development of animal models by describing the natural history of disease and therapeutic validation.

Fig. 1. Natural history of P aeruginosa acute pneumonia: lung morphology (A), lung bodyweight ratio (B), lung (C), and kidney (D) bacterial tests, and hemoplasia (E).

Fig. 2. Therapeutic validation comparing mortality rate of rabbits treated by saline, tobramycin, and meropenem.

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2203. Patient-Specific Risk Stratification to Identify Patients at High and Low Risk for P aeruginosa in Community-Acquired Pneumonia

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Session: 244. Bacterial Respiratory Infections
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Background. Pseudomonas aeruginosa (PsA) is an infrequent pathogen associated with poor outcomes in community-acquired pneumonia (CAP). Identifying patients at high and low-risk for PsA in CAP is necessary to reduce inappropriate and overly broad-spectrum antibiotic use. We evaluated the distribution of risk-factors in hospitalized CAP patients with and without PsA infection.

Methods. Design: retrospective, single-center, case–control study. Inclusion: hospitalized CAP patients admitted to the general medicine wards between January 1, 2014 and May 29, 2018. Exclusion: cystic fibrosis, ≥3 admissions within 30 days, CAP requiring ICU admission, and death within 48 hours of admission. Case patients had PsA in respiratory or blood cultures during the index CAP admission. Controls were randomly selected targeting a 3:1 ratio. Comorbidities, pneumonia severity index, and m-APACHE II were assessed. Gram-negative risk factors defined by Shindo et al. 2013 (PMID: 23855620) and validated by Kobayashi et al. (2018; PMID: 30349327) were scored for each patient. Stepwise logistic regression was used to identify covariates that distinguished cases from controls at a threshold of P ≤ 0.2; these were then used to generate propensity weights (i.e., inverse-probability conditioned on covariates). Unadjusted and adjusted odds ratios for case status were estimated using logistic regression according to: the total number of risk factors present and threshold values, respectively. All analyses were conducted using IC Stata (v.14.2).

Results. 54 cases and 152 controls were included. The distribution of the patient-specific sum of risk factors for PsA is shown in Figure 1. The univariate OR for case status was 4.29 (95% CI:1.55–11.9) at n = 3 risk factors, which was similar after propensity weight adjustment [aOR = 4.64 (95% CI: 1.32–16.3)]. The univariate OR of case status was 2.98 among patients with ≥ 3 risk factors (95% CI: 1.34–6.62), which was similar after propensity weight adjustment [aOR = 2.8 (95% CI: 1.02–7.72)], and correct classification was 73.8%.

Conclusion. PsA risk-stratification on CAP outcomes and appropriate antibiotic use should be evaluated.

Fig. 1. Risk Factor Distribution by Case Status

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2204. Microbiology of Pneumonia Due to Co-Infection in the ICU: Impact of Host Immune Status

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Background. Pneumonia epidemiology is increasingly showing the presence of co-infection due to the utilization of emerging diagnostic modalities such as multiplex polymerase chain reaction (PCR) panels. However, the prevalence and clinical significance of co-infection with respect to host immune status remain unclear.

Methods. A single-center retrospective analysis of mechanically ventilated adult patients treated in critical care units from January to October 2018 was performed on those with positive microbiological analysis of a bronchoalveolar lavage (BAL) sample. Host immune status and microbiological analyses were obtained including PCR and culture testing. Categorical variables and co-infection or immunocompetent status were assessed using Chi-Square, Fisher exact tests, or t-tests. REDCap was utilized for data abstraction and SAS software version 9.4 was used to perform all analysis.

Results. Of the 139 BAL samples that met inclusion criteria, 107 and 32 were obtained from immunocompetent and immunocompromised hosts, respectively. There was no statistical difference found between the frequency of coinfection detected by BAL culture with respect to host immune status. Immunocompetent patients had a higher proportion of positive bacterial cultures compared with immunocompromised (76.7% vs. 43.8% respectively, P = 0.0004). There was no significant difference seen with frequency of fungal or acid fast bacilli cultures between the two groups. Analysis of the microbiologic data obtained (figures) revealed different pathogens according to host immune status.

Conclusion. Pneumonia due to co-infection in critically ill, mechanically ventilated immunocompromised hosts occurs at a similar frequency regardless of host immune status, however different microbiological patterns emerge. Interestingly, patients who were not immunocompromised had a higher proportion of positive bacterial cultures compared with those who were immunocompromised. Comparative analysis of the other pathogen types may also reveal differences in detection rates if sample size is increased. Clinically, this may help guide efficient use of microbiological testing among patients based on immune status.

Comparison of Types of Pathogens Isolated from BAL Samples (% of Response to Immune Status

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2205. Clinical Burden of Pneumococcal Disease in US Adults Aged 65 Years and Above with Chronic or Immunocompromising Conditions
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Background. The presence of chronic and immunocompromising conditions is associated with a disproportionately high risk of developing pneumococcal disease in older ages. The objective of this study was to quantify the risk of all-cause pneumonia (ACP) and invasive pneumococcal disease (IPD) in older US adults aged 65 years and older with underlying medical conditions.

Methods. A retrospective observational study was conducted using the Humana claims database. The study cohorts were identified at January 1 of each calendar year of observation from 2012 to 2017 and comprised adults aged 65 years and older with continuous enrollment for at least one year before and at least one year after January 1 of each year. For each year, comorbidities or medical conditions were identified during the one year before each calendar year and episodes of ACP and IPD were identified during the corresponding 1-year follow-up period from January 1 to December 31. Individuals were stratified into 3 groups: those without any medical conditions of interest (healthy), those with chronic conditions (at-risk) and those with immunocompromising conditions (high-risk). Rate of ACP or IPD was expressed as the number of cases per 100,000 person-years and the rate ratio (RR) was expressed as the rate of pneumococcal disease of patients with medical conditions divided by the rate of pneumococcal disease in healthy adults.

Results. Of the 10,766,827 adults included in the study, 75% of adults had an underlying medical condition linked to an increased risk of pneumococcal disease. In adults with at-risk conditions, rates of ACP and IPD were 3.1 and 3.6 times the rate in healthy adults, respectively. In adults with high-risk conditions, rates of ACP and IPD were 4.1 and 5.3 times the rate in healthy adults, respectively. Rate of pneumococcal disease increased substantially with the addition of medical conditions: RR for ACP and IPD increased from 2.1 and 2.2, respectively, in adults with one at-risk condition to 4.8 and 6.2, respectively, among adults with 2 or more at-risk conditions.

Conclusion. Despite unique medical characteristics and outcomes from younger elderly patients, they have different co-morbidities and appear to receive less aggressive treatment with lower costs and higher mortality despite similar lengths of stay.

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2206. Patterns of Care and Outcomes in Elderly Patients Hospitalized with Community-acquired Pneumonia in the United States
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Background. Community-acquired pneumonia (CAP) is a common cause of morbidity and mortality in the elderly. Studies compare the elderly (>65) and very elderly (285 years). We aimed to describe characteristics and patterns of care for very elderly patients hospitalized with CAP.

Methods. We conducted a retrospective cohort study using administrative data from 2010 to 2015 of about 660 US hospitals in the Premier database. Adults aged 265 years hospitalized with CAP, identified by either a principal ICD-9 code of pneumonia or a principal diagnosis of sepsis or respiratory failure coupled with a secondary code for pneumonia, were included. We compared demographics, insurance status, comorbidities, presentation characteristics and treatments among three age groups: 65–74, 75–84, and ≥ 85 years.

Results. The final sample included 488,382 patients aged 265 years, a third of whom were ≥ 85 years. Geriatrics cared for <1% of patients during hospitalization, regardless of patient age. Compared with those aged 65–74 years, the patients ≥ 85 were more likely to be female, of white race, have Medicare insurance, and a principal diagnosis of aspiration pneumonia (17.1% vs. 7%) (Table 1). The oldest group had higher rates of cardiac comorbidities, chronic kidney disease and dementia, but lower rates of diabetes, obesity, pulmonary disease, and smoking. On presentation, more of the very elderly had concomitant urinary tract infections. They were less likely to receive opioids and benzodiazepines, but more likely to receive foley catheters and antipsychotic medications. Antibiotics given in the first 2 days were similar across the groups. Fewer very elderly patients were admitted to the ICU or got ventilation compared with younger groups. More of the very elderly were discharged to hospice and fewer were discharged home. Compared with younger ages, the very elderly had similar lengths of stay but lower costs, and higher in-hospital mortality and 30-day readmission.

Conclusion. The very elderly represent a unique population with distinct clinical characteristics and outcomes from younger elderly patients. They have different co-morbidities and appear to receive less aggressive treatment with lower costs and higher mortality despite similar lengths of stay.

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2207. Narrowing Antibiotic Spectrum of Activity for Trauma-Associated Pneumonia Through the Use of a Disease-Specific Antibiogram
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Session: 224. Bacterial Respiratory Infections
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Background. Organism susceptibilities for trauma-associated pneumonia (TAP) differ from those of other groups of patients, including the critically ill. The purpose of this study was to identify common organisms and their susceptibilities in the respiratory isolates of trauma patients diagnosed with pneumonia within the first 7 days of hospital admission, and to create a disease-state antibiogram specific to TAP to guide empiric antibiotic therapy in this patient population.

Methods. This study was an IRB-approved, retrospective chart review of adult trauma patients with pneumonia admitted between September 1, 2015 and August 31, 2018 were evaluated. Patients included were diagnosed with and treated for pneumonia, with respiratory cultures drawn within the first 7 days of admission; both culture-positive and culture-negative patients were included. Subgroup antibiograms were made for a diagnosis made on days 1–3, 4–6, and 6–7.

Results. There were 131 patients included with a median age of 45; 85% were male, and 31% were illicit drug users. The majority of patients (63%) had ventilator-associated pneumonia, and most respiratory samples (77%) were obtained via bronchial lavage. Cultures were positive in 109 patients and negative in 22. There were 144 total isolates; 54% were Gram-negative bacteria. The most common Gram-negative pathogens were *Haemophilus influenzae* (16%) and *Klebsiella pneumoniae* (15%). The most common Gram-positive pathogen was *Staphylococcus aureus*; 9% of all patients grew methicillin-resistant S. aureus. With culture-negative patients counted as susceptible, ceftriaxone monotherapy and ceftriaxone + vancomycin susceptibility were 85% and 94% of patients, respectively. Susceptibilities to cefazolin, ampicillin/sulbactam, cefepime, piperacillin/tazobactam, and levofloxacin were 49%, 69%, 91%, 90%, and 92%, respectively. Ilicit drug use and day of pneumonia diagnosis did not appreciably affect antibiotic susceptibilities.

Conclusion. For TAP diagnosed within the first 7 days of hospital admission, ceftriaxone monotherapy is adequate as empiric therapy, including in ventilated patients. The addition of vancomycin can be considered in patients with MRSA risk factors or who are critically ill.

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