Epidemiology and Burden of Respiratory Syncytial Virus in Older Adults in the U.S.

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Advisory Committee on Immunization Practices
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Epidemiology and Burden of RSV in Older Adults

- RSV burden in older adults
- Comparison of influenza v. RSV burden
- Impact of co-morbidities
RSV Epidemiology and Burden
General Epidemiology

- Frequent cause of severe respiratory illness in older adults
- Lower awareness of RSV in adults among healthcare providers and the public
- Under detection: RSV testing often not performed
- No specific recommended vaccine or treatment in adults
Among adults ≥65 years of age in the United States, RSV is associated with...

- **~14,000** deaths/year
- **~177,000** hospitalizations/year
- **~2,200,000** symptomatic illnesses/year

1Falsey et al, NEJM (2005); 2Adapted from Falsey et al, NEJM (2005)
Burden of hospitalization and death: Older adults and children <5

- **Adults aged ≥65 years**
  - ~14,000 deaths/year
  - ~177,000 hospitalizations/year

- **Children aged <5 years**
  - 100-300 deaths/year
  - 58,000-80,000 hospitalizations/year

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RSV is a frequent cause of pneumonia in hospitalized adults


EPIC study:

- RSV detected in 3% of adults hospitalized with pneumonia
- RSV was fifth most commonly detected pathogen
### Annual Hospitalization Rates per 100,000 adults in the U.S.

<table>
<thead>
<tr>
<th>Age group, years</th>
<th>3 seasons, 2 sites: 2017-2020¹</th>
<th>3 seasons, 1 site: 2006-2009²</th>
<th>National data (modeling study): 1997-2009⁴, ⁵</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 – 49</td>
<td>7.7 – 11.9</td>
<td>n/a</td>
<td>9</td>
</tr>
<tr>
<td>50 – 64</td>
<td>33.5 – 57.5</td>
<td>82</td>
<td>28</td>
</tr>
<tr>
<td>≥65</td>
<td>136.9 – 255.6</td>
<td>254</td>
<td>84 (ages 65 – 74)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>258 (75+)</td>
</tr>
</tbody>
</table>

High incidence of RSV hospitalization among older patients

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Substantial burden of medically attended outpatient visits for RSV in older adults

- 11% of outpatients with acute respiratory illness
- 19% had a serious outcome\(^1\)
- Rates nearly 2x higher in patients with chronic cardiopulmonary disease compared with others

Seasonal incidence and 95% confidence limits of medically attended RSV by age group in a community cohort of adults ≥60 years old

\(^1\) Serious outcome defined as hospitalization, emergency department visit and pneumonia.
Among adults ≥65 years of age in the United States, RSV is associated with a similar burden of disease as influenza.

- **RSV**
  - ~14,000^1 deaths/year
  - ~177,000^1 hospitalizations/year
  - ~2,200,000^2 symptomatic illnesses/year

- **Influenza**
  - 12,000-43,000^3 deaths/year
  - 128,000-467,000^3 hospitalizations/year
  - 1,400,000-5,100,000^3 symptomatic illnesses/year

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Similar RSV and influenza hospitalization rates and severity in older adults

Widmer et al, JID (2012)

Adults ≥65 years hospitalized with acute respiratory illness over 3 seasons
- 6.1%: RSV
- 6.5%: Influenza
- Similar clinical severity
Clinical outcomes and co-morbid conditions
Respiratory Syncytial Virus Associated Hospitalization Surveillance Network (RSV-NET)

- Population-based
- ~8.6% of U.S. population
- 12 states
- Laboratory-confirmed RSV
Underlying medical conditions among adults ≥18 years hospitalized for RSV: RSV-NET 2014-2018

<table>
<thead>
<tr>
<th>Major underlying condition categories</th>
<th>N=4,970</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular disease</td>
<td>2833</td>
<td>57.0</td>
</tr>
<tr>
<td>Chronic lung disease</td>
<td>2486</td>
<td>50.0</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>1692</td>
<td>34.0</td>
</tr>
<tr>
<td>Renal disease</td>
<td>1378</td>
<td>27.7</td>
</tr>
<tr>
<td>Immunocompromised condition</td>
<td>1126</td>
<td>22.7</td>
</tr>
<tr>
<td>Neurologic disorder</td>
<td>1041</td>
<td>21.0</td>
</tr>
<tr>
<td>Chronic metabolic disease (except diabetes)</td>
<td>934</td>
<td>18.8</td>
</tr>
<tr>
<td>Liver disease</td>
<td>332</td>
<td>6.7</td>
</tr>
<tr>
<td>Blood disorders/ hemoglobinopathy</td>
<td>132</td>
<td>2.7</td>
</tr>
<tr>
<td>Other disease or condition</td>
<td>429</td>
<td>8.7</td>
</tr>
</tbody>
</table>

94% of hospitalized adults have underlying medical conditions:

- 46%: 1-2 conditions
- 48%: ≥3 conditions

Source: CDC unpublished data.
RSV hospitalization rates much higher in those with congestive heart failure: RSV-NET 2015-2017

28% hospitalized cases had CHF

Higher rates in adults with CHF:
- Overall: 8x
- 50-64: 14x
- ≥65 years: 3.5x

Adjusted rates (per 10,000 population) of RSV-associated hospitalization by congestive heart failure (CHF) status, RSV-NET, 2015–2017 (N = 2042).

https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0264890
RSV in immunocompromised adults at high risk for severe disease

- Greatest risk among:
  - Lung transplant recipients\(^1\)
  - Hematopoietic cell transplant (HCT) recipients\(^2\)
  - Other immunocompromised populations including patients receiving chemotherapy for lymphoma and leukemia

- Incidence of symptomatic illness: 12% (2-year period) and 16% (single season) in lung transplant patients\(^3,4\)

- Severe outcomes in immunocompromised patients
  - Progression to lower respiratory tract infection common
  - Mortality high: 26% among HCT with proven/probable lower respiratory tract infection\(^5\)

Long-term care facility (LTCF) residents vulnerable to outbreaks and serious illness

- Frequent cause of symptomatic illnesses in LTCF residents\(^1\)
- High attack rate in outbreak settings
  - \(13.5\%\) over 1 month\(^2\)
- Study of Medicare data estimated RSV-attributable hospitalizations\(^2\)
  - 2,909,106 LTCF residents \(\geq 65\) years
  - 6,196 cardiorespiratory hospitalizations

<table>
<thead>
<tr>
<th>Attributable cost</th>
<th>$51,503,105 ($38,899,971 – $64,106,240)</th>
</tr>
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<tbody>
<tr>
<td>Length of stay (LOS)</td>
<td>5.3 days (SE 4.6)</td>
</tr>
<tr>
<td>Attributable LOS</td>
<td>32,008 days (95% CI 24,267 – 39,749)</td>
</tr>
</tbody>
</table>

Outcomes among adults ≥18 years hospitalized for RSV: RSV-NET 2017-18 to 2019-20 seasons (n=8,214)

Severe outcomes frequent among adults hospitalized for RSV of all ages

Source: CDC unpublished data.
RSV leads to exacerbations of underlying chronic disease and long-term sequelae

- RSV infections can result in:
  - Acute myocardial infarction
  - Stroke
  - Exacerbation of asthma and chronic obstructive pulmonary disease
  - Long-term decline in respiratory function
  - Other sequelae
RSV hospitalizations in adults by season: RSV-NET 2014-2022

COVID-19 pandemic affected RSV in
2020-21 and 2021-22
RSV is a major cause of severe illness in older adults

- Frequent, often unrecognized, cause of severe respiratory illnesses
- Burden of severe disease may be comparable to influenza, with variability across seasons
- Adults with co-morbidities, immunocompromised adults, and long-term care facility residents may be particularly at risk for severe illness
- High proportion of those hospitalized with RSV have severe outcomes, including ICU admission and death
- Long-term health consequences
Acknowledgements

- Respiratory Viruses Branch, Division of Viral Diseases
  - RSV-NET team
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- RSV-NET Site Principal Investigators and Surveillance Officers
- Emerging Infections Program
- State and local health partners
- Many others....
Questions?

For more information, contact CDC
1-800-CDC-INFO (232-4636)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.