Conclusion. Antibiotic resistance is a major concern in hospital patients admitted with pneumonia. Clinicians need tools to identify patients at increased risk for MDRO infection who may require broad-spectrum antibiotic coverage. We derived a model for risk of pathogens resistant to community-acquired pneumonia (CAP) therapy, using a large sample of pneumonia patients with positive blood cultures.

Methods. This cross-sectional study assessed pneumonia in adults admitted with pneumonia from 2010–2015 to 168 US hospitals that provided administrative and microbiologic data to Premier, Inc. We included all patients with positive blood cultures drawn by hospital day 1. We used stepwise multiple logistic regression to screen potential predictors of resistance to CAP therapy: sociodemographics (age, sex, race, marital status); admissions, antibiotics and drug resistance in the past year; health care–associated pneumonia (HCAP) risk factors, comorbidities, and severity of illness. For parsimony, we culled predictors based on prevalence, odds ratio, and clinical and statistical judgment. We developed our model in an 80% training set, reserving a 20% simple random sample reserved for model validation, and compared its predictive capability to those of the Drug Resistance in Pneumonia (DRIP) score, the HCAP definition, and a model using the HCAP definition's 4 components.

Results. 5491 patients met inclusion criteria, and resistant pathogens were recovered in 726 patients (13.4%). A 21-predictor stepwise model was further reduced to a 10-predictor model. Factors associated with antibiotic resistance in the reduced model were past year hospital admission, more so if within 2 months; admission from a skilled nursing facility; treatment with fDXF or metronidazole within the past year; pressure ulcer; paralysis; other comorbidity counts; public hospital; and congestive heart failure predicted lower risk of resistance. In the validation set the c-statistic was 65.3% compared with 58.9% for the HCAP model, 58.0% for the DRIP score and 57.0% for the HCAP definition.

Conclusion. Indicators readily available at admission predict antibiotic resistance with modest accuracy in pneumonia patients with positive blood cultures. The model slightly outperformed the HCAP model and the DRIP score.

Disclosures. S. Haessler, AHRQ: Investigator, Research grant; S. S. Richter, bioMedNet: Investigator, Research support; BD Diagnostics: Investigator, Research support; Roche: Investigator, Research support; BioFire: Investigator, Research support; OpGen: Investigator, Research support; P. C. Yu, AHRQ: Investigator, Research grant; M. D. Zilberberg, Astellas: Consultant and Investigator, Research support; Merck: Consultant and Investigator, Research support; The Medicines Company: Consultant and Investigator, Research support; Shionogi: Consultant and Investigator, Research support; Pfizer: Consultant and Investigator, Research support; Theravance: Consultant and Investigator, Research support; [If]: Shareholder, Shareholder; M. Rothberg, AHRQ: Investigator, Research grant.

1965. Streptococcus pneumoniae as a Cause of Community-Acquired Pneumonia: Changes Over the Past 100 Years
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Background. In the preantibiotic era, Streptococcus pneumoniae (Sp) was responsible for 90% of community-acquired pneumonia (CAP). Modern studies identify Sp in only 5–14% of CAP in the United States (US) and Canada and 15–35% in Europe.

Methods. Published and Google Scholar were searched for studies reporting the etiologic spectrum of CAP in adults in the US, Canada, or Europe. Inclusion of each study required the use of a conventional case definition for CAP and application of standard microbiologic techniques in >50% of cases. Reports on a single subpopulation (immunocompromised, elderly, etc.) or clinical setting (ICU, outpatient, etc.) were excluded.

Results. Thirty-one studies from the US and Canada (21,315 patients) and 41 from Europe (25,183 patients) met inclusion criteria. Included studies were published between 1917 and 2015. In the US and Canada, the proportion of cases caused by Sp decreased significantly over time (Figure 1A) and was inversely related to the proportion of patients with antibiotic use prior to hospital admission (Pearson’s correlation coefficient -0.76 [95% confidence interval −0.88 to −0.90, P < 0.001]). In the US and Canada, the frequency of Sp has continued to decline during the past 4 decades; in contrast, the frequency of Sp has remained stable in Europe during this time (Figure 1B).

Conclusion. The proportion of CAP caused by Sp has declined dramatically in the US and Canada during the past 100 years. The initial decline between 1940 and 1965 may be explained by availability of antibiotics. Potential factors contributing to the continued decline in Sp include widespread pneumococcal vaccination and declining rates of smoking. The higher frequency of Sp in Europe may be due to lower vaccination rates in adults and higher rates of smoking. Limitations of the present study include heterogeneity among studies in illness severity, comorbidities, microbiologic testing and prior antibiotic use.

1966. Evaluating Symptom Severity of Influenza Viral Infection Using the Influenza Patient-reported Outcomes Instrument (FLU-PRO) in a Healthy Human Challenge Model
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Background. To apply the validated FLU-PRO scoring method to assess influenza symptom severity in a healthy human challenge model.

Methods. Healthy adults admitted to the NIH Clinical Center (Day -1) underwent a 9 day inpatient quarantine after intranasal challenge with H1N1pdm (Day 0). Participants completed the 32 item FLU-PRO diary twice daily for 14 days to assess presence and severity of symptoms across six body systems. Secondary analyses included descriptive statistics to examine FLU-PRO scores over the course of illness and analysis of variance to compare severity scores on Day 3 post-challenge by viral shedding, and pre-challenge hemagglutinin and neuraminidase inhibition (HAI and NAI) titers.

Results. 61 of 65 subjects reported symptoms (Days: Median 5, Mean 6 ± 7), of which 37 (61%) had viral shedding. Pre-challenge, 39 (64%) and 10 (16%) subjects had low (<40) HAI and NAI titers, respectively. Mean daily FLU-PRO symptom severity domain and total scores are shown in Figure 1. Symptoms were present across all FLU-PRO domains from Day 1 post-challenge. Nose, throat, body, and GI symptoms reached peak severity at Day 3, followed by chest and eye symptoms at Day 4. Subjects with viral shedding had significantly higher mean FLU-PRO scores compared with those without, except for Eye and GI domains (P < 0.05); mean FLU-PRO scores were significantly higher for subjects with low NAI titer (P < 0.05) across all domains. No significant differences were observed between HAI titer groups. FLU-PRO scores of the low HAI-low NAI group (n = 10) were significantly higher (more severe) than the other two groups (P < 0.05) (high HAI-low NAI (n = 22), low HAI-high NAI (n = 29)).

Conclusion. The FLU-PRO can be used to track symptom onset, severity, and recovery from influenza infection in clinical research. In this challenge study; scores were responsive to change even in mild disease and distinguished known clinical subgroups. The use of FLU-PRO as a widely used and validated predictor of influenza disease severity was also supported.

Funded by NCI Contract No. HHSN26120080001E and in part by the Intramural Research Program of the NIH, NIAID
1967. Predictors of Clinical Respiratory Virus Testing Among Adults Hospitalized with Acute Respiratory Illness (ARI) (2015–2016)
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Background. Vaccine effectiveness (VE) studies require an accurate indicator of influenza infection, often obtained through research testing independent of clinical (physician-ordered) testing. Clinical testing could be used to detect influenza in these studies if factors associated with clinical testing for influenza were better understood.

Methods. Adults hospitalized with ARI at three study sites during the study period were enrolled in CDC’s 2015–16 Hospitalized Adult Influenza Vaccine Effectiveness Network (HAIVEN) study and tested for influenza by RT-PCR. Clinical testing information, presenting symptoms, and patient characteristics were collected from medical records and patient interview. Logistic regression was used to estimate odds of receiving a clinical test based on age, vaccination status, comorbidities, presentation with influenza-like illness (ILI), defined as fever and cough or sore throat) and other factors.

Results. Of 895 enrollees, 571 (64%) patients meeting study inclusion criteria received physician-ordered testing. Of these, 53% had a multipathogen panel, 13% had a clinical test based on age, vaccination status, comorbidities, presentation with influenza-like illness (ILI, defined as fever and cough or sore throat) and other factors.

Conclusion. Patients with ARI who were clinically tested for influenza differed from those not tested. A lower likelihood of testing among influenza positive cases could potentially bias VE estimates upward and requires further evaluation. Clinical testing alone may fail to detect a substantial proportion of influenza cases.

Disclosures. All authors: No reported disclosures.

1968. A Cross-Sectional Surveillance Study of Acute Respiratory Illness (ARI) in Pregnant Women
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Background. Among pregnant women, pneumonia is the third-leading cause of death and the most common non-obstetric infection resulting in death. Pregnant women who become infected with influenza have hospitalization rates comparable to non-pregnant women with high-risk medical conditions. Other than small case series, little is known about the consequences of viral-related ARI on the pregnant woman and the fetus. Our objective was to determine the respiratory viruses causing ARI and their clinical outcomes during pregnancy.

Methods. Pregnant women in their second and third trimester were enrolled prospectively at a Houston clinic between October 1, 2015 and April 30, 2016 during their regular prenatal visits. Pregnant women were enrolled if they reported having symptoms of ARI or were healthy within the preceding two weeks. Nasal-pharyngeal swabs were evaluated for respiratory viruses by real time-PCR. Clinical outcomes and complications of illness were obtained at enrollment and two weeks after the initial visit.

Results. A total of 155 pregnant women were enrolled. The average age at enrollment was 30.7 years among women with ARI and 29.7 among healthy controls. Average gestational age at enrollment was 26.0 weeks among women with ARI and 26.3 among healthy controls. Among the 91 healthy controls, 10 (11%) tested positive for a respiratory virus, with rhinovirus (n = 6) being the most common of the viruses detected. On the other hand, of the 81 cases of ARI, 51 (63%) tested positive for a virus. The most frequently detected viruses were rhinovirus (n = 22), coronavirus (n = 14), and respiratory syncytial virus (n = 11). Twelve patients reported fever during the course of their ARI. Seventeen ARI patients reported at least one symptom of lower respiratory tract illness (LRTI). Of those patients with LRTI, two reported decreased fetal heart rate and one was hospitalized for her illness.

Conclusion. Respiratory viruses were frequently detected in pregnant women with ARI. One-third of pregnant women with viral ARI had evidence of LRTI. Hospitalization and non-reassuring fetal heart tones were among the complications reported by pregnant women with LRTI. Viral ARI during pregnancy appears common and is associated with significant morbidity.

Disclosures. All authors: No reported disclosures.

1969. Burden of Community-Acquired Pneumonia due to PCV-13 Streptococcus pneumoniae Serotypes Among Hospitalized Adults in the United States
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Background. The burden of disease for US adult patients hospitalized with community-acquired pneumonia (CAP) due to S. pneumoniae (Sp) PCV13 vaccine types (VT) is not known. The objective of this study was to determine the incidence, patients’ characteristics, length of stay and mortality for US adults hospitalized with CAP due to Sp-PCV13VT.

Methods. This was a prospective observational study of adults hospitalized between October 7, 2013 and September 30, 2016 with radiographically confirmed CAP in 19 centers in the US. Patients were included if the following 5 criteria were met: 1) Age 18 years and older; 2) Presence of two or more of the following: fever, hypothermia, chills or rigor, pleuritic chest pain, cough, sputum production, dyspnea, tachycardia, malaise, and/or jaundice. Serotyping of pneumococcal isolates were performed; 3) Radiographic finding consistent with pneumonia; 4) Able to provide urine sample; 5) Signed informed consent. The presence of Sp-PCV13VT was investigated using a Lumines- based urinary antigen detection (UAD) assay or serotyping from a positive Sp isolate. Data on patients’ characteristics, length of stay (LOS) and in-hospital mortality (IHIM) were collected.

Results. From a total of 12,055 hospitalized patients with CAP, VT Sp-PCV13 was detected in 552 patients via UAD or culture (4.6%). Among patients hospitalized with CAP due to Sp-PCV13VT, median age was 64 years, and the most common comorbidities were chronic obstructive pulmonary disease (46.2%) and diabetes (27.3%). Median LOS was 6 days, and IHIM was 5.4%. There were no clinically significant differences when this population was compared with the population of patients with non-PCV13 VT Sp-CAP.

Conclusion. In approximately 5% of US adults hospitalized with CAP, the etiologic agent is Sp-PCV13VT. Clinical characteristics and outcomes in this population were similar when compared with the general population of hospitalized patients with CAP. In conclusion, this study indicates a persistent burden of disease for adult patients hospitalized with CAP due to vaccine preventable Sp serotypes.

Disclosures. All authors: No reported disclosures.

1970. Frailty Hinders Recovery From Acute Respiratory Illness in Older Adults
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