five Moments for Hand Hygiene define the key moments for hand hygiene in daily clinical practice (see Appendix 1). This is an evidence based approach concerning the spread of HCAIs and is easy to learn and use. Many healthcare professionals will be familiar already with the WHO posters and the incorporation of the key messages into daily clinical practice.

Long sleeves, wristwatches, hand jewellery and long or artificial fingernails interfere with proper hand hygiene by making certain areas of the hands and wrist less accessible for cleaning and decontamination. The skin under rings and watches harbours large numbers of organisms. It is advised to roll up sleeves, not to wear a watch or jewellery and to keep fingernails short. Cuts and grazes on the skin should be covered with an impermeable dressing.

With all types of hand hygiene it is crucial that all areas of the skin are covered with the agent, including the fingertips and the areas between the fingers. With alcohol gel a generous amount needs to be applied, so that the hands are covered for a sufficient length of time, and the hands should be rubbed firmly together until they are dry, as friction enhances the antibacterial action.

Gloves protect the wearer more than the patient. Non-sterile gloves can reduce contamination of hands, and should be worn when in contact with blood, secretions, mucous membranes, non-intact skin or other infectious material. Gloves do not, however, replace hand hygiene, and the wearing of gloves does not mean that hand hygiene is less important. Pathogens are transferred from hands to gloves when they are put on, and more importantly, bacteria from patients are transferred to hands during glove removal. Gloves also become contaminated during use. Touching objects, such as door handles, with contaminated gloves will spread pathogens. As a result gloves must be changed before each new contact with a patient. By practicing regular hand hygiene procedures, patients will also be aware of a commitment to safe patient care.
Preventing Infections Related to Intravascular Catheters

Intravascular catheters, including peripheral cannulae, create an opportunity for direct access of pathogens into the bloodstream.

Both the external and internal surfaces of catheters may become colonised with microorganisms. This leads to colonisation of the catheter tip and subsequent infection of the bloodstream. Line infections are frequent, particularly in intensive care units, but many of these infections are preventable.

Central venous catheters (CVCs) should only be used when necessary and should be removed as soon as practical, since longer catheterisation periods significantly increase the risk of bloodstream infections.

Measures that have been shown to reduce the rate of catheter-associated bloodstream infections include:

- All lines must be removed as soon as possible. Peripheral cannulae should not be left in-situ for longer than three days.
- Central lines must be inserted under full barrier precautions using sterile gloves and drapes. The insertion site must be disinfected with 2% alcoholic chlorhexidine solution.
- A femoral site should be avoided if possible because this site has the highest rate of infection - the subclavian site is the preferred site to minimise infection.
- Meticulous hand hygiene and an aseptic technique are mandatory whenever a CVC is manipulated.

Further information can be found on the Health Protection Surveillance Centre’s website at www.hpsc.ie.
Urinary Tract Infection

In almost all healthcare facilities, 40% of HCAIs are urinary tract infections (UTIs). About 80 - 95% of hospital acquired UTI’s originate from urinary catheters. Often the reason for catheter insertion is not clear and it is not always medically indicated. An aseptic technique should be used for catheter insertion. The most effective way to prevent catheter associated urinary tract infection (CAUTI) is to avoid catheterisation.

Urinary catheters should only be used if necessary and should be removed as soon as possible. Catheters are the most common source of these infections; the daily risk for patients acquiring a urinary tract infection is as high as 7% when urinary catheters remain *in situ*. Thus the duration of catheter insertion should always be considered and the catheter removed as soon as possible.
Pneumonia including Ventilator-Associated Pneumonia (VAP)

Many patients with VAP are managed in intensive care units and medical teams frequently have ongoing input into care and management. All staff should be aware of the ways there are to prevent and reduce the risk of VAP.

These include:

- Avoiding tracheal intubation whenever possible and using non-invasive positive pressure ventilation.
- Placing the patient at 30-45° above the horizontal as this reduces the risk of aspiration.
- Using enteral feeding rather than parenteral feeding whenever possible.
- Ensuring good airway and oral care.
Surgical Site Infections

Up to 30% of all surgical patients develop a significant infection at the wound or surgical site. They are more likely to develop with longer operations, a contaminated or dirty procedure or when associated with inadequate scrubbing procedures. Skin preparation before an operation, the correct use of prophylactic antibiotics and the post-operative care of wounds are also factors that need to be considered and attended to in detail.

Laparoscopic surgery should be carried out instead of open surgery whenever possible, as studies and meta-analyses have shown much lower infection rates.

Further information can be found on the Health Protection Surveillance Centre’s website at www.hpsc.ie.
Antibiotics

Antibiotic use promotes the emergence of resistant strains that may render the antibiotics ineffective and obsolete.

Being colonised by a multiresistant organism is not a problem in itself, but if an infection with such an organism occurs, treatment is both difficult and expensive. Also, resistant organisms may spread to more vulnerable patients who do develop infection.

Treatment failures and mortality are also more likely to occur with antibiotic resistant pathogens as there are fewer effective antibiotics available to treat resistant organisms. Key points in the optimal use of antibiotics are outlined in Table 5.

<table>
<thead>
<tr>
<th>Table 5: Key Principles in the Optimum Use of Antibiotics</th>
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<tr>
<td>Does the patient need an antibiotic? Review daily</td>
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<tr>
<td>Correct drug choice; use local advice from clinical microbiologists, infectious disease physicians and antimicrobial pharmacists</td>
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<tr>
<td>Route of administration; change to oral as soon as possible</td>
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<tr>
<td>Dose for the shortest possible duration</td>
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Decontamination of Equipment

While this issue may not be immediately relevant to medical doctors on a day-to-day basis, they should be aware of the risks of cross contamination when equipment is not adequately decontaminated between patients. This will be relevant in most health care settings e.g. blood pressure cuffs in primary care, tourniquets, baths, surgical equipment, endoscopes and hospital beds.

It is also important for medical staff to be aware of the environment and the state of hospital hygiene.
Education of Doctors on HCAIs

Improving the infection and prevention control practices of healthcare workers through education is widely recognised to be challenging.

Education initiatives can be very effective, but their impact is often only of short duration. What is clear is that educational resources have to be coupled with other measures to change staff practice and behaviour and need to be continuous to effect a culture change. Hospitals and other organisations must support these initiatives with adequate resources to facilitate changes in practice and improved outcomes.

Studies to date on the effectiveness of infection prevention and control education have focused on nurses and there is less published research available on similar education for medical staff. There is general agreement that education in infection prevention and control should become integral to the training of all healthcare staff. The opportunities for improvement in medical and surgical training programmes have been highlighted. In addition to lectures and seminars there are opportunities to utilise e learning and other web based educational methods. The involvement of senior staff as role models and leaders of change is essential to the success of educational initiatives and improvements in practice.
Other Issues

Doctors must always be aware of the importance of HCAIs and be informed of the relevant HCAI profile in their organisation.

Information on surveillance data should be regularly presented and available to doctors. Hospital systems must be able to facilitate HCAI surveillance and data collection with the dissemination of information throughout the organisation to improve practice. This should also enable opportunities for review of practice and improvements in performance, e.g. hospital accreditation programmes.

In the area of HCAI prevention, senior doctors are in a unique position to act as role models in clinical practice, and to provide leadership and direction for improving practice and implementing organisational change. Each doctor has a responsibility and professional obligation to keep informed about HCAI and to incorporate infection prevention techniques into their daily practice. This should be facilitated by regular workplace education and feedback. These approaches will contribute significantly to reducing the burden of HCAI and raising patient and public confidence.
### Your 5 moments for HAND HYGIENE

1. **Before Patient Contact**
   - **When**: Clean your hands before touching a patient when approaching them or her.
   - **Why**: To protect the patient against harmful germs carried on your hands.

2. **Before an Aseptic Task**
   - **When**: Clean your hands immediately before any aseptic task.
   - **Why**: To prevent the patient against harmful germs, including the patient’s own germs, entering his or her body.

3. **After Body Fluid Exposure Risk**
   - **When**: Clean your hands immediately after an exposure to body fluids and after glove removal.
   - **Why**: To protect the patient and the healthcare environment from harmful patient germs.

4. **After Patient Contact**
   - **When**: Clean your hands after touching a patient and his or her immediate surroundings when leaving.
   - **Why**: To protect yourself and the healthcare environment from harmful patient germs.

5. **After Contact with Patient Surroundings**
   - **When**: Clean your hands after touching any object or furniture in the patient’s immediate surroundings when leaving.
   - **Why**: To protect yourself and the healthcare environment from harmful patient germs.

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**World Health Organization**

WHO acknowledges the Héloïse Universities de Genève (HUG), in particular the members of the Infection Control Programme, for their active participation in developing this material.
References

1. RCPI Policy Group on Healthcare-Associated Infection:
   a) Guidance on HCAIs for Healthcare Workers in Dealing with Patients and Members of the Public. 16 June 2010
   b) Healthcare Associated Infections and Cancer Patients. 1 June 2010
   c) Healthcare Associated Infections and Nursing Homes or Extended Care Settings. 16 February 2010
   d) Antibiotic Use and the Implications for Healthcare-Associated Infection. 2 February 2009


5. WHO Guidelines on Hand Hygiene in Health Care
   www.who.int/gpsc/tools/Five_moments/en/index.html


RCPI Policy Group on Healthcare-Associated Infection (HCAI)

As part of The Royal College of Physicians of Ireland’s (RCPI) aim to play a proactive role in the development of healthcare policy, it has convened a number of issue-focused policy groups that allows medical experts to meet and discuss healthcare matters of concern to health professionals, healthcare providers and the general public. These policy groups produce evidence-based position papers that outline the issue and propose specific steps to address the issue.

The RCPI Policy Group on Healthcare-Associated Infection was established in 2008. It publishes individual position papers on contributory factors and other topics related to HCAI.

Members:
Prof Hilary Humphreys (Chair) - Professor of Clinical Microbiology, RCSI and Consultant Microbiologist, Beaumont Hospital, Dublin.

Dr Paddy Mallon - Infectious Disease Physician, Mater Misericordiae Hospital, College Lecturer at University College Dublin.

Dr Brian O’Connell - Consultant Microbiologist, St James’s Hospital, Dublin and Medical Director of the National MRSA Reference Laboratory.

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