Disposition of Adults with Invasive Pneumococcal Disease in a US Population

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This Presentation Is Dedicated to the Memory of
Roger Baxter, M.D. (6/14/52 - 12/20/2016)
Suaya JA, Jiang Q, Sings HL, McLaughlin J, Center KJ, Isturiz R, Swerdlow D are Pfizer employees and may be shareholders

Yee A and Aukes L are employees of Kaiser Permanente and have no conflicts of interest to disclose
Invasive pneumococcal disease (IPD) is a group of severe medical conditions including meningitis, bacteremia and septicemia caused by *Streptococcus pneumoniae*

There is limited information on the type and intensity of health care services following initial diagnosis of IPD

- Cost of many of services such as hospice and skilled nursing facility (SNF) are usually not integrated into economic burden of IPD

This study assesses IPD cases disposition of adults in Kaiser Permanente Northern California (KPNC) population
Setting: KPNC, 1

- Integrated health care delivery system with 54 clinics and 22 hospitals in greater San Francisco Bay area
- About 4M members (3.5M adults)
- Membership representative of general population in Northern California
- Members receive almost all medical care at KPNC facilities
Setting: KPNC, 2

- Members with a unique medical record number for life
- Electronic medical records and all health care utilization data linked:
  - Settings (outpatient, emergency room, inpatient), diagnoses, lab testing, imaging, procedures, vaccination, etc.
- Single central microbiology laboratory
IPD Surveillance Study

- Led by Kaiser Permanente Vaccine Study Center
- Active laboratory-based IPD surveillance
- Specimens serotyped by Boston University
- This analysis was restricted to IPD in adults ≥18 years from May 2008 through April 2015
IPD Case Definition

- Acute illness with a positive culture of *S. pneumoniae* from a normally sterile site
- Sterile sites for specimen identification included:
  - Blood
  - Cerebrospinal fluid (CSF)
  - Pleural fluid
  - Other (e.g., peritoneal, pericardial, or joint fluid, etc.)
- Unique IPD case if *S. pneumoniae* identified in a new specimen separated by a period of 14 days
Disposition Categories

Based on the disposition linked to the most complex care received during the diagnosis and treatment of the IPD case:

- Died in Emergency Room or during hospitalization: in-hospital fatality
- Disposition to:
  - Hospice
  - Skilled nursing facility (SNF)
  - Home with home health care
  - Home (routine discharge)
  - Another acute care facility
  - Other: To other health care facility or left against medical advice
Analyses

- Adults stratified by four age groups: 18-49, 50-64, 65-79, and ≥80 years of age

- Estimations
  - IPD cumulative incidence rates by age groups
  - IPD incidence rate ratios compared to 18-49 years age group
  - Disposition rates by age groups
  - Risk ratios of disposition categories compared to 18-49 years age group

- Alpha level for rate ratios and risk ratios=0.05
IPD Cases in Adults by Age Group

Distribution of IPD cases in older adults larger than population share

*Annual average adult members during study period: 2.78M
IPD Incidence by Age Group

IPD Annual Incidence (Cases Per 1,00,000 Population)

- 18-49 Years: 3.7 (Ref.)
- 50-64 Years: 11.1 (x 3.0*)
- 65-79 Years: 19.6 (x 5.4*)
- ≥80 Years: 41.1 (x 11.2*)

* P<0.05.

IPD incidence increased with age
IPD In-Hospital Case Fatality Rate

IPD case fatality rates increased with age with peak of 20% in ≥80 years.

- P<0.05.
IPD Patient In-Hospital Death or Disposition to Hospice

1 in 4 IPD case in ≥80 years resulted in death or disposition to a hospice

* P<0.05.
IPD Patient Disposition to SNF

IPD disposition to a SNF increased with age; 1 of 4 in ≥80 years

*P<0.05.
IPD Patient Disposition to Home with Health Services (HHS)

Disposition to HHS increased with age ranging from 5% to 17%

\[ P<0.05. \]
IPD Patient Disposition to Home

Disposition to home decreased with age ranging from 83% to 32%

*P<0.05.
IPD Patient Disposition by Age Group

IPD Disposition (%)

- **18-49 Years**
  - Died: 5.0%
  - Hospice: 4.9%
  - SNF: 4.5%
  - Other Acute: 8.9%
  - Other (Misc.): 2.8%
  - Died: 2.8%
  - Hospice: 7.5%
  - SNF: 2.0%
  - Other Acute: 10.5%
  - Other (Misc.): 2.0%
  - Died: 67.9%
  - Hospice: 14.1%
  - SNF: 15.1%
  - Other Acute: 1.5%
  - Other (Misc.): 2.0%
  - Died: 55.7%
  - Hospice: 23.3%
  - SNF: 16.9%
  - Other Acute: 2.0%
  - Other (Misc.): 5.2%
  - Died: 32.0%
  - Hospice: 21.5%
  - SNF: 10.5%
  - Other Acute: 2.0%
  - Other (Misc.): 1.5%

- **50-64 Years**
  - Died: 82.7%
  - Hospice: 67.9%
  - SNF: 55.7%
  - Other Acute: 23.3%
  - Other (Misc.): 14.1%

- **65-79 Years**
  - Died: 4.0%
  - Hospice: 2.0%
  - SNF: 5.0%
  - Other Acute: 5.0%
  - Other (Misc.): 5.0%

- **≥80 Years**
  - Died: 8.9%
  - Hospice: 6.4%
  - SNF: 10.5%
  - Other Acute: 14.1%
  - Other (Misc.): 16.9%
IPD Burden in 18-64 Years

Adults 18-64 years account for a significant share of burden imposed by IPD
Limitations

- Generalizability to populations without health insurance, other health care delivery systems, or other regions of U.S. may be challenging
- While disposition of IPD cases was known, intensity of complex services (e.g. days in hospice, or in SNF) was not assessed
- Cost estimates were not sought
- Count of IPD cases of population coming from SNF was not obtained
Conclusions

- IPD in adults increases with age and has severe consequences as measured by mortality and disposition to hospice, SNF and to other complex services.

- Still a large share of the IPD cases and their consequences are in population aged 18-64 years.

- When determining the economic burden of IPD and the value of pneumococcal vaccination, the costs associated with these consequences should be taken into account.
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Back-up
IPD Disposition to Other Acute Care Facility

Disposition to other acute facility decreased with age ranging from 4% to 0.9%.

*P<0.05.