RSV 2023 Update

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Disclosures

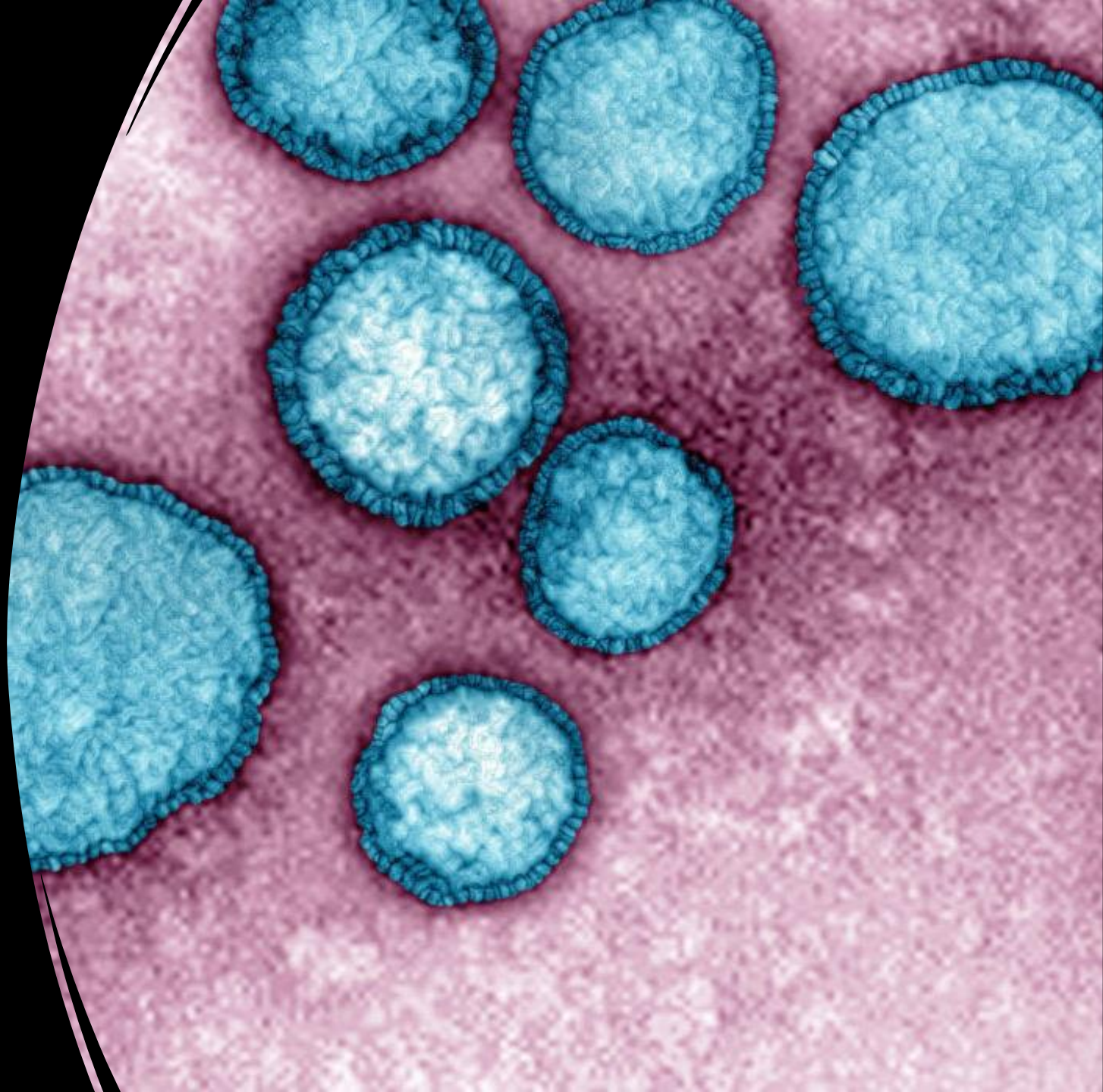
None to disclose

Outline

- Microbiology
- Transmission/Incubation
- Pathogenesis
- Immunity
- Clinical Manifestations
- Diagnosis
- Treatment
- Prevention

Microbiology

- Single stranded, negative-sense RNA virus
- Pneumoviridae family
- Two Subtypes, A and B
  - A is more severe
- Strains shift yearly



RSV Structure

- Retrovirus
- RNA has 10 genes encoding 11 proteins.
- G protein
  - *responsible for viral attachment to host cells*
- F protein
  - *promotes fusion of cells together known as the syncytial formation.*

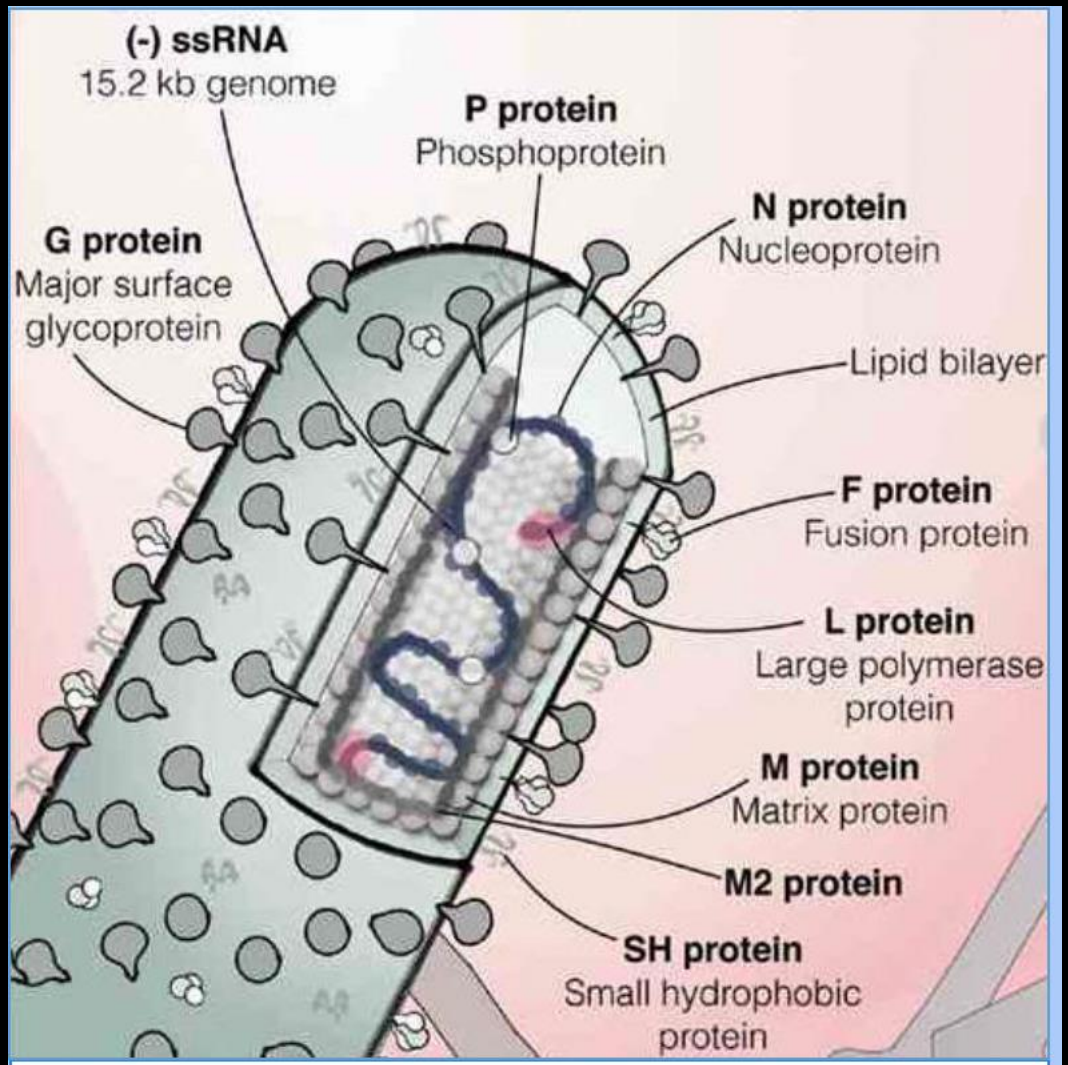


Figure 3: Molecular Structure of Human respiratory syncytial virus

Transmission

- Exposure to oropharyngeal/ocular mucous membranes by respiratory droplets/fomites
- Direct transmission is most common, but fomites can linger on hands and surfaces for several hours
- Young infants usually acquire infection from older siblings
- Proper hand hygiene key to lowering transmission
- Viral shedding around 11 days on average
- Incubation period around four to eight days

Seasonality

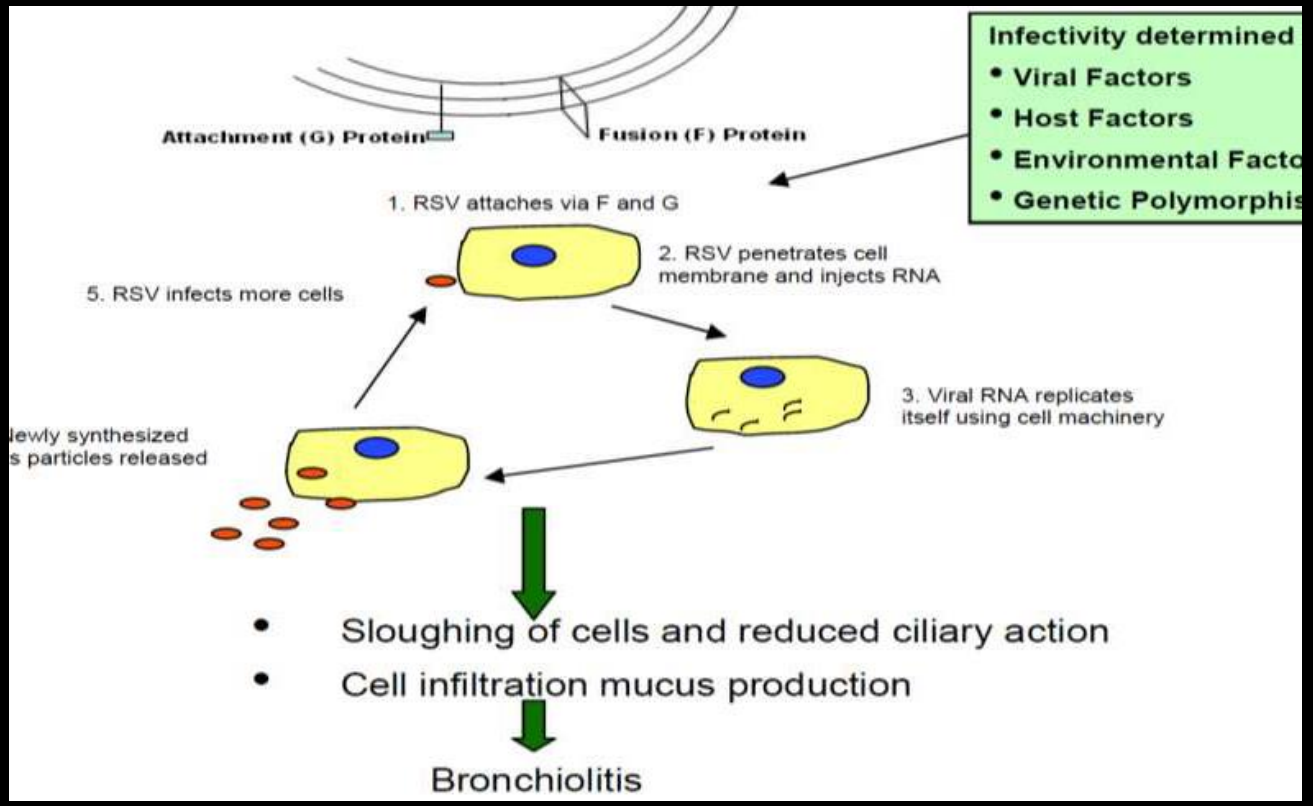
- October/November through April/May in the northern hemisphere with a peak in January and February.
- May to September in the southern hemisphere with a peak in June.

Morbidity and Mortality in Adults

- In a prospective cohort study of respiratory illnesses in 608 healthy adults ≥65 years and 540 high-risk adults (ie, those with chronic heart or lung disease, the annual incidence of RSV was 5.5 percent (ranging from 3 to 7 percent in the healthy older adults and 4 to 10 percent in the high risk group) . In another prospective study, RSV was detected in 11 percent of outpatients ≥60 years of age with acute respiratory illness’
- RSV is an important cause of death in adults older than 50 years. In a systematic review of observational studies, the mortality rate among adults ≥50 years of age who were hospitalized with RSV was 6 to 8 percent

Pathogenesis

- Replication starts in nasopharynx and upper airways then moves to type I and II aveolar pneumocytes
- Lower respiratory tract symptoms appear within three days
- Necrosis leads to cell proliferation and infiltration of immune cells
- Leading to airway obstruction, air trapping, and increased airway resistance.



Immunity

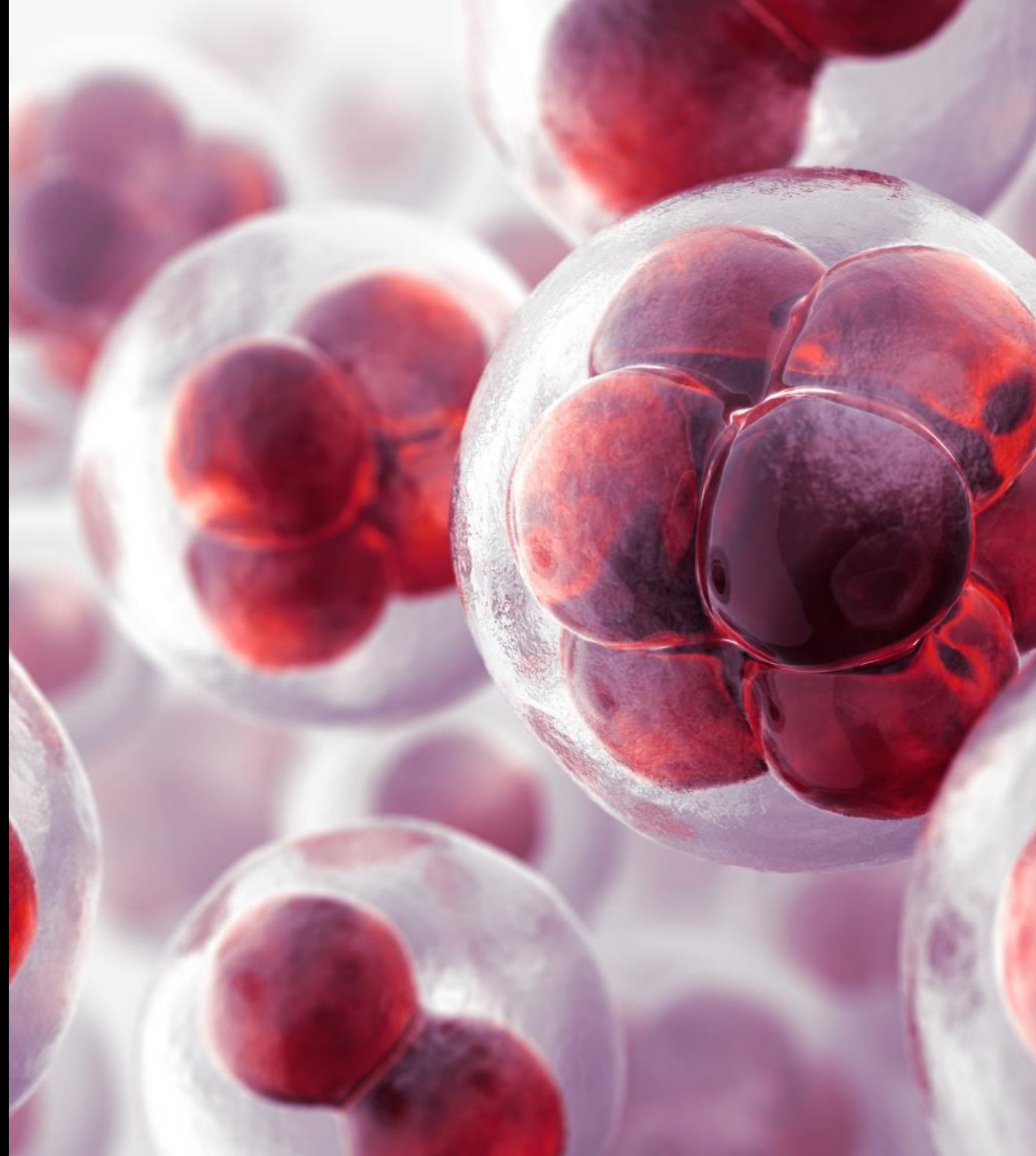
- Virtually all patients by the age of 2 have been exposed to RSV.
- Previous infection not preventative but does make subsequent infection milder.
- Lower antibody titers increased risk of severe recurrence.
  - Vertical transmission of antibodies doesn’t protect but does make infantile infection milder.
  - Cord blood samples with lower amount of RSV IgG had direct correlation with RSV hospitalization before age six months
  - Adults with lower IgG levels had increase incidence of recurrence

Clinical Presentation in Adults

- In young adults, RSV tends to affect the upper airways and present with coryza, cough, rhinorrhea, and conjunctivitis .
  - Common to to have sinus and ear involvement.
- Older adults tend to have increased lower airway involvement such as pneumonia and bronchitis.
  - Increased exacerbations of COPD and asthma found.
  - RSV can also cause new onset reactive airway disease in adults who have never had it in the past.
  - Severe disease can cause prolonged hospital stays over seven days and often can complicated by coronary disease, worsening heart failure, or arrhythmia.

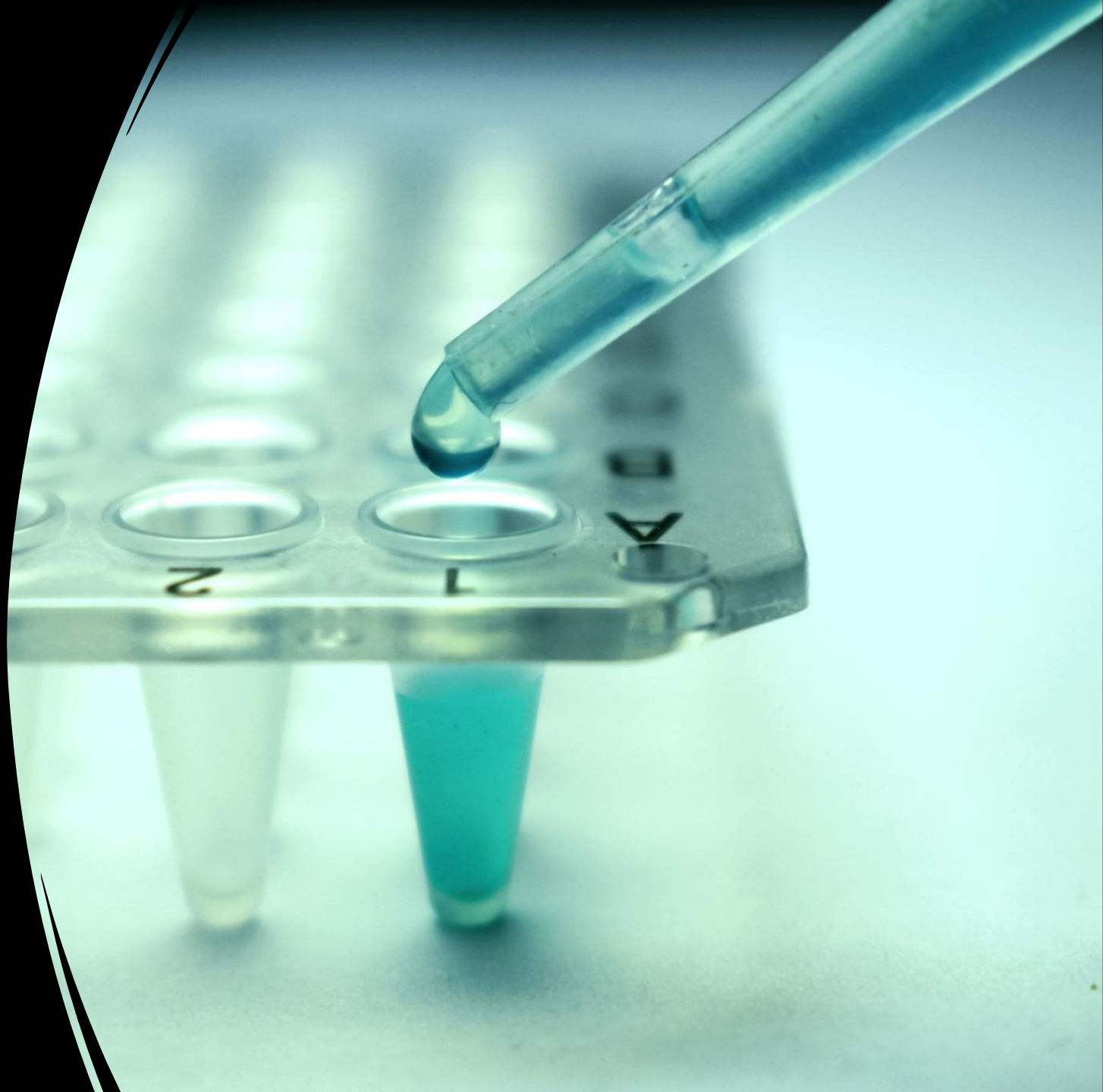
Immunocompromised Patients

- RSV pneumonia is an important cause of morbidity and mortality in the immunocompromised host
- Hematopoietic cell transplant recipients have the highest mortality from RSV, ranging from 70-100%
- Interestingly, RSV does not seem to affect lung or kidney transplant grafts.



Diagnosis

- Should be considered in any hospitalized patient admitted with a lower respiratory infection if immunocompromised or over the age of 50.
- PCR from NP swabs, BAL, tracheal aspirate preferred. Rapid antigen testing is acceptable but not as sensitive as PCR.
  - Viral cultures take too long (days to weeks)
  - Serologies are not helpful



Treatment

- Mostly supportive treatment.
- **Ribarvirin**
  - Nebulized or oral
  - Contraindicated in pregnant patients
  - Avoid in males whose partners may become pregnant
  - Pregnancy should be avoided for nine months post treatment in carriers and six months in cis-gendered males
  - Avoid in patients with COPD or asthma due to bronchoconstriction risk
- **Immunoglobulin (IVIG)**
  - Works well but no longer available in the US.
- **Palivizumab**
  - RSV-specific monoclonal antibody.
  - Infusion dose 15mg/kg x 1
  - Given in HSCT recipients
  - Given for RSV prophylaxis in high risk infants and children


Vaccines

Vaccine History

- Development began in the 1960s with a formalin-inactivated RSV (FI-RSV) combined with alum for IM injection for babes.
- Vaccine not efficacious and enhanced disease when participants were exposed to RSV with hospitalizations far more prevalent in the vaccinated group.
- Two fatalities were reported.
- Retrospectively, it is hypothesized that vaccine targeted the wrong part of the virus's life cycle (after fusion) or had the wrong parts of the virus in it igniting a robust inflammatory response causing severe disease.

60 years later…

- Development of two new recombinant inactivated viral vaccines
- GlaxoSmithKline has released Arexvy
- Pfizer has released Abrysvo

Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
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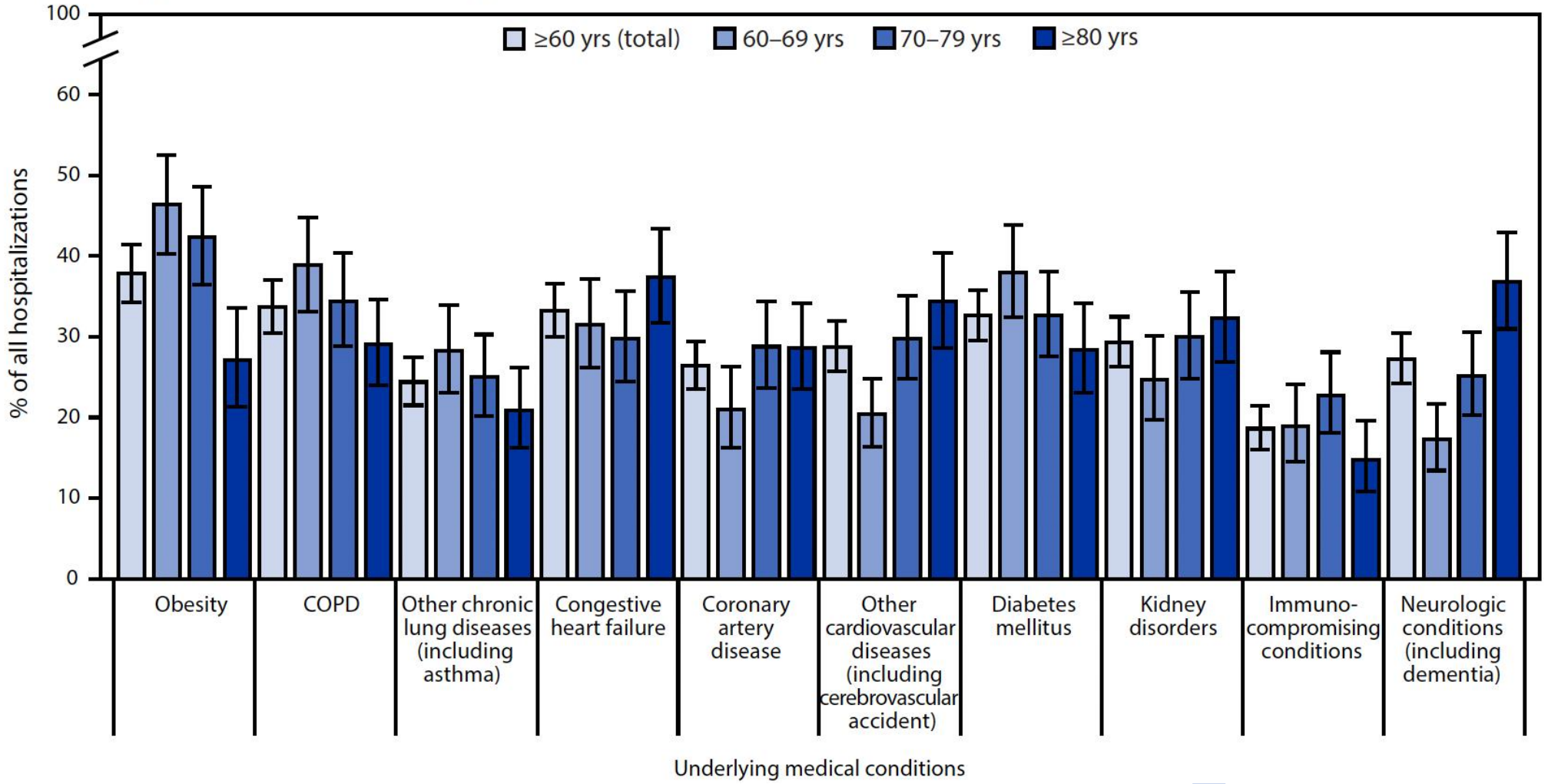
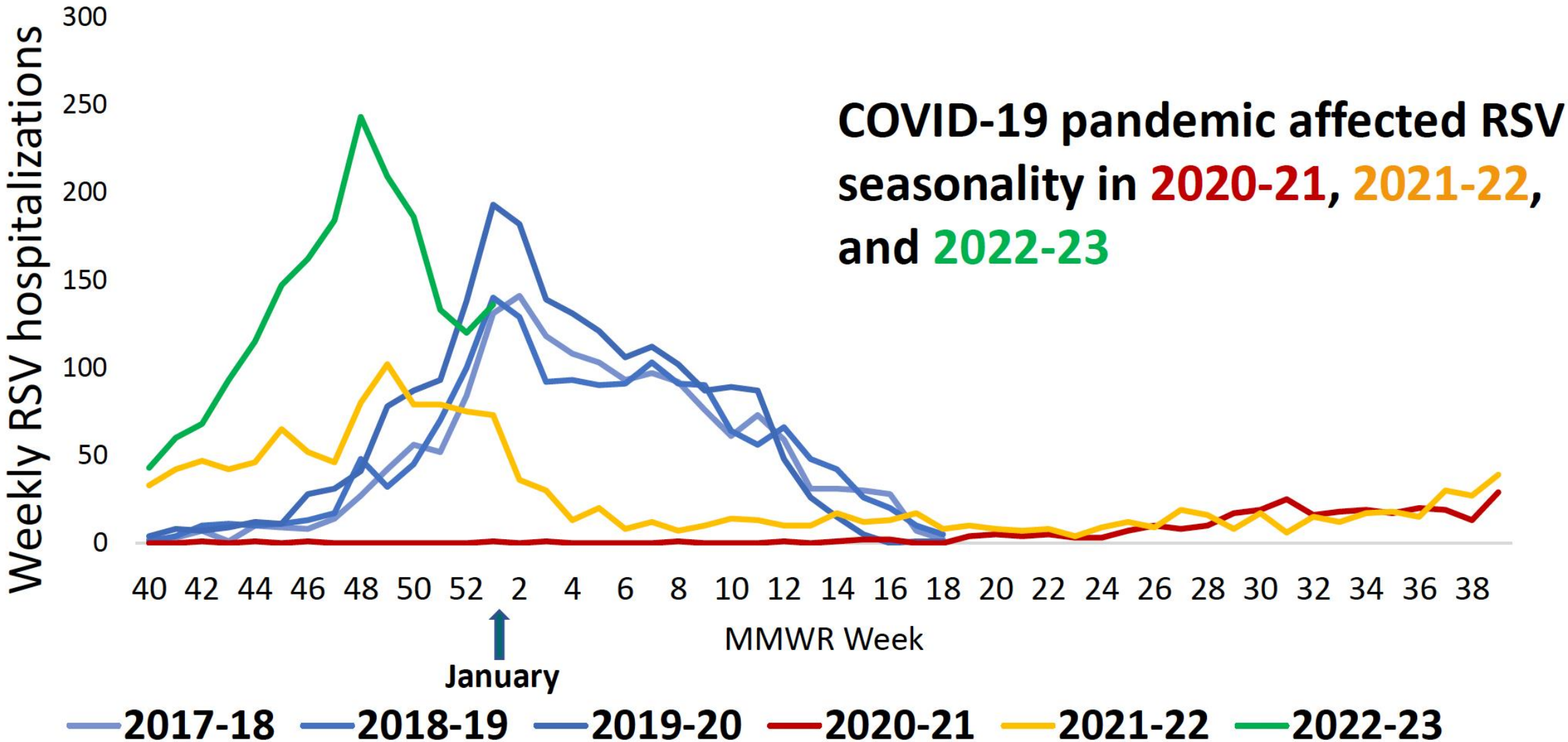
Characteristics and Outcomes Among Adults Aged ≥60 Years Hospitalized with Laboratory-Confirmed Respiratory Syncytial Virus — RSV-NET, 12 States, July 2022–June 2023

Fiona P. Havers, MD[1]; Michael Whitaker, MPH[1]; Michael Melgar, MD[1]; Bhoomija Chatwani, MPH[1,2]; Shua J. Chai, MD[3,4]; Nisha B. Alden, MPH[5]; James Meek, MPH[6]; Kyle P. Openo, DrPH[7,8,9]; Patricia A. Ryan, MS[10]; Sue Kim, MPH[11]; Ruth Lynfield, MD[12]; Yomei P. Shaw, PhD[13]; Grant Barney, MPH[14]; Brenda L. Tesini, MD[15]; Melissa Sutton, MD[16]; H. Keipp Talbot, MD[17]; Kristen P. Olsen[18]; Monica E. Patton, MD[1]; RSV-NET Surveillance Team

FIGURE 1. Underlying medical conditions*,† among patients hospitalized with laboratory-confirmed respiratory syncytial virus infection§ — Respiratory Syncytial Virus–Associated Hospitalization Surveillance Network, 12 states,¶ October 2022–April 2023

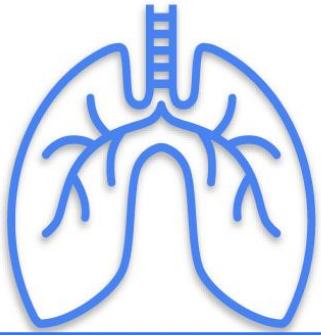


RSV Hospitalizations in adults aged ≥65 years by season: RSV-NET 2017–2023

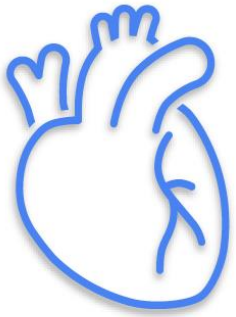


RSV-NET: unpublished data. Surveillance for 2017-18 through 2019-20 seasons were conducted from October – April; for 2020-21 and 2021-22 surveillance was conducted continuously from

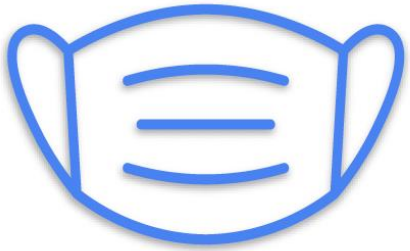
If shared clinical decision-making is recommended adults who may be at higher risk of RSV disease include persons with:



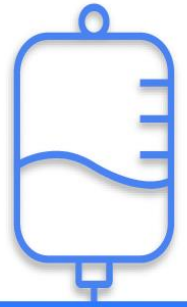
Chronic lung diseases such as COPD and asthma



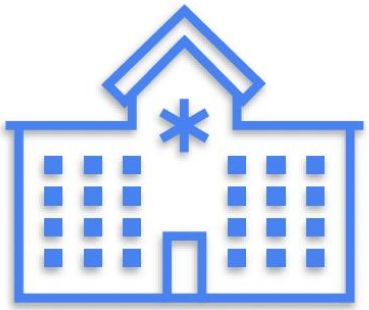
Chronic cardiovascular diseases such as congestive heart failure and coronary artery disease



Immune compromise

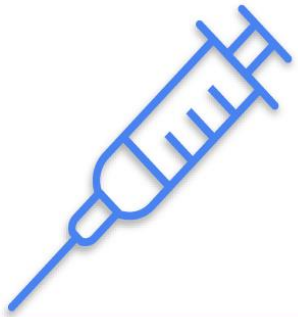


Hematologic disorders

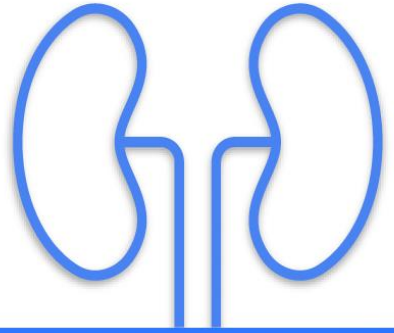


Residents of nursing homes and other long-term care facilities

Neurologic disorders



Endocrine disorders such as diabetes



Kidney and liver disorders

Other underlying conditions or factors that the provider determines might increase the risk of severe respiratory illness

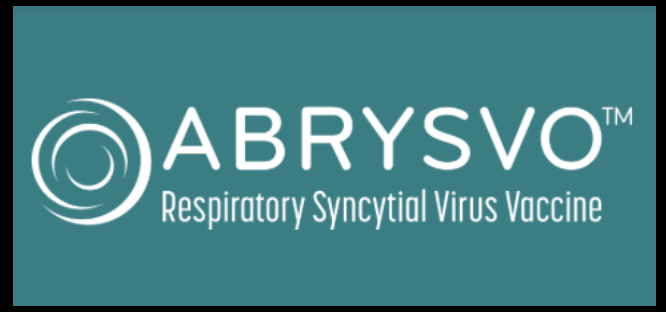
Tale of Two Vaccines

Arexvy

- Recombinant RSV F protein antigen (based on RSV-A subtype)
- Preformation (preF) conformation
- Indicated in adults over the age of 60
- One dose

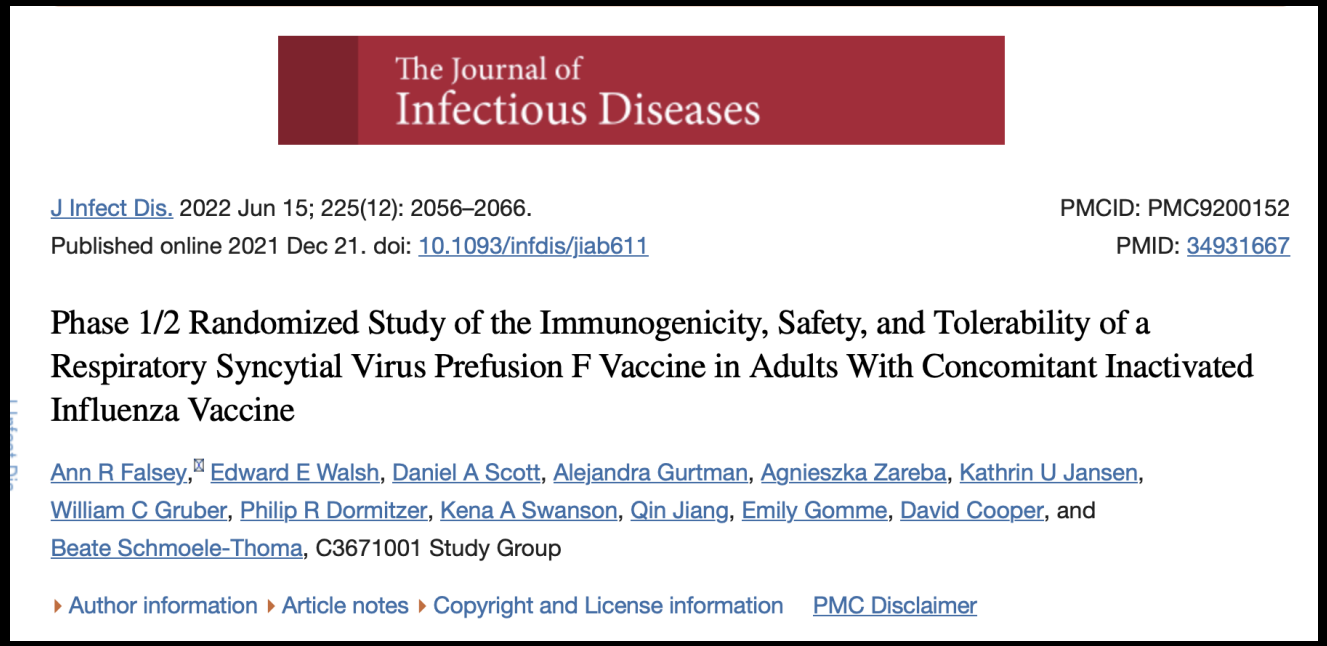
Abrysvo

- Recombinant RSV F protein antigen (based on RSV-A subtype)
- Preformation (preF) conformation
- Indicated in adults over the age of 60 and pregnant individuals between 32-36 weeks gestation.
- One dose



Adverse Effects

- Pain at the injection site
- Headache
- Fatigue
- Myalgias
- Neurologic manifestations (GBS, ADEM)
- New onset Atrial Fibrillation reported with Abrysvo



The Journal of Infectious Diseases

J Infect Dis. 2022 Jun 15; 225(12): 2056–2066. PMCID: PMC9200152
Published online 2021 Dec 21. doi: 10.1093/infdis/jiab611 PMID: 34931667

Phase 1/2 Randomized Study of the Immunogenicity, Safety, and Tolerability of a Respiratory Syncytial Virus Prefusion F Vaccine in Adults With Concomitant Inactivated Influenza Vaccine

Ann R Falsey, Edward E Walsh, Daniel A Scott, Alejandra Gurtman, Agnieszka Zareba, Kathrin U Jansen, William C Gruber, Philip R Dormitzer, Kena A Swanson, Qin Jiang, Emily Gomme, David Cooper, and Beate Schmoele-Thoma, C3671001 Study Group

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Coadministration of Vaccines

- Safe to give with with influenza vaccine and COVID booster.
- May cause increased immunogenicity and augmented post vaccination symptom

Time of Administration

Recommend to give as soon possible as RSV patterns and seasonality are returning to baseline after COVID.

Give before the onset of fall and winter.

Efficacy

- One dose of RSV vaccine provides protection against RSV disease in adults ages 60 years and older for at least two winter seasons, when RSV normally circulates.
- In adults ages 60 years and older with healthy immune systems, one dose of the RSV vaccine Arexvy was 83% effective in preventing lung infections (like pneumonia) due to RSV during the first RSV season after vaccination. During the second RSV season after vaccination, one dose of Arexvy was still 56% effective against lung infections.
- In adults ages 60 years and older with healthy immune systems, one dose of the RSV vaccine Abrysvo was 89% effective in preventing lung infections (like pneumonia) due to RSV during the first RSV season after vaccination. Based on early results from the second RSV season in a large study of how well the vaccine works, Abrysvo continues to provide protection, but the second season is ongoing and final results have not yet been released.

Thank You!