**The use of protective isolation**

The term ‘protective isolation’ describes a range of practices used to protect highly susceptible hospital patients from infection. Protective isolation may include:

- Physical separation from the main hospital or ward population, typically in a standard single room;
- Barrier measures to prevent the exogenous acquisition of micro-organisms, for example hand hygiene;
- Restrictions placed on movement, visitors and diet;
- Antimicrobial prophylaxis and selective decontamination of the digestive system;
- Supportive care to maintain the integrity of skin and mucous membranes, including skin, oral and dental care.

Pizzo (1981) describes an extremely elaborate system known as the total protected environment (TPE). This is where air is supplied by a laminar flow system, which maintains more than 100 air changes per hour via a high-efficiency particulate air (HEPA) filter, thus creating an area that is close to sterile. In addition, surfaces within the room are regularly disinfected, patients themselves are subjected to a rigorous decontamination programme (gastrointestinal tract, skin and orifices), equipment is sterilised or disinfected and the patient is allowed only sterile gowns, masks, gloves and overshoes.

The TPE is cumbersome and extremely expensive. Some of the practice elements (for example, surface disinfection, masks and overshoes) are of little benefit in preventing infection. Most protective isolation is currently practised in standard single rooms that may or may not have en-suite facilities. In some specialist areas, such as haematology or bone marrow transplant units, the rooms may have HEPA filtration with a controlled ventilation system providing airflow at positive pressure to adjacent rooms and 12–20 air changes per hour or in some cases a laminar flow air supply.

**Indications for isolation**

The decision to institute protective isolation will be made as part of a patient’s care plan, taking into account the reason for, and likely duration of, the patient’s immunosuppression. The most common reason for placing a patient in protective isolation is if his or her blood neutrophil count falls, or is expected to fall, below $0.5 \times 10^9/\text{L}$.

Although immunosuppression may occur for many reasons, including organ transplants, extensive burns, some genetic disorders and infection with HIV, it is commonly encountered in cancer services. This is due to high-dose chemotherapy and occurs particularly in patients with haematological malignancies who are given bone marrow or haematopoietic stem cell transplants. In these situations it is common for the period of neutropaenia to be prolonged, lasting more than seven days.

**Examining the evidence**

In the USA, guidance on infection prevention and control comes from the Centers for Disease Control (CDC). The category of protective isolation was eliminated in the 1983 revision of the CDC’s *Guidance for Isolation Procedures in Hospitals*. This was based on evidence that simple protective isolation offered no advantage over routine care for most immunocompromised patients (Patterson, 1996).

A number of studies support this point. Nauseef and Maki (1981) found no advantage in simple protective isolation – that is, without HEPA filtration or other additional measures – for the prevention of infection or in the outcomes for leukaemia patients with granulocytopenia. This finding has been repeated in heart transplant patients (Guttendorf et al, 1988), autologous bone marrow transplant patients (Dekker et al, 1994) and allogeneic bone marrow transplant patients (Russell et al, 2000). Passweg et al (1998) found that protective isolation reduced the risk of infection after allogeneic bone marrow transplants only when HEPA filtration and/or laminar flow air were used.

Micro-organisms causing infections in the immunocompromised patient may be acquired from the hands of hospital staff, equipment or food, or they may already be present as part of the individual’s normal flora. It must be remembered that a hospitalised patient’s endogenous flora may already have altered (due to the acquisition of new organisms) before protective isolation is instituted. As a result, placing a patient in protective isolation may not prevent the subsequent development of infection.

However, some studies have identified a reduced risk of infection and improved outcomes associated with the routine use of barrier precautions, such as wearing gloves and gowns in high-risk populations. Klein (1989) studied children in intensive care and identified advantages: a longer period of time to colonisation with hospital-acquired organisms, and fewer infectious complications with routine additional barrier measures.

It has been suggested, and this is the basis of the CDC guidance, that the prevention of infection in immunocompromised patients relies most heavily on the rigorous implementation of existing infection control precautions (Patterson, 1996).
Patient placement
Although no evidence exists to support single room isolation for most immunocompromised patients, it may be that a single room helps to reinforce the need for rigorous attention to infection-control practice. Immunocompromised individuals should never be placed in the same room or adjacent to people with a known infection. The use of single rooms with HEPA filtration may reduce the risk of hospital-acquired infection by airborne fungi, in particular the Aspergillus genus. This is especially true where refurbishment, building or demolition are in progress in the hospital or nearby.

Despite these recommendations, Russell et al (2000) report on 10 years experience of allowing immunocompromised patients the freedom to leave hospital at any time without having a detrimental effect on infection rates or outcomes. It can be argued that single rooms should be prioritised for patients requiring source isolation because of communicable disease or epidemiologically important organisms, as this would reduce the risk of exposure to these organisms for immunocompromised patients.

Staff and visitors with known or suspected infections or communicable diseases should be excluded from contact with immunocompromised persons. Any possible exposure of an immunocompromised patient to a communicable disease should be reported to the infection-control team as well as to the patient’s medical consultant.

Environment and equipment
Thorough environmental cleaning, particularly the removal of dust from horizontal surfaces, is important and may contribute to the prevention of infection. However, there is no evidence to support the routine use of chemical disinfectants. Medical devices and other equipment should be decontaminated according to existing guidance. Information is available from the Medical Devices Agency (www.medical-devices.gov.uk).

Items labelled as ‘single-use’ must never be re-used or re-processed. When caring for immunocompromised children, their toys should be decontaminated. Although flowers and plants have not been directly linked to infection in immunocompromised patients, they are normally not permitted in protective isolation rooms, as they may be a reservoir for Gram negative bacteria or fungal spores.

Hand hygiene
Hand hygiene is fundamental to the prevention of infection in all situations. All persons should cleanse their hands before any contact with an immunocompromised individual or their immediate environment as well as before any handling of invasive devices or contact with wounds or other breaks in the skin.

Health care workers should pay special attention to their hand-hygiene technique to ensure that no area of the hands is missed out. The use of antiseptic handwash solutions has been recommended.

However, a combination of ordinary liquid soap supplemented with an alcohol-based hand rub will be as effective and is likely to be more acceptable to staff, thus potentially increasing compliance with hand-hygiene requirements.

Protective clothing
As described above, the routine use of non-sterile gloves and impervious aprons or gowns may have some value in preventing the acquisition of micro-organisms. However, staff need to balance this against the potential for the creation of barriers between themselves and the patient. Protective clothing must, as a minimum, be used to prevent contact with bodily fluids or other sources of contamination and when in contact with broken skin or mucous membranes. Any protective clothing should be removed promptly when no longer required and disposed of as clinical waste.

Hands should always be washed after removing protective clothing. Sterile gloves are not required except for certain aseptic or invasive procedures or contact with sterile sites. Facemasks are of no value in preventing infection in immunocompromised patients, although they do protect health care workers against the splashing of the patient’s bodily fluids.

Food and drink
Hospitals are legally obliged to demonstrate compliance with all relevant food hygiene and safety legislation. Additionally, hospitals are subject to inspection by local authority environmental health officers. As a result, hospital food is normally very safe. However, the immunocompromised patient is at increased risk of food-borne illness and the acquisition of harmful micro-organisms from some food and drink. Therefore immunocompromised individuals are advised to avoid certain high-risk foods, for example soft cheeses and foods made with raw egg, such as mayonnaise.

The Bouchier report on cryptosporidium (a waterborne parasite which can cause gastrointestinal disease) in water supplies, published by the Department of Health in 1998, recommended that all drinking water for immunocompromised patients (including bottled water) should be chemically sterilised or boiled.

Conclusion
It should be noted that patients in protective isolation may find the experience easier than those in source isolation as they consider it to be a valuable part of their therapeutic regimen. However, nurses need to be aware of each patient’s individual response to isolation and should plan and adapt their care accordingly.

The value of some, or all, of the additional practices that constitute much of the ritual of protective isolation as currently practised in health care environments, remains largely unproven.

What is clear is that, as in all health care, the primary responsibility of staff is to maintain the highest standards of established infection-control practice and so protect those who are most vulnerable from avoidable health care associated infections.

KEYWORDS
Infection control
Protective isolation
Immunocompromised patients

REFERENCES