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SHORT REPORT

# Prevalence of nosocomial infection in Latin American intensive care units

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Nosocomial infections (NI) continue to cause significant morbidity, mortality, and added costs in the health care setting. Half of all life-threatening nosocomial bloodstream infections and pneumonias occur in intensive care units (ICU's), despite ICU's representing only 15 to 20% of all hospital beds.[1]

The primary objective of this study was to obtain prevalence data for NI from a group of Latin American (LA) mixed ICU's. The participating hospitals were from Argentina (n=3), Bolivia (n=1), Chile (n=2), Colombia (n=10), Costa Rica (n=1), Ecuador (n=9), Perú (n=5) and Venezuela (n=1).

The physicians used a standardized non-commercial website form (http://www.clinicalrec.com; PRIDEH® program) that included all the patients with NI (demographic data, risk factors for infection due to MDR pathogens [Table I], presence of indwelling devices, type of NI, microbiological documentation and antibiotic treatment of the NI).

NI was defined as an infection arising ≥48h after admission to hospital that was neither present nor incubating on admission. NI was confirmed if the patient had signs and symptoms which met the Centres for Disease Control and Prevention (CDC, Atlanta, GA, USA) definition at the time of survey, or, who had one or more signs or symptoms included in the CDC definition and was being treated with an antimicrobial.[2]

For the analysis, carbapenems, vancomycin, piperacillin-tazobactam, broad-spectrum cephalosporins, tigecycline, polymixins and linezolid were considered as "restricted antibiotics" based on their epidemiological and economical implications in the hospitals.

Results are expressed as proportions. When applicable, two tailed hypothesis testing for difference in proportions was used (Proportion Test); a $p$ value of $<0.05$ was considered significant.

On the day of the survey (October 21, 2010), 32 ICU's participated and recruited 1017 adult patients (≥18y); with a mean length of stay (LOS) from admission of 9.2 days (range: 0–38). Seven hundred and seventy-one patients (72%) were hospitalized ≥48h.

The prevalence of patients with NI was 11.6% (90/771; 95 confidence interval: 9.3–14) (Table II). Patients' median age was 50.5 years (range 13-88); 56

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**Table I. Main risk factors for multidrug-resistant pathogens in hospitalized patients**

| |
|---|
| Previous antimicrobial therapy in preceding 90 days |
| Hospitalization for 2 days or more in the preceding 90 days |
| Invasive procedures (haemodialysis included) |
| Residence in a nursing home or extended care facility |
| Inmunosuppression |
| Previous surgical procedures |
| Home infusion therapy (including antibiotics) |

*Modified from American Thoracic Society; Infectious Diseases Society of America. Am J Respir Crit Care Med. 2005;171:388-416.*

were male (62.2%). Ninety percent of admission were emergencies (81/90); 52% (47/90) were surgical; 27% (24/90) respiratory; 15.5% (14/90) neurologic; and 5.5% (5/90) cardiac.

The prevalence of risk factors for infections due to MDR pathogens was 100%. Hospitalization in an acute care hospital for ≥2 days within 90 days; intravenous antibiotic therapy, and immunosuppressive illness or therapy were the commonest risk factors (44%, 31% and 18% respectively). Forty-nine patients (54%) had 2 - 4 risk factors for infections due to MDR pathogens. 84.5% of patients were on ventilators (76/90; mean 12.2 days), 91% (82/90; mean 9.2 days) had urinary catheters, 89% (80/90; mean 9 days) intravenous catheters; and the prevalence of other invasive devices was 43% (39/90; mean 10 days). The LOS in ICU from admission to the diagnosis of NI was 6.3 days (range 3-13).

Of all NIs, 53% (48/90) were nosocomial pneumonia, 32 of which (67%) were ventilator-associated (VAP); 18% (16/90) were bloodstream infections (BSI), 13% (12/90) were surgical site infections (SSI), 10% (9/90) were urinary tract infections (UTI) and 6% (5/90) others. No patients had ≥2 NIs (Table II).

Eighty-one samples for bacterial culture were obtained from 63 patients (70%) before starting antibiotic therapy; 39% of the samples (32/81) were from the respiratory tract (tracheal aspirate [33%], bronchoalveolar lavage (BAL) [1.2%], and mini-BAL [4.8%]), whereas 37% (30/81) and; 6% (5/81) were from blood and skin or soft tissue respectively.

Thirteen samples (16%) yielded no pathogens and for 8 (10%) the results were pending at the time of the study, leaving 60 (74%) from which a pathogen had been isolated (81% of respiratory tract samples and 67% of blood cultures) (Table II). The commonest pathogens were extended-spectrum b-lactamase producing (ESBL) enterobacteriaceae (*Klebsiella pneumoniae* and *Escherichia coli)* (30%); *Acinetobacter* spp. (22%), meticillin-resistant *Staphylococcus aureus* (MRSA) (17%), and *Pseudomonas aeruginosa* (16%). Fifty-one percent of the *Acinetobacter* spp. and 32% of the *Pseudomonas aeruginosa*, were resistant to carbapenems (Table II).

Eighty-three percent of the patients with NI (75/90) received "restricted antibiotics", (≥3 days of treatment in 64/75 patients [85.3%], and <3 days of treatment in 11/75 patients [14.7%]).

Carbapenems were the most frequently prescribed antibiotics (33/90, 36.6%), followed by broad-spectrum cephalosporins (mainly cefepime) (20/90, 22.2%), vancomycin (18/90, 20%) and piperacillin/tazobactam (9/90, 10%) (Table II). In 50% of the cases (45/90) a combination of at least two antibiotics was used.

At the time of the study, the patients had received antibiotic for an average of 6.1 days (range 4-8).

**Table II. General and infection data of patients**

| Characteristics | *Value* |
|---|---|
| Number of patients recruited, n | 1017 |
| Number of patients hospitalized ≥48h, n/total (%) | 771/1017 (72) |
| Number of patients with nosocomial infection, n/total (%) | 90/771 (11.6) |
| Use of invasive device, | |
| • Urinary catheter, n/total (%) | 82/90 (91) |
| • Central venous catheter, n/total (%) | 80/90 (89) |
| • Mechanical ventilator, n/total (%) | 76/90 (84.5) |
| • Other, n/total (%) | 39/90 (43) |
| Type of nosocomial infection, | |
| • Nosocomial pneumonia, n/total (%) | 48/90 (53) |
| • Bloodstream infection, n/total (%) | 16/90 (18) |
| • Surgical site infection, n/total (%) | 12/90 (13) |
| • Urinary tract infection, n/total (%) | 9/90 (10) |
| • Other; n/total (%) | 5/90 (6) |
| Clinical Isolates, | |
| • n isolates/ n total positive cultures | 77/60 |
| ESBL[1]-producing Enterobacteriaceae, n/total (%) | 23/77 (30) |
| Acinetobacter spp. | 17/77 (22) |
| • carb-R[2]-Acinetobacter spp. | 9/17 (51) |
| • carb-S[3]-Acinetobacter spp. | 8/17 (49) |
| MRSA[4] | 13/77 (17) |
| Pseudomonas aeruginosa, n/total (%) | 12/77 (16) |
| • carb-R[4]-P.aeruginosa , n/total (%) | 4/12 (32) |
| • carb-S[5]-P.aeruginosa, n/total (%) | 8/12 (68) |
| Other, n/total (%) | 12/77 (15) |
| Antibiotic treatment | |
| • Carbapenems (imipenem or meropenem)[5] | 33/90 (36.6) |
| • Broad-spectrum cephalosporins[5] | 20/90 (22.2) |
| • Vancomycin[5] | 18/90 (20) |
| • Piperacillin-tazobactam[5] | 9/90 (10) |
| • Fluoroquinolones | 9/90 (10) |
| • Ampicillin-sulbactam | 9/90 (10) |
| • Aminoglycosides[5] | 8/ (9) |
| • Others | 29/90 (32) |

[1] extended-spectrum ß-lactamases (*Klebsiella pneumoniae* and *Escherichia coli*)
[2] carbapenems-resistant
[3] carbapenems-susceptible
[4] meticillin-resistant *S. aureus*
[5] alone or in combinations with other antibiotic

Previously published studies show a wide range of prevalence of NI in general hospitals (i.e. between 5% and 20%).[3] As would be expected, similar prevalence rates were observed in Latin American ICU's (27% and 23.2% in Argentina and Mexico respectively).[4,5] We acknowledge that the lower observed rate in our study (~11%) might be due to a lower sensitivity of diagnosis of infections made by sometimes insufficiently trained ICPs.

All our patients had at least one risk factor for infection with MDR bacteria; mainly hospitalization for ≥ 2 days and previous antibiotic treatment within the past 90 days. In addition, we found high device utilisation rates comparable with other recent studies (near 90% for mechanical ventilation, urinary catheter and central venous catheter use).[6]

Nosocomial pneumonia (mainly ventilator-associated pneumonia), was the commonest infection, accounting for more than half of NI. This is often associated with extrinsic risk factors arising from invasive procedures associated with mechanical ventilators and is considered to have the greatest potential for reduction. Knowledge of this risk allows for infection prevention and control planning for ICUs. Like other authors,[4,5] we found two preventable infections, BSI and SSI were the other principal types of NI present.

MDR-Gram negatives and MRSA were the commonest microorganisms isolated in our patients (83.5%). The TEST program also found that the prevalence of carbapenems-resistant *A. baumannii* in the region has increased markedly, along with that of carbapenem-resistant strains of *P. aeruginosa* and *K. pneumoniae*.[7]

We observed that "restricted" antibiotics (mainly carbapenems), were prescribed for ≥3 days in near 90% of infected patients. The rationale of this could be studies suggesting the advantages of starting with "the best and most powerful" antibiotic treatment in terms of favourable clinical outcome.[8]

Our web-based method for collection of one-day point prevalence was implemented successfully. However, our results must be taken with caution. It is difficult to compare ICU's with different case mix of patients and staff education in hospital epidemiology. We hope that the limitations of our current study may generate enthusiasm for prospective studies, with more robust designs, in order to improve our knowledge on NI in LA ICUs.

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