

Moving the Needle in Vaccinations of Older Adults:

Burden of
Vaccine-Preventable Disease





Pamela G. Rockwell, DO, FAAFP

Professor of Family Medicine
University of Michigan Medical School
Ann Arbor, MI, USA



Julio Alberto Ramirez, MD

Chief Scientific Officer
Norton Infectious Diseases Institute
Norton Healthcare
Emeritus Professor of Medicine
Division of Infectious Diseases
University of Louisville
Louisville, KY, USA

Patient Case



A 72-year-old female with a history of COPD presents for her annual wellness visit. She inquires about vaccination recommendations, expressing concern about recent outbreaks in her assisted living community.

COPD, chronic obstructive pulmonary disease



Risk Factors for RSV

- Respiratory syncytial virus (RSV) infection
 - Can cause severe disease in adults ≥ 65 years of age, patients with chronic heart or lung disease, or patients with weakened immune systems
- Other risk factors
 - Liver or kidney disorders, hematologic disorders, diabetes, living in long-term care facilities

Branche AR, et al. *Drugs Aging*. 2015;32(4):261-269. doi:10.1007/s40266-015-0258-9; Centers for Disease Control and Prevention (CDC). Vaccine-Preventable Adult Diseases. cdc.gov. Accessed May 14, 2024. <https://www.cdc.gov/vaccines/adults/vpd.html>; CDC. RSV in Older Adults and Adults with Chronic Medical Conditions. cdc.gov. Accessed May 20, 2024. <https://www.cdc.gov/rsv/high-risk/older-adults.html>; Falsey AR, et al. *N Engl J Med*. 2005;352(17):1749-1759. doi:10.1056/nejmoa043951.



RSV Clinical Manifestations

- Similar to other viral respiratory pathogens
- Symptoms
 - Cough, nasal congestion, rhinorrhea, sore throat, dyspnea
- Fever
 - Less common than in other respiratory illnesses, such as influenza
 - Possibly leading to an underestimation of infection rates in certain settings, such as long-term care facilities
- Lower respiratory tract disease is common, often leading to hospitalization and exacerbation of an underlying pathology

Branche AR, et al. *Drugs Aging*. 2015;32(4):261-269. doi:10.1007/s40266-015-0258-9; Centers for Disease Control and Prevention (CDC). Vaccine-Preventable Adult Diseases. cdc.gov. Accessed May 14, 2024. <https://www.cdc.gov/vaccines/adults/vpd.html>; CDC. RSV in Older Adults and Adults with Chronic Medical Conditions. cdc.gov. Accessed May 20, 2024. <https://www.cdc.gov/rsv/high-risk/older-adults.html>; Falsey AR, et al. *N Engl J Med*. 2005;352(17):1749-1759. doi:10.1056/nejmoa043951.



Prevalence and Impact of RSV

- Who is affected annually in the US?
 - **3% to 7%** of healthy elderly patients
 - **4% to 10%** of high-risk adults
- Between **~0.9 and 1.4 million** medical encounters per year
- **~60,000 to 160,000** adults ≥ 65 years of age hospitalized annually in the US
- Increased risk of severe illness in immunocompromised persons and residents of long nursing homes and long-term care facilities
- Patients with COPD, asthma, CHF, CAD, DM, and CKD at increased risk of RSV-associated hospitalization
- **~6,000 to 10,000** deaths annually

Branche AR, et al. *Drugs Aging*. 2015;32(4):261-269. doi:10.1007/s40266-015-0258-9; Centers for Disease Control and Prevention (CDC). Vaccine-Preventable Adult Diseases. cdc.gov. Accessed May 14, 2024. <https://www.cdc.gov/vaccines/adults/vpd.html>; CDC. RSV in Older Adults and Adults with Chronic Medical Conditions. cdc.gov. Accessed May 20, 2024. <https://www.cdc.gov/rsv/high-risk/older-adults.html>; Falsey AR, et al. *N Engl J Med*. 2005;352(17):1749-1759. doi:10.1056/nejmoa043951.



Risk Factors for Shingles (Herpes Zoster)

- Shingles (Herpes Zoster) Virus
 - Viral infection caused by the varicella zoster virus (VZV), which persists as a latent infection in the sensory nerve ganglia after the primary infection (chicken pox)
- Who is affected?
 - ~**90% of adults** in the US
- Primary risk factors
 - Age (>50 years), along with an impaired immune system
 - Additional risk factors: Radiation or chemotherapy and use of medications, such as anti-rejection agents or long-term use of steroids

Aging and Immunity: The Important Role of Vaccines. American College of Physicians. Accessed May 15, 2024 https://www.acponline.org/sites/default/files/documents/clinical_information/resources/adult_immunization/aging_and_immunity_guide.pdf; CDC. Shingles (Herpes Zoster). [cdc.gov](https://www.cdc.gov/shingles/hcp/clinical-overview.html). Accessed May 14, 2023. <https://www.cdc.gov/shingles/hcp/clinical-overview.html>; Harbecke R, et al. *J Infect Dis.* Sep 30 2021;224(12 Suppl 2):S429-S442. doi:10.1093/infdis/jiab387; Johnson RW, et al. *Interdiscip Top Gerontol Geriatr.* 2020;43:131-145. doi:10.1159/000504484; Safonova E, et al. *Respir Res.* 2023;24(1). doi:10.1186/s12931-022-02305-1.

Clinical Manifestations of Shingles (Herpes Zoster)



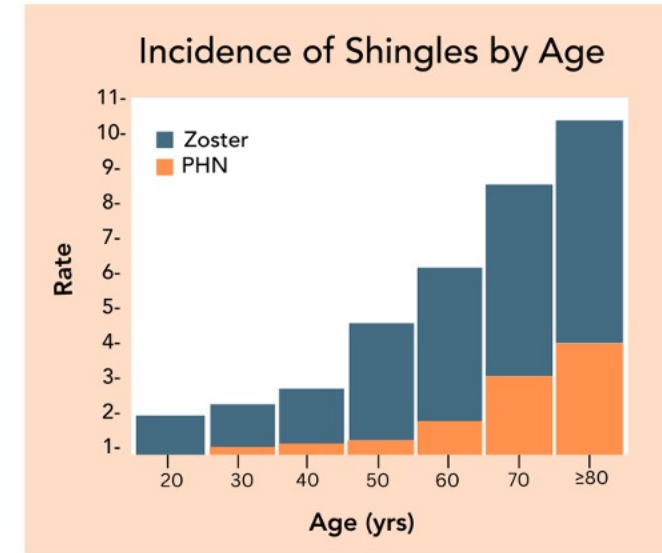
- Headache, photophobia, malaise, pain, and paresthesia often experienced in affected area days before appearance of rash
- Painful/burning/tingling rash evolves from red macules and papules to clusters of vesicles
- Age effect
- Rash usually limited to one or two adjacent unilateral dermatomes
 - Most often on trunk along a thoracic dermatome or on the face
 - Vesicles continue to form over 3-5 days; rash lasts for 7-10 days; healing in 2-4 weeks
- Impact
 - Quality of life is often substantially impaired
 - Can lead to postherpetic neuralgia as most common side effect, hearing or vision loss, encephalitis, and, rarely, death

Aging and Immunity: The Important Role of Vaccines. American College of Physicians. Accessed May 15, 2024 https://www.acponline.org/sites/default/files/documents/clinical_information/resources/adult_immunization/aging_and_immunity_guide.pdf; CDC. Shingles (Herpes Zoster). [cdc.gov](https://www.cdc.gov/shingles/hcp/clinical-overview.html). Accessed May 14, 2023. <https://www.cdc.gov/shingles/hcp/clinical-overview.html>; Harbecke R, et al. *J Infect Dis.* Sep 30 2021;224(12 Suppl 2):S429-S442. doi:10.1093/infdis/jiab387; Johnson RW, et al. *Interdiscip Top Gerontol Geriatr.* 2020;43:131-145. doi:10.1159/000504484; Safonova E, et al. *Respir Res.* 2023;24(1). doi:10.1186/s12931-022-02305-1.

Prevalence and Impact of Shingles (Herpes Zoster)



- Who is affected annually in the US?
 - **1 million** new cases
 - Occurs at least once in **1 in 3** people
 - Mostly in adults over age 50
 - **<100 deaths** annually
 - Mostly among the elderly
- **~1% to 4%** of people with herpes zoster are hospitalized for complications
 - Older adults and people with compromised or suppressed immune systems are more likely to be hospitalized
 - ~30% of people hospitalized with herpes zoster have compromised or suppressed immune systems.



Source: <https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5705a1.htm>

Aging and Immunity: The Important Role of Vaccines. American College of Physicians. Accessed May 15, 2024 https://www.acponline.org/sites/default/files/documents/clinical_information/resources/adult_immunization/aging_and_immunity_guide.pdf; CDC. Shingles (Herpes Zoster). cdc.gov. Accessed May 14, 2023. <https://www.cdc.gov/shingles/hcp/clinical-overview.html>; Harbecke R, et al. *J Infect Dis.* Sep 30 2021;224(12 Suppl 2):S429-S442. doi:10.1093/infdis/jiab387; Johnson RW, et al. *Interdiscip Top Gerontol Geriatr.* 2020;43:131-145. doi:10.1159/000504484; Safonova E, et al. *Respir Res.* 2023;24(1). doi:10.1186/s12931-022-02305-1.



Risk Factors for Pneumococcal Disease

- Pneumococcal disease
 - Wide range of infections caused by *streptococcus pneumoniae* (pneumococcus)
 - Mild ear or sinus infections, which can have serious complications
 - Serious infections
 - Pneumonia – greatest health impact
 - Bacteremia
 - Meningitis
- Risk factors
 - Age ≥ 65
 - Risk conditions
 - Alcoholism
 - Cerebrospinal fluid leak
 - Chronic heart, kidney, liver, or lung disease
 - Cigarette smoking
 - Cochlear implant
 - Diabetes
 - Immunocompromising condition

Arnold FW, et al. *J Am Geriatr Soc*. May 2020;68(5):1007-1014. doi:10.1111/jgs.16327; CDC. Pneumococcal Disease. cdc.gov. Accessed May 14, 2024. <https://www.cdc.gov/pneumococcal/signs-symptoms/>; CDC. Vaccine-Preventable Adult Diseases. cdc.gov. Accessed May 14, 2024. <https://www.cdc.gov/vaccines/adults/vpd.html>; CDC. Pneumococcal Disease in Adults and Vaccines to Prevent It. cdc.gov. Accessed May 14, 2024. <https://www.cdc.gov/pneumococcal/prevent-pneumococcal-factsheet/index.html>; CDC. Pneumococcal Disease: Causes and How It Spreads. cdc.gov. Accessed May 14, 2024. <https://www.cdc.gov/pneumococcal/causes/index.html>.

Clinical Manifestations of Pneumococcal Disease



- Pneumonia
 - Most common clinical presentation
 - Older adults with pneumococcal pneumonia may experience confusion or low alertness rather than the more common symptoms of fever and chills, cough, rapid breathing or difficulty breathing, and chest pain
- Bacteremia
 - Fever, chills, and low alertness; Long term prognosis may involve loss of limbs
 - Can lead to arthritis, meningitis, and endocarditis
- Meningitis
 - Stiff neck, fever, headache, photophobia, and confusion. Long term risks can include hearing loss

CDC. Pneumococcal Disease. cdc.gov. Accessed May 14, 2024. <https://www.cdc.gov/pneumococcal/signs-symptoms/>; CDC. Vaccine-Preventable Adult Diseases. cdc.gov. Accessed May 14, 2024. <https://www.cdc.gov/vaccines/adults/vpd.html>; CDC. Pneumococcal Disease in Adults and Vaccines to Prevent It. cdc.gov. Accessed May 14, 2024. <https://www.cdc.gov/pneumococcal/prevent-pneumococcal-factsheet/index.html>; CDC. Pneumococcal Disease: Causes and How It Spreads. cdc.gov. Accessed May 14, 2024. <https://www.cdc.gov/pneumococcal/causes/index.html>.

Prevalence and Impact of Pneumococcal Disease



Who is affected?

- Annually in the US
 - **31,000** cases of bacteremia and meningitis pneumococcal disease
 - **3,500** deaths
 - **320,000** cases of pneumococcal pneumonia
 - **150,000** hospitalizations and **5,000** deaths
- Mortality rates
 - Pneumonia: 1 in 20
 - Meningitis: 1 in 6
 - Bacteremia: 1 in 6

KEY POINT

Arnold FW, et al. *J Am Geriatr Soc*. May 2020;68(5):1007-1014. doi:10.1111/jgs.16327; CDC. Pneumococcal Disease. cdc.gov. Accessed May 14, 2024. <https://www.cdc.gov/pneumococcal/signs-symptoms/>; CDC. Vaccine-Preventable Adult Diseases. cdc.gov. Accessed May 14, 2024. <https://www.cdc.gov/vaccines/adults/vpd.html>; CDC. Pneumococcal Disease in Adults and Vaccines to Prevent It. cdc.gov. Accessed May 14, 2024. <https://www.cdc.gov/pneumococcal/prevent-pneumococcal-factsheet/index.html>; CDC. Pneumococcal Disease: Causes and How It Spreads. cdc.gov. Accessed May 14, 2024. <https://www.cdc.gov/pneumococcal/causes/index.html>.

Prevalence and Impact of Vaccine-Preventable Disease



• Costs

- Economic burden that is attributable to vaccine-preventable diseases and deaths among unvaccinated US adults: **\$7.1 billion** annually
- Among older adults, annually

	RSV*	Pneumococcal Disease**	Herpes Zoster**
Total direct medical costs	\$2.9 billion	\$4.8 billion	\$1.4 billion
Total societal costs	\$6.6 billion	\$8.4 billion	\$3.5 billion

Costs of care for patients with herpes zoster presenting with PHN were significantly higher than for those without PHN

*Among adults >60 years

**Among adults ≥65 years

PHN, post-herpetic neuralgia

Carrico J, et al. *J Infect Dis*. Published online December 7, 2023. doi:10.1093/infdis/jiad559; Johnson BH, et al. *J Med Econ*. 2016;19(10):928-935. doi:10.1080/13696998.2016.1187150; McLaughlin et al. *J Prim Prev*. 2015;36(4):259-273. doi:10.1007/s10935-015-0394-3; Ozawa, S, et al. *Health Aff (Millwood)*. 2016;35(11):2124-2132; Talbird, S E, et al. *Hum Vaccin Immunother*. 2021;17(2):332-333.

Health Disparities in Vaccination for Vaccine - Preventable Disease



KEY POINT

- Disease burden disproportionately affects some groups
 - Black and Hispanic people are more likely to be hospitalized for influenza than White people
 - Black and Native American people are more likely to be hospitalized for pneumonia compared to White people
 - More likely to die within the hospital and have a longer length of stay

• Disparities in Vaccine Uptake

KEY POINT

- In the US, White elderly adults are significantly more likely to receive vaccinations indicated for elderly adults than are **Black, Hispanic, and Asian elderly adults**
- Vaccination coverage was lower among adults **without health insurance** than in those with health insurance
- Vaccination rates for US-born respondents were significantly higher than those of **foreign-born respondents**
- Key contributor to suboptimal vaccination rates among elderly patients
 - Low awareness of vaccines
 - Healthcare provider recommendations
 - Interactions with primary care providers

Elekwachi O, et al. *J Prim Care Community Health*. 2021;12:21501327211014071. doi:10.1177/21501327211014071; *Adult Immunization Disparities*. National Adult and Influenza Immunization Summit. Accessed May 22, 2024. https://www.izsummitpartners.org/content/uploads/2016/01/NAIIS_Adult_Immunization_Disparities-4-01-2015.pdf; Tse SC, et al. *Prev Chronic Dis*. 2018;15:180101. doi:10.5888/pcd15.180101.

Health Disparities in Vaccination for Vaccine-Preventable Disease



- Reducing Vaccine Disparities: The Role of Social Determinants of Health
 - Requires broad collaborative attention over time, leveraging housing, transportation, education, and employment data
 - Continue ongoing vaccine surveillance to identify disparities
 - Implementation of evidence-based interventions to increase vaccinations rates: reminder/recall systems; use of standing orders; regular assessments of vaccination coverage; use of immunization information systems/registries (IIS); improve public awareness on importance of vaccines
- Healthcare providers can
 - Increase awareness of disparities among own patients
 - Assess vaccination needs at each encounter
 - Strongly recommend vaccination
 - Use local IIS, document vaccine administration
 - Utilize patient education materials in other languages when appropriate

Elekwachi O, et al. *J Prim Care Community Health*. 2021;12:21501327211014071. doi:10.1177/21501327211014071; *Adult Immunization Disparities*. National Adult and Influence Immunization Summit. Accessed May 22, 2024. https://www.izsummitpartners.org/content/uploads/2016/01/NAIIS_Adult_Immunization_Disparities-4-01-2015.pdf.

Impact of Risk Factors on Increased Susceptibility in Aging



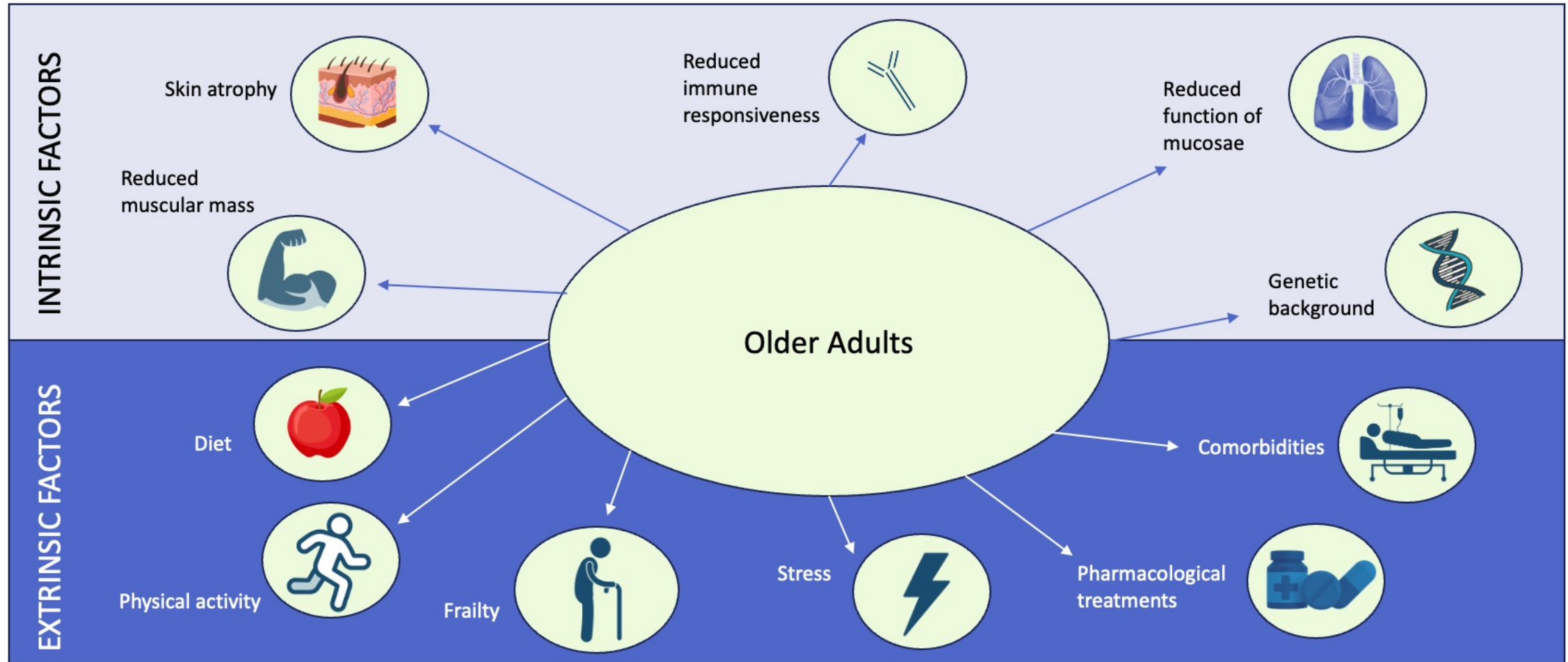
KEY POINT

- Aging is influenced by multifaceted extrinsic and intrinsic factors that lead to increased susceptibility to infections
 - Extrinsic
 - Diet
 - Physical activity
 - Frailty
 - Stress
 - Immune-suppressing medications
 - Comorbidities
 - Intrinsic
 - Reduced muscular mass (sarcopenia)
 - Reduced immune responsiveness (immunosenescence)
 - Reduced function of mucosae
 - Genetic background
- Immunosenescence: age-related decline in immunity
 - Healthy lifestyle insufficient to prevent older adults from acquiring vaccine-preventable diseases
 - Impacted ability to recognize and stop pathogens, starting in 50s
- Pro-inflammatory state → increased risk for diabetes, osteoporosis, atherosclerosis, and other age-associated diseases that share an inflammatory pathogenesis

Aging and Immunity: The Important Role of Vaccines. American College of Physicians. Accessed May 15, 2024 https://www.acponline.org/sites/default/files/documents/clinical_information/resources/adult_immunization/aging_and_immunity_guide.pdf; Del Giudice, G., et al. *NPJ Aging Mech Dis.* 2017;4:1. Published 2017 Dec 21. doi:10.1038/s41514-017-0020-0; Hou, Y., et al. *NPJ Vaccines.* 2024;9(1):77. doi:10.1038/s41541-024-00874-4.

Impact of Risk Factors on Increased Susceptibility in Aging

Aging is influenced by multifaceted extrinsic and intrinsic factors that lead to increased susceptibility to infections



Patient Case Variation #1



Three weeks later, a new patient (age 78) is admitted to the hospital with pneumococcal pneumonia from the same assisted living community. Despite having multiple comorbidities, discussions reveal he was hesitant to receive the recommended vaccines due to misconceptions about the need to be vaccinated.

Older Adults & Risk Assessment

- Older adults are at an increased risk of vaccine-preventable diseases due to
 - Age-related physiologic changes in the immune and other body systems
 - Comorbidities that increase vulnerability to infections and decrease the response to vaccines
- Strategies to improve the response to vaccines include
 - Using a higher antigenic dose (such as that in the high-dose inactivated influenza vaccines)
 - Preparing multivalent antigen vaccines
 - Adding adjuvants (such as MF59 in the adjuvanted inactivated influenza vaccine)



Immunization Schedules



CDC Advisory Committee on Immunization Practices (ACIP): Adult Immunization Schedule by Age

- Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of immunity
 - RSV
 - As of June 7, 2024, Respiratory Syncytial Virus Vaccine, Adjuvanted is indicated in adults 50-59 at increased risk for lower respiratory tract disease (LRTD) caused by RSV, in addition to adults ≥60 years of age
 - Zoster
 - >50 years of age
 - Pneumococcal
 - As of June 17, 2024, PCV21 (Pneumococcal 21-valent conjugate vaccine) is approved for adults ≥18 of age, in addition to PCV15 and PCV20 in adults ≥65 of age
 - COVID-19
 - Influenza
 - Tdap or Td
- Additional immunizations are recommended based on risk factors or other indications

■ Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of immunity
 ■ Recommended vaccination for adults with an additional risk factor or another indication
 ■ Recommended vaccination based on shared clinical decision-making

			Vaccine Received	Date Received
Respiratory Syncytial Virus (RSV)		Age ≥60 years		__/__/__
Zoster recombinant (RZV)	2 doses (2–6 months apart)			__/__/__ __/__/__
Pneumococcal (PCV15, PCV20, PPSV23)	Age 50–65 years	See notes		__/__/__
		See notes		__/__/__ __/__/__
COVID-19	1 or more doses of updated (2023–2024 Formula) vaccine			__/__/__
Influenza inactivated (IIV4) or Influenza recombinant (RIV4)	1 dose annually			__/__/__
Tetanus, diphtheria, pertussis (Tdap or Td)	1 dose Td/Tdap for wound management			__/__/__
	1 dose Tdap, then Td or Tdap booster every 10 years			__/__/__

Notes

- CDC recommends PCV15 or PCV20 for: Children <5 years old; People 5–64 years old with certain risk conditions who never received a PCV; Adults ≥65 years old who never received a PCV.
- CDC recommends PPSV23 for: Children 2–18 years old with certain risk conditions who get PCV15; Adults ≥19 years old who get PCV15.
- People previously recommended to get both PCV13 and PPSV23 who already received PCV13 can complete the recommended series with: PCV20 OR PPSV23.

Adapted from the CDC ACIP.

CDC ACIP. Adult Immunization Schedule by Age. cdc.gov. Accessed May 15, 2024. <https://www.cdc.gov/vaccines/schedules/hcp/imz/adult.html#table-age>; Pneumococcal 21-valent conjugate vaccine. Package insert. Merck; 2024; Respiratory Syncytial Virus Vaccine, Adjuvanted. Package insert. GlaxoSmithKline; 2023.

Patient Case Variation #1



During recovery, the first patient reflects on her peers who have faced similar illnesses, sparking a conversation about the importance of community-wide immunization efforts to reduce disease spread, particularly among vulnerable groups.



Thank You!