Epidemiology and Outcomes of Bacteremia in Patients With Nosocomial Pneumonia Due to *Pseudomonas aeruginosa*

Poster #1643

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BACKGROUND

- Recent trends show an increase in the prevalence of nosocomial pneumonia (NP) caused by multidrug-resistant (MDR) bacteria, most commonly *Pseudomonas aeruginosa* with documented resistance to β-lactams, carbapenems, aminoglycosides, and fluoroquinolones.[1-3]
- The therapeutic effectiveness of current therapies for NP are limited by the increasing prevalence of pathogens that express extended-spectrum β-lactamases (ESBLs), AmpC β-lactamases, or methicillin resistance, emphasizing the need for development of new and effective antimicrobials.
- Initial empirical antibiotic treatment for NP may include the use of cephalosporins, aminoglycosides, fluoroquinolones, penicillins, or carbapenems, alone or in combination. Antibiotic selection is typically individualized based on a given patient's risk factors for MDR pathogens and local susceptibility patterns.
- Prompt and adequate initial antimicrobial therapy has been shown to reduce mortality and improve morbidity associated with NP.[4]

OBJECTIVE

- To evaluate epidemiology and outcomes of hospitalized patients with NP due to *P. aeruginosa* who developed secondary bacteremia due to *P. aeruginosa*.

METHODS

Study Design

- This retrospective multicenter, hospital-based, medical record abstraction study collected data on hospitalized patients with a clinical diagnosis of NP comprising hospital-associated pneumonia (HAP), ventilator associated pneumonia (VAP), and healthcare-associated pneumonia (HCAP), due to *P. aeruginosa*.
  - HAP was defined as pneumonia that occurred more than 48 hours after admission.
  - VAP was defined as pneumonia that occurred more than 48 hours after endotracheal intubation.
  - HCAP was defined as pneumonia that occurred in patients who were hospitalized in an acute care hospital for 2 or more days within 90 days of the infection; resided in a nursing home or long-term care facility; received recent intravenous antibiotic therapy, chemotherapy, or wound care within the past 30 days of the current infection; or attended a hospital or hemodialysis clinic.

METHODS (cont'd)

Participating Sites

- France: Groupe Hospitalier Pitié-Salpêtrière, Hôpital Raymond-Poincaré
- Germany: University Hospital of Munich, Medizinische Hochschule Hannover
- Italy: Policlinico Universitario A. Gemelli, Azienda Ospedaliera Universitaria Pisana
- Spain: Hospital Universitari Mutúa de Terrassa, Hospital Vall d'Hebron, Hospital Clínic de Barcelona
- United States: Barnes-Jewish Hospital, Mayo Clinic, Northwestern Memorial Hospital

Inclusion Criteria

1. Age 18 years or older
2. Admitted for index hospitalization 36 months prior to study initiation at each site
3. Clinical diagnosis of NP, defined as findings consistent with pneumonia on chest x-ray or computed tomography scan, and either temperature >38.3°C or leukocytosis >10,000 cells/mm^3, or both
4. Microbiological cultures (qualitative or quantitative) obtained within the 24-hour period after initiation of antibiotics
5. *P. aeruginosa* organism cultured from a respiratory specimen, including sputum, pleural puncture, flexible bronchoscopy with protected specimen brush, bronchoalveolar fluid, "mini-BAL" (bronchoalveolar lavage) or transbronchial biopsy, and tracheobronchial aspirate in intubated patients

Key Variable Definitions

- Susceptibility[5] was as described in medical records based on local laboratory results:
  - Resistant (R) was defined as resistant or intermediate susceptibility to 1 or 2 antibacterial drugs.
  - MDR was defined as resistant or intermediate susceptibility to at least 1 drug in ≥3 anti-pseudomonal classes.
  - All other infections were defined as susceptible (S).
- Appropriate therapy was defined as an antibiotic that was initiated within 24 hours of the diagnosis date and demonstrated in vitro activity.

RESULTS

Table 1. Patients' Baseline Characteristics by *P. aeruginosa* Bacteremia Status

	Secondary Bacteremia (n = 176)	No Bacteremia (n = 486)
Age, y, mean (SD)	59 (15)	59 (17)
Gender, male, n (%)	114 (65%)	336 (69)
Location prior to hospitalization, n (%)		
Home	106 (61)	219 (46)
Skilled nursing facility	10 (6)	35 (7)
Long-term care facility	6 (3)	21 (4)
Assisted living	1 (1)	6 (1)
Inpatient rehabilitation	5 (3)	42 (9)
Other	47 (27)	158 (33)
Unknown	1 (1)	5 (1)
Coexisting conditions, n/N (%)		
Sepsis	34/171 (20)	72/428 (17)
Acute coronary syndrome	42/172 (24)	34/415 (8)
Valvular heart disease	31/172 (18)	40/419 (10)
Hypertension	91/173 (53)	212/462 (46)
Venous thromboembolism	21/171 (12)	26/429 (6)
COPD/asthma	49/172 (28)	103/434 (24)
Other respiratory disease	58/169 (34)	117/418 (28)
Diabetes	56/169 (33)	136/429 (32)
Chronic kidney disease	41/171 (24)	100/422 (24)
Chronic liver disease	20/169 (12)	68/405 (17)
NP category, n (%)		
HAP	43 (24)	102 (21)
HCAP	86 (49)	105 (22)
VAP	47 (27)	279 (57)
Hospitalized in prior 6 months, n/N (%)	95/164 (58)	236/405 (58)
Antimicrobials in prior 30 days, n (%)	58 (33)	167 (34)
Admitted to ICU, n (%)	74 (42)	416 (86)

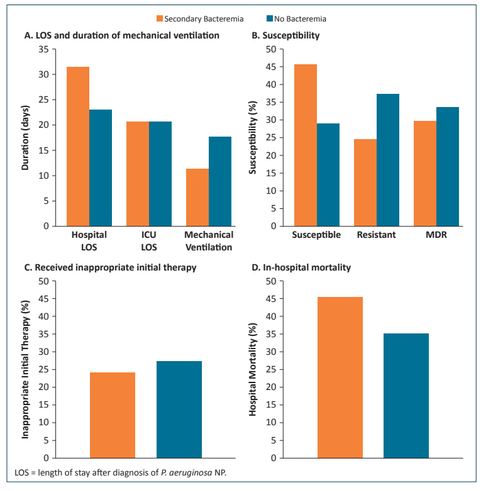
COPD = chronic obstructive pulmonary disease; ICU = intensive care unit.

Table 2. Antibiogram by *P. aeruginosa* Bacteremia Status

		Aminoglycoside	AP-PCN + β-lactamase Inhibitor	Carbapenem	AP Cephalosporin	Fosfomycin	Aztreonam	Ciprofloxacin	Colistin
Secondary bacteremia	No. isolates (susceptible %)	173 (71)	170 (66)	172 (66)	172 (77)	16 (63)	71 (39)	174 (70)	74 (100)
No bacteremia	No. isolates (susceptible %)	478 (71)	473 (66)	482 (59)	478 (70)	175 (63)	294 (55)	470 (66)	292 (93)

Aminoglycoside: amikacin, gentamicin, tobramycin.
Antipseudomonal penicillin (AP-PCN) + β-lactamase inhibitor: piperacillin/tazobactam, ticarcillin/clavulanate.
Carbapenem: doripenem, imipenem/cilastatin, meropenem.
Antipseudomonal cephalosporin: cefepime, ceftazidime.

Figure 1. Patient Outcomes by *P. aeruginosa* Bacteremia Status



LOS = length of stay after diagnosis of *P. aeruginosa* NP.

CONCLUSIONS

- Patients with *P. aeruginosa* NP who developed secondary bacteremia due to *P. aeruginosa* infection were more likely to present with HCAP and to die during hospitalization. Among survivors, length of hospital stay was longer in patients with bacteremia.
- In this sample of patients, the development of bacteremia due to *P. aeruginosa* infection during hospitalization was not associated with some expected characteristics such as older age, prior hospitalization, recent antibacterial treatment, increased ICU admission, increased *P. aeruginosa* antibacterial resistance, or lack of appropriate initial antibacterial therapy.
- The inability to predict development of bacteremia presents a therapeutic challenge in the treatment of patients with *P. aeruginosa* NP.

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