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Review

Air quality self-management in asthmatic patients with COPD: An integrative review for developing nursing interventions to prevent exacerbations

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ABSTRACT

Objectives: Asthma-chronic obstructive pulmonary disease (COPD) overlap (ACO) patients experience a lower quality of life, frequent exacerbations, and worse pulmonary function. Environmental management is essential in a complex chronic condition, as pollutant exposure can worsen symptoms and increase morbidity and mortality. We aimed to identify evidence that informs nursing interventions in promoting self-management of air quality in asthmatic people with COPD.

Methods: We conducted an integrative review in March of 2023. We searched the databases CINAHL, MEDLINE, Academic Search Complete, Cochrane Database of Systematic Reviews (CDSR), Scopus, Web of Science, Joanna Briggs Institute (JBI) Evidence-Based Practice Database, and Google Scholar. We included articles whose participants were adults with asthma, COPD, or both; the intervention was air quality management and the outcome of any exacerbations. We excluded editorials, letters, commentaries, opinion papers, position papers, study protocols, conference abstracts, and reviews. Data extraction and synthesis were performed, categorizing interventions according to nursing actions. Methodological quality assessment was conducted using the JBI Critical Appraisal Checklist tools. The review protocol was registered at Open Science Framework (https://doi.org/10.17605/OSF.IO/5Y4KW).

Results: We included five articles from different countries. The interventions promoting air quality self-management for individuals with asthma and COPD included vigilance interventions (health professional regular visits, assessment of symptoms), monitoring interventions (measurement of indoor and outdoor trigger factors), and educational interventions (air quality alerts, allergen avoidance). Policy interventions such as smoke-free policies and comprehensive strategies to improve air quality were also identified. These areas of focus represent critical components of nurses' interventions and can integrate the fundamental patterns of knowing in nursing. Although the studies reveal heterogeneous interventions and the methodological quality is variable, these interventions showed potential for preventing exacerbations, reducing emergency department visits, and minimizing hospitalizations.

Conclusions: The study emphasizes the need for a comprehensive approach involving nurses in multidisciplinary teams to air quality self-management. They can use these results to inform their interventions and ways of knowing, benefiting individuals with asthma and COPD. Further research is needed to expand the evidence base and refine these interventions.

What is known?

- The coexistence of asthma and chronic obstructive pulmonary disease (COPD) adds complexity to nursing interventions.

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- Therapeutic approaches for asthma and COPD are typically segregated despite their frequent coexistence.
- Air quality, as an environmental determinant, significantly influences respiratory health.
- Nurses, as frontline healthcare professionals, have a pivotal role in championing self-management for individuals with asthma and COPD.
- Despite the high prevalence of asthma and COPD, evidence is scarce supporting nursing interventions in air quality self-management.

What is new?

- There is a lack of evidence regarding interventions that involve self-reporting for persons with asthma and COPD.
- Vigilance, monitoring, education, and policy measures stand out as essential interventions led by nurses to encourage self-management of air quality and prevent exacerbations.
- A novel framework is suggested, aligning with key patterns of nursing knowledge, encompassing empirical, aesthetic, personal, ethical, and emancipatory knowing.
- Nurse-led interventions, particularly vigilance, monitoring, and education on air quality self-management, can potentially enhance patient outcomes.

1. Introduction

Asthma and chronic obstructive pulmonary disease (COPD) are the most common airway diseases, affecting 5%–15% of the population in developed countries [1,2]. Because of their high prevalence and the fact that they share some common risk factors, the two conditions are almost certain to coexist in some people. The link between the two diseases has recently received the designation of asthma-COPD overlap (ACO), although the precise definition and diagnostic criteria for ACO still need to be established [3].

ACO is characterized by persistent airflow limitation with several asthmatic and COPD-related features. It is thus distinguished by its similarities with asthma and COPD [4]. ACO prevalence has ranged widely in studies: from 0.9% to 11.1% in the general population, 11.1%–61.0% in asthma patients, and 4.2%–66.0% in COPD patients [5].

Although asthma and COPD can exist in the same individual, their therapeutic approaches are currently taken separately [2]. However, it makes sense to look at the whole person living with the overlap of these two diseases as a complex chronic patient. Complex chronic disease is a condition that involves multiple morbidities, making patients with unique needs [6].

COPD is a common, preventable, and treatable disease characterized by persistent respiratory symptoms and airflow limitation due to airway and alveolar abnormalities, usually caused by significant exposure to noxious particles or gases and influenced by host factors. These people experience daily symptoms such as coughing, sputum production, dyspnea, wheezing, chest tightness, and fatigue [2]. It is frequently diagnosed in smokers/ex-smokers. Although there is treatment for COPD, given its chronic nature, it will always have signs and symptoms that are not fully reversible.

Asthma is a heterogeneous disease, generally characterized by chronic airway inflammation. It is characterized by respiratory symptoms, such as wheezing, shortness of breath, chest tightness, and coughing, which vary over time and intensity. These variations are often associated with external factors, such as physical exercise, exposure to allergens or irritants, or climate changes [1].

Patients with ACO experience low quality of life [7], frequent exacerbation and high hospitalization rate [8], and worse pulmonary function [9]. Among the risk factors for developing and worsening ACO are smoking habits and internal, occupational, and external environmental exposures [2,10,11]. Because there is a positive association between exposure to air pollutants and the risk of asthma and COPD exacerbations [12–14], it becomes imperative that the person with ACO learns to know and manage their environment, precisely air quality. As it is a risk factor for managing exposure, its mitigation can reduce mortality and morbidity associated with the disease [15].

The environment determines the population's health status [16]. The environmental determinant is defined by the physical and social characteristics of the places where people live, work, and recreate, with several environmental determinants having a demonstrated impact on respiratory diseases [15]. Within this, we distinguish air quality, which is affected by atmospheric pollution. The WHO defines air pollution as the contamination of the internal or external environment by any chemical, physical, or biological agent that modifies the natural characteristics of the atmosphere [17]. It can occur through the increase of fine particles (particulate matter [PM], such as $PM_{2.5}$ and PM_{10}), carbon monoxide (CO), ozone (O_3), sulfur oxides (SO_x), and nitrogen monoxide (NO). The increasing number of these particles in the air leads to poorer air quality and, consequently, the increase in the prevalence, mortality, morbidity, and exacerbations of asthma and COPD [11,15]. Thus, the quality of the indoor and outdoor environment is a determining factor in managing respiratory diseases. Its management can minimize ACO exacerbations, which ultimately contribute to slowing the decline in lung function [18].

Nurses can lead in promoting self-management in people with asthma and COPD by implementing a support-education intervention system for managing the environment within the scope of air quality [19]. However, to our knowledge, no evidence reviews support this intervention. In this sense, we aim to identify evidence that informs nursing interventions in promoting self-management of air quality in asthmatic people with COPD.

In this study, we adopted an integrated review approach to examine the current literature thoroughly. This approach involves synthesizing findings from diverse research traditions to provide a more nuanced and comprehensive understanding of the subject [20]. We seek to encompass the intricate factors shaping self-management behaviors, including environmental conditions, individual perspectives, and healthcare interventions.

This study was part of the id. Care umbrella project titled "Centered-care for complex chronic patients in critical and acute care". The overarching goal of the id. Care project is to collaboratively create, develop, implement, and assess comprehensive nursing interventions, and to empower nurses to implement nursing practices that promote self-care among patients, family members, and caregivers. These interventions are designed to cultivate a secure environment while caring for individuals with complex chronic illnesses within acute or critical care settings. This Portuguese project strategically addresses three health determinants: environment, care provision, and health-related behaviors.

2. Methods

Following the steps proposed by Whittemore & Knafl [20], we conducted an integrative review and reported it according to the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [21]. We formulated the guiding question as follows: What nursing interventions promote self-management of air quality (I) in individuals with COPD and asthma (P) to prevent exacerbations (O)?

2.1. Search strategy

The study begins by searching the following databases/search engines: Medline, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Cochrane Database of Systematic Reviews (CDSR), Joanna Briggs Institute (JBI) Evidence-Based Practice (EBP) Database, Scopus, Clarivate Web of Science, Academic Search Complete, and Google Scholar, in March of 2023. We used combined keywords, searching the title and abstract between 2017 and 2023 (Table 1). Our decision to focus on literature for the last six years was driven by the need to ensure the inclusion of the most recent and relevant studies. This timeframe allows us to capture the latest advancements, emerging trends, and contemporary perspectives that might significantly contribute to our understanding of this subject. Furthermore, the dynamic nature of environmental conditions and respiratory health requires a contemporary understanding of best self-management practices [22]. Recent studies can provide insights into specific interventions, emerging technologies, or practical adaptations that may not be present in older research. This temporal scope aims to incorporate the latest findings, considering technological progress and heightened societal emphasis on addressing air quality, particularly relevant for individuals with respiratory conditions such as asthma or COPD.

The Google Scholar query was a short form of the main query, using only three keywords (intervention, air pollution, and "asthma-COPD overlap"). This search was limited to literature without patents or citations. The search results were sorted by relevance, and we retrieved only the first 100 results [23].

2.2. Inclusion and exclusion criteria

The searches were restricted to Portuguese, Spanish, or English articles. We limited the search queries to articles published from 2017 until 2023. We selected studies for review based on the following criteria: a) Population: adults with asthma, COPD, or both; b) Intervention: air quality management; c) Outcome: exacerbations, emergency department admission, hospitalization, mortality. The basis for determining the outcome indicators was established through a preliminary review conducted [7,10,13,18].

We excluded articles based on the following criteria: a) Population: under 18 years old; b) Intervention: other; c) Studies with no outcomes; d) Type of publication: editorials, letters, commentaries, opinion papers, position papers, study protocols, conference abstracts, and reviews; e) Language: articles written in other languages.

Meeting all inclusion criteria is a prerequisite for an article to be chosen for inclusion in the revision. Additionally, selected articles must not meet any of the exclusion criteria.

2.3. Study selection

The screening process was conducted systematically, encompassing a comprehensive procedure. It involved a meticulous examination of inclusion and exclusion criteria, starting with the type of study, followed by scrutinizing the publication type. The intervention was then carefully assessed, followed by an evaluation of the targeted population. Finally, our attention was directed toward the outcomes.

To ensure reliability, five authors (BS, RH, SG, JF, JP, and HRH) were involved in the screening process so that each study was screened independently by two reviewers. All screened articles were assessed against the eligibility criteria by one author (HRH). Five authors (BS, RH, SG, JF, and JP) evaluated the full text of the chosen articles. For disagreements, the author (HRH) was consulted. Any discrepancies were resolved through discussion. We used the Rayyan QCRI tool (Rayyan Systems Inc., Cambridge, MA, USA) [24] in the selection process.

2.4. Data extraction

Three authors (BS, RH, and SG) performed the data extraction using a predesigned electronic form, and three authors (HRH, JF, and JP) verified the data extracted. The researchers gathered information from each eligible article, including the study aims, participants, air quality self-management interventions, and outcome measures. Also, data such as the study's authors, year of publication, study design, and country were collected from all eligible studies.

2.5. Data synthesis

Each article followed a standardized structure. It included authors and publication year, study design, country, objective, participant details, interventions for air quality self-management, outcome measures, and concluding remarks. The data related to interventions for air quality self-management underwent a thematic-categorial analysis [25]. When possible, interventions were categorized according to the nursing actions described by the International Classification for Nursing Practice (ICNP®) [26] and analyzed considering the available evidence and the fundamental patterns of knowing in nursing [27,28].

2.6. Assessment of methodological quality

Two authors (JF and JP) independently evaluated the quality of the studies included in this review using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist tools [29]. Any disagreements

Table 1
Search strategy.

Item	Keywords
Population	[TITLE-ABS ["emphysema" OR "pulmonary emphysema" OR "pulmonary disease, chronic obstructive" OR "lung diseases, obstructive" OR "bronchitis, chronic" OR "pulmonary disease, chronic obstructive" OR "copd" OR "asthma" OR "asthma, occupational" OR "status asthmaticus" OR "asthma-chronic obstructive pulmonary disease overlap syndrome" OR "acos"]]
	And
Intervention	[TITLE-ABS ["air pollution" OR "air pollution, indoor" OR "air pollutants, occupational" OR "tobacco smoke pollution" OR "environmental pollutants" OR "carbon monoxide" OR "ozone" OR "nitrogen dioxide" OR "particulate matter" OR "oils, volatile" OR "volatilization" OR "smoke inhalation injury" OR "environmental exposure" OR "pollen" OR "traffic-related pollution" OR "inhalation exposure" OR "occupational exposure" OR "sulfuric oxide" OR "air quality" OR "pm" OR "microparticles" OR "air pollutants, environmental" OR "air pollution" OR "nitrogen oxides" OR "essential oils" OR "traffic pollution" OR "air pollutants, environmental" OR "occupational exposure" OR "home environment" OR "indoor environment" OR "outdoor environment"]]
	And
Outcome	[TITLE-ABS ["symptom flare up" OR "disease progression" OR "hospitalization" OR "disease exacerbation" OR "complications"]]

between the two authors were resolved through discussion with a third author (HRH).

2.7. Compliance with ethical standards

This review article adhered to the ethical standards established for literature review research. All sources used were adequately cited and referenced, respecting the copyrights and intellectual integrity of the original authors. The review protocol was registered at Open Science Framework https://doi.org/10.17605/OSF.IO/5Y4KW.

3. Results

This study initially gathered a substantial number of articles (n = 1,136). The searching in JBI and CDSR did not yield any results. After eliminating duplicate records (n = 590), 546 records remained available for further screening. Subsequently, upon applying inclusion and exclusion criteria to the title and abstract, the total number of publications was reduced to 78 records. Upon analyzing the full-text, we excluded 2 opinion papers, 3 articles on the pediatric population, and 68 articles irrelevant to air quality management. The final sample is composed of 5 articles [30–34] (Fig. 1) from Canada, China, France, Romania, and Spain (Table 2).

3.1. Characteristics of included articles

The included case-control and quasi-experimental designs fulfill all or more than 70% of the quality criteria defined by JBI [29]. The checklists utilized for this review are specified along with their details in Appendix A. Concerning the cohort studies, we found them to be of low to moderate quality (Table 3).

The available evidence regarding self-reporting interventions in individuals with asthma and COPD is limited. The scarcity of studies suggests that promoting self-managing of air quality is part of a comprehensive disease management approach [30–32]. Our analysis revealed that vigilance, monitoring, and educational interventions are crucial for supporting individuals with asthma and COPD in managing air quality [30–32]. The studies also showed that health policies are essential in controlling environmental risk factors [33,34]. Although not all interventions are conclusive, the results suggest that they facilitate behavior changes that help prevent exacerbations, reduce emergency healthcare visits, and minimize hospitalizations (Fig. 2).

3.2. Crucial interventions for supporting individuals with asthma and COPD in managing air quality from literature

3.2.1. Vigilance interventions

Vigilance interventions are related to an integrated approach that assesses the patient's compliance with the therapeutic regimen [30]. The authors performed regular visits with symptom control questionnaires (Asthma Control Test [ACT], COPD Assessment Test [CAT]), forced expiratory volume in one second (FEV_1) evaluation using spirometry, and education about trigger factors such as air quality. The results indicate low long-term compliance due to patients' abstinence from regular check-ups.

3.2.2. Monitoring interventions

Monitoring interventions refer to the measurement of indoor environmental allergens [30–32], the measurement of outdoor trigger factors, such as pollutants or climate conditions [32], and individual clinical and symptom monitoring [30]. These interventions allow the patient to identify risk factors.

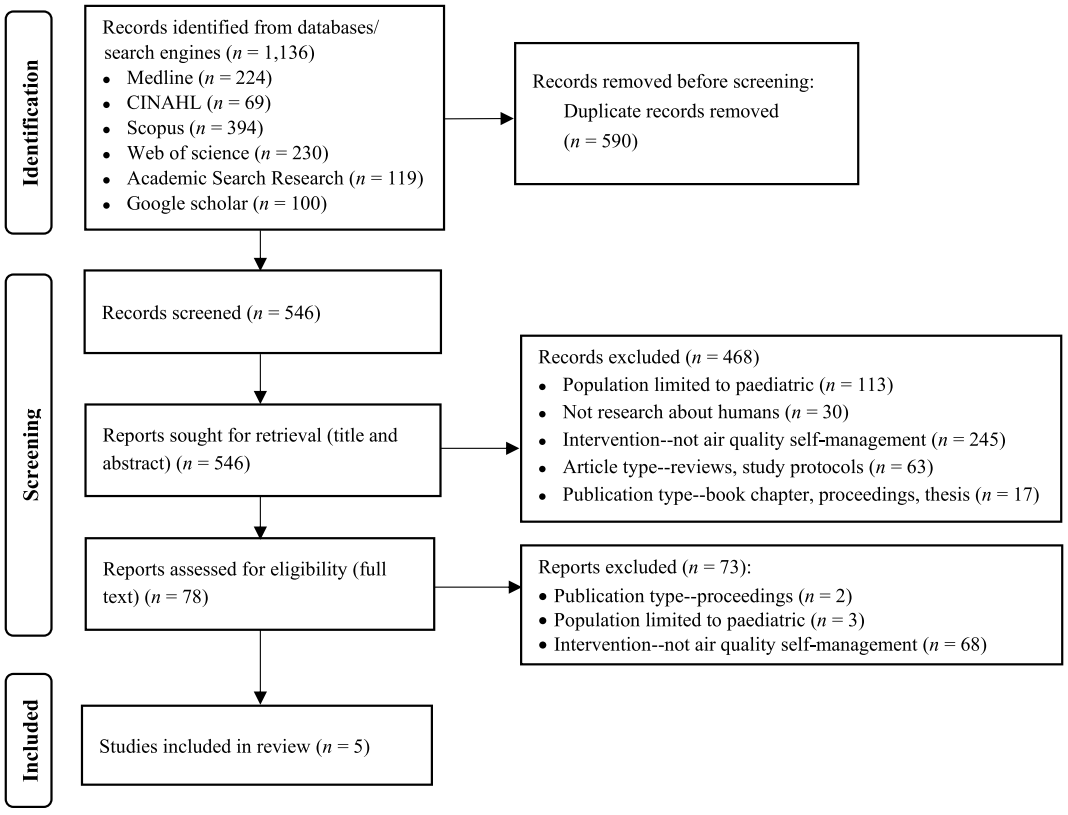

Fig. 1. Prisma flow diagram.

Table 2
Included studies.

Author, year, country	Study design	Aim	Participants	Interventions promoting air quality self-management	Outcome measures	Conclusions
Țîrcă et al., 2021 [30] Romania	Randomized study	To identify the factors that cause non-compliance with treatment in children, adolescents, and adults with asthma/COPD/ACO in Romania, the methods by which these factors can be understood and corrected, and the evaluation of symptoms.	251 participants with an initial and previous diagnosis of asthma, COPD, or ACO Age >6 and under 80: 6–18 (12.5%) 19–40 (17.0%) 41–60 (45.0%) 61–80 (25.5%)	Physicians' regular visits were carried out for one year. Interventions for the correction of noncompliance: 1. Planned visits and followed the appointment schedule, and the correct feedback on the status to improve disease control and patients' expectations was provided at each visit. 2. Revealed the trigger factors [allergens, smoking, air pollution] and recommended avoiding them. 3. The importance of using the medication, even in the absence of symptoms, was discussed with the patient. Patients were informed about the status of the disease and the consequences of not observing the treatment. 4. The inhalation technique was explained and shown to each patient. Subsequently, each patient received a demo device in which they could practice the inhalation technique to master it better.	Compliance was assessed by the number of visits, assessment of symptoms using the Symptom control questionnaires (ACT and CAT), and FEV_1 evaluation using spirometry.	In total, 12.4% of the patients had 5 visits during the year; 35% were partially compliant, and 52.6% were non-compliant. Correcting factors that depend on patients and the healthcare system remains challenging.
Gangneux et al., 2020 [31] France	Cohort study	To assess the impact of a global allergen avoidance method implemented by an indoor environment counselor on the clinical improvement of the patients and multiple indoor environmental risk factors.	57 asthmatic patients (>12 years old), 71.4% classified as uncontrolled/ unacceptable asthma; 27 patients were prospectively included in the group with intervention in the home indoor environment and compared to a cohort of 30 control patients with the standard of care without any intervention.	The intervention consisted of the evaluation of the allergens in the indoor environment, measurement of physical parameters, sampling for culturable fungi, and providing educational advice to the patients to limit indoor moisture, pollutants such as cleaning agents, and allergens, among which fungal allergens, but excluded renovation works. Through specific tools, they advise the patients on the global avoidance method: cockroach, dust-mite, cat and dog allergens, moisture and fungal allergens, and indoor pollutants, including tobacco smoke, disinfectants, and volatile organic compounds.	The level of control of asthma at inclusion and after 1 year was evaluated by the clinical signs, the evolution of the FEV_1, and the health care use.	A significant clinical improvement in the population that benefited from the home counselor's visit was observed compared to the baseline ($P < 0.001$), decreased hospitalizations for asthma, and the consumption of anti-asthma drugs ($P < 0.01$). Dampness markers slightly improved with an improvement of the fungal loads in two-thirds of the dwellings.
Chen et al., 2018 [32] Canada	Quasi-experimental study	To assess the public health effects of an air quality alert program in	Between Jan 1, 2003, and Dec 31, 2012, on average, three and 27 daily cardiovascular or	Air quality alerts in Toronto communicate the health importance of air pollution to the	The health outcomes were cardiovascular-related mortality, respiratory-related	Alert announcements reduced asthma-related emergency department visits by 4.73 cases per

Table 2 (*continued*)

Author, year, country	Study design	Aim	Participants	Interventions promoting air quality self-management	Outcome measures	Conclusions
		the city of Toronto [Ontario, Canada].	respiratory events were reported in Toronto.	public by announcing poor air quality through information campaigns, such as web notifications and media coverage, to urge behavioral changes related to outdoor activities.	mortality, and hospital admissions or emergency department visits for acute myocardial infarction, heart failure, stroke, asthma, and chronic obstructive pulmonary disease [COPD].	1,000,000 people per day (95% CI 0.55–9.38), or in relative terms by 25% (95% CI 1%–47%). Program eligibility also led to 2.05 (95% CI 0.07 –4.00) fewer daily emergency-department visits for asthma. This finding suggests that issuing air quality alerts alone has a limited effect on public health and that implementing enforced public actions to reduce air pollution on high-pollution days could be warranted.
Lu et al., 2021 [33] China	Time-stratified case-crossover	To investigate the benefits of the Three-Year Action Plan to Win the Battle for a Blue Sky for tackling COPD hospitalization due to ambient air pollution.	138,015 COPD hospitalizations aged ≥60 years.	The Action contains specific targets for reducing emissions of $PM_{2.5}$, SO_2, and NO_2, mainly due to vehicle and industrial exhaust.	Data on 24-h average concentrations of $PM_{2.5}$, PM_{10}, SO_2, NO_2, CO, and daily maximum 8-h average concentration of O_3 were obtained from the National Urban Air Quality Real-Time Publishing Platform in China during 2016 –2019, based on 114 monitoring stations.	Reduced levels of ambient air pollutants by the Action can effectively lower the risk of COPD hospitalization among older people.
Galán et al., 2017 [34] Spain	Poisson additive models	To assess the joint association of two consecutive smoking bans and hospital admissions via emergency departments due to COPD and asthma using a large sample of the Spanish population.	Participants with COPD as primary diagnosis in individuals 40 years or older and with asthma regardless of age. During the entire study period, there were 431,797 hospital admissions for COPD in the fourteen largest Spanish provinces and 95,411 hospital admissions for asthma in 5 provinces.	Two consecutive smoke-free regulations: a partial ban in 2006 and a comprehensive ban in 2011.	The partial ban was associated with a substantial, significant, pooled immediate decline in COPD-related admission rates (14.7%, 95% CI 5.0%–23.4%), sustained over time with a one-year decrease of 13.6% (95% CI 2.9% –23.1%). Asthma-related admission rates decreased by 7.4% (95% CI 0.2%–14.2%) immediately after the comprehensive ban was implemented, although the one-year decrease was sustained only among men (9.9%, 95% CI 3.9%–15.6%)	The implementation of the first partial smoking ban is associated with a 14.7% decrease in COPD-related hospital admissions. This reduction remained steady and, basically, unaffected by the introduction of the comprehensive smoking ban. Asthma-related results are not conclusive.

Note: ACO = asthma-COPD overlap. ACT = Asthma Control Test. CAT = COPD Assessment Test. CI = Confidence Interval. COPD = Chronic Obstructive Pulmonary Disease. FEV_1 = forced expiratory volume in one second. $PM_{2.5}$ = Particulate Matter of 2.5 μm. PM_{10} = Particulate Matter of 10 μm.

Table 3
Qualitative appraisal.

Study	Item number of checklists *										
	1	2	3	4	5	6	7	8	9	10	11
Case-control study											
Lu et al., 2021	Y	Y	Y	U	Y	Y	Y	Y	U	Y	–
Cohort study											
Galan et al., 2017	Y	Y	NA	Y	Y	NA	Y	Y	U	U	Y
Ţîrcă et al., 2021	U	Y	Y	Y	Y	U	Y	U	U	U	Y
Gangneux et al., 2020	Y	Y	Y	U	U	Y	Y	Y	U	U	Y
Quasi-experimental study											
Chen et al., 2018	Y	Y	Y	Y	Y	Y	Y	Y	Y	–	–

Note: *The Joanna Briggs Institute Critical Appraisal Checklists for different types of study design are listed in Appendix A. NA= Not Applicable. U= Unclear. Y= Yes.

3.2.3. Educational interventions

Educational interventions involve air quality alerts for outdoor activities [32] and indoor allergen and climate conditions avoidance [30–32]. Alert announcements reduced asthma-related emergency department visits [32], and a global allergens avoidance method with counselors visiting patients' homes for allergens measures decreased asthma hospitalizations and the consumption of anti-asthma drugs [30–32].

3.2.4. Policy interventions

Policy interventions are guidance for decision-making. The Action Plan to Win the Battle for a Blue Sky in China is a comprehensive strategy to improve air quality through actions across all

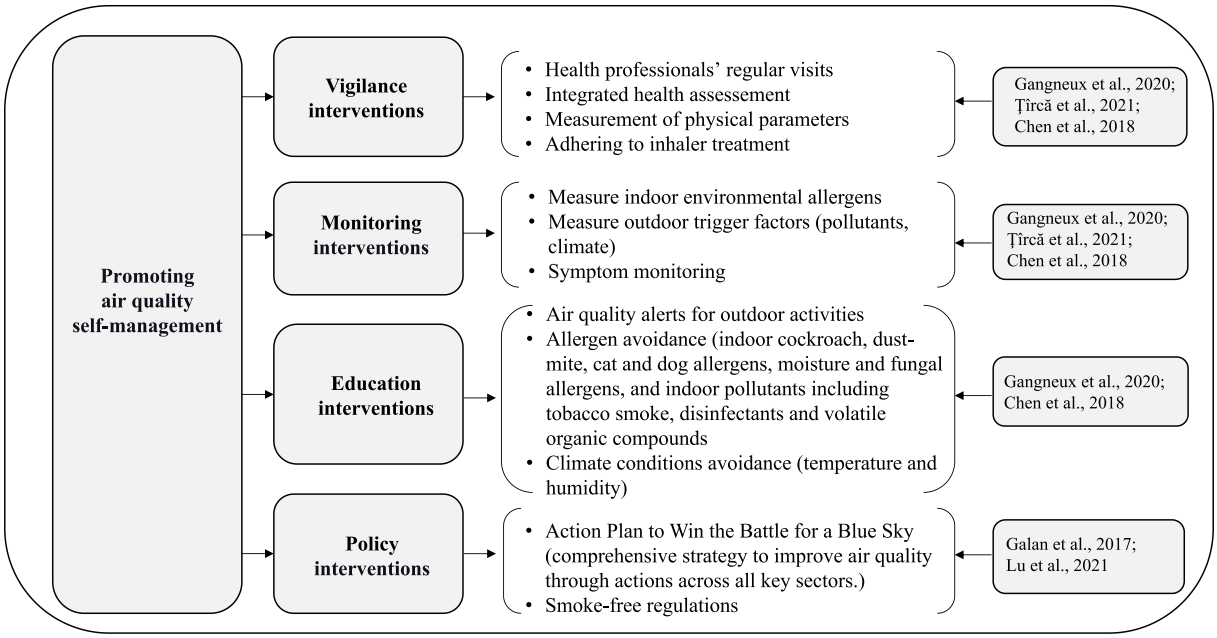

Fig. 2. Interventions for air quality self-management.

key sectors, reduce levels of ambient air pollutants, and effectively lower the risk for COPD hospitalization among aging patients [33]. Smoke-free policies were associated with a solid significant pooled immediate decline in COPD-related admission rates [34].

3.3. Exploring nursing interventions that promote self-management of air quality in asthmatic people with COPD

Vigilance, monitoring, educational, and policy interventions have been identified as crucial in supporting individuals with asthma and COPD in managing air quality and preventing exacerbations. These areas of focus represent critical components of nurses' interventions [26] and can integrate the fundamental patterns of knowing in nursing, including empirical, aesthetic, personal, ethical [27], and emancipatory knowing [28] (Fig. 3).

Vigilance and monitoring interventions involve keeping a close watch on the patient's condition, aligning with the empirical knowledge in nursing [30–32]. Empirical knowing is based on information, evidence, and observation [27]. Vigilance and monitoring contribute to gathering empirical data about risk factors, which is essential for informed decision-making. Empirical knowing is addressed through evidence-based practices in medication adherence, lifestyle modifications, and symptom monitoring [30–32].

Education is crucial in empowering patients to understand and manage their outdoor or indoor conditions [30–32]. Therapeutic education goes beyond relying solely on empirical knowledge; it highlights the crucial role of personal and aesthetic ways of knowing in nursing. This involves prioritizing a holistic and individualized approach to patient care and the nurse-patient relationship and cultivating a deep understanding of the patient as unique [27]. Ethical knowing is also reflected in relationship interventions [27].

Policies shape the larger healthcare environment and can influence the resources and support available to patients [33,34]. This aligns with the emancipatory knowing pattern in nursing, as policies require understanding and addressing power dynamics, as seen in the empowerment of patients through education and policy interventions [28].

Vigilance, monitoring, educational, and policy interventions represent a holistic approach to promoting self-management of air quality in asthmatic people with COPD.

4. Discussion

The available evidence regarding air quality self-management interventions in individuals with asthma and COPD is limited. However, the existing studies highlight the importance of promoting self-management of air quality as part of a comprehensive disease management approach [30]. It highlights the need for a comprehensive strategy to help patients with ACO and underscores the value of a multidisciplinary approach where nurses can lead. By addressing various aspects of self-management, including medication adherence, lifestyle modifications, and symptom monitoring, an interventional program can empower patients to take control of their condition and improve their overall well-being. This result is consistent with other studies that demonstrated the effectiveness of a comprehensive, nurse-led health education program in enhancing self-management practices among patients [35–37].

Crucial interventions—vigilance, monitoring, education, and policy—support asthma and COPD management. These nurse-led efforts encompass essential patterns of nursing knowledge [27,28].

Vigilance is the essence of nursing [38]. Nursing professionals play a crucial role in constantly monitoring patients, identifying changes in health status, watching for signs of complications or side effects of treatments, and promptly intervening to ensure patients' well-being and safety. Regular vigilance of asthmatic patients with COPD contributes to proper diagnosis, treatment, health promotion, and disease exacerbation.

These are important moments to make the patient aware of the environmental factors that trigger specific symptoms and to understand the causes of low adherence behaviors. The issue of adherence to therapeutic regimens is widely recognized as a significant challenge for asthma and COPD patients [39]. Several factors are significantly associated with better compliance, including

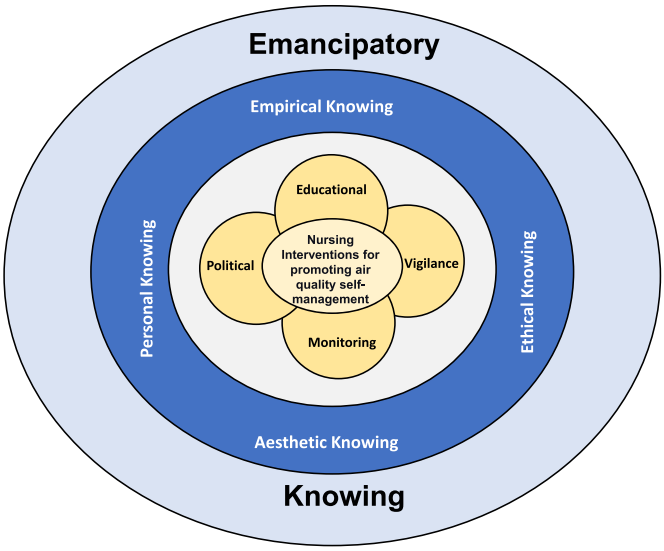

Fig. 3. Framework for nurse-led air quality self-management interventions.

higher income, a high literacy level, obesity, good cognitive performance, and older age. However, being employed and using multiple drugs or inhalers have been linked to decreased adherence [40]. Several interventions can be employed to improve compliance, like educational interventions, multiple component interventions (such as pharmacy care and self-management programs), motivational strategies, shared decision-making approaches, simplification of medication regimens, and providing feedback on medication use [41]. A patient-centered intervention can significantly enhance the response to any self-management intervention [42], which also holds for self-management of air quality.

Monitoring indoor and outdoor trigger factors, such as allergens, pollutants, or climate conditions, proved valuable in helping patients identify risk factors [30–32]. This knowledge can empower patients to take the necessary precautions and make informed environmental decisions.

Indoor pollutants (biological or chemical) may trigger respiratory exacerbation [43]. Biological sources include bacteria, viruses, fungi, and allergens from dust mites, pet dander, and mold spores. Inorganic chemical sources refer to pollutants like arsenic and fluorine (coal combustion), asbestos, carbon monoxide (tobacco smoke, wood, and gas stoves, car or truck exhaust from attached garages), fine particles (fuel/tobacco combustion, cleaning, cooking), nitrogen oxides (NO_x) (fuel combustion), O_3, household air cleaners generating O_3, PM (cigarettes, wood stoves, fireplaces, cooking, vacuuming, burning candles, and incense, products generated from reactions of O_3 with fragrances), Radon (soil under buildings, some construction materials, and groundwater), Sulfur oxides (SO_x). Organic chemical sources of household air pollution include Aldehydes (furnishings, construction materials, cooking), environmental tobacco smoke, plastics, pesticides, flame retardants, solvents, glues, cleaning agents, pesticides, building materials, paints, Volatile and semi-volatile organic compounds [43]. Household pollution can be reduced by reducing, occluding, or substituting the source of the pollution, improving the ventilation system by increasing the volume of outdoor air to lower the concentration of household pollutants, or implementing air purification or treatment technologies [43,44].

Allergens commonly associated with asthma, such as pollen, dust mites, indoor molds, and pet dander, can provoke bronchial hyperresponsiveness, leading to wheezing, coughing, and breathlessness in asthmatic patients with COPD [45]. Allergen avoidance measures should be implemented to reduce the frequency and severity of asthma-COPD overlap syndrome symptoms [46].

Several studies confirm a significant link between air pollutants, especially PM, like $PM_{2.5}$ and PM_{10}, and exacerbations in individuals with asthma and/or COPD [47]. Pollutants such as O_3, nitrogen dioxide, sulfur dioxide, and carbon monoxide contribute to respiratory disease exacerbations and hospitalizations [48–51].

Natural emissions, such as those resulting from dust storms in expansive desert regions [52], accidental fires [53,54], and the release of NO_x through lightning [55], can also indirectly impact generating air pollutants and lead to exacerbations of respiratory disease. Implementing measures to control ambient air pollution and avoiding environments during periods of high emissions can yield significant benefits for individuals with asthma and COPD.

High temperatures exacerbate respiratory issues, with increased $PM_{2.5}$, PM_{10}, O_3, CO, and NO_2 levels linked to higher hospital admissions for chronic obstructive pulmonary disease. These conditions also escalate daily emergency transports for asthma and contribute to premature mortality from respiratory diseases [56]. It underscores the need for effective measures to mitigate air pollution and protect vulnerable populations.

Nurses can use this empirical knowledge [27] to make informed vigilance interventions when working with people with asthma and COPD. Using this as a starting point, they can employ their competencies and other different ways of knowing (aesthetic, personal, and ethical) [27] to identify problems and create an education strategy that encourages self-management of air quality and is tailored to the patient's needs.

Nursing educational interventions are about enabling ACO patients to recognize the pollutants and risk levels that can trigger exacerbations. Our results showed that educational interventions, such as providing air quality or climate conditions alerts for outdoor activities and promoting the avoidance of indoor allergens, had positive outcomes [31,32]. The Particulate Matter Education program, coordinated by nurses, improved participants' health, maintaining six-month effects on self-care knowledge regarding air pollution, symptom changes, and indoor air quality among patients with COPD. It improved their environments in terms of air pollution and enhanced their self-prevention knowledge and CAT scores [57]. For asthmatic patients, a nursing educational program improves their self-care knowledge, use of inhalers, self-monitoring of asthma control, avoidance of asthma triggers, and ability to perform daily activities [58].

Policy interventions, including implementing strategies to improve air quality, demonstrated significant benefits [33,34]. Although it is not common, it is imperative that nurses, as frontline healthcare professionals, be recognized for their invaluable insights into patient care, healthcare systems, and the diverse needs of populations. Policymakers must actively engage nurses in policymaking to harness their firsthand experiences and unique perspectives, deriving significant benefits [33]. This involvement requires an emancipatory knowing, which involves being aware of societal, cultural, and political contexts and critically reflecting on them [28].

The interplay between monitoring, educational, and policy interventions aligns with and reinforces each dimension of nursing knowledge patterns [27,28], fostering a comprehensive and interdependent approach to care.

Vigilance involves the continuous observation and assessment of empirical data [27], while monitoring ensures ongoing data collection. Educational efforts are informed by empirical (scientific) evidence, contributing to a robust foundation of knowledge for nursing practice. Vigilance can be used to develop new ways of

improving nursing practices, such as diagnosis, monitoring, and assessment [38].

Aesthetic knowing [27] is enriched by personalized and tailored educational interventions considering individual patient experiences and preferences. The artistry of nursing care is complemented by vigilance [38], as nurses attune themselves to the nuances of each patient's condition.

The interdependence of vigilance, monitoring, and educational endeavors strengthens personal knowledge [27] by fostering meaningful nurse-patient relationships. Through these interactions, nurses gain a deeper understanding of the patient's unique context, experiences, and needs.

Policy decisions, an integral part of the discussed indicators, are guided by ethical principles aimed to ensure the well-being of individuals and communities. Educational interventions also embody ethical considerations, aligning with principles such as autonomy and beneficence [27].

The interconnectedness of vigilance, monitoring, educational, and policy efforts speaks to the emancipatory knowing within nursing [28]. Policy decisions, especially those related to air quality, address broader societal factors, reflecting nurses' commitment to advocating for health equity and environmental justice.

Overall, while not all interventions showed conclusive results, they were found to facilitate behavior changes that contribute to the prevention of exacerbations, reduction of emergency healthcare visits, and minimization of hospitalizations. These findings emphasize the importance of a multi-faceted approach to air quality self-management in individuals with asthma and COPD, involving vigilance, monitoring, education, and policy initiatives to optimize patient outcomes and reduce the burden of respiratory exacerbations. Nurses may inform their interventions and ways of knowing [27,28] based on these results (Fig. 3). Further research is needed to expand the evidence base and refine these interventions to benefit individuals with these conditions.

The evidence presented in the review has several limitations worth discussing. The included studies exhibited heterogeneity in their interventions, making it challenging to draw definitive conclusions about the most effective strategies. Additionally, the variability in methodological quality across the studies could potentially impact the overall reliability of the findings. The small number of articles included in the review from diverse countries might limit the generalizability of the results to a broader population. Although the review emphasized the potential benefits of various interventions in preventing exacerbations and reducing healthcare utilization, the variability in outcomes and the absence of long-term follow-up in some studies may limit the comprehensive understanding of the interventions' effectiveness over time.

5. Conclusion

The available evidence underscores the importance of further research into self-reporting interventions for individuals with asthma and COPD. Existing studies highlight the integral role of promoting self-management of air quality within comprehensive disease management strategies. A nurse-led, patient-centered intervention addressing diverse self-management aspects can empower patients and enhance their well-being. Essential components, including vigilance, monitoring, education, and policy measures, support individuals in managing air quality and preventing exacerbations. Concurrently, implementing strategies to control air pollution and climate conditions holds the potential to significantly benefit respiratory health, necessitating active nurse involvement and diverse ways of knowing.

Moreover, the review's implications span three key dimensions. In practice, collaborative efforts led by nurses are essential for tailored interventions such as vigilant monitoring and education. Policymakers should prioritize reinforcing smoke-free regulations and broader air quality strategies to protect public health. Meanwhile, research endeavors should emphasize long-term effects, diverse population considerations, comparative studies, and innovative approaches, all of which contribute to refining and enhancing future interventions.

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CRediT authorship contribution statement

Bruna F. Sebastião: Conceptualization, Methodology, Validation, Formal analysis, Writing - original draft, Writing - review & editing, Project administration. **Raquel M. Hortelão:** Conceptualization, Methodology, Validation, Formal analysis, Writing - original draft, Writing - review & editing, Project administration. **Sara S. Granadas:** Conceptualization, Methodology, Validation, Formal analysis, Writing - original draft, Writing - review & editing, Project administration. **José M. Faria:** Conceptualization, Methodology, Validation, Writing - review & editing. **Joana R. Pinto:** Conceptualization, Methodology, Validation, Writing - review & editing. **Helga Rafael Henriques:** Conceptualization, Methodology, Validation, Formal analysis, Writing - original draft, Writing - review & editing, Supervision, Project administration.

Data availability statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declaration of competing interest

The authors have declared no conflict of interest.

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Appendices. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijnss.2023.12.003.

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