

Optimizing adult immunization in chronic respiratory diseases through a pharmacist-supported framework for integrated primary care: A narrative review

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ABSTRACT

Patients with chronic respiratory diseases (CRDs) are at increased risk of vaccine-preventable infections, disease exacerbations, hospitalization, and adverse clinical outcomes. Although adult immunization is central to preventive respiratory care, vaccination coverage remains inconsistent due to patient-, provider-, and system-level factors, including hesitancy, limited risk perception, fragmented care pathways, insufficient professional recommendation, incomplete documentation, and missed opportunities. Community pharmacists are increasingly recognized as contributors to vaccination delivery because of their accessibility, repeated contact with citizens, and expanding preventive care roles. This structured narrative review aims to synthesize implementation-oriented evidence on adult immunization in CRDs and translate current vaccination priorities into a pharmacist-supported primary care framework. Targeted searches were conducted in PubMed/MEDLINE, Scopus, and Web of Science to identify relevant publications from January 2015 to June 2026, complemented by national and international guidelines, regulatory information, policy documents, and practice recommendations. Evidence was synthesized narratively around vaccination priorities, barriers to uptake, pharmacist-supported interventions, patient communication, and interprofessional care. Based on the reviewed evidence, the resulting framework, informed by the Greek healthcare ecosystem and potentially relevant to comparable settings, structures pharmacist-supported immunization around patient identification, vaccination-status assessment, risk-based prioritization, and implementation with follow-up. Within physician-led and interprofessional pathways, pharmacists may complement primary care provision by supporting individualized counselling, eligibility and contraindication screening, access facilitation, vaccine administration in accordance with national regulations, referral, documentation, reminders, and continuity of care. Pharmacist-supported immunization has the potential to strengthen adult vaccination for patients with CRDs as part of coordinated, physician-led primary care pathways. Within these pathways, community pharmacists are well positioned to translate guideline recommendations into routine preventive care by identifying and addressing patients' vaccination needs. The proposed framework provides a structured approach to support this process. Prospective studies should assess its feasibility, acceptability, implementation fidelity, vaccination uptake, documentation quality, and patient-related outcomes.

ABBREVIATIONS CRD: chronic respiratory disease, PCV: pneumococcal conjugate vaccine, RSV: respiratory syncytial virus, RZV: recombinant zoster vaccine, Tdap: tetanus, reduced-diphtheria, and acellular pertussis vaccine, COVID-19: coronavirus disease 2019

INTRODUCTION

Vaccine-preventable diseases (VPDs) represent a substantial and persistent burden among adults, particularly in patients with chronic respiratory diseases (CRDs) such as chronic

obstructive pulmonary disease (COPD), asthma, and interstitial lung diseases (ILDs). For these patients, VPDs may trigger acute exacerbations, worsen disease progression, reduce quality of life, and increase hospitalization and mortality. The cumulative clinical burden is further amplified

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by aging and the presence of multiple comorbidities, positioning patients with CRDs as a priority group for targeted immunization strategies^{1,2}.

Vaccination is a core preventive strategy to address this issue, yet adult vaccination coverage often remains suboptimal and uneven across recommended vaccines³⁻⁵. This gap reflects limited awareness and perceived susceptibility, concerns about vaccine safety and effectiveness, misinformation and mistrust, inadequate healthcare provider recommendation, access-related barriers, and missed opportunities during routine care, preventing evidence-based recommendations from being consistently translated into individualized, patient-centered preventive action in primary care^{3,5}. Addressing this gap is important because adult immunization programs can generate important health benefits while demonstrating favorable cost-effectiveness and positive socioeconomic returns^{6,7}.

Community pharmacists are well positioned within primary care as highly accessible healthcare professionals in the community, with frequent contact with adults living with chronic conditions and an established contribution to preventive care⁸. From a pharmaceutical care perspective, pharmacists contribute to patient care by optimizing medicine use and improving health outcomes. Applied to adult immunization, this contribution extends beyond vaccine administration and may include patient identification, vaccination-status assessment, eligibility and contraindication screening, individualized evidence-based counselling, response to concerns and misinformation, reminder systems, referral or appointment scheduling, documentation, and follow-up. When implemented among older adults and patients with chronic diseases such as CRDs, these pharmacist-led activities have been shown to improve vaccination uptake and access to preventive care^{9,10}. Moreover, their contribution is strengthened when these activities are embedded within coordinated interprofessional primary care pathways that support shared responsibility, communication, and continuity of care¹¹⁻¹⁴.

European and international professional frameworks support the expansion of pharmacy-based vaccination services and emphasize the policy, organizational, and competency requirements for their safe integration into healthcare systems^{8,15,16}. In Greece, certified community pharmacists are legally authorized to administer vaccines included in the National Adult Immunization Program, subject to defined clinical exceptions, under Law 5102/2024, Article 47(1) (Government Gazette A' 55, 13 April 2024). More recently, the e-Government Center for Health and Social Security Single Member S.A. (IDIKA S.A., <https://www.idika.gr/>) activated pharmacists' access to the National Adult Vaccination Registry, enabling them to review patients' vaccination histories and document vaccinations administered in community pharmacies¹⁷.

These developments improve the capacity for vaccination documentation and create conditions for more integrated

pharmacist participation in preventive care. However, the main implementation challenge is to translate this expanded capacity into structured, evidence-based primary care pathways that define responsibilities, support interprofessional coordination, and align pharmacy-based vaccination activities with physician-led care^{18,19}. This issue is also relevant to healthcare systems with comparable primary care and community pharmacy structures, where guideline recommendations must be operationalized into consistent, documented, and continuous adult immunization pathways.

Building on the considerations outlined above, this work aims to synthesize implementation-oriented evidence on adult immunization in patients with CRDs and translate it into a pharmacy practice perspective. Through a structured narrative review, it presents vaccination priorities, barriers to uptake, pharmacist-led interventions, and interprofessional care requirements relevant to routine pharmacy encounters for this patient group. By summarizing available guidelines and evidence through the prism of pharmaceutical care, it outlines a practice-oriented framework for community pharmacists to support vaccination-status assessment, patient counselling, documentation, referral, and follow-up within physician-led primary care pathways. Informed by the Greek primary care ecosystem, the review aims to show how guideline-based vaccination recommendations can be operationalized into structured pharmaceutical care activities to optimize adult immunization in patients with CRDs, with potential relevance to comparable healthcare systems.

A structured narrative review was conducted to synthesize evidence on adult vaccination in patients with CRDs, with emphasis on implementation strategies and the role of community pharmacists in primary care. Targeted literature searches were performed in PubMed/MEDLINE, Scopus, and Web of Science for English-language publications from January 2015 to June 2026. This period was selected to capture approximately the most recent decade of evidence and contemporary developments in adult immunization recommendations, pharmacy practice, and primary care delivery. Search terms combined concepts related to adult vaccination, chronic respiratory disease, COPD, asthma, ILD, vaccine uptake, vaccine hesitancy, community pharmacy, pharmacist-led interventions, pharmaceutical care, interprofessional collaboration, and immunization programs. Searches were complemented by relevant guideline, policy, and practice documents from national and international organizations, including WHO, ECDC, the Hellenic Ministry of Health, the Hellenic Thoracic Society, and other scientific or professional bodies.

The literature searches and initial identification of potentially relevant sources were conducted by CV and AF. The identified literature was subsequently reviewed and synthesized by MS and EV, who prioritized sources according to their direct relevance to the review objectives, recency, and, for recommendations and policy, the authority of the issuing organization. Where several publications

addressed the same question, contemporary systematic reviews, meta-analyses, and current national or international guidance were preferentially used. Additional references were identified through citation searching for key publications and organizational documents. The search was intended to identify key contemporary evidence for a structured narrative synthesis rather than to provide exhaustive systematic retrieval of all available studies.

Findings were synthesized narratively and organized around vaccination priorities, implementation barriers, pharmacist-supported interventions, patient communication, interprofessional care, and practical considerations for integrating community pharmacists into adult immunization pathways within the Greek primary healthcare context. Following the narrative synthesis, the proposed framework was informed by recurrent implementation functions identified across national adult immunization guidelines, international recommendations, systematic reviews, and pharmacy-practice evidence, and was refined for routine community-pharmacy encounters through discussion among the multidisciplinary author team. The reporting and presentation of the review were guided by the Scale for the Assessment of Narrative Review Articles (SANRA)²⁰ ([Supplementary file](#)).

DEVELOPMENTS

Current vaccination priorities in chronic respiratory diseases

Adult immunization programs combine age-based and risk-based recommendations endorsed by national and international scientific bodies, with patients with CRDs consistently included among priority groups^{2,21-23}. Vaccination strategies therefore address both high-impact respiratory pathogens and other VPDs that may contribute to morbidity, complications, or clinical destabilization.

Across Europe, recommendations focus on prioritizing patients with CRDs, although implementation strategies, reimbursement conditions, schedules, and delivery pathways may vary²⁴. In Greece, the National Adult Immunization Program (NAIP), issued by the National Vaccination Committee (NVC), includes a broad range of vaccines considered clinically relevant for patients with CRDs because of their association with exacerbations, hospitalization, and severe outcomes^{2,21,25,26}. Scientific societies, such as the Spanish Society of Pulmonology and Thoracic Surgery (SEPAR), strongly advocate a comprehensive vaccination approach in patients with CRDs, extending beyond core respiratory vaccines to include pertussis and herpes zoster². Scientific societies in Italy also emphasize the importance of implementing focused immunization strategies to reduce complications, decrease healthcare expenditures, and improve the overall quality of life for individuals with respiratory conditions²³. At the global level, pertussis remains a public health problem despite established pediatric vaccination programs, while vaccination coverage

among adults remains suboptimal and the disease burden has increasingly shifted towards adolescents and adults, including vulnerable populations with chronic conditions such as patients with COPD²⁷. Recent developments in adult pneumococcal vaccination include the 21-valent pneumococcal conjugate vaccine (PCV21), which broadens the available higher valency conjugate vaccine options²⁸. Although the evidence base varies across vaccines and respiratory conditions, current recommendations consistently support risk-based vaccination in adults with CRDs. Evidence for influenza and pneumococcal vaccination is well established, whereas recommendations for COVID-19 and RSV continue to evolve with epidemiology and emerging evidence. Tdap and RZV are mainly incorporated within broader age- and risk-based adult immunization strategies. In practice, vaccine prioritization should therefore follow national guidance while considering respiratory diagnosis and severity, age, smoking status, comorbidities, immunosuppression, and previous vaccination history^{1,2,22,23,26}. From a pharmacy practice perspective and considering the expanding role of pharmacists within the primary care ecosystem, clear and practical guidance is essential during pharmacy encounters.

Table 1 summarizes practice-oriented vaccine considerations for adults with CRDs, based on current immunization recommendations, regulatory guidance, and relevant product information, and highlights how pharmacists can support patients and collaborate with other healthcare professionals to implement vaccination recommendations. These vaccination priorities define the scientific content that pharmacists need to recognize during routine pharmacy encounters; however, their impact depends on whether eligible patients are systematically identified, informed, referred, vaccinated, documented, and followed up.

Vaccination coverage, barriers, and opportunities

During the 2024–2025 season, only a few countries approached or exceeded the 75% influenza vaccination coverage target generally pursued across the EU. According to data from the European Centre for Disease Prevention and Control (ECDC), coverage among older adults was highest in Denmark (76%), Ireland (74.5%), Portugal (70.58%), Sweden (68%), and Norway (66%), whereas substantially lower rates were reported in Poland (5%), Latvia (14.7%), Lithuania (24.10%), Estonia (24.65%), the Czech Republic (26.07%), and Croatia (27%). Among the total adult population aged ≥18 years in EU/EEA countries during the same season, Malta reported the highest coverage at 57.22%, while rates in all other reporting countries were 29% or lower²⁹.

Barriers to vaccination are multifactorial and operate at patient, provider, and system levels. At the patient level, vaccine hesitancy remains a major obstacle, driven by concerns about safety, perceived low effectiveness, misinformation, limited awareness of individual risk, and declining trust in healthcare systems^{30,31}. These challenges

Table 1. Practice-oriented adult vaccine priorities, clinical recommendations, and pharmacist-supported assessment, medication review, and referral considerations for adults with CRDs in the Greek primary care context^a, based on national and international guidance current to June 2026

Clinical relevance and key recommendation	Pharmacist assessment, continuity and co-administration	Medication review and physician referral ^c
Influenza		
- Major cause of exacerbations, hospitalization and mortality. - Annual vaccination; high-dose or adjuvanted vaccines may be used in older adults - Protection remains clinically relevant despite antigenic variability	- Check seasonal status; recommend before influenza season - Document vaccination and arrange annual reminders - Co-administration at separate injection sites is possible according to current guidance; RZV co-administration supported	- ICS/LABA/LAMA^c require no adjustment - Refer if severe immunosuppression or complex clinical status may affect timing or response
COVID-19		
- Increased risk of severe outcomes, particularly in ILD and advanced CRDs - Vaccination/boosters should follow current age, risk, epidemiology and national guidance	- Review vaccination/booster history - Identify ILD, pulmonary hypertension and other high-risk CRDs - Document and follow up - Co-administration at separate injection sites is possible according to current guidance	- Continue chronic inhaled therapy - Defer during active infection or significant respiratory exacerbation - Refer directly in complex cases
Pneumococcal disease (PCV20, PCV21^b)		
- Prevents pneumococcal pneumonia, invasive disease and respiratory decompensation - PCV20 and PCV21 are higher valency options - Selection depends on national guidance, serotype epidemiology and previous vaccination	- Assess age, CRD, smoking, immune status and previous PCV/PPSV vaccination - Confirm eligibility according to current guidance - Co-administration at separate injection sites is possible according to current guidance	Refer if vaccination history is unclear or severe immunosuppression is present
RSV		
- Increased risk of lower respiratory tract disease, hospitalization and exacerbations in high-risk CRDs - Vaccination according to current age- and risk-based guidance	- Assess age, COPD/asthma/ILD, pulmonary hypertension, comorbidities and eligibility - Document and follow up - Can be co-administered with influenza, Tdap and COVID-19 vaccines at separate sites	Refer in severe immunosuppression, complex comorbidity or clinical uncertainty
Tetanus-diphtheria-pertussis (Tdap)		
- Pertussis may worsen respiratory symptoms and trigger exacerbations. - Booster generally every 10 years - Vaccination status should be actively reviewed	- Check booster history; Determine whether vaccination status is up to date, has vaccination gaps, or is unknown/undocumented - Identify missing doses and arrange reminders - Co-administration at separate injection sites is possible according to current guidance	- Review previous tetanus-containing vaccines and serious neurological reactions - Refer when contraindications or vaccination history are uncertain
Herpes Zoster (RZV)		
- Risk is increased with older age, asthma, COPD, corticosteroids and immunosuppression - Two-dose recombinant vaccine schedule in eligible adults	- Assess age, immune status, corticosteroid/immunomodulator use and previous vaccination - Verify completion of both doses - Co-administration with inactivated influenza vaccine is supported	Refer when intense or fluctuating immunosuppression may affect timing

^a Greek practice context: Conventional seasonal influenza vaccines may be administered in community pharmacies without prior medical prescription. Certified pharmacists may also administer prescribed vaccines included in the National Adult Immunization Program, subject to defined exceptions. ^b PCV21: Recommendations reflect current Greek and international guidance as of June 2026. PCV21 is authorized in the European Union but not included in the current Greek adult immunization guidance available at the time of this review. ^c Common medication review: Review systemic corticosteroids, immunosuppressive biologics, chemotherapy, radiotherapy, transplant medicines, anticoagulants, thrombocytopenia and bleeding disorders. Chronic inhaled respiratory therapy generally requires no change in vaccination timing. Refer for physician review when immunosuppressive biologics, chemotherapy, radiotherapy or transplant medicines are prescribed, or in severe immunosuppression, complex comorbidity, uncertain vaccination history, active febrile illness or significant respiratory exacerbation. CRD: chronic respiratory disease. COPD: chronic obstructive pulmonary disease. ILD: interstitial lung disease. ICS: inhaled corticosteroid. LABA: long-acting β_2 -agonist. LAMA: long-acting muscarinic antagonist. PCV: pneumococcal conjugate vaccine. PPSV: pneumococcal polysaccharide vaccine. RSV: respiratory syncytial virus. RZV: recombinant zoster vaccine. Tdap: tetanus, reduced-diphtheria, and acellular pertussis vaccine.

intensified after the COVID-19 pandemic, while misinformation through digital media has extended hesitancy beyond COVID-19 vaccines to adult immunization in general³². In patients with CRDs, mobility limitations, multimorbidity, and access difficulties may create additional obstacles, especially among older adults. At the system level, fragmented care, poor provider coordination, and limited proactive identification and follow-up can delay or prevent vaccination³³.

In Greece, community pharmacists can dispense and administer adult vaccines prescribed by physicians under the National Immunization Program, while conventional trivalent seasonal influenza vaccines can also be administered to the general population without prior medical prescription. Recent developments have further expanded pharmacists' access to patients' electronic vaccination history, allowing vaccination-status records to be reviewed and updated after pharmacy-based vaccination. These developments are relevant because adult vaccination coverage in Greece remains fragmented, with reported uptake of approximately 55% for influenza among high-risk groups, 36% for pneumococcal vaccination, 12% for herpes zoster and 21% for tetanus³. More recent data from a single primary care sample of Greek adults aged ≥60 years, not specifically restricted to patients with CRDs, further indicate fragmented vaccination patterns, with higher uptake for influenza (82.5%), moderate for pneumococcal (68.3%) and herpes zoster (56.0%), and low uptake for tetanus–diphtheria–pertussis booster (13.0%) and RSV (5.2%). Only 10.1% of participants achieved a high vaccination coverage score (VCS ≥66.7%), defined as receipt of at least two-thirds of the vaccines individually recommended for them⁴. These findings support the need for further strengthening adult immunization within primary care. An operational framework for community pharmacists could guide patient identification, risk-based prioritization, reminders, counselling, documentation, referral pathways, and communication with primary care physicians^{34,35}.

Evidence for pharmacist-led vaccination interventions and implementation opportunities
Evidence from systematic reviews and meta-analyses

supports the positive effect of community pharmacist-led interventions on adult vaccination uptake, although effect magnitude varies according to study design, vaccine type, pharmacist role, intervention intensity, and integration into routine care (Table 2). Borlini et al.³⁶ in a meta-analysis of 35 studies involving more than 1.3 million participants, reported increased uptake in pre–post analyses comparing vaccination after versus before pharmacy-based interventions (OR=1.88; 95% CI: 1.68–2.12) and in case–control analyses comparing individuals exposed to pharmacy-based interventions with controls (OR=4.87; 95% CI: 2.23–10.64), with the most consistent effects observed for multicomponent interventions combining assessment, counselling, and vaccine administration³⁶. Amare et al.³⁷, examining adults aged ≥60 years, reported pooled RRs of 3.29 (95% CI: 2.01–5.39) across eight pre–post studies and 3.04 (95% CI: 1.46–6.34) across five randomized studies. Elghanam and Kim³⁸ included 22 studies, of which 17 randomized or cluster-randomized trials contributed to the meta-analysis. Pharmacist interventions increased vaccination uptake overall (RR=1.58; 95% CI: 1.40–1.79), with subgroup estimates of RR=1.76 (95% CI: 1.07–2.88) for pharmacist immunizer interventions and RR=1.59 (95% CI: 1.41–1.80) for advocate interventions; substantial heterogeneity was found ($I^2=93\%$)³⁸.

Evidence from low- and middle-income countries further highlights variability in implementation. In a systematic review of 25 LMICs, pharmacists were involved in vaccine education and advocacy in 60% of countries, while pharmacist-administered vaccination was reported in 32%, access to immunization records in 24%, and involvement in vaccine adverse-event reporting in 16%¹². These findings illustrate the heterogeneous and still limited integration of pharmacists across immunization systems.

More moderate but consistent benefits are reported in other analyses. Le et al.¹¹ found that, compared with usual care or interventions without pharmacist involvement, pooled RCT estimates were RR=1.14 (95% CI: 1.12–1.15) when pharmacists acted as immunizers and RR=1.31 (95% CI: 1.17–1.48) when they acted as advocates. Rahim et al.⁹

Table 2. Selected international evidence published from 2016 to 2026 on pharmacist-supported interventions and adult vaccination uptake from systematic reviews, meta-analyses, and randomized studies

Study type/ Population	Number of studies	Intervention characteristics	Effect estimate (95% CI)	Key findings	Reference (Year)
SR-MA; adults	35 (~1.3 million participants)	Multicomponent pharmacy interventions (assessment, counselling, administration)	Effect estimate: OR 1.88 (95% CI: 1.68–2.12), post-intervention vs pre-intervention; OR 4.87 (95% CI: 2.23–10.64), intervention-exposed vs control	Increase in uptake; highest impact with integrated pharmacist roles	36 (2026)

Continued

Table 2. Continued

Study type/ Population	Number of studies	Intervention characteristics	Effect estimate (95% CI)	Key findings	Reference (Year)
SR-MA; adults	22 studies included; 17 randomized/ cluster- randomized trials in MA	Pharmacist interventions: education, advocacy, and direct immunization (immunizer vs advocate roles compared)	pooled RR 1.58 (95% CI: 1.40–1.79); immunizer RR 1.76 (1.07–2.88); advocate RR 1.59 (1.41–1.80)	Strongest effect observed when pharmacists act as immunizers; substantial heterogeneity across studies ($I^2=93\%$)	38 (2025)
SR-MA; adults ≥60 years	13 (8 pre- post; 5 randomized)	Pharmacist-led interventions across major adult vaccines	RR 3.29 (95% CI: 2.01–5.39), post- vs pre-intervention; RR 3.04 (95% CI: 1.46–6.34), randomized intervention vs control	Large effect sizes, particularly in older populations	37 (2025)
SR-MA; mixed populations	19 (4 RCTs + 15 non-RCTs)	Pharmacist-led interventions (varied roles)	RR 1.51 (95% CI: 1.28–1.77), pharmacist intervention vs usual care; advocate role RR 2.09 (95% CI: 1.42–3.07) vs usual care	Increased uptake, stronger effect with active advocacy	9 (2023)
SR-MA; mixed populations	14 RCTs + 79 observational	Pharmacist as immunizer, advocates, or both	Immunizer RR 1.14 (95% CI: 1.12–1.15); advocate RR 1.31 (1.17–1.48); immunizer + advocate RR 1.14 (1.12– 1.15), compared with usual care or non-pharmacist- involved interventions. Pooled estimates are from the RCT analyses	Modest but consistent improvements depending on role	11 (2022)
SR; low- and middle- income countries	25	Pharmacist roles in vaccination: education/ advocacy (60%), administration (32%), storage (32%), training (32%), record access (24%), adverse event reporting (16%)	Not applicable – descriptive implementation data	Pharmacists are mainly involved in education; limited clinical integration and weak system embedding across LMICs	12 (2021)
SR-MA; influenza vaccination	6 (MA)	Pharmacy-based influenza interventions	RR 1.24 (95% CI: 1.05–1.47), pharmacy-based intervention vs standard care	Moderate increase; active engagement more effective than passive strategies	14 (2021)
RCT; adults	1	Automated telephonic reminders	OR 1.05 (95% CI: 0.87– 1.26), automated telephonic prompt vs usual care	Effect NS; No significant increase in vaccination uptake; call completion was low	39 (2019)
Review; UK pharmacy programs	28 evaluations	Community pharmacy vaccination services	No pooled effect estimate	No evidence of increased overall uptake; high acceptability and convenience	40 (2018)
SR-MA; mixed populations	36 (6 RCTs included in MA)	Pharmacists as educators, facilitators, administrators	Not pooled (directional increase)	All studies showed increased uptake regardless of role	13 (2016)

CI: confidence interval. LMIC: low- and middle-income country. MA: meta-analysis. NS: not statistically significant. OR: odds ratio. RCT: randomized controlled trial. RR: relative risk. SR: systematic review. I^2 : percentage of variability across studies attributable to heterogeneity rather than sampling error.

reported an overall RR=1.51 (95% CI: 1.28–1.77) compared with usual care, increasing to RR=2.09 (95% CI: 1.42–3.07) for advocacy interventions⁹. Earlier evidence by Isenor et al.¹³ similarly found increased vaccination rates across educator, facilitator, and administrator roles. Influenza-specific data show smaller but significant effects; Murray et al.¹⁴ reported increased uptake with pharmacy-based interventions compared with standard care (RR=1.24; 95% CI: 1.05–1.47) with stronger outcomes when interventions were proactive and patient-facing. In contrast, an automated registry-based telephone reminder intervention did not significantly improve uptake compared with usual care (OR=1.05; 95% CI: 0.87–1.26) while UK program evaluations similarly suggested that accessibility alone does not necessarily translate into increased uptake^{39,40}.

These estimates should not be interpreted as independent cumulative evidence, as the included works may contain overlapping primary studies and differ in populations, vaccine types, pharmacist roles, interventions, and comparators. Overall, the evidence suggests that the effectiveness of pharmacist-led vaccination interventions depends on the intensity of pharmacist engagement and the extent to which activities are integrated into care pathways. The strongest outcomes are generally observed in multicomponent interventions that combine active patient identification, individualized counselling, and vaccine delivery, while passive advice or isolated vaccination activity appears less robust. These findings should be interpreted with caution, as many studies focus on influenza vaccination or mixed adult populations rather than patients with CRDs specifically, and most outcomes assess uptake rather than clinical outcomes, continuity of care, or documentation quality. Taken together, the evidence supports pharmacist involvement when it is active, structured, and connected to routine care processes rather than limited to passive advice or isolated vaccine administration.

An integrated pharmaceutical care framework for community pharmacist-supported adult immunization in CRDs

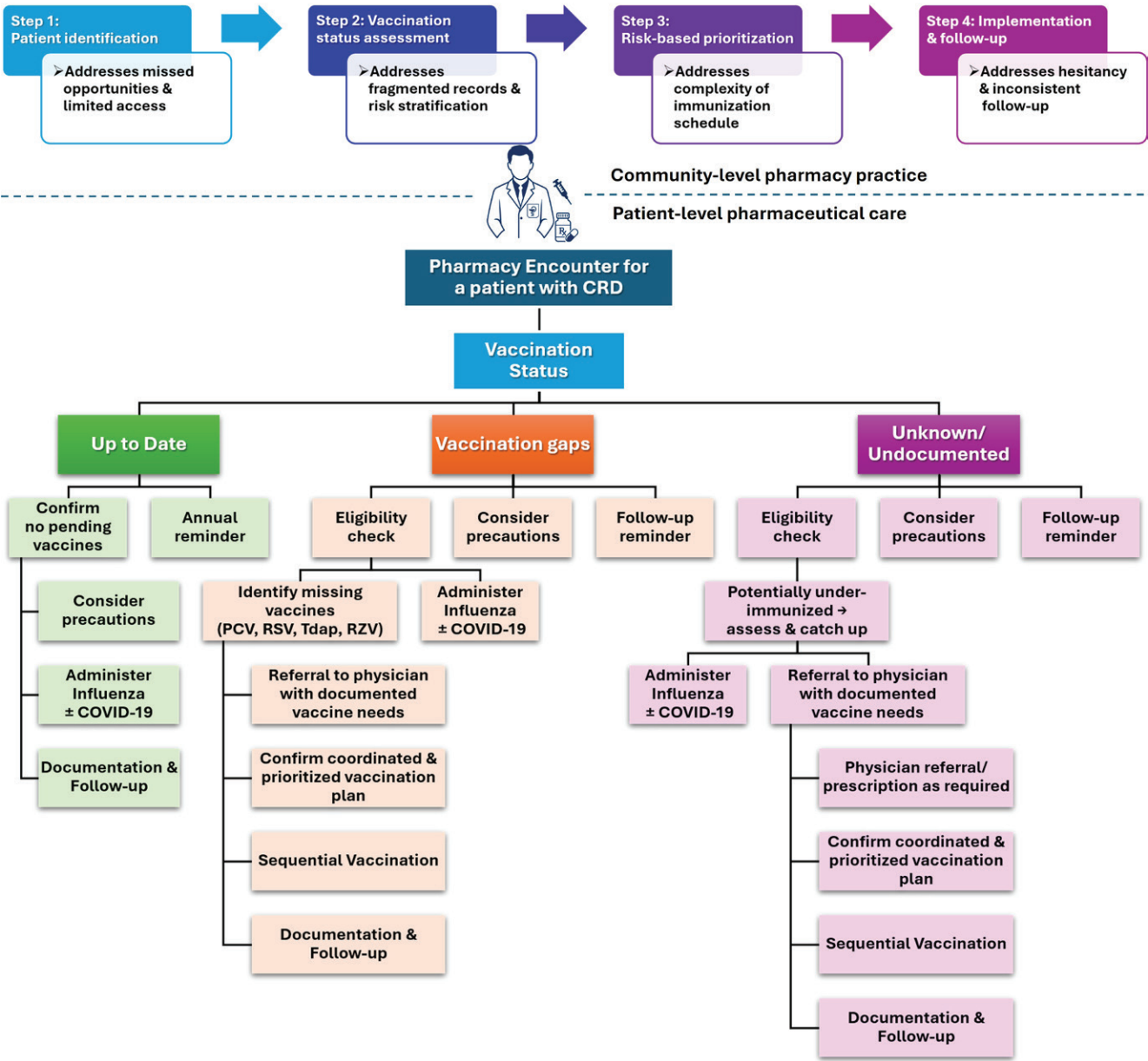
The evidence summarized above points to a practical implementation gap: adult vaccination recommendations for patients with CRDs are available, but alignment with recommended vaccination schedules remains incomplete in routine primary care. Building on the reviewed evidence, the vaccine priorities summarized in Table 1, and the impact of pharmacist-led interventions summarized in Table 2, an integrated pharmaceutical care framework for adult vaccination in patients with CRDs can be envisioned as a way of translating recommendations into routine practice. For the purposes of this framework, CRDs mainly refer to common adult chronic respiratory conditions such as COPD, asthma, ILD, bronchiectasis, and other chronic lung diseases, while vaccine prioritization and referral thresholds may differ according to disease severity, age, smoking status,

comorbidities, immunosuppression, pregnancy, and national guidance. This framework does not introduce a separate model of care but builds on existing healthcare pathways by structuring pharmacist-supported vaccination care around assessment, counselling, access facilitation, administration, and continuity. The framework should be interpreted as a conceptual, implementation-oriented model rather than a validated clinical algorithm. It is intended to support, rather than replace, national recommendations and individualized clinical judgement.

The approach employs community pharmacists as accessible healthcare professionals positioned at the interface between clinical recommendations and patients' lived experience. From a pharmaceutical care perspective, this role integrates vaccination support with medicine optimization, preventive care, and broader community pharmacy services⁴¹. Vaccination encounters are therefore not merely technical acts but patient-centered preventive interactions in which evidence-based recommendations, professional judgement, patient beliefs, health literacy, concerns, and perceived risk interrelate^{5,30,31}.

Figure 1 operationalizes this framework by linking the four implementation steps with vaccination-status categories and the corresponding pharmacist-supported actions, including eligibility assessment, prioritization, administration or referral, documentation, reminders, and follow-up. In practice, pharmacists can translate guideline-based recommendations into personalized and context-sensitive actions by providing a strong individualized recommendation with a brief clinical rationale, responding empathetically to questions or misinformation, adapting key messages to the patient's level of understanding, and reducing missed opportunities through reminders, opportunistic engagement, and appointment scheduling. Patients can then be stratified according to vaccination status as up to date according to current recommendations, having identified vaccination gaps, or having unknown or undocumented vaccination status. In routine pharmacy practice, this framework can be applied during regular CRD-related encounters and seasonal vaccination periods. Its four steps correspond to key implementation gaps in adult immunization. Patient identification addresses missed opportunities and limited access by allowing pharmacists to recognize potentially eligible adults during routine encounters. Vaccination-status assessment addresses fragmented records and incomplete risk stratification by combining available vaccination records, patient-reported information, CRD diagnosis, age, smoking status, comorbidities, current pharmacotherapy, contraindications, precautions, and barriers to uptake. Risk-based prioritization addresses the complexity of adult immunization schedules by linking national recommendations and patient-specific risk to relevant vaccines, including influenza, pneumococcal vaccines, COVID-19, RSV, Tdap, and RZV. Implementation and follow-up address vaccine hesitancy and inconsistent follow-up through evidence-

Figure 1. Integrated pharmaceutical care framework for pharmacist-supported adult vaccination in patients with CRDs



The framework links four implementation steps: 1) patient identification, 2) vaccination-status assessment, 3) risk-based prioritization, and 4) implementation with follow-up, to corresponding pharmacist-supported actions and referral pathways within coordinated primary care. Patients are stratified according to vaccination status, with tailored pharmacist-supported actions and physician referral where indicated.

based counselling, access facilitation, physician referral when prescription or additional clinical evaluation is required, vaccine administration when permitted, documentation of outcomes, and reminder-based follow-up. Patients who are up to date need confirmation and continued follow-up, whereas those with identified vaccination gaps require identification of missing vaccines and sequential planning, while patients with unknown or undocumented status should be considered potentially under-immunized until further assessment. Overall, this approach enables

community pharmacists to identify and document vaccine needs, refer patients for physician review and prescription when required, and contribute to a coordinated, prioritized vaccination plan. In this way, pharmacy-based vaccination support can strengthen shared decision-making, adherence, interprofessional collaboration, and continuity of care within primary healthcare pathways^{42,43}.

Patient communication and shared decision-making
Effective patient engagement is a key determinant of

vaccination uptake among adults with CRDs, where clinical vulnerability may coexist with low perceived risk, uncertainty, or vaccine hesitancy. Within routine primary care encounters, including community pharmacy contacts, structured communication can support vaccine confidence, adherence, and informed decision-making⁹. In community pharmacy practice, this communication can be integrated into CRD-related encounters such as inhaler prescriptions or refills, inhaler technique consultations, smoking cessation discussions, seasonal respiratory infection periods, or follow-up after exacerbation-related medicines.

Improving vaccination uptake requires more than providing information. A strong, clear, and personalized recommendation from a healthcare professional is one of the most important predictors of vaccine acceptance³. For patients with CRDs, brief patient-tailored messages can connect vaccination to the individual's respiratory risk profile, age, smoking status, comorbidities, exacerbation history, and incomplete vaccination record. Communication should remain empathetic, accurate, and non-confrontational, particularly when addressing safety concerns, misinformation, or doubts about vaccine effectiveness. Simple key messages, adapted to the patient's level of understanding, may improve comprehension and acceptance⁴⁴. Community pharmacists can also reduce practical barriers through opportunistic vaccination-status assessment, reminders, appointment scheduling, and referral when needed. Shared decision-making and motivational interviewing may further support hesitant patients by aligning vaccination decisions with patient values, addressing ambivalence, and reinforcing physician recommendations^{45,46}.

Interprofessional collaboration and continuity of care

Improving adult vaccination uptake in patients with CRDs requires coordinated action across primary care, community pharmacy, public health services, and policy structures. This approach is consistent with emerging proposals to redesign primary care as a network of community-embedded coordination hubs that integrate longitudinal clinical care, interprofessional collaboration, and community engagement⁴⁷. Primary care physicians, family physicians, and relevant specialists, including pneumonologists, remain central to clinical assessment, diagnosis, vaccine prescription, and individualized risk evaluation. Within this physician-led framework, community pharmacists can support vaccination pathways by identifying eligible patients, reinforcing medical recommendations, facilitating access, and promoting adherence^{42,43}.

This role should not be understood as independent or substitutive, but as collaborative and complementary. Through structured channels of communication and cooperation, prescribing physicians can strengthen the quality of pharmacy-based vaccination support by sharing clinical judgement, patient-specific concerns, and practical

experience with pharmacists. In parallel, pharmacists must further develop their scientific knowledge, clinical reasoning, communication skills, and professional responsibility toward patients, so that vaccination counselling is accurate, consistent, and aligned with physician-led care⁴⁸.

The patient transition from physician consultation to community pharmacy creates opportunities for continuity, but also requires aligned messages, shared documentation, and coordinated follow-up. Evidence from communication-based interventions shows that strong, clear, and personalized recommendations are associated with higher vaccine acceptance and uptake⁴⁴. Community pharmacists may also strengthen delivery through accessibility, repeated contact with adults living with chronic conditions, and patient trust. In Greece, the high density and wide distribution of pharmacies can facilitate timely access to vaccination-related services, including in semi-urban or underserved areas⁴⁹. However, accessibility alone is not sufficient. Pharmacist-led interventions are more effective when they are active, structured, and connected to care pathways, including education, eligibility assessment, reminders, counselling, administration where permitted, and coordinated referral^{9,11,36-38}. Their effective integration also requires appropriate training, access to vaccination records, interoperable documentation, clear referral pathways, and safety and pharmacovigilance procedures^{8,15,16}. Such integration may reduce missed opportunities, improve vaccination coverage, and strengthen immunization delivery within primary healthcare systems⁵⁰.

Strengths and limitations

This review has several strengths. It integrates vaccination guidance, evidence from pharmacist-supported vaccination interventions, and implementation considerations into a pharmacy-practice perspective for adults with CRDs. It also contextualizes international evidence within the Greek primary care setting, where expanding pharmacist access to vaccination records creates new opportunities for structured adult immunization support.

Several limitations should nevertheless be considered. The work was designed as a structured narrative review rather than a formal systematic review or meta-analysis. Accordingly, the literature search was intended to identify key contemporary evidence relative to the review objectives rather than to achieve exhaustive retrieval. Record-level screening and exclusion counts were not prospectively recorded, and no PRISMA-style record flow accounting or formal independent duplicate-screening procedure was undertaken. No quantitative synthesis or formal study-level risk-of-bias assessment were performed. In addition, the available evidence is heterogeneous in terms of study populations, healthcare settings, pharmacist roles, vaccines assessed, intervention intensity and comparators. Many studies also focus on influenza vaccination or mixed adult populations rather than patients with CRDs and most evaluate vaccination

uptake rather than clinical outcomes, continuity of care, or documentation quality. Evidence remains limited for CRD-specific outcomes such as exacerbations, hospitalization, safety, cost-effectiveness, equity, and interprofessional continuity. Adult vaccination recommendations also vary between studies and are frequently updated, particularly for COVID-19, RSV and pneumococcal vaccination. Finally, the proposed framework represents an implementation-oriented synthesis and has not yet been prospectively evaluated in community pharmacy practice.

CONCLUSION

Patients with CRDs are at increased risk for vaccine-preventable diseases, making vaccination a key strategy to reduce morbidity and healthcare burden. Bridging the gap between evidence and implementation in adult immunization will depend not only on updated recommendations, but also on their effective integration into everyday clinical practice. Community pharmacists, within a physician-led and interprofessional primary care pathway framework, can support patient identification, education, and delivery of vaccination strategies. The framework offers a practice-oriented pathway for bridging guideline recommendations and real-world vaccination support, although its feasibility and impact require evaluation in routine practice. Future research should evaluate its real-world effectiveness and scalability.

CONFLICTS OF INTEREST

The authors have each completed and submitted an ICMJE form for disclosure of potential conflicts of interest. The authors declare that they have no competing interests, financial or otherwise, related to the current work. M. Spanakis reports that in the past 36 months received from Novo Nordisk and MSD, compensation for educational lecture on Community Pharmacists, and had a leadership role at the Community Pharmacists Association of Heraklion (Head of the Scientific Committee, unpaid position). E. Vasarmidi reports that in the past 36 months received a research grant from the Hellenic Thoracic Society, received payment or honoraria from Boehringer Ingelheim and ELPEN, support for attending meetings and/or travel from Boehringer Ingelheim, ELPEN, Menarini, Guidotti and Chiesi and had a participation on a data safety monitoring board or advisory board with Boehringer Ingelheim. C. Vardiampasis reports that in the past 36 months had a leadership role at the Community Pharmacists Association of Rethymno (Head of the Scientific Committee, unpaid position). A. Skountakis reports that in the past 36 months had a leadership role at the Community Pharmacists Association of Heraklion (Head of the Scientific Committee, unpaid position). K.M. Antoniou reports that in the past 36 months received research Grants from Boehringer Ingelheim, F. Hoffmann-La Roche, and Menarini, received consulting fees from Boehringer Ingelheim, F. Hoffmann-La Roche, GlaxoSmithKline, had speaker honoraria

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ETHICAL APPROVAL AND INFORMED CONSENT

Ethical approval and informed consent were not required for this study.

DATA AVAILABILITY

Data sharing is not applicable to this article as no new data were created.

AUTHORS' CONTRIBUTIONS

MS: conceptualization, methodology, investigation, project administration, writing of original draft.. EV: investigation, methodology, visualization, project administration. AF: investigation. CV: investigation, methodology, visualization. AS: conceptualization KMA.: conceptualization. NT: visualization. EKS: conceptualization, supervision. All authors: writing, reviewing and editing of the manuscript. All authors read and approved the final version of the manuscript.

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DISCLAIMER

Katerina M. Antoniou and Nikolaos Tzanakis, Editorial Board members of the journal, had no involvement in the peer-review or acceptance of this article and had no access to information regarding its peer-review. Full responsibility for the editorial process for this article was delegated to a handling editor of the journal.

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