Chapter 15

Intensive Care Unit

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1. INTRODUCTION

Critically ill-patients admitted to intensive care units (ICUs) are highly susceptible to infections because of predisposing illnesses and the use of invasive procedures, and are therefore exposed to high antibiotic pressure. Use of antibiotics in the ICU must follow best clinical practice if the emergence of resistance to antibiotics is to be minimised. Antibiotic resistance is an important factor governing treatment success and mortality (Carmeli et al., 2002; Kollef and Ward, 1998; Kollef et al., 1999). The problem of resistance is greater in ICUs than in other hospital wards or primary care centres (Archibald et al., 1997; Hanberger and Nilsson, 2000; Hanberger et al., 2001a). Control of antibiotic resistance, that is, detecting, monitoring, and fighting the emergence of resistant bacteria is, therefore, especially important in the intensive care environment. According to a recent review of European ICUs, the prevalence of antibiotic resistance in bacteria was, with some exceptions, highest in ICUs in Southern European countries and in Russia, and lowest in Scandinavia (Hanberger et al., 2001a). This was also true for the key organism methicillin-resistant Staphylococcus aureus (MRSA) (Regnier, 1996; Vincent et al., 1995). Antimicrobial resistance also varies markedly by region and ward level in the United States, Canada, and Latin America with the highest resistance rates
being found in Latin America (Burwen et al., 1994; Diekema et al., 1997; Edmond et al., 1999). As patterns of resistance change, physicians need to reassess standard therapies to ensure appropriate antibiotic coverage.

2. ANTIBIOTIC CONSUMPTION IN ICUs

Because data on antimicrobial use are reported using various measurement units, comparisons are only possible among ICUs using the same measurement unit. Several studies have reported antibiotic use expressed as a number of WHO Defined Daily Doses (DDD) per 1,000 patient-days in individual or groups of European ICUs. Depending on the ICU, antibiotic use ranged from 490 to 3,456 DDD per 1,000 patient-days (Erlandsson et al., 1999; Gruson et al., 2000; Hanberger et al., 2004; Kiivet et al., 1998; Lemmen et al., 2000; Naaber et al., 2000; Petersen et al., 1999; Vlahovic-Palcevski et al., 2000; Walther et al., 2002).

In one study, Bergmans et al. (1997) used the prescribed daily dose (PDD) as the measurement unit and reported 921 PDD per 1,000 patient-days in two Dutch general ICUs in 1994. The ICARE DDDs developed to report antibiotic use in Centers for Disease Control and Prevention (CDC) Project ICARE represent a form of PDDs (Capellà, 1993). In 40 US hospitals, which participated in Project ICARE during the period 1996–7, antibiotic use ranged from 413 to 927 ICARE DDD per 1,000 patient-days depending on the type of ICU (ICARE Surveillance Report, 1999). It is important to note that this does not correspond to total antibiotic use since Project ICARE did not collect data on all antibiotic classes used in these ICUs.

Other studies have collected data at patient level and expressed antibiotic use as the number of daily antibiotic treatments (all individual antibiotics received on a single day are taken into account) per 1,000 patient-days. In a group of four Danish ICUs, Petersen et al. (1999) reported that antimicrobial use ranged from 1,390 to 2,510 daily antimicrobial treatments per 1,000 patient-days. Although the highest use was reported from one ICU that routinely used selective decontamination of the digestive tract (SDD), antimicrobial use in this ICU is likely to have been underestimated because multiple agents for the SDD protocol were recorded as one single antimicrobial.

In the European Strategy for Antibiotic Prophylaxis (ESAP) study, the median antimicrobial use (including antifungals) was 928 daily treatments per 1,000 patient-days (range: 355–1,686) in 21 ICUs that did not use SDD (Monnet et al., 2000). In comparison, two ICUs that routinely used SDD reported 3,753 and 4,794 daily antimicrobial treatments per 1,000 patient-days and two other ICUs that used SDD for very selected indications only reported 997 and 1,085