

## Chapter 4

# Antimicrobial Consumption and Multidrug Resistant Organisms in Intensive Care Units: Lessons from Saudi Arabia

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### ABSTRACT

*Improper antimicrobial use and bacterial resistance can affect an entire community, threaten public health and create economic burdens and ecological consequences on societies. This chapter discusses the importance of counteracting this public health issue. In Saudi Arabia, the appropriate use of antimicrobial agents is of particular concern. The prescribing of broad-spectrum antimicrobials in hospital settings is not highly restricted, and antimicrobials are available over the counters in pharmacies. This unwise use provides a scenario for the emergence of bacterial resistance and subsequent public health concerns. In addition, there is a lack of representative epidemiological research on antimicrobial consumption and quantitative data linking consumption to the incidence of resistance. This chapter illustrates that the implementation and the success of the strategies that monitor and control antimicrobial consumption depend on the availability of information about the extent and patterns of antimicrobial consumption. It demonstrates the potentials and recommendations on obtaining antimicrobial consumption data using defined daily dose as a unit of measurement in Saudi hospital settings.*

### INTRODUCTION

Bacterial resistance has been a universal public-health concern for decades (Metz-Gercek et al., 2009; Monnet, Molstad, & Cars, 2004). Based on the increasing incidence of bacterial resistance, the insufficient availability of novel and effective antimicrobial agents, and the development of resistance against new agents, physicians will be unable to treat all infections (Bassetti et al., 2000; Gandhi, DePestel, Collins, Nagel, & Washer, 2010; Metz-Gercek et al., 2009; D Plonczynski & K Plonczynski, 2005; What are

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the consequences of resistance?, 2010). Infections caused by antimicrobial-resistant microorganisms increase morbidity and mortality, length of hospitalization, and cost of health care (Jacoby et al., 2010). Under the title “Combat Drug Resistance,” the World Health Organization (WHO) selected bacterial resistance and its global spread as the theme for World Health Day 2011 (WHO-World Health Day, 2011; World-health-day2011 –brochure, 2011). This public health issue was chosen to stress its significance for good health and wellbeing (WHO-World Health Day, 2011; World-health-day2011 –brochure, 2011). The WHO and the European Commission recommend more research on understanding the development and drivers of bacterial resistance, and note the importance for rational approach to constrain it (Bronzwaer et al., 2002). On World Health Day 2011, the WHO issued a call for action: “WHO will call on everyone: policy-makers and planners, the public and patients, practitioners and prescribers, pharmacists and dispensers, the pharmaceutical industry, to think, act and take responsibility for combating drug resistance (World-health-day2011 –brochure, 2011)” and stated that “No action today, no cure tomorrow (World-health-day2011 –brochure, 2011).”

Antimicrobial agents are increasingly used to treat patients (Iosifidis et al., 2008). Today, antimicrobial agents are the most frequently prescribed therapies in hospitals (Rogues et al., 2004). Some studies claim that one-third to one-half of hospitalized patients receive antimicrobial therapy (Erbay, Bodur, Akinci, & Colpan, 2005; Vlahovic-Palcevski, Morovic, Palcevski, & Betica-Radic, 2001). The use of these agents is often inappropriate and because of their liberal prescribing and misuse, they increase the risk of adverse reactions, the need for additional medical attention, and place an unnecessary burden on the hospital pharmacy and other departmental budgets, and also are associated with the increased risk of the emergence of bacterial resistance (Arda et al., 2007). In intensive care units (ICUs), most of the patients are critically ill and are at higher risk than those in general hospital wards of developing and spreading infections, especially healthcare associated infections and infections by multidrug-resistant organisms. Thus antimicrobial agents are prescribed ten times more often in such units, are used by 60- 70% of ICU patients and account for a major part of the ICU drug expenditure (de With et al., 2006; Erbay et al., 2005; Jacoby et al., 2010). Vlahovic-Palcevski et al. (2001) reported that Simmons and Stolley came up with the following two questions: (A) have we reached the point where the enormous use of antibiotics is producing as much harm as good, and (B) are the risks beginning to outweigh the benefits?

The link between antimicrobial use and bacterial resistance has been reported in many reports from single hospitals and from multicenter studies (Fridkin & Gaynes, 1999). According to Alfandari, Bonenfant, Depretere, and Beaucaire (2007) and Cristino (1999), a steep rise in bacterial resistance is linked to the therapeutic (empirical and definitive) and prophylactic use of antimicrobial agents in the individual patient, the hospital, and the community. However, the excessive prescription of such medications to hospitalized patients is associated with a higher prevalence of antimicrobial-resistant bacteria in hospital wards than in the community (Benko et al., 2009). D Plonczynski and K Plonczynski (2005) reported that if the patterns of overconsumption are not stopped, newer therapies may fail due to the development of bacterial resistance. Therefore, the use of available antimicrobial agents should be carefully targeted and well regulated to moderate the initial emergence of bacterial resistance and slow the transmission of resistant microorganisms (Bassetti et al., 2000; Metz-Gercek et al., 2009). In addition, effective primary prevention strategies, combating the threat of bacterial resistance and improving antimicrobial prescription practice require auditing the management of antimicrobial prescription, surveying of both antimicrobial consumption and bacterial resistance, providing education on their relationship, monitoring the impact of infection control measures, ensuring greater involvement from the pharmacist and continually educating healthcare professionals (Meyer, Schwab, Gastmeier, Rueden, & Daschner, 2006;

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