Continued decline of invasive pneumococcal disease in ESRD patients following introduction of the pneumococcal conjugate vaccine (PCV)

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Introduction
• In February 2000, a 7-valent pneumococcal conjugate vaccine (PCV) that was designed to protect against IPD was licensed in the US for routine use in infants and young children.
• PCV uptake increased substantially after US government purchasing began in June 2000.
• Subsequently, there were reports that IPD incidence had declined across all ages, manifestations of efficacy and, perhaps, herd immunity.
• IPD hospitalizations: 30-40% in the elderly (McBean, Vaccine
• Pneumococcal meningitis: 65% in infants (Grijalva Lancet
• Pneumococcal meningitis: 33% overall (Tsai, Clin Infect Dis)
• IPD incidence is significantly higher in ESRD patients than it is in the general population – regardless of age.
• Using USRDS data, we assessed IPD hospitalization rates between 1991 and 2005 in retrospective cohorts of Medicare dialysis patients.
• We hypothesized that use of PCV had conferred herd immunity to the dialysis population.

Methods
• For each year from 1991 to 2005, we constructed a point-prevalent cohort of patients who, on June 30, were alive, received dialysis, and entered Medicare as primary payer (MPP).
• Follow-up began on July 1, and then continued until the earliest of death, transplantation, cessation of MPP, or June 30 of the next year.
• IPD cases were defined by diagnosis codes on Medicare inpatient claims:
  • Pneumococcal septicaemia: 038.2 or 041.2 & 038.9 or 796.7
  • Pneumococcal meningitis: 320.1 or 320.8 & 038.2 or 041.2
  • Pneumococcal disease in another normally sterile site: 041.2 & [511.0, 513.x, 711.0, 727.0]
• IPD hospitalizations within 30 days of one another were defined as a single case of IPD.
• Adjusted IPD incidence rates were estimated with Poisson regression.
• IPD incidence rates were standardized to the 2000 cohort, with adjustments for age, gender, race, and the primary cause of ESRD (DM, HTN, GN, other).

Results
• IPD hospital admission rates ranged from 120 to 130 per 100,000 patient-years (pt-yrs) during 1992-1995.
• Rates peaked during 1996-1998, at 200-210 admits per 100,000 pt yrs.
• Rates began falling in 1999, and have since settled in the range from 125-140 admits per 100,000 pt yrs.
• Rates increased with age, with a 9.9% increase (95% CI: 7.5-12.3%) in IPD incidence per 10-year increment.
• Rates were elevated in patients with non-DM/HTN/GN causes of ESRD (e.g., PKD, vascular disease, cancer).
• IPD admission rates during 1996-1999 were significantly higher than during 1991-1995 (RR = 1.37, p < 0.01).
• IPD admission rates during 2001-2005 were significantly lower than during 1996-1999 (RR = 0.74, p = 0.01).
• In contrast, IPD hospital admission rates during 2001-2005 were not significantly different than rates during 1991-1995 (p = 0.25).
• While monthly pneumonia/influenza (P/I) admission rates were correlated (r = 0.59) with IPD rates, P/I admission have increased, even since 2000.

Conclusions
• IPD admission rates are over 6 times higher in the dialysis population than in the broader Medicare population.
• Current admission rates are roughly 25% lower than during the era from 1996 to 1999, when rates peaked.
• This decline in IPD incidence supports the hypothesis that increased uptake of PCV in infants has conferred herd immunity to dialysis patients.
• However, current IPD incidence rates are nearly unchanged from rates in the first half of the 1990s, not only in the dialysis population, but also in the broader Medicare population.
• This counterpoint suggests that IPD rates in dialysis patients may merely exhibit sinusoidal variation.
• Still, IPD rates have fallen, even in the presence of increasing hospitalization rates for pneumonia and influenza.