American Journal of Infection Control ■■ (2015) ■■–■■

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Original Research Article

Control of endemic extensively drug-resistant *Acinetobacter baumannii* with a cohorting policy and cleaning procedures based on the 1 room, 1 wipe approach

Laura Gavaldà MD, MPH [a,*], Ana M. Soriano RN [a], Jordi Cámara MD [b], Rosa Gasull RN [c], Olga Arch RN [d], Montserrat Ferrer RN [c], Evelyn Shaw MD, MPH, PhD [d], Rosa M. Granada MD [c], M. Angeles Dominguez MD, PhD [b], Miquel Pujol MD, PhD [d]

[a] *Preventive Medicine Department, Hospital Universitari de Bellvitge, Institut d'Investigació Biomèdica de Bellvitge, L'Hospitalet de Llobregat, Barcelona, Spain*
[b] *Microbiology Department, Hospital Universitari de Bellvitge, Institut d'Investigació Biomèdica de Bellvitge, L'Hospitalet de Llobregat, Barcelona, Spain*
[c] *Intensive Care Department, Hospital Universitari de Bellvitge, Institut d'Investigació Biomèdica de Bellvitge, L'Hospitalet de Llobregat, Barcelona, Spain*
[d] *Infectious Diseases Department, Hospital Universitari de Bellvitge, Institut d'Investigació Biomèdica de Bellvitge, L'Hospitalet de Llobregat, Barcelona, Spain*

Key Words:
Acinetobacter baumannii
infection control
disinfection
screening

Background: Our institution experienced an endemic situation with extensively drug-resistant (XDR) *Acinetobacter baumannii* in the intensive care units (ICUs). Here, we describe the long-term results of the implementation of a screening and cohorting policy and new cleaning techniques based on a procedure that we call the 1 room, 1 wipe approach.

Methods: We conducted a 4-year quasi-experimental study in the ICUs of an 800-bed teaching hospital. The main actions implemented were active surveillance of XDR *A baumannii* and cohorting of carriers and introducing new cleaning techniques intended to avoid sharing wipes between rooms.

Results: XDR *A baumannii* significantly decreased from 132 cases in 2011 to 8 cases in 2014 and from 10.78 cases per 1,000 patient days in 2011 to 0.69 cases per 1,000 patient days in 2014. Segmented regression analysis showed that after implementing the measures, the monthly rates presented a sustained negative slope, with a significant change of –0.623 ($P = .002$).

Conclusions: The prompt identification and isolation of patients and adequate environmental cleaning are effective measures for reducing XDR *A baumannii* in ICUs. The 1 wipe, 1 room approach should be considered a standard measure for cleaning hospital facilities to avoid cross-transmission as a result of reusable cleaning wipes.

Extensively drug-resistant (XDR) *Acinetobacter baumannii* is a significant pathogen capable of causing multiple health care–associated infections. The epidemiology of *A baumannii* has been thoroughly reviewed, but it remains a serious concern in hospitals because of its persistence on inanimate surfaces and its propensity to cause outbreaks.[1,2] Hand hygiene, contact precautions, active patient screening, and good environmental cleaning practices are the most accepted measures for controlling XDR *A baumannii* in endemic or epidemic scenarios.[3] However, the relative importance of each of these efforts is not well known because they are usually implemented in a simultaneous and complementary way.[4-9] In addition, most studies do not provide a detailed description of the methodology used for improving cleaning practices, whereas the role of hospital surfaces in the transmission of *Acinetobacter* spp is well established.[10]

We present the results of enhancing 2 previously described measures for controlling XDR *A baumannii* in intensive care units (ICUs): screening, and cohorting and improving environmental cleaning. For the latter purpose, we specifically highlighted the organizational measures at the workplace and the introduction of new cleaning techniques, which allowed us to apply a procedure that we call the 1 room, 1 wipe approach.

METHODS

Setting and study design

The study was performed at the ICUs of Bellvitge Hospital, an 800-bed referral teaching hospital located in the metropolitan area

* Address correspondence to Laura Gavaldà, MD, MPH, Preventive Medicine Department, Hospital Universitari de Bellvitge, Feixa Llarga, s.n. 08907 L'Hospitalet de Llobregat, Barcelona, Spain.
E-mail address: lgavalda@bellvitgehospital.cat (L. Gavaldà).
Conflicts of Interest: None to report.

0196-6553/
http://dx.doi.org/10.1016/j.ajic.2015.11.036

of Barcelona, Spain, and belonging to the Catalan Public Health System. The hospital initially had 4 medical-surgical areas with 12 rooms each, but in December 2011, 1 unit was permanently closed.

We conducted a 4-year quasi-experimental study. The preintervention period included a 13-month follow-up from January 2011-January 2012. The postintervention period spanned from February 2012, when a bundle of interventions began, to December 2014.

Definitions

XDR *A baumannii* was defined as an isolate resistant to all currently available antimicrobials (including carbapenems), with the exception of colistin.[11] A specimen was considered to be nosocomially acquired if it was recovered from a patient who was hospitalized for ≥48 hours at the ICU.[12]

XDR A baumannii *surveillance and standard environmental control strategies*

Systematic surveillance for XDR *A baumannii* was established at the ICUs in 1992.[13] After a period of high endemicity, XDR *A baumannii* rates were quite stable. However, in 2011, an unexplained increase in new cases forced the development of new efforts for controlling the microorganism. The standard environmental control strategies for XDR *A baumannii* were mainly based on cleaning policies (Table 1). Remarkably, cleaning solutions and cloths were shared between different rooms, except for isolated patients.

Bundle of interventions

In December 2011, a multidisciplinary task force was established to determine the main control strategies. The group was formed by the medical and nursing directors, the director of environmental services, the nurse managers and physician leaders of the ICUs, and the physicians and nurses of the infection control team. Because of the needs of the accorded control policies, 2 different subgroups were then created and met on a weekly basis from January 2012-May 2012. One group coordinated the screening, isolation, and cohorting practices. The second group was responsible for the cleaning policies. One particular task of this group was to agree on the specific responsibilities and allocation of cleaning duties of the auxiliary nurses and housekeepers because there was some confusion about who had to clean some particular items. For this purpose, the equipment inventory of the 3 units was reviewed and updated. The bundle of interventions were implemented as follows.

Thorough environmental cleaning

In-depth environmental cleaning was started in February 2012, after a staggered schedule, to maintain the normal function of the 3 units. In summary, it consisted of increasing the cleaning frequency of high-touch surfaces (6 times per day instead of 3 times per day) and cleaning all of the rooms according to the contact precautions policy when the patient was discharged. For each unit, these measures were maintained during 15 days and until all of the rooms were cleaned. At the end of March 2012, the 3 units were considered to be clean areas.

Screening, isolation, and cohorting policies

Screening cultures were performed on a regular basis from February 2012-September 2013. Because of the emergence of a 3-case cluster of XDR *A baumannii* infections in August 2014, active surveillance was again implemented from September 2014 onward. Rectal swabs were obtained from patients admitted to the ICUs during the first 48 hours after admission and weekly thereafter. Rectal swabs were plated on MacConkey agar supplemented with 4 mg/L of gentamicin and were incubated at 37°C for 48 hours. Colonies were then selected based on their morphology. Isolates were identified as *A baumannii* on the basis of standard biochemical reactions, on their ability to grow at 44°C, and by the MicroScan Walkaway system (Beckman Coulter, Brea, CA). The antimicrobial susceptibility was studied by an automated microdilution method (MicroScan) following the European Committee on Antimicrobial Susceptibility Testing recommendations and criteria.[14] Any patient

Table 1
Summary of cleaning policies of auxiliary nurses and housekeepers during the study period

Study period	Cleaning technique	Sharing practices
Auxiliary Nurses		
Preintervention period	Application of a manually prepared solution of water and detergent with a reusable cotton cloth. Rinse with a different wet cloth. Disinfection using gauze with 70% ethyl alcohol.	Cleaning solutions and cloths were shared between different rooms, except for isolated patients. Gauzes were discarded after use. Cloths were manually disinfected with a 0.1% hypochlorite solution.
Postintervention period		
February 2012-May 2013	Same technique as in the preintervention period.	Cleaning solutions and clothes were discarded between different rooms. Gauzes were discarded after use. Cloths were manually disinfected with a 0.1% hypochlorite solution.
June 2013-December 2014	Routine cleaning: ready-to-use disinfectant wipes with cationic surfactant tensioactives, quaternary ammonium compounds, and polymeric biguanide (Clinell Universal Wipes; GAMA Healthcare, London, UK). Terminal cleaning: detergent and disinfectant foam with quaternary ammonium compounds and biguanide chlorhydrate (Surfa'Safe; Anios, Lille-Hellemmes, France) applied with a single-use cellulose wipe (DuPont Sontara, Basel, Switzerland).	Wipes were directly applied on the surface and discarded after use, without an additional rinse. They were never shared between different rooms.
Housekeepers		
Preintervention period	Double-bucket technique: 1 bucket containing a 0.1% chlorine solution with detergent and the other containing rinse water. The same cotton cloth is soaked in the cleaning solution but had always had to be rinsed previously in the water bucket.	Cleaning solutions and cloths were shared between different rooms, except for isolated patients. Cloths were manually disinfected with a 0.1% hypochlorite solution.
Postintervention period	Microfiber cleaning system (TTS bucketless system; TTS, Santa Giustina in Colle, Italy): the appropriate number of microfiber cloths for cleaning a previously defined specific area are provided. Clean cloths are soaked in a basin containing 0.1% chlorine solution. Dirty cloths are placed in a bag on the cart and sent to the laundry.	For each room, 2 different cloths were used. They were never shared between different rooms. All cleaning solutions were prepared in a central cleaning station. Cloths were laundered according to the manufacturer's recommendations and stored in a unique warehouse.