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REVIEW

Educational programmes in COPD management interventions: A systematic review

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Summary
Background: According to practice guidelines, educational programmes for patients with COPD should address several educational topics. Which topics are incorporated in the existing programmes remains unclear.
Objectives: To delineate educational topics integrated in current COPD management interventions; and to examine strengths, weaknesses, and methods of delivery of the educational programmes.
Data sources: A systematic literature search was performed using MEDLINE/PubMed, Cochrane Central Registry of Controlled Clinical Trials, and Web of Science. The authors of included studies were contacted for additional information.
Study selection: Studies that contained educational programmes incorporated in COPD management interventions were included.
Data extraction: Data were extracted using a pre-designed data form. The Reach, Efficacy, Adoption, Implementation and Maintenance (RE-AIM) framework was used for evaluating the strengths and weaknesses of the programmes.
Data synthesis: In total, 81 articles, describing 67 interventions were included. The majority (53.8%) of the studies incorporated 10 or more educational topics. The following topics were frequently addressed: smoking cessation (80.0%); medication (76.9%); exercise (72.3%); breathing strategies (70.8%); exacerbations (69.2%); and stress management (67.7%). Printed

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material and/or brochure (90.5%) and demonstrations and practice (73.8%), were the predominant tool and method, respectively. Nurses (75.8%), physicians (37.9%) and physiotherapists (34.8%) were the most involved healthcare professionals.
Conclusions: Heterogeneity and wide variation in the content and the method of delivery of educational interventions were present. Alignment between educational topics incorporated in the existing programmes and those recommended by the COPD guidelines, involvement of various professionals and combined use of methods should be emphasised.

Contents

Introduction

Patient education is an important aspect of management programmes for patients with chronic diseases such as chronic obstructive pulmonary disease (COPD) [1,2]. It is recommended to provide education at the time of diagnosis and to continue through end-of-life care [3—5]. Self-management education refers to any formalised patient educational programme aimed at teaching specific disease-related skills that emphasise disease control through behaviour change [3]. Its goal is increased adherence to treatment, as well as improved clinical outcomes [3]. However, studies evaluating outcomes of education in patients with COPD show extremely varied results. Findings range from increased patient knowledge [6], and reduction of health care service utilisation [7]; to a longer hospital stay [8] or increased risk of dying in the first year in the treatment group when compared to controls [9]. Nonetheless, interventions evaluated in these studies are complex and among other factors, differences in educational programmes may have contributed to divergent results.

The practice guidelines of the Global strategy for chronic Obstructive Lung Disease (GOLD) [10,11] and the American Thoracic Society/European Respiratory Society (ATS/ERS) Statements on pulmonary rehabilitation (PR) [5,12] emphasise the important role of educational components in COPD management interventions. Therefore, educational programmes should address several topics, such as early recognition and treatment of exacerbations, proper use of medication, informed end-of-life decision

making, breathing strategies and secretion clearance techniques [5,10—12]. However, which educational topics are incorporated in the existing programmes remains unclear.

The Reach, Efficacy, Adoption, Implementation and Maintenance (RE-AIM) framework for evaluating chronic illness management interventions is a method that systematically considers the strengths and weaknesses of programmes [13]. The use of RE-AIM evaluation framework in the processes of planning, evaluating, and reporting studies, may guide the translation of research into practice, as well as it may help determining the applicability of programmes to specific settings, type of patients, available resources and assessed outcomes [14].

This systematic review aims to delineate which educational topics are integrated in educational programmes of the current COPD management interventions. Further, the present review will address the methods of delivery of educational components in these interventions. Finally, the RE-AIM evaluating framework will be used to systematically consider the strengths and weaknesses of the included management interventions.

Methods

Data sources and search for relevant studies

Using MEDLINE/PubMed (1966—2012), Cochrane Central Registry of Controlled Clinical Trials (1966—2012) and Web of Science (1988—2012), a systematic literature search was performed to identify studies which evaluated educational programmes in patients with COPD published between January 1, 1966 and July 1, 2012.

The following three groups of search terms were combined using 'and': (*1*) 'COPD', 'pulmonary disease, chronic obstructive'; (*2*) 'health education', 'patient education as topic', 'education'; (*3*) 'disease management', 'case management', 'self-care', 'delivery of health care, integrated', 'patient care planning', 'pulmonary rehabilitation'. The keywords within each group were combined using 'or' (see Online Supplement, Search Terms).

To identify additional studies that may have been missed during the initial search, the electronic searches were supplemented by searching the reference lists from eligible articles. Additionally, we contacted the corresponding authors of included studies for additional data and/or clarification of data. Authors received a structured questionnaire by email which consisted of ten questions concerning the setting, modality, duration, healthcare professionals involved in the intervention, content, teaching tools, methods and activities (see Online Supplement, Author Questionnaire).

Study inclusion criteria

Studies that contained educational programmes incorporated in COPD management interventions were included. Selection of studies was done by two reviewers (AS and DJAJ) based on the following predetermined criteria: (*1*) *condition*: patients with a diagnosis of COPD; (*2*) management interventions including an *educational programme* (defined as a programme which transfers information to COPD patients on at least one educational topic as recommended by practice guidelines in verbal, written, audio or visual forms) as part of self-management, PR, disease management, chronic care model, case management, or integrated care; (*3*) *design*: randomized clinical trials or controlled clinical trials including a control group or comparison group; (*4*) *language*: written in English. Studies reporting outcomes with COPD patients in the same group with patients with other diseases were excluded. Disagreements between the two reviewers were resolved by consensus.

Data extraction

Data were extracted using a pre-designed data extraction form. The following data were recorded: authors, year of publication, country of origin, population characteristics, number of patients completing the programme, study design, educational topics, tools and methods, involved healthcare professionals, self-management skills, duration and number of educational sessions, follow-up period and outcomes.

Data synthesis, analysis and quality assessment

Identification of relevant educational topics was based on the topics stated in the practice guidelines and PR statements by Rabe et al. [10], Vestbo et al. [11], Nici et al. [5], and Spruit et al. [12]. The number of studies including specific educational topics is presented. Didactic tools and educational methods used in individual or group sessions, involved healthcare professionals, as well as self-management skills taught in educational sessions are shown using number of studies and/or percentage.

Further, the criteria of the RE-AIM framework were applied to all eligible studies. RE-AIM consists of five dimensions: Reach: participation rate and representativeness of individuals who are willing to participate in a given programme; Efficacy: the success rate of an intervention on important outcomes, when it is implemented as intended; Adoption: percentage and representativeness of organisations that will begin or adopt a programme; Implementation: quality and consistency of programme delivery when the intervention is implemented as intended in the real-word settings; and Maintenance: sustainability of intervention effects on individual's behaviour change, as well as the extent to which a programme becomes institutionalised [14]. The RE-AIM evaluation framework was recently applied to assess the translation of an evidence-based intervention in patients with asthma [15]. It categorises several types of chronic illness self-management interventions in the following modalities: one-to-one in-person counselling, group counselling sessions, telephone calls, interactive computer sessions, mailed print and health system policy. In addition, a three-level qualitative rating scale (high, medium or low) for each intervention type is provided. For interventions that used multiple modalities ($n = 25$), the highest rating on the five dimensions according to the RE-AIM framework was recorded.

This systematic review conforms to the PRISMA statement [16], (see Online Supplement).

Results

Description of studies

Eventually, 67 interventions reported in 81 articles [4,6–9,17–92] were identified as COPD management interventions including an educational programme (Fig. 1). Studies ranged in publication date from 1982 to 2012. Seven interventions were described in more than one article: [7,21,26,31,37–44,53,54,57,60,61,63,72,75,91]. Out of 67 studies, 60 corresponding authors were contacted. We were unable to contact the authors of 7 studies [19,23,30,35,36,81,86]. The majority of the contacted authors (n = 43, 72.0%) provided the requested information. Fifty-four (80.6%) studies were randomized controlled trials and 13 (19.4%) studies were controlled clinical trials. For each study, characteristics for which data were extracted are shown in Tables M1 and M2 in the Online Supplement.

Various interventions were evaluated in these studies: self-management (n = 30, 44.8%); PR (n = 13, 19.4%); integrated care (n = 7, 10.4%); disease management (n = 4, 6.0%); a smoking cessation programme (n = 3, 4.5%); case management (n = 3, 4.5%), pharmaceutical care (n = 3, 4.5%); exercise video (n = 2, 3.0%) and cognitive behavioural therapy/COPD educational programme (n = 2, 3.0%).

Educational topics

Based on the educational topics stated in the practice guidelines and PR statements, 18 topics were identified as relevant educational issues for COPD patients (Table 1). Out of 65 studies reporting on education, 60 (92.3%) studies addressed multiple topics in their educational programme. Only five (7.7%) studies covered a single educational topic such as inhaler technique/device, smoking cessation, exercise and muscle relaxation technique. The majority of the eligible studies (n = 35, 53.8%), incorporated 10 or more educational topics in the curriculum of their programmes. In contrast, 30 (46.2%) studies covered equal-to or less than 9 educational topics from the identified 18 topics in the practice guidelines and PR statements. The most included, were the following 12 educational topics: *smoking cessation* (n = 52); *medications* (n = 50); *exercise* (n = 47); *breathing strategies* (n = 46); *exacerbations* (n = 45); *stress management* (n = 44); *respiratory devices* (n = 41); *action plan* and *nutrition* (both n = 40); *coping with chronic lung disease* (n = 38); *pathophysiology of chronic respiratory disease* (n = 36); and *communicating with a healthcare provider* (n = 33). Less than half of the programmes included: *secretion clearance techniques* (n = 32); *energy conservation* (n = 31) and *pulmonary anatomy and physiology* (n = 30). *End-of-life decision making* (n = 6); *interpretation of medical testing* (n = 13) and *leisure activities* (n = 15) were the educational topics included in fewer than 25% of the programmes (Fig. 2).

Authors' responses were received for 43 studies. In 23 (53.5%) of these studies, all patients in the intervention group received the same educational curriculum, whereas in 20 (46.5%) studies, the educational component was tailored to some extent according to the patients' characteristics.

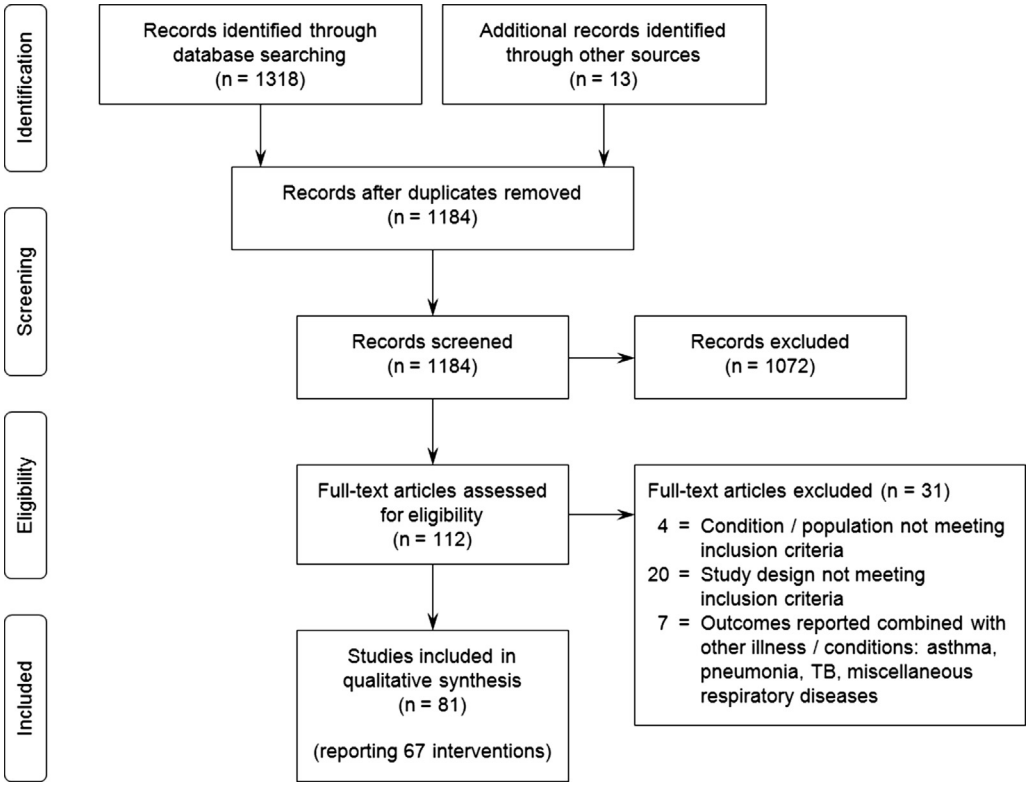

Figure 1 Flow diagram of the process that was used to select the relevant studies. PRISMA flow diagram. Adapted from Moher et al. [16].

Table 1 Educational topics.

- Early recognition and treatment of exacerbations
- Action plan for self-treatment of exacerbations
- End-of-life decision making
- Coping with chronic lung disease
- Normal pulmonary anatomy and physiology
- Pathophysiology of chronic respiratory disease
- Interpretation of medical testing
- Breathing strategies
- Role and rationale for medications, including oxygen therapy
- Effective use of respiratory devices
- Secretion clearance techniques
- Healthy food intake
- Irritant avoidance, including smoking cessation
- Anxiety and panic control, including relaxation techniques and stress management
- Benefits of exercise and physical activities
- Energy conservation during activities of daily living
- Communicating with your healthcare provider
- Leisure activities

The educational topics were adapted from the practice guidelines and PR statements [5,10—12].

Educational tools, methods and activities

The following educational tools were identified: printed materials and/or brochure, flip board, PowerPoint presentation, posters, video and/or internet. In a minority of the programmes other tools were identified (Table 2).

Demonstrations and practice was the predominant teaching method used in educational sessions. For the majority of the educational programmes, the following single methods and activities or their combination were used: interactive lecturing, feedback and reinforcement, assessment of information needs and written material adapted to patients' level of literacy. Peer observation was the least used patient educational method (Table 2).

Healthcare professionals delivering educational programmes

In 38 programmes, a team of two or more health care professionals were conducting the programmes. Nurses, physicians and physiotherapists were the most involved healthcare professionals. Psychologists, pharmacists and social workers were less likely to be involved (Table 3).

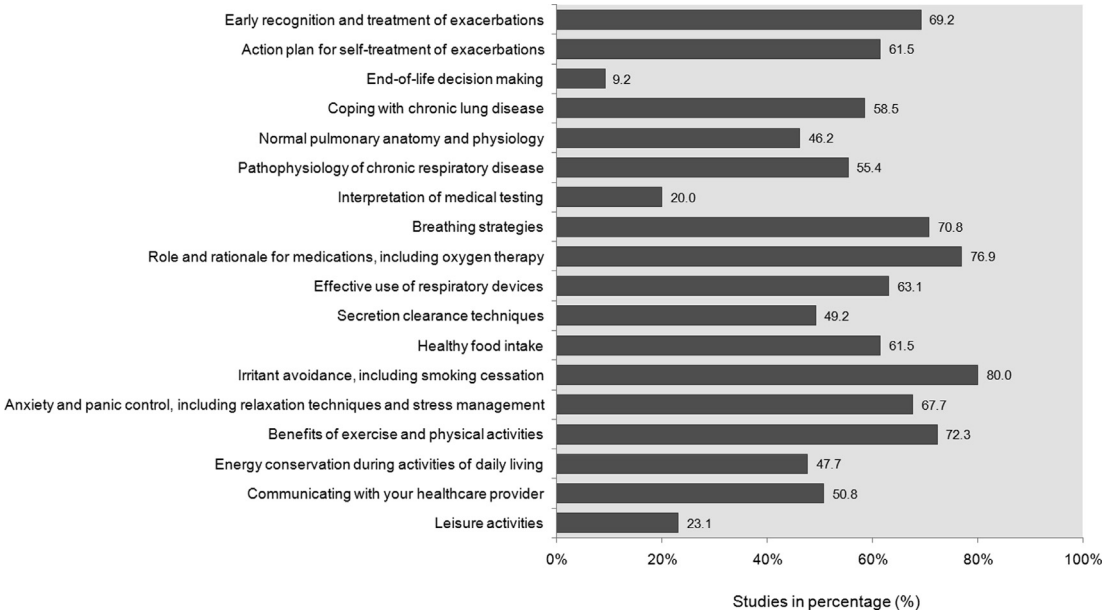

Figure 2 Percentage of studies that included each educational topic. $n = 65$ studies; 2 studies did not report the included educational topics [35,83]. The educational topics were selected from the practice guidelines and PR statements [5,10—12].

Table 2 Educational tools and methods used in educational sessions.

Educational tools, $n = 42$[a]	Educational methods, $n = 42$[b]
• PowerPoint presentation, $n = 12$, (28.6%) [32,33,44,47,55,56,61,64,67,71,78,90] • Flip board with large sheets of paper, $n = 14$, (33.3%) [7,20,28,32,33,61,65–67,71,72,80,88,90] • Posters, $n = 6$, (14.3%) [7,20,25,50,67,90] • Printed material and/or brochure, $n = 38$, (90.5%) [4,7,8,17,20,22,24,25,27–29,32,33,44,46–48,50,54–58,61,64–67,72–74,76–78,80,87,89,90] • Video, $n = 6$, (14.3%) [44,47,74,78,84,90] • Internet, $n = 4$, (9.5%) [4,54,66,90] Other, $n = 7$, (17%): COPD exacerbation action plan, diaries, airway models, set of inhalation devices, box (to practice lifting during breathing exercise) [32,33]; education/counselling usually either face to face or by phone [4,24,70]; not structured – the nurses were having their own material/tools [25].	• Interactive lecturing $n = 28$, (66.7%) [17,20,22,25,27,28,32,33,47,48,54–58,61,64–67,71–74,78,80,88,90] • Passive lecturing, $n = 12$, (28.6%) [25,44,46,54–57,72,78,80,89,90] • Assessment of information needs, $n = 23$, (54.8%) [4,7–9,22,24,27–29,32,33,47,48,50,54,57,58,65,66,70,77,78,90] • Motivational interviewing technique (building ambivalence), $n = 13$, (30.9%) [7,27–29,44,50,54,64,66,70,77,88,90] • Demonstrations and practice (educator and/or the learner), $n = 31$, (73.8%) [4,7–9,17,22,24,25,28,32,33,44,48,50,55–58,65–67,70–74,76–78,84,88] • Simulations or case scenarios, $n = 13$, (30.9%) [7,22,28,32,44,47,48,57,64,67,78,88,90] • Feedback and reinforcement, $n = 28$, (66.7%) [4,7,8,20,22,24,27–29,32,33,44,46,48,50,56–58,61,64–66,70,74,76,77,80,90] • Have patients summarise transmitted information (evaluation of patient's comprehension), $n = 14$, (33.3%) [4,7,8,17,22,28,44,48,57,61,67,71,77,90] • Evaluate patient's level of self-efficacy, $n = 15$, (35.7%) [7–9,25,28,44,47,48,54,61,66,70,74,77,90] • Learning contracts (homework, goals achievement), $n = 16$, (38.1%) [7,8,17,22,27,28,32,33,44,48,56,57,61,65,74,90] • Group exchange or discussions, $n = 20$, (47.6%) [20,25,27,28,32,33,44,55–57,61,64,66,71–74,78,88,90] • Peer observation (use of an expert patient), $n = 2$, [28,90] (4.8%) • Written material adapted to patients' level of literacy, $n = 23$, (54.8%) [4,7,8,17,22,24,27,28,32,33,46,48,54,57,58,61,64,65,72,74,77,88,90]

n: number of studies.
The educational methods were adapted from Bourbeau and Nault [100].
[a] Not reported, $n = 1$ study [9].
[b] Not reported, $n = 1$ study [87].

Self-management skills taught in educational programmes

Patients with COPD were more frequently taught to: take medications as prescribed, do not smoke, know and control the triggers and symptoms and control exacerbation, than to communicate with significant people and/or modify work and role functions (Table 4).

Setting and modality of interventions

The majority of the studies ($n = 46$, 68.7%) used outpatient education in the hospital setting (see Online Supplement, Table M1). Furthermore, most studies provided group counselling sessions, whereas, few studies used interactive computer and/or telehealth technology (Table 5).

Duration and total number of educational sessions and follow-up length

The duration of educational sessions varied from 10 min or less [76] to 180 min [17,57] per session with a median of 60 min. In 13 (19.4%) studies the duration was variable or not reported. The total number of educational sessions ranged from 1 session to 60 sessions, with a median of 6 sessions. Follow-up length ranged from 4 weeks post discharge [35,45,49] to 5 years [20] (see Online Supplement, Table M1). Summary of outcomes of the eligible studies containing education is presented in the Online Supplement (Table M2).

Table 3 Healthcare professionals in educational programmes.

Healthcare professionals, [a]$n = 66$[b]
• Nurse, $n = 50$, (75.8%) [4,7,8,17–20,22,24,25,27–29,32–35,43,46–51,54,57–59,61,64–67,70,71,73,74,77–86,88–90]
• Physician/pulmonary physician, $n = 25$, (37.9%) [4,7,19,22,25,28,35,43,45,48,54,55,59,65,67,69–71,73,74,79,81,85,86,90]
• Pharmacist, $n = 7$, (10.6%) [30,43,50,54,71,78,87]
• Physiotherapist, $n = 23$, (34.8%) [7,18,22,25,27,32–36,43,48,51,62,65,67,70,71,73,77–80]
• Occupational therapist, $n = 10$, (15.2%) [19,22,34,36,49,57,70,73,79,80]
• Dietician, $n = 15$, (22.7%) [18,19,27,28,34–36,48,65,67,70,71,73,78,80]
• Respiratory therapist, $n = 14$, (21.2%) [4,7,9,28,36,44,50,52,65,72,74,76,78,90]
• Psychologist, $n = 8$, (12.1%) [19,28,56,57,70,71,74,78]
• Social worker, $n = 4$, (6.1%) [19,28,34,70]
Other, $n = 8$, (12.1%): certified COPD educator [6]; contracted practitioners [51]; respiratory educator [23,59]; psychiatric doctor [65]; lung function assistant [84]; health care worker in old age home [58]; case manager [92].

$n = 1$ study [68].
[a] n: number of studies.
[b] not reported.

The RE-AIM analyses

Interventions containing educational programmes showed mixed ratings on the "reach" dimension. Furthermore, interventions received predominantly medium ratings on the "efficacy", "adoption" and "maintenance" dimensions. "Implementation" was rated as high for the majority of included studies (Table 5).

Discussion and conclusion

This review has systematically evaluated 67 interventions incorporating education for patients with COPD. Out of 18 identified educational topics, 12 topics were frequently addressed, e.g. smoking cessation, medication, exercise, breathing strategies, exacerbations and stress management. Printed materials and/or brochure were the most used educational tools, while demonstrations and practice was the educational method used in majority of education sessions. Nurses, physicians and physiotherapists were the most frequently involved healthcare professionals. The studies showed heterogeneity in their design, duration and number of educational sessions and follow-up. The majority of the interventions were rated as medium on the 'efficacy', 'adaptation' and 'maintenance' dimensions; the majority of the interventions had high 'implementation'; while on the 'reach' dimension, mixed ratings for the eligible interventions were reported.

Table 4 Self-management skills taught in educational programmes.

Self-management skills, [a]$n = 42$[b]
• Know and control the triggers and symptoms, $n = 35$, (83.3%) [4,7–9,17,22,24,27,28,32,33,44,46–48,50,54–58,61,64–67,70–74,77,78,89,90]
• Take medications as prescribed, $n = 38$, (90.5%) [4,7–9,17,22,24,25,27–29,32,33,44,46–48,50,54,56–58,64–67,70–74,76–78,80,84,89,90]
• Control acute episodes and emergencies, $n = 34$, (81.0%) [4,7,8,17,22,24,27–29,32,44,46–48,50,54–58,61,64–67,70–72,74,76–78,80,90]
• Have a healthy diet, $n = 27$, (64.3%) [4,7,8,17,24,27,28,32,33,44,46–48,54,56–58,61,64–67,70,71,78,80,90]
• Do not smoke, $n = 36$, (85.7%) [4,7,8,17,20,22,24,25,27–29,32,33,44,46–48,50,54–58,64–67,70–73,77,78,80,89,90]
• Use relaxation and stress reduction techniques, $n = 30$, (71.4%) [4,7,8,17,22,24,25,28,32,33,44,47,48,54–58,61,64–66,70–72,74,78,88–90]
• Make good use of health care professional, $n = 28$, (66.7%) [4,7–9,22,24,27–29,32,33,44,46,47,54–58,61,64,70–72,74,77,78,90]
• Ask for information and help; use available resources in the community, $n = 24$, (57.1%) [4,8,22,25,27,28,32,33,44,46–48,54,57,58,61,64,66,70,71,74,77,78,90]
• Modify work and role functions, $n = 16$, (38.1%) [4,8,17,22,28,32,33,46,48,57,58,61,70,71,78,80]
• Communicate with significant people, $n = 19$, (45.2%) [4,7,8,25,27,28,32,33,44,46,48,57,58,64,70,71,74,78,90]
• Manage negative emotions and psychological reactions to the disease, $n = 22$, (52.4%) [4,7,8,22,28,32,33,44,48,50,55–58,64–66,70,71,74,78,90]

The self-management skills were adapted from Bourbeau and Nault [100].
[a] n: Number of studies.
[b] Not reported, $n = 1$ study [87].

Table 5 Intervention modalities on RE-AIM dimensions.

Modality, [a]$n = 67$	Reach	Efficacy	Adoption	Implementation	Maintenance
• One-to-one in-person counselling $n = 39$, (58.2%): - Home-based outreach, $n = 18$, [4,7,8,17,22–24,29,44,46,47,51,62,65,70,71,84,90] - Health education referral, $n = 16$, [6,34,43,44,48,54,59,62,66,76,82,84,85,87,88,92] - Primary care, $n = 5$, [9,27,45,81,86] • Group counselling, $n = 43$, (64.2%): - Hospital-based, $n = 37$ [18–20,23,25,30,32,33,35,36,43,45,49,52,55–58,61,64–69,71–74,77,79,80,84,88–90,92] - Community-based, $n = 6$, [25,27,58,78,89,90] • Telephone: - Nurse outreach call, $n = 23$, (34.3%) [4,7,8,22,28,29,32,33,35,44,47,50,54,55,58,66,70,72,77,79,82,90,92] • Mailed print: - Tailored mailings, $n = 5$, (7.5%) [28,32,33,64,90] • Interactive computer: - Internet, $n = 3$, (4.5%) [4,66,70] • Telehealth technology, $n = 3$, (4.5%) [4,78,83]	• Low: $n = 29$, (43.3%) [6,18–20,30,32–34,36,43,48,49,52,55–57,59,61,64,67–69,73,74,76,80,85,87,88] • Medium: $n = 6$, (8.9%) [25,58,66,78,83,89] • High: $n = 32$, (47.8%) [4,7–9,17,22–24,27–29,35,44–47,50,51,54,62,65,70–72,77,79,81,82,84,86,90,92]	• Low: $n = 0$, (0.0%) • Medium: $n = 51$, (76.1%) [4,7–9,17–20,22–25,27–30,32,33,35,36,44,46,47,49–52,55–58,61,64,65,67–74,77–81,83,86,89,90] • High: $n = 16$, (23.9%) [6,34,43,44,48,54,59,62,66,76,82,84,85,87,88,92]	• Low: $n = 6$, (8.9%) [17,22,24,46,51,65] • Medium: $n = 40$, (59.8%) [4,6,9,18–20,23,30,32–34,36,43,45,48,49,52,55–57,59,61,62,64,66–69,71,73,74,76,80,81,83–88] • High: $n = 21$, (31.3%) [7,8,25,27–29,35,44,47,50,54,58,70,72,77–79,82,89,90,92]	• Low: $n = 6$, (8.9%) [17,22,24,46,51,65] • Medium: $n = 16$, (23.9%) [7–9,25,27–29,45,47,58,70,78,81,86,89,90] • High: $n = 45$, (67.2%) [4,6,18–20,23,30,32–36,43,44,48–50,52,54–57,59,61,62,64,66–69,71–74,76,77,79,80,82–85,87,88,92]	• Low: $n = 29$, (43.3%) [6,18–20,30,32–34,36,43,48,49,52,55–57,59,61,64,67–69,73,74,76,80,85,87,88] • Medium: $n = 35$, (52.2%) [7–9,17,22–25,27–29,35,44–47,50,51,54,58,62,65,70–72,77–79,81,82,84,86,89,90,92] • High: $n = 3$, (4.5%) [4,66,83]

[a] n: number of studies.

Educational topics

At present, no "gold standard" on specific educational topics which should be integrated in the educational programmes offered to COPD patients is established. Therefore, we used the educational topics as formulated in the current practice guidelines of the GOLD [10,11] and the ATS/ERS statements on PR [5,12], to provide an insight on the relevant educational domains which need to be addressed in the programmes.

The present findings of a very broad variety of educational programmes are consistent with the current literature. Namely, two previous systematic reviews on self-management education for COPD patients provided inconsistent recommendations regarding the form and the content of educational programmes in COPD [93,94]. This is due to diverse study interventions, variations in design, outcomes, follow-up periods and methodological flaws of the included studies. The aforementioned reviews, systematically evaluated 14 and 13 publications, respectively. Furthermore, an underlying cause for these inconsistencies may be an absence of evidence-based recommendations on which educational topics are essential for inclusion [95]. Additionally, recommendations on the duration, total number of educational sessions and the follow-up length of an educational programme are not included in the current practice guidelines [5,10—12].

Action plans were used in a majority of the studies, albeit contrasting findings have been reported in the literature [96]. Use of an action plan within a multi-faceted self-management programme, was stressed by Walters et al. [97] as a requirement for the use of an action plan as a standard of care in COPD.

The minority of the surveyed authors reported that their educational programme was adapted to the needs and environment of the individual patient [10,11]. Some tailoring was based on: baseline and/or on-going assessment of disease severity or problems [8,32,33,48], smoking status [50,54], inhaler technique or device, [76,84] disease-specific needs and personal goals specified in the action plan [27], and patient comprehension and skill acquisition [22]. In order to assess, from the patient's perspective, COPD patient's information needs for education in PR, the Lung Information Needs Questionnaire (LINQ) has been developed [98]. In addition, the Understanding COPD (UCOPD) questionnaire, assessing patient's understanding, self-efficacy, self-management skills and satisfaction with the educational component of PR, was recently developed by O'Neill et al. [99]. However, only one of the included studies [85] used the LINQ to systematically identified patient educational needs, whereas none of the studies used the UCOPD. Nevertheless, assessment of educational needs may be important. Indeed, patients and providers do not identify the same individual categories as the greatest learning needs, which in turn lead to patients' educational needs remaining unmet [95]. More specifically, Wilson et al. [95] showed that patients request information on welfare and benefits systems. To date, this topic is not included in the current practice guidelines [5,10—12].

Educational methods and activities

The present review shows that printed materials and/or brochure were frequently used educational tools, and demonstrations and practice was the educational method used in majority of education sessions. This is in accordance with patient's preferences. Indeed, patients prefer combining demonstration and practice of care strategies with visual aids, and group exchange and discussions, as a way of peer support and shared knowledge, supplemented with written material adapted to patients' level of literacy [95]. Additionally, educational methods should be chosen in the way that considers patient's style of coding and retrieving the information, reinforce patients' active role, enhance self-efficacy and support the integration of knowledge and self-management skills [100]. In this context, motivational interviewing technique, used in approximately one-third of the included programmes, has emerged over the past few years as an effective framework for engaging patients and facilitating health-related behaviour change [101,102].

Healthcare professionals delivering educational programmes

Although respiratory therapists in some countries are the key professionals involved in the education of patients with COPD [103], nurses were highly represented healthcare professionals in the current programmes offering education. Inclusion of a pharmacist however, might improve outcomes and management of COPD. Lemmens et al. [104] suggest that this may be due to the higher intervention intensity of pharmacist education when compared with nurse education. Likewise, involvement of a social worker might address the reported patients' need for education about welfare and benefits systems [95]. Also psychologists were healthcare professionals rarely involved in education of patients. An active role of psychologists in the process of education, may be an important determinant for facilitating and sustaining successful patient's behaviour change [105], which in turn, is the goal of a self-management education [3]. Nonetheless, to date, skills of healthcare professionals needed to provide effective patient education, are rather vague and generally covered in the guidelines and position statements [5,10—12].

Self-management skills

Education should incorporate not only teaching various disease educational topics, but also provide patients with specific skills aimed at patient's behaviour [3,12]. Acquired knowledge and self-management skills will result in enhanced patient's self-efficacy and improved health behaviour [3], which in turn, may lead to decrease in healthcare utilisation [61]. Other potential benefits of education are active participation in healthcare, increased coping skills and collaborative self- and end-of-life management skills [106,107]. Coping styles, although closely associated with exercise tolerance and symptoms of anxiety and depression in patients with COPD [108—110], were often included as an educational topic in the programmes, but it remains unknown whether they were assessed pre- and/or post-intervention. Pre-intervention testing of personality traits, patient's comprehension, attitudes and self-efficacy may provide an opportunity for development of individually tailored educational programmes [38,100].

Evaluation of interventions

The quality assessment according to the RE-AIM framework of the management interventions containing education showed that interventions had a low or a high "reach" within the target population. Lowering patients' barriers (scheduling appointments, transportation, repeated telephone call attempts) and increasing patients' convenience to participate in a programme may result in increased "reach" of an intervention [13]. Furthermore, one-to-one-in person counselling is considered to be a more effective intervention (high efficacy) when compared to the group counselling sessions (medium efficacy), because of the possibility to tailor the programme to the individual [13]. However, a higher percentage of eligible studies in our review conducted group sessions compared to one-to-one-in person counselling. The high implementation seen in the included interventions generally refers to involvement of experienced providers [13]. Moreover, few studies, in the current review used internet, interactive computer or telehealth technologies. Incorporating new information technologies may lead to a greater reach of participants by providing care in their homes, as well as it may increase efficacy, adaptation and maintenance [13]. Glasgow et al. suggest that taking into account multiple dimensions in the process of programme planning, rather than only considering efficacy; will increase the health impact of the interventions [13].

Limitations

There are several limitations that need to be considered in interpreting the results. First, non-English-language studies were not included. Second, the reported results in Tables 2 and 4 were based only on the studies of authors that responded to the questionnaire we have sent. This decision was undertaken based on the difference between authors' responses and limited information reported in the articles. Nonetheless, confirming the accuracy of the extracted data by surveying authors and reporting these results may reduce reporting bias and overcome incomplete reporting of study methods in the primary studies [111]. Third, heterogeneity in disease severity was present. This might have influenced the inclusion of specific educational topics in the curriculum of selected interventions. Fourth, programmes incorporated additional components e.g., exercise, psychosocial support, in addition to education. Hence, we were unable to analyse the effect of education alone on specific outcomes. Although, it is difficult to separate out the effects of education [112], education combined with exercise and support are usually an integral part of self-management programmes, PR or integrated care programmes [2,113]. Finally, factors that might have influenced the treatment effect, such as: the quality, reproduction and administration of the educational programmes [92]; as well as the information or the training provided to the healthcare professionals actively involved in the interventions, were not studied.

Practice implication

Patient education is an important component of COPD management interventions [5,10—12]. However, the present results draw attention to the inconstancies between the selected educational topics incorporated in the educational programmes and those recommended by current practice guidelines and PR statements. This may suggests that further research is required to identify which educational topics actually contribute to behaviour change and successful COPD management. Moreover, these findings may imply that more in-depth recommendations on the content and structure of educational programmes in the practice guidelines and statements are warranted. Additionally, only a minority of the educational programmes assessed in this study, provided education tailored to their patients, despite the fact that this is recommended in current practice guidelines [5,10—12]. Developing educational packages, tailored according to the patient's needs, might facilitate equitable patient access to COPD education. Use of a combination of educational tools and methods may be an efficient way for facilitation and retention of self-management learning process in COPD patients [95,100]. These observations may permit healthcare professionals who design educational programmes to include these requirements in a format that is acceptable to patients.

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Authors' contributions

AS, DJAJ and EFMW drew up the design and framework of this manuscript. Selection of studies was done by AS and DJAJ. Analysis of the data was done by AS. Wrote the first draft of the paper: AS. Contributed to the writing of the manuscript: AS, DJAJ and EFMW. All authors read and approved the final manuscript.

Conflict of interest statement

The authors declare that they have no conflict of interest.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.rmed.2013.08.006.

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