New Zealand, and this subject has been recently discussed in an editorial,⁵ where it was noted that, for reasons that are far from clearly expressed, the recent government committee shied away from any no-fault scheme for compensation for medical accidents. I think that failing to do a malaria smear for someone with symptoms who has returned from a malarious area should automatically be considered negligent and result in the offer of compensation if death occurs.

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Hospital Topics

Isolating patients in hospital to control infection*

Part V—An isolation system

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There are many differences in the degree and methods of isolation ideally suited to a wide variety of communicable diseases. At the same time, it is impracticable to have an infinite variety of isolation procedures; some form of isolation category or grading is therefore useful. For each patient, the relative risks to the patient and to others should be assessed and the appropriate type of isolation determined. The four types of isolation suggested by Sherris (unpublished) have been used in the isolation system described below, which is based on a system devised for a district general hospital.^{1 2} High-security isolation is most safely provided in a separate unit.

Standard isolation

Conditions needing standard isolation—Most bacterial and viral infections need standard isolation; these include: wounds, burns, bedsores, dermatitis infected with *Streptococcus pyogenes* or with extensive sepsis; other infections by *Str pyogenes* including sore throat; infection by multiresistant *Staphylococcus aureus* (but strict isolation for *Staph aureus* enteritis and pneumonia); cutaneous anthrax; bacterial or viral meningitis; open tuberculosis (except urinary); and common infectious diseases.

Requirements—A single room, preferably with gowning lobby and wash basin, is needed. The room should have:

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ventilation to the exterior or filtered recirculation but not to adjacent patient areas; its own toilet or access to bedpan steriliser without conveyance through patient areas; gowns and gloves available for staff and visitors; and facilities for disposing or disinfecting articles used in the room, preferably with access that is not through ward areas.

Operational instructions—The patient should be confined to his room with the doors kept closed. Gowns or plastic aprons should be worn by all persons in contact with the patient; gloves should be worn whenever contact with infected tissues or articles is possible; hands should be washed on leaving the room; and articles and bedpans used in room should be disinfected, and discarded or wrapped and sent to the central sterile supplies department (CSSD) for sterilisation.

Stool-urine-needle isolation

Infections requiring stool-urine-needle isolation are those known to be transmissible primarily by exposure to stool or urinary organisms or by contaminated needles, syringes, and blood. These include gastrointestinal infections in children and adults, including diarrhoeas of unknown cause (but neonates and people with staphylococcal enteritis need strict isolation); urinary-tract tuberculosis; viral hepatitis (all jaundice unless proved obstructive or haemolytic); and acute poliomyelitis.

Requirements. These are the same as for standard isolation.

Operational instructions—The patient must be confined to his room, with the doors kept closed. Everyone in contact with the patient or dealing with his excreta must wear gowns or plastic aprons and wash their hands on leaving the room; they should wear gloves for all procedures that involve touching the patient or objects possibly contaminated by excreta or blood. Articles used in the room should be discarded into closed receptacles and disinfected or wrapped for return to the CSSD.

Strict isolation

Conditions requiring strict isolation are the highly infective and very serious diseases and those with extensive superficial sepsis, including extensive vaccinia; pulmonary anthrax;

staphylococcal enterocolitis; neonatal enteritis; dermatitis with severe sepsis; diphtheria.

Requirements—A single room with a washbowl and ventilation to open air or filtered recirculation is needed. There should be a gowning lobby with washbowl, and gowns, aprons, and gloves should be available for staff and visitors. The room should have its own toilet and bedpan sterilisation, and facilities for disinfecting articles used in the room or wrapped disposal that is not through patient areas.

Operational instructions—The patient must be confined to the room and everyone entering it must wear a gown, plastic apron, mask, and gloves. On leaving the room staff and visitors must wash their gloves then hands. All articles used in room should be discarded in sealed containers and disinfected or wrapped for return to the CSSD.

Protective isolation

In general, it is undesirable to strain the isolation resources and staff efficiency by nursing infected patients and those with increased susceptibility to infection in communicating areas or with the same staff.

The degree of protective isolation required for each patient is likely to change from day to day. In special units different grades of protective isolation may be possible but this depends on the physical and operational conditions of the unit. It is generally better to establish the appropriate degree of protective isolation in advance of the need for it. For example, when intensive cytotoxic chemotherapy is being given isolation should precede the onset of profound leucopenia. The risk of infection from endogenous sources is high in patients requiring this form of isolation. Sterilisation of the gut may be advantageous in some cases.

Conditions requiring protective isolation—This form of isolation applies to patients who are highly susceptible to self- or cross-infection owing to agranulocytosis, immunosuppression, or damaged epithelial surfaces. They include patients with extensive uninfected dermatitis; extensive uninfected burns; agranulocytosis due to radiation, cytotoxic chemotherapy, drug reactions, bone-marrow hypoplasia of unknown cause, leukaemia, and other forms of malignant disease; and immunodeficiency.

Requirements—A single room with gowning lobby and washbowl or an "isolator" is necessary, preferably with positive-pressure ventilation with filtered air. The room should have its own toilet or sterile bedpans; a special space for visitors, preferably excluded from room but with a large clear plastic talking and viewing panel; and facilities for sterilising or disinfecting articles taken into the room. Facilities for sterile food supply may be required.

Operational instructions—The patient must be confined to his room, with the doors kept closed. Gowns or plastic aprons and masks should be worn by all entering the room, who should also wash their hands before entering. Gloves should be worn for specified procedures, and sterile food may be needed. Sometimes routine bacteriological examination of the patient, staff, and visitors may be needed.

High-security isolation

For patients suffering from or strongly suspected of suffering from a few diseases of exceptional severity, such as smallpox, Lassa fever, Ebola fever, and Marburg disease, isolation in any of the above categories is not adequate; high-security isolation for them is most effectively provided in a separate purpose-built unit supplemented by the use of negative-pressure plastic isolators.^{3 4} A description of this system is outside the scope of this article.

Evaluation and control

The efficacy of isolation depends on the quality of performance of each of its component procedures. But a veneer of ritual precautions and a strong smell of disinfectant may sometimes convey an impression of efficiency when important components of the system are being neglected. Methods for supervising and testing an isolation system are therefore needed to ensure that its performance is being maintained and to provide a means of evaluating modifications of the system. Some of the possible control methods are considered in this section.

DIRECT CHECKS OF ISOLATION PERFORMANCE

Evidence that an organism from a person on one side of the barrier has infected a person on the other side of the barrier is direct evidence of isolation failure.

Spread of infective disease is obviously the most convincing evidence that an isolation system has failed. Acquisitions of infective disease by patients and staff should be continuously sought and recorded. Every escape of disease from source isolation and every infective intrusion into protective isolation deserves careful investigation of possible means of transfer. Continuous unit records of these incidents have often not been kept, which accounts partly for our ignorance of the value of many "isolation procedures." Nevertheless, even serious defects of isolation are not necessarily disclosed by immediate and obvious spread of disease; this may be delayed until a source and a susceptible victim are critically placed in relation to the defective procedure. A direct method of evaluating isolation at any time is therefore of interest.

Symptomless acquisition of organisms—For most patients in source isolation the identity of the responsible microbe is known. Therefore it will often be possible to detect its escape from the isolation room by bacteriological examination of staff and other patients. If the organism is a common one the identity of strains should be checked by studies not only on the organism that is the cause of isolation but also on any convenient marker organism—pathogenic or non-pathogenic—that is carried by the patient. Investigations of this sort demand repeated rounds of swabbing or specimen collecting and much laboratory work. They are obviously essential for research and for investigating isolation failure; in a running unit they are probably not routinely necessary but may be useful as occasional safety checks.

INDIRECT CHECKS OF ISOLATION PERFORMANCES

The checks considered in this section are mechanical and procedural, to ensure the proper functioning of equipment and methods, and bacteriological, to indicate spread not from source to victim but from source to some intermediate situation.

Mechanical and procedural—When ventilation plant is installed the following items should be checked: fan speed, pressure across filters, volumes of air delivered and extracted, and directions of airflow through doorways. Routine regular checks thereafter are essential; each check should be recorded and notified to the ward staff.

Bacteriological—If the results of mechanical tests of ventilation are satisfactory and airflows are in the specified directions, bacteriological sampling of air is not routinely necessary. The use of a slit-sampler or sedimentation plates, however, is sometimes valuable to demonstrate to staff the results of faults—such as leaving doors open—or as encouragement in a unit where the system is working well. Air sampling may be an essential routine test when extreme protective isolation is being applied and is, of course, needed for research. There are differences of opinion on the need for routine sampling of walls,

floors, furniture, and other fomites. One view is that the efficacy of cleaning is best monitored in this way; the other is that effective cleaning methods should be specified and that the best form of control is then to ensure, by supervision, that these methods are used. We incline to the latter view, on the grounds that continuous process control is more effective than occasional product testing. For patients in extreme protective isolation bacteriological sampling of food may occasionally be useful but, here again, routine process control is adequate and more convenient.

ADMINISTRATIVE CONTROL

The general policies of infection control in a hospital are usually decided by a control-of-infection committee, with their day-to-day application supervised by a control-of-infection

officer or nurse. It is usually convenient for these responsibilities to include the policies and control of the isolation system and checking its performance. But whatever the administrative arrangements are, it is important that hospital staff who have to apply the isolation procedures should understand the chain of responsibility and should know where to turn for advice when problems arise.

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MATERIA NON MEDICA

The old order

Many years ago I used to travel occasionally during the summer on the overnight Inverness-to-London sleeper. I joined it at Pitlochry, where in olden times the steam trains could be heard huffing and puffing over the pass at Killiecrankie, to relax as they started the long run down; latterly the diesel would growl its way in as the long summer light was fading to the north-west behind it. Not infrequently I would see symbolism on the platform. The porter, usually middle aged, would be a source of many stories and often father to successful products of the upward social spiralism of Scotland. Further north at Kingussie it is related that earlier in the century the baggage porter could say without boasting that his three sons were a high court judge, a mandarin of the Indian Civil Service, and a successful industrialist. There would be the English predator with his cased Purdy's, or the broken down Remington, or the marvellously evocative fish-shaped canvas bag containing his best Tay catch. Occasionally there would be a bowler-hatted, umbrella-toting business executive about to appear next morning on the Stock Exchange or commodity market.

These days for me have changed. Now I drive or fly from further north and east. My flying companions on the last plane out of Aberdeen on Sunday are most likely to be oilmen off to the far corners of the earth; occasionally, they are representatives of the secondary industry of communication—television, radio, or journalism. But the old order lingers long and I was delighted to find a soft (not bowler) hatted, properly clad, senior civil servant complete with ER II briefcase. More importantly, he was weaponed and accoutred well with a treasured trout rod. I do not know whether it was split cane or fibre-glass, but it was obviously precious because it stayed in his hands throughout the flight. Next week it was to be deployed on a fresh-water stream in the West Country and this was more important than any committee he was due to attend. Long may our possibly outmoded values continue to flourish.—HUGH DUDLEY (professor of surgery, London).

Spiders

I confess I feel saddened when I hear a person exclaim, on finding a spider, that it must be killed. Curiously, in my experience, it is usually women who hold such beliefs, and many, on questioning, agree that their fears are irrational. I have asked several people why they dislike spiders. The answers given usually indicate that they hate small black objects with several legs that travel silently and at speed.

Sometimes the same people with a phobia of spiders are the first to admire the geometric design of frosted or dew-coated webs seen on a winter's morning. They marvel also at the abundance of gossamer (derived, by the way, from goose and summer) among autumn vegetation and the sight of gossamer fragments floating in the air. Similarly, they will watch a disturbed nest of young spiders in a bush and show interest as the juveniles disperse at speed along their silken lines. They may even be delighted to note the agility of a spider as

it pounces on its fly prey, and later they may enthuse while watching its enzyme injection into the fly and the eventual sucking up of a digested, juicy meal; or they may simply admire the wrapping up of a fly caught by a spider, so soon secured by rapidly prepared silk fibres.

The difficult topic of the mechanism of spinning the silk intrigues many people, although few biologists claim to really understand the subject. But most observers agree that the paired, hairy spinnerets of the spider's abdomen are highly efficient weaving structures and that the multiple spinning tubes, fed by silk glands, open on to the spinnerets to supply the silk material.

Why should some humans, many of whom admit their fascination with spiders' specialised activities and know that they really have little or nothing to fear from them, show such a deep dislike? Whatever may be the answer, the fact remains that, as in the case of Miss Muffet, a harmless though hated spider is readily able to dislodge many a person from her (or his) tuffet.—PHILIP RADFORD (general practitioner, Bristol).

Jane Ford's conjuring book

Almost 400 years ago, in the province of Hesse Nassau, a young cow lay chewing the cud. I am obliged to remember that animal, for at this moment its well-tanned skin rests in my hand, bound round a little book I have treasured for years. It is in easy Latin, such as a dunce like myself can just get along with, and it is all about ancient coins. The preface, which addresses me courteously as *Studiosus Reader*, speaks clearly and pleasantly across the centuries and ends with a Farewell from the author, Levinus Hulsius, at Frankfurt, 14 April 1603. That was the year of Elizabeth's death and two years before the Gunpowder Plot. There are separate chapters for all the Roman emperors from Julius Caesar down to the contemporary Rudolphus II, who looks rather silly wearing a laurel wreath and a fashionable, well-laundered ruff, but is still *Romanorum Imperator*. There are innumerable delightfully clear engravings to help with identification. Hulsius always says which coins are scarce, *rari & cari sunt*, or easy to come by or not easy to come by. These distinctions, like all the rest of his information, are still valid and trustworthy.

With the flourishing of classical learning every gentleman had his cabinet of antique coins, and I like to think that my book has been in constant use ever since it was printed. At any rate, a long succession of owners have left their indefinite signs of handling on its pages. I began to collect ancient coins when I was trying to learn Roman history, and luckily the book came to help me at the right time, as fresh and clear in its message as it had been to generations of becurled or periwigged collectors before me. One of these has left a tiny secretive message in what looks like goose-quilled Greek but is probably a cipher. Whatever it is, I have so far been unable to crack it, and the ghostly chuckles continue to taunt me. Not so with another faded inscription, written in a childish late seventeenth-century hand up the edge of a page at the back, so that it would be discovered only by chance: *Jane ford's Conjuring Book*. The little girl who put this in is real enough to me. She must have looked very pretty and lovable as she stood ruffling the incomprehensible pages, wide-eyed at her elder sister's erudition. Then the mischievous search for a quill, the head turned sideways. Jane was furious.—VIVIAN JONES (St Albans).