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THE ROLE OF RSV VACCINATION IN THE PREVENTION OF RESPIRATORY DISEASES IN OLDER ADULTS

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ABSTRACT

Introduction and objective: Respiratory syncytial virus (RSV) is one of the leading causes of lower respiratory tract infections in older adults. In 2023, the first subunit vaccines based on the prefusion conformation of the RSV fusion protein - Arexvy and Abrysvo - were approved, followed in 2024 by the mRNA-1345 vaccine marketed as mRESVIA. The aim of this study is to present the importance of RSV vaccination in the prevention of respiratory diseases in adults aged ≥60 years.
Review methods: The literature review was conducted using articles available in the PubMed, EMBASE, Web of Science, and Cochrane Library databases. The analysis focused on studies addressing RSV epidemiology as well as the efficacy and safety of RSV vaccines, particularly Arexvy and Abrysvo. FDA and CDC/ACIP documents were also included. Studies involving pediatric populations and narrative reviews were excluded.
State of knowledge: RSV accounts for 5-10% of lower respiratory tract infections in older adults, with mortality among infected individuals reaching 2-5%. Arexvy induces a strong immune response, while Abrysvo is characterized by a favorable safety profile. Studies have demonstrated vaccine efficacy ranging from 66-83% against RSV-associated lower respiratory tract disease and over 90% against severe RSV infection. Protection conferred by Arexvy persists for at least two seasons.
Summary: RSV vaccination reduces the incidence of lower respiratory tract infections, hospitalizations, and mortality in the older adult population. The 2024 ACIP guidelines recommend a single dose of RSV vaccine for individuals aged ≥75 years and for adults aged 60-74 years with risk factors, without routine booster doses.

KEYWORDS

Respiratory Syncytial Virus Infections, Vaccines, Aged, Respiratory Tract Infections

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Introduction

Respiratory syncytial virus (RSV) is a common respiratory pathogen and a significant cause of lower respiratory tract infections in older adults [1–3]. In the elderly population, RSV leads to seasonal epidemics of bronchitis and pneumonia, often with a severe clinical course. Studies have shown that RSV accounts for 10–20% of pneumonia cases in long-term care facilities and approximately 2–5% of fatal infections [4]. The risk of severe disease increases with age and the presence of comorbidities.

RSV infections in older adults may result in prolonged hospitalization and complications such as secondary bacterial pneumonia, exacerbation of chronic diseases, and substantial mortality [3,5,6]. It has been demonstrated that among hospitalized patients aged 60 years and older, RSV infection was associated with poorer outcomes compared with influenza, including a higher incidence of pneumonia, more frequent need for intensive care, and higher mortality within one year after illness onset [7].

It is estimated that in the United States alone, RSV causes up to approximately 160,000 hospitalizations and 10,000 deaths annually among individuals aged ≥65 years [8], while mortality among older adults with RSV infection has reached 2-5% in some studies [4].

In 2023, subunit RSV vaccines for adults developed by GSK and Pfizer were approved for the first time, followed in 2024 by Moderna's mRNA-1345 vaccine. In 2024, the Advisory Committee on Immunization Practices (ACIP) updated its recommendations, advising a single vaccine dose for individuals aged ≥75 years and for adults aged 60-74 years with risk factors [9-11].

Aim of the study

The aim of this publication is to discuss the role of RSV vaccination in the prevention of respiratory diseases in older adults, with particular emphasis on vaccine efficacy, safety, and current recommendations.

Review methods

The literature search was conducted using major bibliographic databases, including PubMed, EMBASE, Web of Science, and the Cochrane Library, as well as local Polish sources such as the Polish Medical Bibliography and vaccination-related information services. The search covered publications from 2017 to 2025 in both Polish and English.

The analysis included publications addressing RSV vaccination in adults, particularly older adults aged 60 years and older, encompassing randomized controlled clinical trials (Phase II/III), observational studies, review articles, and meta-analyses, as well as guidelines or official expert recommendations. In scientifically justified cases, older sources were also included.

A critical analysis of the collected publications was subsequently performed, focusing on data concerning the epidemiology of RSV infections in older adults (incidence, hospitalizations, mortality), immunological aspects of the response to RSV in older individuals, clinical efficacy of vaccines, effectiveness in different subpopulations, and vaccine safety profiles, including the frequency and type of adverse events. Official recommendations regarding RSV vaccination issued by expert bodies such as the Advisory Committee on Immunization Practices (ACIP), the Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO), and national scientific societies were also analyzed.

Exclusion criteria included non-peer-reviewed articles, case reports, and publications involving pediatric populations.

State of knowledge

Epidemiology of RSV in older adults

For decades, RSV was primarily regarded as a pathogen responsible for infections in childhood. This perception began to change in the early 21st century, when data emerged indicating a substantial burden of RSV-related disease among older adults. As early as 2005, Falsey et al., in a study published in The New England Journal of Medicine, analyzed more than 1,800 hospitalizations of adults with respiratory infections in New York State. The authors demonstrated that RSV accounted for 5-10% of all hospitalizations in this age group, with in-hospital mortality of approximately 2-5% [12].

In subsequent years, epidemiological data confirmed these observations. Ackerson et al. followed more than 2,500 older adults enrolled in the Kaiser Permanente healthcare system and found that the risk of severe complications and death among patients hospitalized with RSV was higher than among those hospitalized with influenza [7].

The COVID-19 pandemic provided unique comparative data. Surie et al. analyzed hospitalization outcomes during the 2021/22 and 2022/23 seasons and found that although RSV-related hospitalizations were less frequent than those due to COVID-19, their clinical course was often more severe than influenza. Patients required longer oxygen therapy and were more frequently admitted to intensive care units [13].

Data from 2023 further confirmed a high short-term mortality risk. In an analysis of more than 7,000 hospitalized adults aged ≥60 years, the 30-day mortality risk was 13.5% for RSV, compared with 7.0% for influenza and 10.2% for COVID-19. RSV was also associated with the highest risk of readmission within 30 days [14].

Pathophysiology and susceptibility of older adults

Key antigen - the F protein

RSV possesses several surface proteins, of which the fusion (F) protein is the most clinically important. It is responsible for viral entry into host cells. In the natural viral life cycle, the F protein exists in two conformations: prefusion (preF) and postfusion (postF). Structural studies have shown that most neutralizing antibodies are directed against epitopes present in the preF conformation. This discovery enabled the design of effective vaccines, and stabilization of the preF protein represented a breakthrough in RSV immunoprophylaxis [9,15].

Immunosenescence

With aging, there is a gradual decline in immune system function. The number of naïve T lymphocytes decreases, interferon production is reduced, natural killer cell function is impaired, and B-cell responses are weakened. Consequently, older adults respond less effectively to new viral infections [4,12]. Falsey et al. noted that most patients hospitalized with RSV had comorbidities such as chronic obstructive pulmonary disease, heart failure, and diabetes [12].

Cardiopulmonary complications

RSV may induce exacerbations of chronic obstructive pulmonary disease and asthma, as well as decompensation of heart failure. Retrospective analyses have shown that patients with RSV had a significantly higher risk of myocardial infarction and arrhythmias during hospitalization compared with patients with influenza [7].

Introduction to subunit vaccines

The development of RSV subunit vaccines was made possible by the discovery of stabilization of the RSV fusion protein in its prefusion conformation (preF). This structure contains the most immunogenic epitopes against which the human immune system produces neutralizing antibodies. The vaccines Arexvy (manufactured by GSK) and Abrysvo (manufactured by Pfizer) are the first subunit vaccines based on the preF protein to receive approval for use in adults aged ≥60 years in 2023 [9–11,17–18].

For many years, despite intensive research efforts, no licensed RSV vaccine was available, as highlighted by current WHO data. Only in 2023-2024 did the first vaccines become approved for use in adults and for infant prophylaxis, representing a breakthrough in the global strategy to prevent severe RSV infections. WHO emphasizes that the introduction of vaccines and long-acting antibodies has opened a new chapter in reducing disease burden in high-risk populations [8]. Current vaccines demonstrate both high clinical efficacy and favorable safety profiles [9].

All three approved RSV vaccines - Arexvy, Abrysvo, and mRNA-1345-target the same antigen, the RSV fusion protein in its prefusion conformation (preF), but differ in their design and use of adjuvants [15,19].

Characteristics of individual vaccines

The Arexvy vaccine contains recombinant RSV-A preF protein combined with the AS01E adjuvant, which is also used in the herpes zoster vaccine Shingrix. This formulation induces both strong humoral and cellular immune responses [10,16–17].

Abrysvo is a non-adjuvanted protein-based vaccine containing preF antigens of both RSV-A and RSV-B. The absence of an adjuvant is associated with a more favorable safety profile while maintaining high clinical efficacy, particularly against more severe forms of disease [9,18].

Comparison of clinical trial data

A comparison of clinical trial data regarding vaccine efficacy and adverse events is presented in the tables below.

Table 1. Efficacy of RSV subunit vaccines [9,10,16]

Vaccine	Effectiveness against RSV-LRTD (≥2 symptoms)	Effectiveness against RSV-LRTD (≥3 symptoms)	Effectiveness against severe RSV-LRTD	Notes
Arexvy (Papi 2023)	82,6%	-	94,1%	Effectiveness maintained over 2 seasons
Abrysvo (Walsh 2023)	66,7%	85,7%	62,1%	Long-term data ongoing

RSV-LRTD - Lower Respiratory Tract Disease caused by Respiratory Syncytial Virus.

Table 2. Comparison of adverse events associated with Arexvy versus Abrysvo [9,10]

Vaccine	Injection-site pain	Redness/swelling	Fatigue	Muscle pain	Serious Adverse Events
Arexvy	61%	13%	33,6%	29%	rare; no difference compared with placebo
Abrysvo	11%	5%	16%	10%	isolated incidents

Duration of protection

Available data indicate that clinically meaningful protection is maintained for at least two seasons, with some decline in effectiveness, but without clear evidence supporting the need for annual booster doses. Studies evaluating the duration of vaccine-induced immunity are ongoing [11].

Recommendations and implications for primary care

According to ACIP guidelines issued in June 2024, a single dose of RSV vaccine is recommended for individuals aged ≥75 years and for adults aged 60-74 years with risk factors, without the need for revaccination. This recommendation applies to Arexvy, Abrysvo, and mRESVIA. Vaccination should preferably be administered in late summer or autumn. Concomitant administration with the influenza vaccine is permitted, provided that different injection sites are used [11,17-19].

Conclusions

RSV remains a significant public health threat requiring effective preventive measures. Further research is needed to determine the duration of vaccine-induced protection.

Summary

Respiratory syncytial virus (RSV) poses a significant risk to the adult population, particularly older adults and individuals with comorbidities. Epidemiological data indicate that the clinical burden of RSV in this group is comparable to, and in some cases greater than, that of seasonal influenza. Reports indicate that hospitalizations among individuals aged ≥65 years with RSV infection have been associated with mortality rates as high as 2–5%. The risk of complications and death associated with RSV infection is significantly higher than that of influenza. RSV leads to more severe hospitalizations than influenza and, in selected cohorts, has been associated with higher short-term mortality than COVID-19.

A major breakthrough in RSV prevention occurred with the development of a stabilized prefusion conformation of the F protein, enabling the creation of effective vaccines. Currently available vaccines include Arexvy, Abrysvo, and mRNA-1345/mRESVIA. Phase 3 clinical trials have demonstrated high efficacy of all three vaccines in preventing RSV-associated lower respiratory tract disease, including severe forms. Current 2024 ACIP recommendations advise a single RSV vaccine dose for all adults aged ≥75 years and for individuals aged 60–74 years with risk factors. Routine revaccination is not recommended.

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