

Acinetobacter spp

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Risk Factors Associated with the Acquisition of Multi-Drug Resistant *Acinetobacter baumannii* Bloodstream Infections

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Background

A.baumannii is becoming an important healthcare-associated pathogen worldwide.

Objectives

To determine risk factors, co-morbidities, and outcomes of patients with MDR-AB BSIs.

Methods

Two-year, retrospective case-control analysis of all blood cultures positive for *A. baumannii* at a tertiary care medical center. Each case was matched to 2 controls. Patients admitted for less than 48 hours were excluded. Demographic, clinical, and microbiological data were obtained from medical record review. In the univariate analysis, continuous variables were analyzed using the student's t-test, while categorical variables were analyzed using χ^2 or Fisher's exact tests. All tests were two-tailed with $p < 0.05$ considered significant. Variables with $p < 0.30$ were inserted into a stepwise multiple logistic regression model.

Results

30 cases were identified and matched with 60 controls. Cases had a mean number of hospital days before positive culture of 15.0. 56.7% of cases had pan-resistant isolates. There were no differences in age, gender, and race. By univariate analysis, cases were more likely to be residents of long term care facilities ($p=0.01$), more likely to be in the SICU ($p<0.001$), less likely to be on a surgical floor ($p<0.001$), and have had a longer length of stay (31.8 vs. 7.6 days, $p<0.001$) and a previous ICU stay ($p<0.001$). Underlying renal insufficiency ($p<0.001$), hemodialysis ($p<0.001$), hepatic dysfunction ($p=0.008$), history of trauma ($p=0.01$), central venous catheter ($p<0.001$), endotracheal tube ($p<0.001$), tracheostomy ($p=0.04$), nasogastric tube ($p<0.001$), and PICC line ($p=0.03$) were also more likely to be found in cases. Cases were previously treated with a higher number of antibiotics (3.4 vs 1.9 antibiotics, $p<0.001$) and had a higher number of previous antibiotics days (11.3 vs. 4.8 days, $p<0.001$). They were more likely to have been treated with cefepime ($p=0.03$), vancomycin ($p<0.001$), carbapenems ($p=0.01$), and piperacillin/ tazobactam ($p<0.001$). 100% of the cases fit the criteria for septic inflammatory response syndrome (SIRS), and 33% of cases fit the criteria for septic shock. Cases had a higher APACHE II score (20.2 vs 7.4, $p<0.001$) and a higher crude mortality rate during hospitalization (26.7% vs. 1.7%, $p<0.001$). Multivariate analysis revealed APACHE II score ($p<0.001$), location in the SICU ($p=0.003$), location in the NSICU ($p=0.01$), and the presence of a PICC line ($p=0.01$) were independently associated with MDR-AB BSI's. Molecular analysis of 21 available isolates revealed 4 strains and some clonality within certain hospital locations.

Conclusions

These findings suggest that ill patients with exposure to antibiotics and certain locations are more at risk for MDR-AB BSI's, emphasizing the importance of infection control

measures, such as isolation, hand hygiene, and limitation of invasive devices, in preventing hospital acquired MDR-AB BSI's.

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Active Surveillance Cultures to Detect Multidrug-Resistant Acinetobacter (MDR-ACIN)

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Background

Patients colonized with antimicrobial-resistant (MDR) organisms often go unrecognized and can serve as reservoirs for healthcare-associated transmission (HAT) of pathogenic organisms. Active surveillance cultures (ASC) are often used in the outbreak setting to interrupt transmission of MDR organisms and are used to control HAT of endemic MDR gram-positive organisms such as methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococcus* (VRE). ASC are not routinely used for MDR gram-negative organisms such as MDR-ACIN.

Objective

To implement a pilot program of ASC combined with isolation precautions for patients found to be colonized or infected with MDR-ACIN and to determine if location prior to admission can identify a group of patients at high risk for infection or colonization with MDR-ACIN at the time of hospital admission.

Methods

Between March 6 and June 30, 2006, 5 hospital units performed ASC, for each patient upon admission and weekly, from the axilla and from wounds, sputum, and endotracheal suction (ETS) if available. MDR-ACIN was defined as *Acinetobacter* isolates susceptible to no more than one class of antimicrobial agents, excluding colistin. Isolation precautions were implemented for patients infected or colonized with MDR-ACIN. Location prior to admission was abstracted from medical records.

Results

Of the 1601 admissions or transfers to the study units, axilla ASC for MDR-ACIN were obtained within 24 hours of admission or transfer in 82.5%. Admission cultures that grew MDR-ACIN were: axilla 3/1156 (0.3%); wound 3/49 (6.1%); and ETS 1/18 (5.6%). 5 patients with a prior history of MDR-ACIN were admitted to the study units and 4 (80%) grew MDR-ACIN again. 8 patients were newly identified with MDR-ACIN during the study; 4 (50%) were identified by surveillance cultures alone. Of the 13 patients with MDR-ACIN, 69% had been in a long-term care facility (LTCF) within the preceding 6 months. This compares to 15% of control patients without MDR-ACIN (OR=12.4, $p<0.001$). Paraplegia was also a risk factor for MDR-ACIN (OR=22, $p<0.0001$). The majority of patients with MDR-ACIN were co-colonized with other MDR pathogens: MRSA (62%), VRE (77%), and extended-spectrum beta-lactamase (ESBL) gram-negatives (39%).

Conclusions

ASC of axilla, wound, and ETS identified twice as many patients with MDR-ACIN during this study when compared with using clinical cultures alone. We found high rates of co-colonization with MDR-ACIN, MRSA, VRE, and ESBL gram-negatives. Residing in a

LTCF within the preceding 6 months and paraplegia were significant risk factors for colonization with MDR-ACIN. Screening patients for recent LTCF exposure or paraplegia and targeting active surveillance cultures for MDR organisms and isolation precautions to this population may be an effective strategy to prevent transmission of MDR pathogens in the hospital.

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Risk Factors for Acquisition of Multi-Drug Resistant *Acinetobacter baumannii* During a Hospital-Wide Outbreak

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Background

In August 2005, an increase in multi-drug resistant *A. baumannii* was noted during surveillance of clinical microbiology cultures. To identify risk factors, an investigation by Barnes-Jewish Hospital (BJH) Infection Control was performed.

Objectives

To assess characteristics and risk factors for multi-drug resistant *A. baumannii* acquisition during a hospital-wide outbreak

Methods

Case finding and molecular typing identified 19 patients from 11/15/04 to 10/8/05 with a highly related strain of multi-drug resistant *A. baumannii*. A 1:3 case-control study was performed. Uninfected controls were matched based on nursing unit and hospitalization at the same time as cases. Additional clinical and laboratory data were gathered from charts and the hospital Informatics Database. Data were analyzed using SPSS v12.0 (SPSS Inc, Chicago, IL).

Results

Molecular typing of *A. baumannii* from saved blood culture isolates showed the outbreak strain was present at BJH since 8/04. All isolates were resistant to fluoroquinolones, all cephalosporins, trimethoprim/sulfa, and piperacillin/tazobactam. 17 isolates (89%) were resistant to gentamicin, 13 (68%) to imipenem, and 12 (63%) were resistant to both drugs. 9 of 19 cases (47.4%) were from ICUs. Independent risk factors associated with being a case included previous stay in an extended care facility (ECF) (odds ratio (OR) 6.07, 95% confidence interval (CI) 1.64-22.44), requiring mechanical ventilation (OR 5.18, 95% CI 1.63-16.47) or a central venous catheter (CVC) (OR 1.43, 95% CI 1.22-1.68), and tracheostomy (OR 7.65, 95% CI 2.22-26.32). Cases were also more likely than controls to receive vancomycin (OR 3.88, 95% CI 1.02-14.82), cefepime (OR 13.16, 95% CI 3.85-44.94), or metronidazole (OR 3.38, 95% CI 1.12-10.17). The mean length of hospital stay for case patients was longer (64 vs 15 days, $p < 0.01$), and crude mortality was higher (53% vs 19%, $p < 0.01$) than for controls.

Conclusions

Retrospective molecular analysis of stored blood isolates showed that a clonal strain of multi-drug resistant *A. baumannii* was endemic in our hospital for at least a year prior to

an outbreak. Risk factors for acquisition of the outbreak strain were related to mechanical ventilation and CVC use. Vancomycin and cefepime are the most common empirical antibiotics used in our hospital and may be an indirect marker for severity of illness. Cases were more likely to stay at an ECF in the 12 months prior to the current hospitalization suggesting the possibility of a broader dissemination of this clone in the local healthcare system.

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Intensification of Infection Control to Reduce Multi-Drug Resistant *Acinetobacter baumannii* in a Medical Intensive Care Unit

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Background

Multi-drug resistant *Acinetobacter baumannii* (MDR-AB) has become a major cause of healthcare-associated infections (HAI), especially in the intensive care unit setting. A recent increase and clustering of cases in our medical intensive care unit (MICU) prompted reevaluation of infection control (IC) practices with an intensification of compliance with isolation practices, environmental cleaning, and hand hygiene.

Methods

Continuous surveillance for HAIs due to MDR-AB and other MDR pathogens is routinely conducted within this 25 bed MICU, housed within a 1000 bed academic medical center. Upon identification, routine contact precautions were instituted. When a cluster of cases became apparent in early 2006, routine IC was assessed and an intense education campaign was initiated by IC and MICU nursing staff to increase compliance with these practices. Gloving and gowning were required for any person crossing the threshold of the room whereas previously only gloves were often used for minor contact (e.g. adjusting the ventilator setting or turning off an alarm). Signage and awareness was greatly increased. Supplies in each room were reduced considerably to avoid waste and were transferred from a clean attendant to an in-room dirty attendant. Cleaning of rooms after each case was intensified. Hand hygiene was emphasized. Shifting of responsibility for compliance from IC personnel to MICU nursing staff was viewed as a major component of the intervention.

Results

The study period was June 2005 to September 2006. Prior to January 2006, cases of MDR-AB were only seen sporadically with a total of 4 cases from June 2005 to December 2005 (rate= 0.8 cases per 1000 patient days). From January 2006 to May 2006 the number of cases dramatically increased to a total of 34 (rate=9.96). Beginning in May 2006 intensification of infection control practices were initiated and a subsequent decrease in cases were noted. From June 2006 to September 2006 only 6 cases were detected (rate=2.2). Intensification of IC practices continues to the present.

Conclusions

Intensification of infection control efforts were required to control an outbreak of MDR-AB in a large MICU. This intervention was most successful because of collaboration between IC and MICU staff with a shifting of responsibility for compliance to MICU nursing staff. This shift confirms a concept well recognized for the successful

implementation of performance improvement interventions. Frequent assessment of compliance with IC practices may be required to control MDR-AB and other resistant pathogens in the ICU setting.

Acinetobacter baumannii
MICU
June '05 - September '06

