REVIEW ARTICLE

Educating frontline health workers to support evidence-based management and treatment for chronic obstructive pulmonary disease patients: A literature review

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Problem: Chronic Obstructive Pulmonary Disease (COPD) is one of the leading causes of death worldwide, yet frontline workers lack the capacity and education required to provide evidence-based management and support for COPD patients.

Purpose: The aim of this review was to: (*i*) identify the respiratory education gaps within frontline health workers such as nurses, physicians, respiratory therapists, and other allied health professionals, in the initiation of integrated care coordination, and (*ii*) outline organizational strategies to initiate integrated care coordination towards comprehensive evidence-based management and treatment for COPD patients.

Methods: A literature review representing articles published between 2011 and 2021 was conducted. The focus was examining the factors that are involved in educating frontline health workers to support evidence-based COPD management and identifying organizational strategies to provide this comprehensive care. The initial searches yielded 353 articles; 18 were retained for review.

Results: Thematic analysis revealed two prominent themes as contributing factors to the challenges and strategic solutions: (*i*) the perceived challenges of frontline health worker respiratory education and (*ii*) the current deficits within organizational strategies, collaboration, resources, and educational interventions.

Conclusions: Providing respiratory education to frontline health workers is imperative to optimize evidence-based care, patient support, and improve outcomes. The solutions include recognizing and focusing on identified contextual barriers, implementing/disseminating strategic solutions, and engaging specialty trained COPD certified respiratory educators as facilitators of COPD primary care.

Key Words: *Chronic Obstructive Pulmonary Disease; COPD education; COPD management; frontline worker respiratory education*

BACKGROUND

The current challenges of Chronic Obstructive Pulmonary Disease (COPD) are worsening both locally and globally. COPD affects more than 300 million people globally [1] and is the third leading cause of death worldwide [1–3]. By 2030, it is predicted that there will be over 4.5 million COPD-related deaths annually [1]. COPD is defined as a respiratory disorder largely caused by smoking [4], which can also include other causative factors such as: (*i*) occupational exposure [5], (*ii*) age-specific changes [6], and (*iii*) genetic factors [1]. It is characterized by partial airway obstructions, lung hyperinflation, systemic manifestations, and increasing frequency and severity of acute exacerbations of COPD (AECOPD) [7, 8]. This respiratory disorder is associated with a significant economic burden through indirect costs (e.g., loss of productivity and COPD-related premature deaths) and direct costs (e.g., outpatient and hospital visits), with AECOPD accounting for the largest proportion of these burdens [1, 7, 9]. This results in a significant and increasing public health problem—a leading cause of mortality and morbidity [8, 10, 11]. The prevalence, burden, and death from COPD are projected to increase over the coming decades [2, 12, 13].

COPD is one of the leading causes of death worldwide, yet frontline workers may lack the capacity and education required to provide evidence-based management and support for COPD patients [2]. Frontline health workers play a significant role in the evidence-based management and care of COPD patients. These individuals aim to improve patient health outcomes, provide high-level specific services to reduce emergency room and hospital visits, and facilitate self-management action plans to improve patient outcomes for prompt recognition/treatment of AECOPD [7, 9] using an integrated care approach. For the purposes of this review, frontline health workers include (*i*) health service providers and professionals, who under their regulatory governing bodies represent physicians, nurse practitioners, nurses, dietitians, pharmacists, physiotherapists, occupational therapists, respiratory therapists, and social workers and (*ii*) other frontline workers such as clerical workers and associates, who provide frontline support to COPD patients.

COPD clinical practice guidelines, as highlighted by Bourbeau et al. [2], emphasize the need to improve coordination and communication in facilitating patient support and learning by frontline workers, as gaps exist in COPD patients not receiving respiratory information, education, and self-management skills from these workers. Providing information, education, and tools for frontline workers is imperative to optimize COPD patient support to improve outcomes and provide evidence-based respiratory care [2]. Evidence-based practice defines a conscientious

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approach to clinical decision-making and patient care using current, peer-reviewed research, combined with experiential knowledge and patient preferences [14]. The Global Initiative for Chronic Obstructive Lung Disease (GOLD) provides an evidence-based strategy and approach for the diagnosis, management, and prevention of COPD, and encourages related research, awareness, and care through the dissemination of such strategies [15]. Respiratory guidelines represent the evidence-based practice recommendations for the prevention, diagnosis, and management of COPD.

For the purpose of this review, integrated care coordination included areas of frontline service delivery such as acute, primary, community care, physicians' offices, and pharmacies representing interorganizational and intraorganizational levels within global, national, provincial, and local respiratory care settings. Health workers are defined as, "people whose job it is to protect and improve the health of their communities. Together these health workers, in all their diversity, make up the global health workforce" (p. 1) [16].

An integrated care coordination and approach includes enabling such workers to enhance respiratory patient support in facilitating their patients' COPD self-management action plans. Gardener et al. [17] emphasized the need to understand the requirements of COPD patient support and highlights the positive implications for practice by enabling clinicians to enhance such support. Bourbeau et al. [2] and Marciniuk [18] suggested that COPD patients require such disease-specific management, which involves an inter-professional team working together in unison in clinical practice to provide an integrated and comprehensive approach to care.

The optimization of the integrated and comprehensive approach should be based on the current gold standard clinical practice guidelines that represents evidence-based practice recommendations for treatment and management of COPD patients [2]. An integrated comprehensive approach highlights such elements as patient self-management techniques involving respiratory education and an individualized written COPD action plan with standing order antibiotic and prednisone medications to improve patient outcomes for prompt recognition/treatment of AECOPD [2].

There are several respiratory guidelines and recommendations utilized throughout the world including the: (*i*) American Thoracic Society (ATS) [19], (*ii*) European Respiratory Society [20], and (*iii*) Canadian Thoracic Society (CTS) Canadian Respiratory Guidelines (CRG) [2, 8]. Additionally, global societies such as the Forum of International Respiratory Societies (FIRS) [4] and World Health Organization (WHO) [21] also offer respiratory recommendations. Each guideline provides guidance to healthcare workers to properly manage COPD patients in preventing disease progression, reducing the frequency and severity of exacerbations, alleviating dyspnea and other respiratory symptoms, improving exercise tolerance, prompting treatment of exacerbations and complications of the disease, improving health status, and reducing mortality [2, 8]. COPD education as recommended by the CTS involves, "effective inhaler technique, recovery breathing techniques, early recognition and treatment of acute exacerbations" (p. 3A) [8], in addition to self-management education with a written COPD action plan with standing order medications to improve patient outcomes for prompt recognition/treatment of AECOPD [2, 8]. Despite clear clinical practice guidelines to support COPD patient management, frontline workers may not or are unable to provide the recommended evidence-based respiratory care as they lack the capacity and education required to provide such evidence-based management and support for COPD patients [2]. The aim of this review was to: (*i*) identify the respiratory education gaps within frontline health workers in the initiation of integrated care coordination and (*ii*) outline organizational strategies to initiate integrated care coordination towards comprehensive evidence-based management and treatment for COPD patients. The research questions guiding this review were: (*i*) what are the gaps in providing respiratory education to frontline health workers in providing evidence-based practice? and (*ii*) what organizational strategies are suggested to bridge this gap to ensure frontline health workers have the ability to apply evidence-based respiratory guidelines?

METHODS

The research team conducted a literature review using a combination of keywords with variables that included: COPD, COPD education, COPD management, and frontline worker respiratory education. The digital databases searched included: the Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, ProQuest Nursing, Medline, OVID, and Google Scholar and only encompassed relevant peer-reviewed and scholarly literature in the English language. The search comprised of articles published between 2011 and 2021 to ensure that the most recent articles were utilized. The reviewers also included the strategies outlined in Bailey et al. [22] showing a national healthcare initiative on preserving lung health. This paper aimed at forestalling premature COPD morbidity and mortality as the first documented resource for COPD frontline healthcare providers known as The National Lung Health Education Program (NLHEP). This article was compared to the included literature in this review to identify changes from 1998 to 2021 and to evaluate past trends to the present-day existing gaps in COPD frontline worker education. Thematic analysis was done according to the method outlined by Braun and Clarke [23] to identify recurrent concepts that emerged from the reviewed literature based on the research questions. Specifically, we systematically extracted the data related to the research questions and familiarized ourselves with the papers. Then we began to code patterns in the articles and aggregated similar codes into the final themes reported in this paper [23].

INCLUSION CRITERIA

Initially, the articles were screened for relevance according to their title and abstract. The criteria focused on examining the factors that are involved in educating frontline health workers to support evidence-based COPD management and identifying organizational strategies to provide this comprehensive care.

EXCLUSION CRITERIA

Within this literature search, the following exclusion criteria were applied: non-English language reports, non-peer reviewed articles and non-scholarly data such as grey literature. Additionally, articles that discussed various components of COPD management, but were not specific to the factors involved in educating frontline health workers to support evidence-based COPD management and in identifying organizational strategies to provide this comprehensive care were excluded.

RESULTS

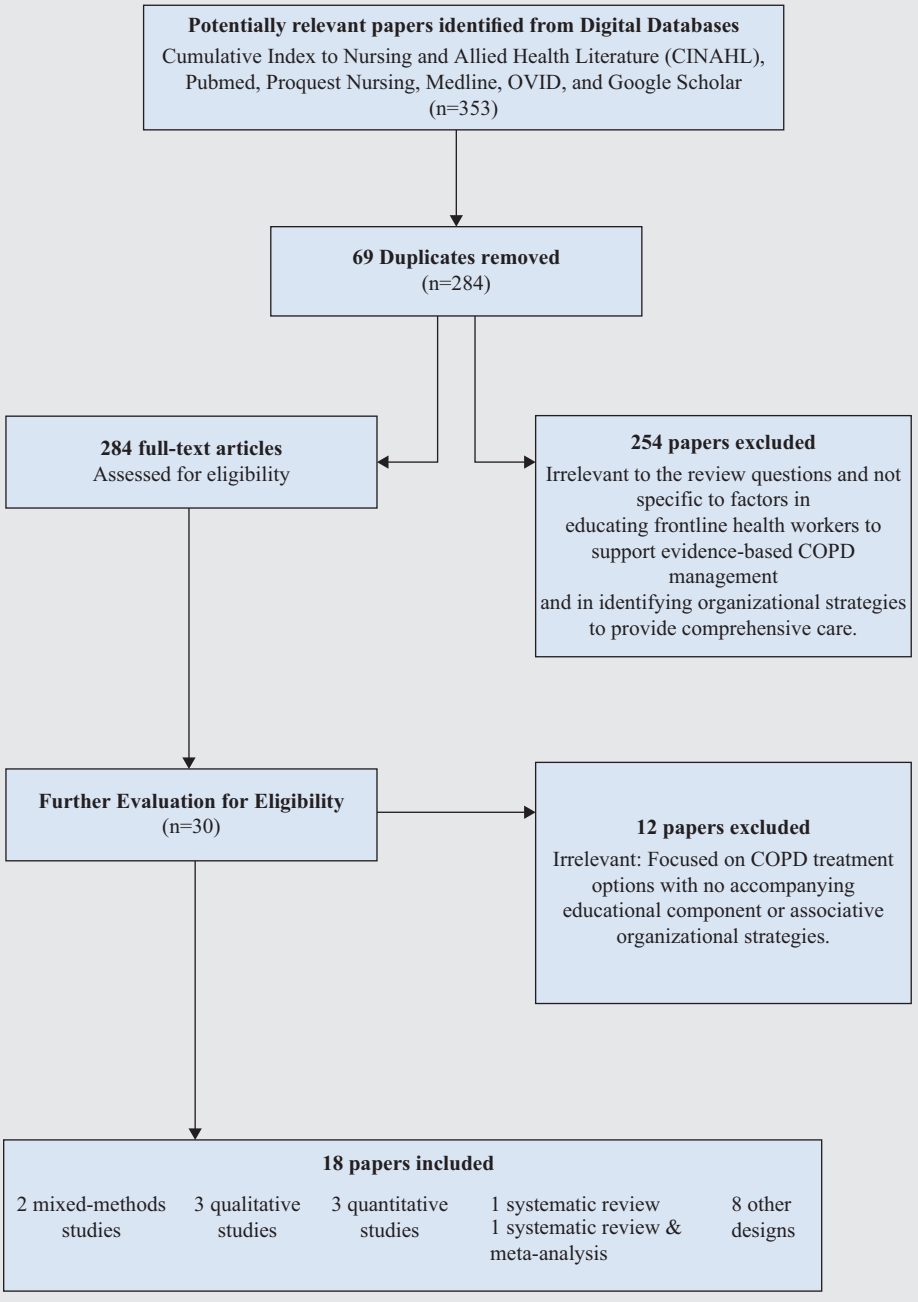
The initial search revealed 353 articles of which 69 duplicates were removed. After full-text screening was completed, an additional 254 articles were eliminated due to exclusion criteria, as these articles discussed various components of COPD-specific management related to smoking cessation, inhaler technique and COPD medications, and COPD monitoring, but were not specific to the factors that were involved in educating frontline health workers to support evidence-based COPD management and in identifying organizational strategies to provide this comprehensive care. An additional 12 articles were eliminated as they focused on current COPD treatment options with no accompanying educational or associative organizational strategies. A total of 18 relevant articles were retained, based on the topic and inclusion criteria for this review (Figure 1).

There were two mixed-methods, three qualitative, and three quantitative research studies; one systematic review; and one systematic review and meta-analysis. Eight articles included national education programs, respiratory guidelines, global initiatives and strategies, and international society recommendations (Table 1). The review also included recommendations and guidelines that were developed by expert panels with a global perspective.

Based on the results from this methodology and thematic analysis, two prominent recurrent themes within the 18 articles were identified as contributing factors to challenges, deficits, and organizational strategic solutions. The themes included: (*i*) perceived challenges of frontline health worker respiratory education related to lack of knowledge and education to support the patient and (*ii*) current deficits in organizational

FIGURE 1

Literature search flow diagram according to inclusion and exclusion criteria. COPD = chronic obstructive pulmonary disease.



strategies, collaboration, resources, and educational interventions related to lack of interprofessional collaboration (IPC); lack of organizational resources; and lack of organizational educational interventions.

PERCEIVED CHALLENGES OF FRONTLINE HEALTH WORKER RESPIRATORY EDUCATION

We identified that many authors of the included studies discussed perceived challenges of healthcare professionals reporting a lack of knowledge and deficits in their initial university respiratory care training and thereafter in their organizational workplace training opportunities. These healthcare professionals expressed insecurity and limited experience, thus highlighting a lack of knowledge and education as a significant factor related to COPD patient support [24]. Furthermore, Bourbeau et al. [2] also highlighted that respiratory patients reported gaps in receiving COPD information and, as a result, minimal education on self-management skills.

LACK OF KNOWLEDGE AND EDUCATION TO SUPPORT THE PATIENT

The included studies highlighted clinical examples of a lack of knowledge from frontline workers including, deficits in the healthcare provider's knowledge, limited experience, and the lack of training events

TABLE 1

Overview of chronic obstructive pulmonary Disease inclusion articles

Article, country	Type of study	Key characteristics
Cai et al. [27], China	Mixed methods (*n* = 225 physicians)	1. Frontline health worker education: Physician 1-h training session improved physician's knowledge related to COPD thus, improving ability to diagnosis and treat COPD.
Lundell et al. [24], Sweden	Mixed methods 1. Qualitative (*n* = 14 healthcare professionals) 2. Quantitative (A: *n* = 26 senior management and nurses; B: *n* = 18 other healthcare professionals)	1. COPD statistics, training for professionals, resources, organizational deficits and support (patient education; interprofessional collaboration). 2. Improved organizational structure of support of COPD patients in respiratory care/ self-management/exacerbations.
Damhus et al. [29], Denmark	Qualitative (*n* = 25 health professionals)	1. Barriers and enablers of health workers: Domains (staff perspectives, skills, professional role/identity, beliefs re: capabilities/consequences/environmental context/resources/social influences).
Foster et al. [30], United States	Qualitative (*n* = 784 survey case-vignettes of random sample physicians in adult primary care settings)	1. Education. A: clinical practice guidelines in place, but awareness, education, and continuing respiratory education is not yet reached; B: dissemination and education of guidelines is required for frontline care; and C: gap identified—guidelines in place but 55% of physicians were aware of major COPD guidelines, but only 25% used them to guide decision-making.
Leung et al. [31], Canada	Qualitative (*n* = 68 pre- and post-questionnaires—Health care professions impact of inhaler teaching)	1. Education frontline health workers: Two inhaler educational sessions incorporating technique—small group hands-on learning for family physicians and allied health care workers improved attitudes towards inhaler teaching and facilitated implement within their clinical practices.
Chen et al. [33], Hong Kong	Quantitative (Phase 1: *n* = 2358 COPD patients aged 40 or above; Phase 2: *n* = 2177 COPD patients aged 40 or above)	1. Goal: Audited COPD care at 13 primary care clinics and developed improvement strategies. Established criteria for audit based on literature. Phase 1 identified deficiencies of care. Phase 2 improvement strategies were designed/implemented. Strategies included: (*i*) department level—team-based approach, (*ii*) management level—COPD patients referred to a nurse-led, multidisciplinary program; (*iii*) clinic level—advocated for COPD risk factor screening policy and supported a continuous monitoring/feedback system; (*iv*) doctor level—disseminated GOLD-based diagnosis/management guidelines to frontline doctors; (*v*) patient level—increases awareness/knowledge. Results: Phase 2 showed improvement in established criteria, decreased AECOPD-related hospital admissions.
Pietinalho et al. [28], Finland	Quantitative (>250 COPD information and training events (prevention and treatment) for healthcare professionals over a 6-year period)	1. Goal: Education and training events to: reduce incidence of COPD, severity of the disease, and reduce number of periods/days of hospitalization and treatment costs. 2. Goal: Improve cooperation/collaboration between primary/specialized care and hospitals through COPD treatment chains, decrease hospital/ER visits, appoint a COPD person in charge at health centers and pharmacies. Results: 18% decrease in COPD hospitalizations and hospital days.
Uzzaman et al. [32], Bangladesh	Quantitative (*n* = 32 physicians; pilot study included 2 groups: *n* = 16 traditional classroom learning and *n* = 16 blended approach of e-learning and in person)	1. Gaps in knowledge and practice in COPD under-management due to lack of resources: (Human resources/inequitable distribution; limited rural/semi-urban care providers). 2. Solutions of blended e-learning.
Koblizek et al. [25], Czech Republic	Systematic review	1. Limited resources. 2. Improving knowledge with simple educational training on COPD for healthcare providers. 3. Inconsistent patient education (time-consuming). 4. Interprofessional care/collaboration. 5. Utilization of CRE for general practitioner inhaler education.
Massimi et al. [26], Italy	Systematic review and meta-analysis	1. Primary care (meet needs/reduce cost/prevent hospitalizations). 2. Education: COPD nurse based. 3. Education: COPD nurse (self-management). 4. Meeting the gap in primary care and chronic disease—task shifting.
Bailey et al. [22], United States	Other—The National Lung Health Education Program (NLHEP) 1998 comparison of trends and current outcomes (primary care physicians and nurse practitioners at this time)	1. Premise to filling the COPD gap. 2. National Lung Health Education Program for frontline workers.
Global Initiative for COPD [15], Global	Other—Global Initiative Recommendations	1. Global Initiative Recommendations to COPD diagnosis, management, and prevention.
Marciniuk et al. [4], Global	Other—Forum of International Respiratory Societies (FIRS)	1. Statistics. 2. Initiatives, goals, GOLD. 3. Key to gaps. 4. Effective frontline education is key to lung health. 5. Cost benefits/outcome measures.
Bourbeau et al. [2], Canada	Other— Canadian Thoracic Society Clinical Practice Guidelines on Pharmacotherapy in patients with COPD – 2019 update of evidence	1. Canadian (CTS) Guidelines for evidence-based care and management of COPD. 2. Combining and optimizing pharmacological and nonpharmacological therapies with the dual goals of reducing symptoms and preventing acute exacerbations of COPD. 3. Dissemination/implementation of education in collaboration with key stakeholders.

TABLE 1 (Continued)

Overview of chronic obstructive pulmonary Disease inclusion articles

Article, country	Type of study	Key characteristics
O'Donnell et al. [8], Canada	Other— Canadian Thoracic Society Guidelines for COPD	1. Action plan/self-management. 2. Canadian (CTS) Guidelines for evidence-based care and management of COPD for primary care.
Schunemann et al. [19],United States	Other— Guidelines: ATS/ERS Report	1. Individuals and organizations need to collaborate to achieve the best possible coordination of efforts. 2. Individuals and organizations need to collaborate to achieve cost-effective coordination of efforts.
Waseem et al. [20], Untied States and Europe	Other Guidelines: American College of Physicians, American College of Chest Physicians, American Thoracic Society, European Respiratory Society	1. Following COPD Management Guideline strategies (education) through the world (America–Europe). 2. Major educational arm of NLEP.
World Health Organization (WHO) [21], Global	Other—Global Strategies for COPD management	1. Global management A. Goals B. Education (patient and physician) C. AECOPD guidelines

Note: AECOPD = acute exacerbations of COPD, CRE = certified respiratory educator, GOLD = Global Initiative for Chronic Obstructive Lung Disease, CTS = Canadian Thoracic Society, NLEP = The National Lung Health Education Program.

or small group hands-on learning to provide enhanced respiratory education to COPD patients. Barriers in frontline skills include professional role and identity, environmental context and resources, and social influences around such education.

In a study conducted in Sweden, Lundell et al. [24] described that COPD care is on shaky ground and identified the strong desire to provide high-quality COPD care, but a lack of competence to achieve this goal [24]. Questionnaires and interviews revealed that the frontline workers lacked knowledge, expressed insecurity in their limited experience, described training mainly came from the pharmaceutical industry, had limited training opportunities, and found deficits in national criteria for university training [24]. The conclusions deemed that an investment of time and training for nurses was a wise use of resources and that a specialty-trained COPD nurse or healthcare professional was recommended within primary care centres [24]. This investment and intervention were highlighted as providing successful patient self-management support and health worker education [25, 26].

Cai et al. [27] provided physicians with a 1-h training session that focused on Chinese COPD guidelines. The results showed an improvement in physicians' knowledge, which substantially improved physicians' ability to diagnose and treat COPD. In Finland, Pietinalho et al. [28] highlighted the launching of The Finnish National Prevention and Treatment Program for Chronic Bronchitis and COPD, with the goal to reduce the incidence, severity, and number of hospitalized periods and days and associated treatment costs. The implementation of over 250 training events for healthcare professionals included: (*i*) smoking cessation, (*ii*) risk factors, (*iii*) COPD treatment, (*iv*) early diagnosis, (*v*) self-management, and (*vi*) pulmonary rehabilitation. These training events resulted in a decrease of 18% in such periods and days of hospitalization; thus, it can be seen as a frontline enabler of decreasing COPD associated treatment costs [28].

Damhus et al. [29] recognized the enablers and barriers of COPD telerehabilitation from a frontline staff perspective in Denmark and identified several predominant domains. These domains included: (*i*) frontline staff skills, (*ii*) professional role and identity, (*iii*) beliefs about capabilities and consequences, (*iv*) environmental context and resources, and (*v*) social influences. The findings also noted the essential domains in the perspectives of frontline staffs, which were essential to the implementation process of COPD frontline education.

The level of importance that primary care physicians can provide as an essential part of enhancing COPD management in primary care American clinical settings was explored by Foster et al. [30]. In this context, clinical practice guidelines have been developed and executed, but the perceptions, decision-making, and educational needs related to COPD were insufficient. "Although 55% of physicians were aware of major COPD guidelines, only 25% used them to guide decision making" (p. 1) [30]. This study concluded that practice guidelines through continuing medical education programs for COPD management have not been adequately addressed, reached, or utilized by most physicians. Yet, these guidelines can provide valuable resources in patient management and care. The findings indicated outcomes such as: (*i*) dissemination efforts surrounding education are required, (*ii*) future education should be present in COPD management and treatment, and (*iii*) "patient centered content that accurately reflects the nature of primary care practice may enhance physician's learning experience" (p. 1) [30].

In British Columbia and Alberta, Canada, a study was conducted that provided a two-session, small, group-based, hands-on inhaler device training event for family physicians and their associative allied healthcare workers [31]. As previously noted, inhaler technique and usage are an important respiratory element for proper and effective medication delivery in COPD management. This study highlighted, "outpatient education in inhaler technique remains inconsistent due to limited resources and inadequate provider knowledge" (p. 266) [31]. Prior to this education training, 49% reported providing some inhaler teaching within their practices, but only 10% felt competent in teaching patients how to use their inhalers. Post education, 98% rated this teaching as "good-to-excellent" and 83% reported returning to their practices and providing inhaler patient education [31]. Physicians and allied health care worker education on inhaler training empowered the facilitation and implementation of their clinical practice and improved attitudes towards such education.

DEFICITS IN ORGANIZATIONAL STRATEGIES, COLLABORATION, RESOURCES AND EDUCATIONAL INTERVENTIONS

We identified deficits in organizational strategies related to a lack of IPC, resources, and organizational educational interventions, as significant factors related to frontline support of COPD patients as a second major theme.

LACK OF IPC

In 2017, Lundell et al. [24] stated that "According to the national guidelines people with COPD should be offered tailored health care with interprofessional collaboration" (p. 11). This review identified that IPC strategies should be utilized globally, nationally, provincially, and locally in unifying COPD management. Interorganizational [28] and intraorganizational [24] is recommended. Globally, GOLD provides unified recommendations to COPD diagnosis, management, and prevention, where collaboration is built on evidence-based practices [1].

On a national level, Bailey et al. [22] introduced an educational program known as the National Lung Health Education Program (NLHEP); a collaborative initiative to offer strategies in lung health education for

primary care physicians and frontline workers [22]. The American College of Chest Physicians (ACCP) made the ongoing commitment to become, "the major educational arm of NLHEP" (p. 123S) [22]. The ACCP continues to design and provide educational programs for frontline staff and primary care clinicians [20]. Collaboration between organizations was also examined through a quantitative study by Pietinalho et al. [28] in which the Finnish Action Program proposed to improve cooperation between primary and specialized care by hospitals creating local COPD treatment chains to improve IPC within different treatment centres, resulting in decreased hospital events.

In reference to IPC between organizational team members, Damhus et al. [29] framed the essential predominant domain of social influences in understanding enablers and barriers of sufficient COPD education and skill training [29]. This exemplified the potential solutions in COPD frontline staff organizations through cooperation, communication, and collaboration, with colleagues and other health professionals, including managers and associative workers. Lundell et al. [24] also identified a gap between clinical practice and treatment guidelines where IPC education and collaborative support was lacking in relation to COPD written action plans, smoking cessation interventions, nutritional care, and exercise training.

LACK OF ORGANIZATIONAL RESOURCES

Lundell et al. [24] recognized key limitations within the primary care component of COPD management related to both the lack of competence and resources. These limitations included: (*i*) providing quality COPD care due to the burden of new patients without the provision of additional resources, and (*ii*) the apparent limited recruitment of rural area professionals and frontline workers. Lacking these key resources creates down-prioritizing in partaking of continuing education for COPD management by frontline health workers [24] and reveals inconsistent education techniques in clinical practice settings [25].

Uzzaman et al. [32] provided a global perspective in Bangladesh, describing the lack of human resources due to the current COPD health crisis and inequitable distribution, which results in a lack of qualified health providers and frontline workers in rural and semi-urban areas. These findings reflect a considerable gap between current COPD guidelines, provided care, and under-management in primary care. Although the research highlights the contributory factors within this gap, improving the capacity in this situation through a blended e-learning approach was suggested as a solution to delivering specific COPD education.

Damhus et al. [29] identified several barriers within COPD care from frontline staff perspectives in individual and focus group interviews. The barriers of staff skills, sufficient education, and skill training were as previously stated, with a lack of resources and organizational support also playing a major role in this situation.

LACK OF ORGANIZATIONAL EDUCATIONAL INTERVENTIONS

A lack of organizational strategies and educational interventions is emphasized in reference to low priority status of COPD within the health care organization, "COPD was treated as less important and less interesting than other chronic conditions" (p. 5) [24]. This study revealed that supplementary training for COPD was not prioritized by management, when compared to diabetes training. An interviewed participant noted she wanted to take COPD courses instead of mandatory diabetic courses, "but you're not allowed to do that. You have to take time off and do it on your own, or use annual leave days for it" (p. 6) [24]. The findings included, "several contextual barriers for implementation of evidence-based practice—the "shaky ground"—such as low prioritisation for COPD, lack of interprofessional collaboration, limited support from management, and lack of resources" (p. 11) [24]. Chen et al. developed and implemented improvement strategies for COPD care in Hong Kong after identifying that "insufficient patient education, under-treatment of COPD and lack of an integrative management model were the main issues to be tackled" (p. 185) [33]. One of the main patient outcomes of these strategies was a reduction in AECOPD-related hospital admissions.

DISCUSSION

According to the findings from this review, several contextual barriers exist between frontline health workers' clinical practice and the recommended treatment guidelines for COPD management and care. This stems from two key functions that include the perceived challenges of frontline health worker education related to lack of knowledge and education to support the patient and current deficits within organizational strategies related to lack of IPC, resources, and organizational educational interventions.

PERCEIVED CHALLENGES OF FRONTLINE WORKERS' RESPIRATORY EDUCATION

Findings of the contextual barriers were related to perceived challenges of frontline health worker education and encompasses a lack of knowledge and education to support patients [24–26]. Bourbeau et al. [2] emphasized, "patients reported gaps such as not receiving information after diagnosis of COPD, and receiving almost no education on self-management skills" p. 3. Foster et al. [30] highlighted similar barriers in frontline health worker education, in the context that clinical practice guidelines have been developed and executed, but the perceptions of health care frontline workers' utilization, decision-making, and educational needs of COPD patients are not considered and were insufficient. This insufficiency impedes frontline health workers in providing evidence-based management and treatment for COPD patients. Thus, as Foster et al. [30] emphasized, it is important that all frontline workers are educated in COPD management and treatment education.

When conducting this review, we identified many papers on COPD and COPD management but few regarding COPD management and the importance of educating frontline health workers to support these patients. Future research should focus on empirically studying how frontline healthcare workers provide education, noting the contextual barriers, and then begin documenting the necessary implementation processes to support this education.

DEFICITS IN ORGANIZATIONAL STRATEGIES: COLLABORATION, RESOURCES, AND EDUCATIONAL INTERVENTIONS

Findings in this review suggested contextual barriers regarding deficits within organizational strategies related to IPC, resources, and organizational educational interventions. Several contextual barriers were identified for the implementation of evidence-based practice of COPD management, including a low prioritisation for COPD, lack of IPC, limited support from management, and lack of resources [24]. Other barriers include the need for organizations to recognize the importance of applying evidence-based COPD management and the necessary educational solutions required, including IPC, management support, and adequate resources [24].

Interprofessional collaboration

Solutions to these barriers include implementing and disseminating organizational strategies to address these contextual barriers and initiating integrated care coordination towards comprehensive evidence-based management and treatment for COPD patients [24]. Through identifying the educational respiratory gaps and lack of capacity in frontline health workers, the process of integrated care coordination can begin. Recognition of this need can then provide a plan of action to disseminate continuing education on COPD management and guidelines to frontline workers within healthcare settings as dissemination efforts surrounding education are required [30].

In addressing the barriers and enablers of COPD education from a frontline perspective, Damhus et al. [29] stated that within clinical practice, "specific attention toward involvement of the health professional in the decision process combined with sufficient education and skill training is highly essential to support a successful implementation" (p. 2). They highlighted the importance of decision processes related to the importance of IPC through close collaboration with colleagues and other healthcare professionals such as doctors and managers, as an essential social influence element of COPD management and

decision-making [29]. This provides implementation solutions not only in addressing the lack of frontline health worker knowledge and education to support COPD patients, but also through the necessity of emphasizing specific attention towards such involvement within organizational deficits in organizational strategies, collaboration, resources, and educational interventions.

Such specific attention to involving and collaborating with health professionals provides solutions to the identified deficits within this review related to organizational collaboration and educational interventions at various levels. Providing planning and implementation into the decision-making process bridges the existing gap of IPF collaboration, addresses innovative ways to fuel the efficiency of resources, and creates a community of practice for respiratory care within organizations.

Strategies identified in this review that organizations could implement to foster IPC include (*i*) utilize global, national, provincial, and local forefronts to unify COPD management in support of patients; (*ii*) inter-organizational collaboration, and (*iii*) intra-organizational collaborations [1, 22, 24, 25, 28]. Lundell et al. [24] suggested that IPC lacks recognition, suggestions, and implementation related to educating frontline workers and supporting patients in the gap between clinical practice and treatment guidelines.

Damhus et al. [29] recognized these gaps and the enabling solutions within IPC when driven by cooperation, communication, and colleagues. Thus, IPC integrated care would provide internal and external avenues of frontline support within these integrated organizational strategies and interventions. "Given the immense amount of work that is required, individuals and organizations need to collaborate to achieve the best possible and cost-effective coordination of these efforts" (p. 1) [19].

Lack of resources

Within achieving the best possible and cost-effective coordination, authors stated several solutions to the present realities and burdens of COPD. Within the vast array of causative factors, three key issues include: (*i*) the lack of resources related to respiratory management, care, and continuing education; (*ii*) the lack of resource allotment within primary care for COPD management; and (*iii*) limitations of rural resources [24]; all of which potentiate a down-prioritizing of providing frontline health worker education and support.

Such solutions may initially commence as only short, inexpensive, COPD educational sessions or in the offerings of e-learning events that provide learner flexibility and accessibility, especially to health workers in rural and remote areas. Additionally, Lundell et al. [24] emphasized the investment in a COPD nurse or certified respiratory educator (CRE), health professionals who can provide education and support to both the patient and frontline health worker. Koblizek et al. [25] and Massimi et al. [26] concurred regarding the role that CREs play in primary care. "It is an investment that pays for itself right away in primary care centres" (p. 5) [24]. Pietinalho et al. [28] described that hospitalization periods and days decreased significantly when pharmacies and health centers appointed a professional who was in charge of COPD patients' ongoing management [28]. These innovative solutions propose to address the lack of frontline health worker education to support the COPD patient and in bridging the gaps in organizational collaboration, resources, and educational interventions.

Lack of organizational educational interventions

These contextual barriers and challenges related to frontline health worker awareness and education as a guide for clinical practice for COPD management are not a new challenge and were highlighted over 15 years ago by Foster et al. [30] and included several key elements: (*i*) clinical practice guidelines were in place, but awareness, education, and continuing respiratory education has not yet been reached; (*ii*) recognition of a need to disseminate continuing education on COPD management and guidelines in frontline workers within health team settings; (*iii*) gaps were identified related to frontline workers' awareness of COPD guidelines and utilization to guide decision-making; and (*iv*) future COPD education should be tailored to primary care settings where long distance or internet-based formats may be essential to reach high-need areas.

Findings from this review note these same challenges and gaps still exist as ongoing contextual barriers within COPD comprehensive care within organizations. This emphasizes the following strategies and actions that include: (*i*) continued efforts to provide respiratory education to frontline workers enabling evidence-based management; (*ii*) the need to bridge the respiratory education gaps within frontline health workers' various settings in the initiation of integrated care coordination tailored to specific settings, including providing remote or long distance learning for high-need areas; and (*iii*) to provide organizational strategies through implementing elements of IPC and providing organizational education and resources to initiate integrated care coordination towards comprehensive evidence-based management and treatment. Leung et al. [31] and Cai et al. [27] clearly identified the significance of providing a 1 or 2-h small group session and hands-on learning event for family physicians and allied healthcare workers. This would provide a small-step beginning positive approach towards facilitating implementation of proactive changes to clinical practice towards organizational educational interventions, thus improving diagnosis, assessment, and treatment in evidence-based respiratory care.

FUTURE CONSIDERATIONS AND STRATEGIES

The findings in this study suggest a strong need to find solutions to these contextual barriers in COPD frontline health worker support and implement and disseminate these solutions [24, 30]. This potentiates the future development of strategies for comprehensive management and implementation in evidence-based practices and management of respiratory care. These strategies include (*i*) recognizing and focusing on this review's identified contextual barriers and implementing strategic solutions [29] and (*ii*) recognizing and engaging specialty trained and certified COPD nurses or CRE health professionals as facilitators of primary care patient education [24]. These innovative solutions propose to address the lack of frontline health worker education to support the COPD patient and to fill in the deficits and gaps within organizational collaboration, resources, and educational interventions.

Another consideration is to provide further training of all frontline health service providers and support workers within the global, national, provincial, and local forefront to better implement evidence-based respiratory guidelines in routine care. In 2007, Foster et al. [30] recognized the importance and need to broadly disseminate continuing education on COPD management within health teams. One suggestion is to increase access to educational programs specifically tailored to COPD education programs such as The Lung Association of Saskatchewan "Respiratory Training and Educator Course" (RESPTREC) [34]. RESPTREC provides educational courses to health care professionals wishing to learn and/or achieve national respiratory certification. Similarly, RESPIPLUS is another educational program for COPD management available to frontline workers through interactive technological platforms [35]. Both RESPTREC AND RESPIPLUS are endorsed by pulmonary organizations such as the CTS [2], the Canadian Respiratory Health Professionals (CRHP), and the Family Physicians Airway Group of Canada [36]. These organizations agree that the addition and adaptation of these endorsed health worker courses would be an asset to provide basic frontline knowledge and competence at all levels of capacity, where the frontline health worker functions and provides COPD patient support [36].

Another educational opportunity includes The Canadian Network for Respiratory Care (CNRC), who grants national certification credentials through examinations for the CRE and Certified Tobacco Educator (CTE), can further provide respiratory education and formats through their educational literature and webinar venues [37]. Provincially, frontline workers can look to the various local lung associations to provide literature and webinars surrounding these contextual barriers and themes in addressing these challenges at global, national, and provincial respiratory conferences. Distributing, facilitating, and enabling educational knowledge, competence, collaboration, efficiency of resources, and strategies fulfills such mandates and are necessary interventions [24].

In the local context, strategies can be presented to primary care health workers in a less formal format (e.g., through workplace lunch and learn workshops, interprofessional rounds, and clinicians' corner) to foster integrated care, coordination, and IPC. This supports the COPD patient as a whole organizationally, where current care and support are provided. Within this local setting, the utilization of specialty trained CREs promotes the components of: (*i*) interprofessional collaboration; (*ii*) ongoing patient and frontline health worker education, support, and management to provide/improve evidence-based care by frontline health workers; and (*iii*) ensures organizational strategies are initiated around integrated care coordination and communication [24].

Utilizing such strategic interventions will create what Lundell et al. [24] described as a functional knowledge base and structure for collaborative COPD patient support, which exemplifies the need to understand the requirements of COPD patient support [15]. It also meets the requirements for disease-specific management involving an inter-professional team working to improve coordination and communication in facilitating patient support and learning by health team members [18]. This provides information, education, and tools for frontline workers, which is imperative in optimizing COPD patient support. Initiating such integrated care and coordination by providing respiratory education to frontline health workers to support comprehensive evidence-based management and treatment for the COPD patient provides optimization as a key ingredient for success.

LIMITATIONS

The main limitation within this review is the small number of articles that were examined. Although the purpose of this review was to provide representation from various methodologies of research study and through several global perspectives, a more exhaustive search and critical appraisal of the articles could be beneficial. Regarding future research, Lundell et al. [24] suggested that the incorporation of more qualitative components through mixed-methods designs would be advantageous in answering COPD research questions, where previously there has been a focus on COPD quantitative research. Since an essential component of COPD evidence-based practice and management by health workers includes patient qualitative considerations regarding their quality of life, patient perceptions and perspectives, and various subjective comfort measures, conducting in-depth qualitative and mixed-methodology studies could provide novel evidence.

Studies that focus on the patients' perspective of the healthcare professionals providing care may be a beneficial frame of reference to strengthen contextual barriers. Over a decade ago, the premise of patient-centered content that accurately reflects the nature of primary care practice was suggested as a way to enhance health workers' learning experiences in COPD management highlighting, "patient centered content that accurately reflects the nature of primary care practice may enhance physician's learning experience" (p. 1) [30]. Based on the results of this review and the identified contextual barriers, further research should be administered within the perceived challenges with frontline health worker respiratory education and the current deficits within organizational collaboration, resources, and educational interventions to enhance COPD management and treatment.

CONCLUSION

COPD is one of the leading causes of death worldwide, yet frontline workers lack the capacity and education required to provide evidence-based management and support for COPD patients. Such support can play a significant role in the care of COPD patients by seeking to improve patient health outcomes through: (*i*) providing high-level accessible specific services to lessen such burdens, (*ii*) decreasing emergency room and hospital visits, and (*iii*) enhancing respiratory patient support to facilitate self-management action plans to improve patient outcomes for prompt recognition/treatment of AECOPD.

The results of this review suggest that providing respiratory education to frontline heath workers will enhance the coordination of integrated care and communication between patients and frontline workers. The optimization of this integrated and comprehensive approach should be based on current gold standard clinical practice guidelines representing evidence-based practice recommendations for treatment and management of COPD patients. Providing information, education, and tools for frontline workers is imperative to optimize patient support within their circle of care to improve COPD outcomes.

Within this review, the primary area of focus was on the factors that affect educating frontline health workers to support such evidence-based management and treatment. Two key themes were identified as contributing factors in challenges, deficits, and strategic solutions: (*i*) the perceived challenges of frontline health work respiratory education and (*ii*) the current deficits within organizational strategies, collaboration, resources, and educational interventions. Through examination, these themes were analyzed and revealed several contextual barriers that exist in frontline health worker clinical practice and the recommended guidelines for COPD management and care.

Implications for practice and future considerations emphasize such strategies as (*i*) examining solutions to these contextual barriers and implementing and disseminating these solutions on a local, provincial, national and global level and (*ii*) recognizing and engaging specialty trained COPD nurses/CRE health professionals as the facilitators of primary care patient education, IPC and education, and supporting frontline health workers organizationally. These strategies provide optimization for success to meet the current and future realities and burdens of COPD through educating frontline health workers to support evidence-based management and treatment for COPD patients.

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Competing interests

All authors have completed the ICMJE uniform disclosure form and declare: no financial relationships with any organizations that might have an interest in the submitted work in the previous 3 years; no other relationships or activities that could appear to have influenced the submitted work.

Ethical approval

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