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ORIGINAL ARTICLE

Implementation of a multimodal infection control program during an *Acinetobacter* outbreak

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Summary
Objectives: *Acinetobacter* in the ICU presents a challenge worldwide due to its capacity for long-term survival on environmental surfaces. This report describes a multimodal infection control program designed to control a sustained outbreak *Acinetobacter* colonization.
Methods: Multimodal interventions implemented by unit-appointed infection control nurses in an Australian intensive care unit (ICU) during a sustained outbreak of *Acinetobacter* colonization.
Results: In the first 12 months of the outbreak, the mean monthly colonization rate was 3.1 (±1.2) cases per 100 bed-days (increased from 0.5 [±0.4] in the previous 6 months). In the subsequent 20-months, the mean monthly colonization rates declined to 1.5 (±1.5) cases per 100 bed-days ($P = 0.004$). Hand hygiene compliance increased from 33% (95% CI 30—36%) before action plan implementation to 49% (95% CI 46—52%) measured 6-months after implementation. Compliance subsequently dropped to 39% (95% CI 36—42%) 12-months after implementation. The median volume of alcohol/chlorhexidine hand rub solution used per 1000 bed-days increased from 24 L (interquartile range (IQR) 12—47 L) to 148 L (IQR 120—165 L) per 1000 bed-days ($P < 0.001$).
Conclusions: Introduction of ICU-appointed infection control nurses, who then led multimodal interventions, was effective in reducing the rate of *Acinetobacter* colonization.

Introduction

Acinetobacter species are aerobic Gram-negative bacilli capable of causing infection and acquiring antibiotic resistance (Garnacho et al., 2003). Transmission occurs via the hands of health care workers' and contaminated medical equipment and environmental surfaces (Baraibar et al., 1997). Its capacity for long-term survival on

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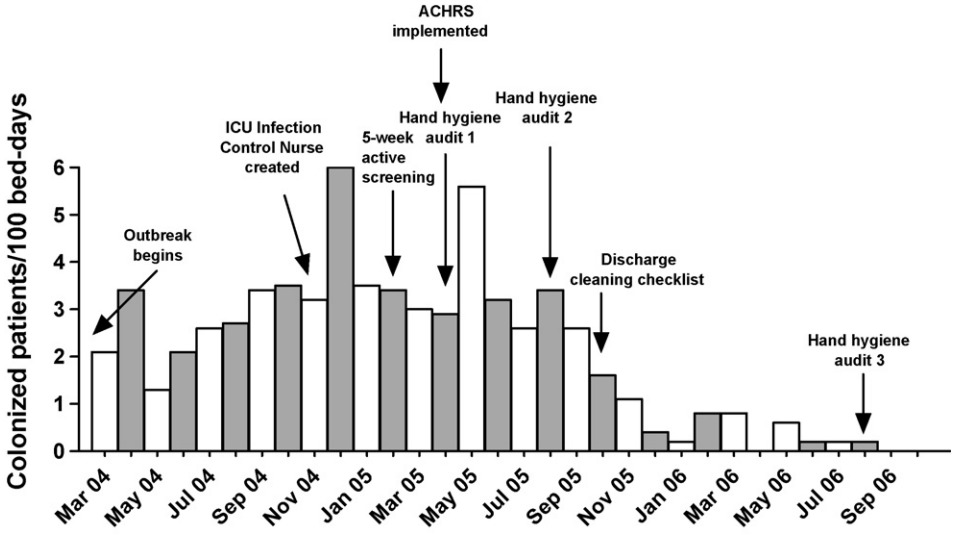

Figure 1 Timeline of *Acinetobacter* outbreak and implementation of multimodal infection control program.

environmental surfaces can result in sustained outbreaks and increased opportunities for transmission (Wendt et al., 1997; Jawad et al., 1998). Such outbreaks tend to occur in areas of high patient acuity such as ICUs, medical oncology wards, and burns units (Bergogne-Berezin and Towner, 1996). *Acinetobacter* has been recently responsible worldwide for sustained outbreaks of infections in intensive care units (ICUs) (Denton et al., 2004). Studies have shown critically ill patients infected with *Acinetobacter* have an increased risk of death compared to non-infected patients (Garcia-Garmendia et al., 2001; Grupper et al., 2007).

While *Acinetobacter* may sometimes be a pathogen in its own right, its isolation generally indicates local colonization and does not require specific treatment (Joly-Guillou, 2005). Identification of *Acinetobacter* in an environment with any frequency is important for several reasons. First, it may cause significant infection particularly in the compromised host (Bergogne-Berezin and Towner, 1996; D'Agata et al., 2000; El Shafie et al., 2004). Second, *Acinetobacter* may develop multi-drug resistance that may be transferred to other more pathogenic Gram-negative organisms (Maragakis et al., 2008). Third, and perhaps more importantly, its presence is a marker of ineffective hand hygiene and environmental cleaning (Getchell-White et al., 1998; Kramer et al., 2002).

In March 2004, the incidence of *Acinetobacter* species colonization identified through routine infection surveillance screening rose sharply from an average of 0.5 ± 0.4 cases per 100 bed-days in the previous six months to 3.1 ± 1.2 cases per 100 bed-days at the ICU of the Royal Melbourne Hospital, Australia. Over a six-month period from March 2004 to August 2004, the mean colonization rate remained elevated (2.4 ± 0.7 cases per 100 bed-days) indicating a sustained outbreak. An ICU-specific infection control nurse role was created to determine potential causative factors, to institute cultural change in health care worker hand hygiene practices and to conduct ongoing surveillance. This paper describes the implementation and outcomes of this infection control strategy.

Method

Setting and ICU infection control nurse role

The ICU of the Royal Melbourne Hospital is a 24-bed adult, combined medical-surgical-trauma unit in a university-affiliated hospital. This ICU admits in the region of 2000 patients per year and employs about 160 nursing and 40 medical staff.

Eight months into the *Acinetobacter* outbreak, two full-time (enabling seven-day cover) senior ICU nurses were appointed to a dedicated infection control position (Fig. 1). The primary objective for the infection control role was to develop and implement a staged action plan that comprised: monitoring and investigation of potential causative factors associated with the outbreak; policy and procedure review including environmental cleaning and reprocessing of respiratory equipment; liaison with existing hospital infection prevention and surveillance team; product evaluation; and ongoing education; evaluation and performance feedback of all multidisciplinary team members to improve compliance with infection control measures with a specific emphasis on hand hygiene. In addition, weekly meetings were held with senior medical and nursing staff to enable discussion of organizational changes.

Prior to commencement in the role, training for the nurses was provided by the hospital infection prevention and surveillance service (IPSS) and the microbiology department. Ongoing mentoring from the IPSS and senior ICU management teams continued throughout the appointment.

Interventions

Environmental cleaning program

Following audit of existing procedures and discussion with hospital housekeeping managers, new environmental cleaning guidelines, policies and learning packages were developed. Specifically, observational audits revealed deficits in discharge cleaning of bed areas (both colo-