

THE CONTROL OF HOSPITAL INFECTION

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INTRODUCTION

Sammelweis first introduced the concept of infection control in hospitals in the mid-1800s but it was not until about 20 years ago that the control of hospital infection has become such an important issue. In the United States, it is estimated that approximately 5% of all hospital admissions acquire hospital infection.¹ The financial expense related to the management of these infections is estimated to be in the region of US\$3,000,000,000 per annum.² In the United States today, all hospitals are required to have infection control programmes by the Joint Commission on Accreditation of Hospitals.

The control of hospital infection may be discussed under the following topics: (1) architectural design; (2) surveillance; (3) sterilisation and disinfection; (4) ward procedures; (5) isolation; (6) antibiotics and (7) prophylaxis.

ARCHITECTURAL DESIGN

A modern hospital should be designed with infection control in mind.³ The main aim of the architect is to reduce the risk created by the human element to a minimum. Many aspects have to be considered including ventilation, sewage disposal, hand washing facilities, clean and dirty traffic and the location of the various services. In the wards, horizontal surfaces should be kept to a minimum as these are places where dust tends to settle. Wards should be designed such that they are easy to clean. Special attention has to be paid to the design of operating theatres. The Medical Research Council of the United Kingdom has recommended six basic requirements for operating theatres.⁴ They are (1) separation from the general traffic of the hospital; (2) a sequence of increasingly sterile zones from the entrance to the operating area; (3) easy passage from one clean area to another without passing through "dirty" areas; (4) removal of contaminated materials without passing through clean areas;

(5) air flow from the clean to less clean areas and (6) heating and ventilation to ensure safe and comfortable conditions for patients and staff. The design of special care units also warrants special consideration. Space should be adequate to allow for easy access of staff and equipment. One or two isolation rooms may be needed for use by either infected patients (source isolation) or hypersusceptible patients (protective isolation). The ventilation must be adequate, in the region of 15 to 20 air changes per hour to prevent build-up of bacteria released by patients. Patients are best separated by retractable waterproof curtains to prevent contamination of adjacent beds.

SURVEILLANCE

Surveillance may be defined as the continuing scrutiny of all aspects of a disease that is pertinent to its effective control.¹ Surveillance is necessary for the following reasons: (1) to assess the efficacy of the preventive measures currently in use in a hospital; (2) to recognise any change in the level of incidence thus recognising the existence of an outbreak or impending outbreak and (3) to judge the desirability of introducing special measures to contain such an outbreak and to assess the efficacy of the measures taken. Surveillance is the responsibility of the hospital infection control officer. In many hospitals, the infection control officer is a member of the hospital staff, usually the microbiologist. Some hospitals have even appointed full-time infection control officers, usually a nursing sister or a staff nurse. The duties of a hospital infection control officer include (1) identification of infected patients and staff and the wards they are in; (2) arranging for the isolation of such persons; (3) checking on aseptic techniques in wards and operating theatres; (4) routine bacteriological monitoring of equipment and the environment; (5) supervision of the central sterilising and

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supply department; (6) investigation of outbreaks and (7) training of personnel with regards to the control of hospital infection. The Joint Commission on Accreditation of Hospitals of the United States has laid down guidelines for the formation of Hospital Infection Control Committees.⁶ These multidisciplinary committees formed from members of the hospital staff are responsible for (1) developing written standards for hospital sanitation and asepsis; (2) developing, evaluating and revising procedures and techniques pertaining to sanitation; (3) developing a system of surveillance; (4) reviewing the use of antibiotics and (5) providing assistance for the employees health programme. This committee should also meet regularly, at least once a month in a large hospital. The infection control officer reports to the committee which will decide on policy and measures to be taken.

STERILISATION AND DISINFECTION

The control of hospital infection depends to a great extent on sterilisation and disinfection. Sterilisation in most hospitals is achieved largely by heat sterilisation using autoclaves. To ensure sterility of the materials autoclaved, the effectiveness of the autoclaves has to be checked regularly. Regular inspection of temperature and pressure records is supplemented by the use of Browne's indicator tubes. The high vacuum autoclave is tested daily by the Bowie-Dick test for satisfactory removal of air and penetration of steam.⁷ Every hospital should have a disinfection policy suited to its needs. The correct disinfectant should be used for a particular purpose, taking into account the antimicrobial activity of the disinfectant and its cost. Since disinfectants are used under a variety of circumstances, it is necessary to conduct tests that ensure their effectiveness under actual conditions of use. The commonest cause of failure of a disinfectant is inadequate concentration. Certain types of plastic mops and detergents can also inactivate disinfectants. In-use tests of disinfectants should be performed regularly.⁸ The disinfectant policy should also be reviewed from time to time.

WARD PROCEDURES

The control of infection in wards and operating theatres involves the application of aseptic tech-

niques and hygiene to the many details of patient care and management. No antibiotic or combination of antibiotics will ever be as effective as aseptic techniques in the prevention of hospital infection. The hands of nurses and doctors are the most important vehicles of cross-infection in wards. Therefore, hand washing is the single most important factor in preventing such cross-infections. The habit of hand washing must be instilled into all medical personnel. Hand washing facilities must be made readily available. Hands should be washed with a suitable disinfectant such as chlorhexidine. Special sinks have been designed to reduce the risks of cross-infection while washing hands.⁹ Hand drying is another important aspect. Disposable paper towels are ideal but if their costs are prohibitive, cloth towels which may be recycled may be used but used only once. The practice of hanging a single towel near a sink for drying hands must be stopped. Gloves and protective clothing are used when attending to infected patients. A water repellent plastic apron is ideal. Cotton gowns when wet are permeable to bacteria and are therefore unsatisfactory. The plastic aprons can easily be scrubbed with disinfectant after a dressing procedure. Masks contribute little to protection of patients in wards. They need only be worn when attending to patients with burns and extensive wounds.

ISOLATION

There are two types of isolation: (1) source isolation which is the isolation of patients to prevent the transmission of their infection to others and (2) protective isolation to prevent the transfer of infective microorganisms to patients at risk, for example renal transplant patients. Barrier nursing are special nursing procedures which reduce the risks of transferring infection from one person to another by direct contact or via fomites. Protective isolation should be practised in specially constructed rooms and strict barrier nursing procedures observed. In source isolation, strict isolation procedures also have to be observed, the more infectious the disease the stricter the procedures to be laid down. All aspects have to be considered including the use of gloves and protective clothing, the disposal of infected material including the patient's faeces and

urine, the use of equipment like stethoscopes, sphygmomanometers and thermometers, and terminal disinfection when the patient dies or is discharged. The Control of Hospital Infection Committee is responsible for drawing up the procedures to be followed, taking into consideration the existing facilities in the hospital.

ANTIBIOTICS

Recent years have seen the rapid and often alarming emergence of antibiotic resistant bacteria. Multiple resistant *Staphylococcus aureus* and Gram-negative rods are the major causes of hospital infection. These organisms have appeared as a result of extensive and often indiscriminate use of antibiotics. Gentamicin-resistant Gram-negative rods are now a significant problem in the General Hospital, Kuala Lumpur.¹⁰ In order to combat the emergence of such organisms, every hospital should have an antibiotic policy. The restrained and controlled use of antibiotics means that the appearance of these resistant organisms is delayed or kept to a low level. The antibiotic policy of a hospital depends to a considerable extent on the sensitivity patterns of currently isolated strains of bacteria. The microbiologist, therefore, has the duty of keeping the clinicians informed of the current resistance pattern in the hospital. As resistance patterns are constantly changing, the antibiotic policy will have to be regularly reviewed.

PROPHYLAXIS

Staff in hospitals are at risk of contacting a variety of infectious diseases. It is impractical to immunise everybody against all diseases for which there is a vaccine available but BCG, poliomyelitis vaccine and tetanus toxoid should be given routinely. Female staff of child-bearing age should be screened serologically for immunity to rubella and if found susceptible, be offered rubella vaccination provided they are not pregnant at that time. Recently, anti-pseudomonal vaccine has been found to be of value in patients with burns. Selective chemoprophylaxis against known organisms has been found effective under certain circumstances such as in patients undergoing bowel, gynaecological and orthopaedic surgery. It must be stressed, however, that antibiotics given for such purposes should only be administered an

hour or so before the procedure and continued for not more than 24 hours after. This is because resistance may develop if antibiotics are given for longer than this period. Systemic antibiotics given routinely without any rational basis must only be condemned.¹

CONCLUSION

Hospital infection is an important cause of morbidity and mortality today. Its importance can be considered both in terms of the patient's illness and of prolonged occupancy in beds, hence increased expenditure. If hospital infection can be controlled, the government will save a lot of money and the patients spared a good deal of unnecessary suffering.

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