aged 19–64 years targeted by the high-risk recommendation issued by the Advisory Committee on Immunization Practices (ACIP) in 2012.

**Methods.** Uptake was evaluated from October 2012 through October 2016 in two statistically de-identified databases: Optum's Clinformatics Data Mart (CDM), consisting of administrative health claims, and the Optum-Humedica Electronic Health Record (EHR) database, which includes EHR data from providers, primarily integrated delivery networks in the United States to cover the continuum of care. Eligibility for the recommendation was determined based on age (≥65 years) or risk factors (such as chronic conditions) indicated in the EHR. The proportion of vaccinated individuals was calculated for different age groups and risk categories.

**Results.** Uptake of PCV13 was lower among 1,888 patients in the CDM vs. 571,993 patients in the EHR database, with <1% of recommended high-risk patients receiving PCV13 in the 4 years following publication of the recommendation. Vaccination among 19- to 64-year-old high-risk patients accelerated after the October 2014 publication of the recommendation for all adults aged 265 years. This was consistent in both CDM and EHR databases (Table 1).

**Conclusion.** Uptake of PCV13 among high-risk adults aged 19–64 years in the US has been very low. Some of the PCV13 vaccination among high-risk patients may have been driven by spillover from the subsequent age-based recommendation for adults aged 265 years.

**Table 1.** KM Estimates at the End of Study with 95% CI

| Uptake Rate | 95% CI |
|-------------|--------|
| her         | 0.042  | 0.041–0.043 |
| CDM (claims)| 0.048  | 0.046–0.052 |

**Disclosures.** All authors: Employee and Shareholder, Salary.

1439. The Cost-Effectiveness of Vaccinating Adults at Increased Risk of Pneumococcal Disease Against Pneumococcal Disease in The Netherlands

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**Session:** 146: Pneumococcal Vaccines

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**Background.** There is currently no data on the age- and risk-group-specific cost-effectiveness of the 13-valent pneumococcal vaccine (PCV13) compared with the 23-valent polysaccharide vaccine (PPV23). The aim of this study was to evaluate the cost-effectiveness of vaccinating these specific groups against pneumococcal disease.

**Methods.** A previously published and independently validated (by The Dutch National Health-Care Institute) age- and risk-group-specific Markov-type model was used to compare the cost-effectiveness of PCV13 vaccination vs. PPV23 vaccination of all adults at increased risk of pneumococcal disease (i.e., adults with underlying disease and those ≥50 years). Efficacy estimates for PCV13 were extrapolated from the Community-Acquired Pneumonia Immunization Trial in Adults (CAPITA). Efficacy estimates for PPV23 were based on systematic literature reviews and other published data.

**Results.** At list price ($68.56 for PCV13 and $19.99 for PPV23), vaccination of all adults at increased risk of pneumococcal disease resulted in an ICER of $20,186/QALY, while vaccinating those with chronic medical conditions (moderate risk) and immunocompromising conditions (high risk) resulted in an ICER of <$10,000/QALY. Large differences in ICERs between age- and risk-groups were observed (Table). Vaccinating high-risk individuals with PCV13 was cost-saving for those aged less than 65 years of age compared with PPV23 while vaccinating those aged 85 years and older with PCV13 was moderate cost-effective with an ICER of $66,908/QALY. Vaccinating moderate-risk individuals was highly cost-effective (<$20,000/QALY), while vaccinating those with low-risk of pneumococcal infection was cost-effective (<$50,000/QALY). However, within risk groups the ICER differed significantly between age groups. Sensitivity analysis showed that a proportional decrease in list price, such as common in national vaccination programs, decreased the ICER disproportionately in favor of PCV13.

**Conclusion.** Vaccination all adults with PCV13 is cost effective compared with PPV23. There is a large variation in the cost-effectiveness between age and risk groups. Targeting individuals with underlying diseases aged less than 85 years would provide the most value for money.

1440. Potential Impact of Routine Use of 13-Valent Pneumococcal Conjugate Vaccine on Hospitalizations for Pneumonia Among Older Adults in Canada

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**Background.** In Canada, 13-valent pneumococcal conjugate vaccine (PCV13) was licensed for the prevention of vaccine-type (VT) pneumonia in adults in July 2015. Herd effects stemming from the routine pediatric PCV13 program have historically led to reductions in VT disease in older adults, and there is currently no recommendation for a routine age-based PCV13 program for this age group. However, recent data suggest these indirect effects may have plateaued, leaving a persistent and substantial burden of potentially preventable pneumococcal disease in older adults. We evaluated the potential impact of PCV13 immunization program for Canadian adults aged 265 years on hospitalizations for community-acquired pneumonia (CAP). Methods. We constructed a mathematical model based on Canada-specific burden of disease estimates and published estimates of PCV13 effectiveness and durability. We estimated the number of hospitalizations averted as the product of (i) the size of the Canadian population aged 265 years, (ii) the incidence of all-cause CAP, (iii) the proportion of CAP that is VT, (iv) PCV13 effectiveness, and (v) the duration of protection for PCV13 over a 5-year time horizon. We assumed that rates of all-cause CAP, the proportion of VT CAP, and PCV13 effectiveness remained constant over the 5-year assessment period. We assumed a 5% annual all-cause mortality rate in the overall population. We estimated hospital days averted as the product of hospitalizations averted and median length of stay. Model assumptions are summarized in Table 1.

**Results.** Based on model assumptions, PCV13 use in Canadian adults aged 265 years would lead to an annual rate reduction of 62 (11–77) hospitalizations per 100,000 persons, per year. This reduction, applied to the entire Canadian population of older adults, would averat an estimated 17,274 (3,037–21,711) hospitalizations and 138,192 (24,298–173,690) hospital days over a 5-year period.

**Conclusion.** Despite herd effects from the routine pediatric program, direct PCV13 immunization of older adults in Canada could result in considerable additional reduction in hospitalizations for pneumonia.

**Table 1.** Model Assumptions

| Parameter | Value | Source |
|-----------|-------|--------|
| Population size | 6.195,500 | Statistics Canada |
| Annual all-cause CAP incidence | 1,692 per 100,000 | Canadian Institute of Health Information Database (2015) |
| Percentage of all-cause CAP caused by PCV13 serotypes | 5% | LeBlanc et al. Vaccine, 2017; 35(29):3647-3654 |
| PCV13 effectiveness against hospitalization for VT CAP | 72.8% (12.8–91.5%) | McCaughan et al. Clin Infect Dis. 2018; in press |
| Duration of PCV13 effectiveness | 5 years (ie, no waning) | Patterson et al. Trivael Vaccinol. 2016;9:92-96 |
| Median length of hospital stay (pneumococcal CAP) | 8 days | LeBlanc et al. Vaccine, 2017; 35(29):3647-3654 |

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1441. Doses of 13-Valent Pneumococcal Conjugate Vaccine (PCV13) for Patients With Multiple Myeloma (MM)

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**Background.** Patients with MM are vulnerable to bacterial infection, especially invasive pneumococcal diseases. Vaccination with one-dose PCV13 is recommended, but their poor immunogenicity was observed. We aimed to assess whether two-dose PCV13 might help.

**Methods.** Patients with MM were randomized to receive one- or two-dose PCV13. The two doses were given 1 month apart. Measurements of antibody to the
four most common serotypes 6B, 14, 19F, and 23F pre-vaccination, 1, 3, 6, 9, and 12 months after the last dose of PCV13 were performed. Achievement of significant antibody response was defined as greater than equal to twofold increase in the IgG level.

Results. From January 2016 to December 2017, a total of 72 patients were randomized to receive one (n = 35) or two doses (n = 37) PCV13. Of all 31 patients (43%), including one dose in 14 and two doses in 17, had completed 12-month follow-up with a median age of 62 years old (IQR 54–66). Sequential changes of significant antibody responses to serotype 6B, 14, 19F, and 23F during 1-year follow-up in one and two doses are presented in Figure 1. The proportions of significant antibody responses to serotype 6B, 14, 19F, and 23F after 1-year follow-up were 33.3, 25.0, 41.7, and 41.7% in one dose group and 11.8, 35.3, 29.4, and 23.5% in two-dose group, respectively.

Conclusion. Two-dose PCV13 did not provide better immunogenicity to patients with MM. Innovative strategies to improve the immunogenicity of PCV13 in patients with MM are needed.

Figure 1: Sequential changes of significant antibody responses to serotype 6B, 14, 19F, and 23F during 1-year follow-up in one- and two-dose groups.

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1442. Pneumonia Hospitalizations Averted With 13-Valent Pneumococcal Conjugate Vaccination of Adults Aged 18–64 Years With Diabetes in the United States
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Background. Diabetes, a prevalent chronic condition in younger adults, increases the risk of pneumonia. The incidence of pneumonia hospitalization among adults aged <65 years with diabetes is comparable to that of the overall population aged 265 years. While 13-valent conjugate pneumococcal vaccination (PCV13) is routinely recommended for adults aged 265 years, it has not been recommended for younger adults with diabetes. We modeled the potential impact of PCV13 use in this population.

Methods. We estimated the cumulative number of pneumonia hospitalizations and hospital days potentially averted with PCV13 use in adults aged <65 years with diabetes over 5 years in the United States. Model inputs are summarized in Table 1. We ran multiple scenarios depending on a number of vaccine efficacy/effectiveness (VE) estimates. We estimated the number of hospitalizations averted as the product of (i) the size of the target population, (ii) the incidence of all-cause CAP, (iii) the proportion of CAP that is PCV13 type, (iv) PCV13 effectiveness, and (v) the duration of protection for PCV13 over a 5-year time horizon. Number-needed-to-vaccinate (NNV) for each scenario was also assessed.

Results. Roughly 15 million adults aged <65 years have diabetes in the United States, accounting for about 250,000 pneumonia hospitalizations annually. Based on published, US estimates of pneumonia incidence and PCV13 etiology, PCV13 vaccination in this population could avert 24,638–44,506 hospitalizations and 206,955–373,854 hospital days over a 5-year period. NNV to avert one hospitalization and one hospital day were 344–622 and 41–74, respectively.

Conclusion. PCV13 vaccination of younger adults with diabetes could reduce a substantial number of pneumonia hospitalizations. NNV is comparable to those for adults aged 265 years, for whom PCV13 is currently recommended.

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1443. Serotypes 8 and 3 Are the Leading Cause of Invasive Pneumococcal Disease in Adults in Portugal (2015–2017)
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Background. In Portugal, following the use of PCVs in children, there were major changes in the serotype distribution of the pneumococcal population in adult pneumococcal invasive disease (IPD). The inclusion of PCV13 in the National Immunization Plan in 2015 could have an even greater impact on adult IPD. To evaluate this, we monitored the serotypes and antimicrobial resistance of invasive pneumococcal isolates in 2015–2017.

Methods. A total of 1,495 adult IPD isolates were recovered, serotyped by Quellung and tested for susceptibility to antimicrobials by disk diffusion or Etest.

Results. The number of isolates recovered in each year remained approximately constant. Among the 1,495 isolates, 58 different serotypes were found and only a small proportion of these were nontypeable (0.6%, n = 9). The most common were serotypes 8 (18%), 3 (15%), 22F and 14 (7% each), 19A (6%), and 20 (4%). The majority of isolates expressed serotypes exclusively found in the 23-valent polysaccharide vaccine (41%, n = 619). A considerable number of isolates expressed PCV7 serotypes (n = 563), of which 207 isolates (14%) expressed PCV7 serotypes and the remaining isolates expressed the additional serotypes included in PCV13 (n = 356, 24%). Non-vaccine types (NVT) were found in 313 isolates (n = 21%) and among these, serotypes 6C, 15A, 16F, 23A and 31 were the most prevalent, together accounting for approximately half of the NVT. Overall, 19% of the isolates presented resistance to erythromycin and penicillin nonsusceptibility was found in 17% of the isolates recovered in 2015–2017.

Conclusion. After several years of pneumococcal conjugate vaccines use in children, PCV serotypes are still frequently responsible for adult IPD. Moreover, serotypes exclusively found in PPV23 were also found to be important causes of invasive disease in this period, suggesting an important role for vaccination in disease prevention in this age group.

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1444. Trends in Antimicrobial Non-susceptibility of PCV13-Type Streptococcus pneumoniae Pneumonia in Adults in the United States During 2009–2017
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