TWENTY

PREVENTING NOSOCOMIAL INFECTIONS

KEY CONCEPTS you will learn in this chapter include:

- What the most common types of nosocomial infections are
- What impact nosocomial infections have on healthcare
- How nosocomial infections increase the cost of healthcare
- Why preventing nosocomial infections is important

BACKGROUND

"Nosocomial infections are widespread. They are important contributors to morbidity and mortality. They will become even more important as a public health problem with increasing economic and human impact because of:

- **Increasing numbers and crowding of people.**
- **More frequent impaired immunity (age, illness and treatments).**
- **New microorganisms.**
- **Increasing bacterial resistance to antibiotics." (Ducel 1995)**

Nosocomial (hospital-acquired) infections are an important focus of infection prevention in all countries, but in developing countries they are a major cause of preventable disease and death. The most important are:

- urinary tract infections, pneumonia and diarrhea;
- infections following surgery or invasive medical procedures; and
- maternal and newborn infections.

The organisms causing most nosocomial infections usually come from the patient's own body (endogenous flora). They also can come from contact with staff (cross-contamination), contaminated instruments and needles, and the environment (exogenous flora). Because patients are highly mobile and hospital stays are becoming shorter, patients often are discharged before the infection becomes apparent (are symptomatic). In fact, a large portion of nosocomial infections in hospitalized patients—and all from ambulatory care facilities—become apparent only after the patients are discharged. As a consequence, it is often difficult to determine whether the source of the organism causing the infection is endogenous or exogenous.

Rates of nosocomial infections are markedly higher in many developing countries, especially for infections that are largely preventable (e.g., those following surgical procedures such as cesarean section). In these countries, nosocomial infection rates are high because of a lack of supervision, poor infection prevention practices, inappropriate use of limited resources and overcrowding of hospitals. Key contributing factors are:

- inadequate standards and practices for operating blood transfusion services (**Chapter 18**);
- increasing use of invasive medical devices (e.g., mechanical ventilators, urinary catheters and central intravenous lines) without proper training or laboratory support (**Chapters 17, 24** and **27**);
- use of contaminated intravenous fluids, especially in hospitals making their own IV solutions (**Chapter 24**);
- antibiotic resistance due to overuse of broad spectrum antibiotics; and
- unsafe and frequently unnecessary injections (**Chapters 7** and **24**).

The latter is most important. For example, after reviewing a number of studies, Simonsen et al (1999) concluded that more than 50% of injections in developing countries are unsafe (i.e., the needle, syringe or both are reused) and many injections are unnecessary (e.g., routine injections of vitamin B-12 or antibiotics). A major consequence of this is that an estimated 80,000 to 160,000 new HIV infections occur annually in sub-Saharan Africa, and even more cases of HBV and HCV occur worldwide each year as a result of unsafe injections (Kane et al 1999).

Understanding Nosocomial Infections

The role of Transmission-Based Precautions in minimizing the risk of nosocomial infections is detailed in **Chapter 21**. In subsequent chapters, information is presented regarding the epidemiology, microbiology, risk factors and practical measures for preventing nosocomial infections involving the urinary, gastrointestinal and respiratory systems (**Chapters 22, 26** and **27**) as well those following surgery (**Chapter 23**), the use of intravascular devices (**Chapter 24**) and maternal and newborn infections (**Chapter 25**). Also included is information on how to:

- manage food and water sources in hospitals and clinics in order to prevent food- and waterborne outbreaks; and
- assure a continuous source of clean and safe water for drinking and medical use (e.g., handwashing and instrument cleaning) (**Chapter 26**).

Finally, in **Chapter 28**, guidelines for monitoring (surveillance) of infection prevention practices and investigating outbreaks and exposures are briefly covered.

DEFINITIONS

- **Contaminated**. State of having been actually or potentially in contact with microorganisms. As used in healthcare, the term generally refers to the presence of microorganisms that could be capable of producing disease or infection.
- **Laboratory-acquired infection**. Nosocomial infection resulting from performance of laboratory activities by staff, regardless of how it occurred.
- **Nosocomial** or **hospital-acquired infection (terms used interchangeably)**. Infection that is neither present nor incubating at the time the patient came to the hospital. (Nosocomial refers to the association between care and the subsequent onset of infection. It is a time-related criterion that does not imply a cause and effect relationship.)
- **Occupational injury** or **infection**. Injury or infection acquired by healthcare staff while performing their normal duties.

FREQUENCY AND TYPE OF NOSOCOMIAL INFECTIONS

Nosocomial infections are a significant problem throughout the world and are increasing (Alvarado 2000). For example, nosocomial infection rates range from as low as 1% in a few countries in Europe and the Americas to more then 40% in parts of Asia, Latin America and sub-Saharan Africa (Lynch et al 1997). In 1987, a prevalence survey involving 55 hospitals in 14 developing countries in four WHO Regions (Europe, Eastern Mediterranean, South-East Asia and Western Pacific) found an average of 8.7% of all hospital patients had nosocomial infections. Thus at any time, over 1.4 million patients worldwide will have infectious complications acquired in the hospital (Tikhomirov 1987). In this survey the highest frequencies were reported from hospitals in the Eastern Mediterranean and South-East Asia Regions, 11.8% and 10% respectively (Mayon-White et al 1988). These rates most likely do not reflect the current situation because at that time the HIV/AIDS pandemic was just beginning. Moreover, the survey did not include any countries in Africa where nosocomial infection rates are much higher. They do, however, provide some guidance as to which types of nosocomial infections occur most frequently in developing countries. Surgical site infections, urinary tract infections and lower respiratory (pneumonia) infections were the leading types reported. This sequence differs somewhat from what is reported in the US, for example, where urinary and respiratory tract infections are the most common followed by surgical site infections (Emori and Gaynes 1993).

The WHO study and others also found that the highest prevalence of nosocomial infections occurs in intensive care units and acute care surgical and orthopedic wards. Not surprisingly, infection rates are higher among patients with increased susceptibility because of old age and the severity of the underlying disease. To this list should now be added those

hospitalized patients with decreased immunity due to AIDS and/or multidrug-resistant tuberculosis.

IMPACT OF NOSOCOMIAL INFECTIONS

Nosocomial infections add to functional disability, emotional stress and may, in some cases, lead to disabling conditions that reduce the quality of life. In addition, nosocomial infections have now become one of the leading causes of death (Ponce-de-Leon 1991). The impact of nosocomial infections takes on even more significance in resource-poor countries, especially those affected most by HIV/AIDS, because recent findings strongly suggest that unsafe medical care may be an important factor in transmitting HIV (Gisselquist et al 2002).

During the past 10–20 years little progress has been made in addressing the basic problems responsible for the increasing rates of nosocomial infections in many countries, and in some countries, conditions are actually worsening. Nosocomial infections increase the cost of healthcare in the countries least able to afford them through increased:

- length of hospitalization;
- treatment with expensive medications (e.g., antiretroviral drugs for HIV/AIDS and antibiotics); and
- use of other services (e.g., laboratory tests, X-rays and transfusions).

As a consequence, in resource poor countries, efforts to prevent nosocomial infections must assume even greater importance if progress is to be made in improving the quality of patient care in hospitals and other healthcare facilities.

PREVENTING NOSOCOMIAL INFECTIONS

Most of these infections can be prevented with readily available, relatively inexpensive strategies by:

- adhering to recommended infection prevention practices, especially hand hygiene and wearing gloves;
- paying attention to well-established processes for decontamination and cleaning of soiled instruments and other items, followed by either sterilization or high-level disinfection; and
- improving safety in operating rooms and other high-risk areas where the most serious and frequent injuries and exposures to infectious agents occur.

Unfortunately, not all nosocomial infections are preventable. For example, some reflect the influence of advanced age, chronic diseases such as uncontrolled diabetes, end-stage kidney disease or advanced pulmonary emphysema, severe malnutrition, treatment with certain drugs (e.g.,

antimicrobials, corticosteroids and other agents that decrease immunity), the increasing impact of AIDS (e.g., opportunistic infections) and irradiation.

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