




BMJ Open Healthcare providers' attitudes, beliefs and barriers to pulmonary rehabilitation for patients with chronic obstructive pulmonary disease in Saudi Arabia: a cross-sectional study

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To cite: Aldhahir AM, Alqahtani JS, Aldraiwiesh IA, *et al.* Healthcare providers' attitudes, beliefs and barriers to pulmonary rehabilitation for patients with chronic obstructive pulmonary disease in Saudi Arabia: a cross-sectional study. *BMJ Open* 2022;**12**:e063900. doi:10.1136/bmjopen-2022-063900

► Prepublication history and additional supplemental material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2022-063900>).

Received 14 April 2022
Accepted 05 October 2022



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ABSTRACT

Objectives To assess the attitude of healthcare providers (HCPs) towards the delivering of pulmonary rehabilitation (PR) to patients with chronic obstructive pulmonary disease (COPD) and identify factors and barriers that might influence referral.

Design A cross-sectional online survey consisting of nine multiple-choice questions.

Settings Saudi Arabia.

Participants 980 HCPs including nurses, respiratory therapists (RT) and physiotherapists.

Primary outcome measures HCPs attitudes towards and expectations of the delivery of PR to COPD patients and the identification of factors and barriers that might influence referral in Saudi Arabia.

Results Overall, 980 HCPs, 53.1% of whom were men, completed the survey. Nurses accounted for 40.1% of the total sample size, and RTs and physiotherapists accounted for 32.1% and 16.5%, respectively. The majority of HCPs strongly agreed that PR would improve exercise capacity 589 (60.1%), health-related quality of life 571 (58.3%), and disease self-management in patients with COPD 589 (60.1%). Moreover, the in-hospital supervised PR programme was the preferred method of delivering PR, according to 374 (38.16%) HCPs. Around 85% of HCPs perceived information about COPD, followed by smoking cessation 787 (80.3%) as essential components of PR besides the exercise component. The most common patient-related factor that strongly influenced referral decisions was 'mobility affected by breathlessness' (64%), while the 'availability of PR centres' (61%), the 'lack of trained HCPs' (52%) and the 'lack of authority to refer patients' (44%) were the most common barriers to referral.

Conclusion PR is perceived as an effective management strategy for patients with COPD. A supervised hospital-based programme is the preferred method of delivering PR, with information about COPD and smoking cessation considered essential components of PR besides the exercise component. A lack of PR centres, well-trained staff and the authority to refer patients were major barriers

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ To our knowledge, this is the first national study that explores healthcare providers' (HCPs') attitudes and beliefs about the delivery of pulmonary rehabilitation (PR) to patients with chronic obstructive pulmonary disease (COPD) and identifies factors and barriers that might influence referral in Saudi Arabia
- ⇒ The availability of PR centres, the lack of trained HCPs and the lack of authority to refer patients were the most common barriers preventing the referral of COPD patients to PR programme
- ⇒ The study was conducted during the COVID-19 pandemic, which may have impacted the respondents' opinions.

to referring patients with COPD. Further research is needed to confirm HCP perceptions of patient-related barriers.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a common, preventable and treatable disease characterised by airway and/or alveolar abnormalities, leading to airflow limitation and persistent pulmonary symptoms.¹ Patients with COPD are susceptible to daily respiratory symptoms, reduced exercise capacity and frequent chest infections that could result in deterioration of lung function and acceleration of disease progression, subsequently leading to emergency hospital admissions.^{1,2} In addition to pharmacologic approaches, the International Global Initiative for Obstructive Lung Disease stresses the importance of including non-pharmacologic interventions such as pulmonary rehabilitation (PR) in the management of COPD symptoms as PR provides symptomatic

improvement,^{3 4} thereby reducing unnecessary hospital admissions.

PR is a comprehensive, multidisciplinary, non-pharmacologic intervention aimed at improving quality of life and exercise performance in patients with COPD.⁴⁻⁶ PR usually consists of patient assessment with an exercise test and dyspnoea assessment, exercise training that includes endurance and resistance training, quality of life measure, nutritional with occupational evaluation and health education and is administered by a group of multidisciplinary HCPs.⁷

There has been an increasing trend in Saudi Arabia's prevalence and incidence of COPD from 1990 to 2019.⁸ In 2019, it has been estimated that around 434560 people had COPD in the Kingdom of Saudi Arabia.⁸ This study shows that the burden of COPD is increasing, and public health policy is necessary to offset this trend. PR programmes are an example of community-based primary care management that must be implemented to lessen such a burden.⁸ However, in Saudi Arabia, PR programmes are often unavailable or underused,⁹ for multiple reasons, including the lack of trained staff who can manage patients with COPD.¹⁰ In addition, PR services across the country must be conducted under close supervision by pulmonologists or internists with an interest in pulmonary medicine, although the number of chest physicians in Saudi Arabia is relatively low.^{11 12} Consequently, an inadequate number of services are provided to meet the needs of patients with COPD.

International and national COPD management guidelines recommend increasing the implementation of PR programmes worldwide by involving well-trained HCPs in the PR team,^{5 11 12} considering that COPD is now perceived as a heterogeneous disease with multisystem manifestation that causes systemic consequences.¹² Despite the current contribution and involvement of experienced HCPs (eg, nurses, respiratory therapists, physiotherapists, psychologists, occupational therapists, and dietitians) in Saudi PR programmes, awareness of and barriers to healthcare professionals in delivering PR programmes in Saudi Arabia are limited. Recently, we have conducted a study to assess pulmonologists', internists' and general practitioners' attitudes towards the delivery of PR to patients with COPD and to identify factors and barriers that might influence PR referral decisions. Our findings showed that the referral rate was low among all physicians, which was attributed to a lack of PR centres and trained staff.¹³ Given the fact that our previous study did not survey non-physicians HCPs' attitudes, although they were implicated as a barrier to referral, the present study aimed to explore allied healthcare professionals' attitudes and expectations towards delivering a PR programme and identify their views on factors and barriers that might influence the referral of patients with COPD in Saudi Arabia.

METHODS

Study design

A cross-sectional survey was conducted through an online platform (Survey Monkey) between 15 September 2021, and 19 January 2022.

Questionnaire tool

The survey was composed of nine multiple-choice closed questions and free text fields for additional comments; it was structured, formulated and validated by multidisciplinary experts including nursing, respiratory therapy, physiotherapy and nutrition in the field of PR based on the currently available literature.^{5 7 14} Before the initial distribution, content and face validity were assessed after piloting the survey with 10 healthcare professionals with a clinical background in COPD management.

Before participants started to answer the questionnaire, the aim of the study was provided, together with information about the lead investigator. Additionally, no personal information was recorded; voluntary participation was ensured by asking if participants were happy to complete the survey or not. An additional statement was provided in the survey: 'By answering "yes" in completing the survey question, you voluntarily agree to participate in this study and give your consent to use your anonymous data for research purposes'. The time required to complete the survey was approximately 3–5 min. The questionnaire consisted of two pages of structured responses that involved multiple-choice answers in three sections. Section 1 requested the respondents' demographic information, including gender, profession, years of experience and responsibilities in the management of COPD. Section 2 consisted of three questions asking about HCPs' perceptions of PR. The first question had six statements regarding the effectiveness of PR with patients with COPD and used a 5-point Likert scale ranging from 1=strongly disagree to 5=strongly agree. The second question asked about additional components of PR aside from the exercise component, and the third question was about the best way to deliver PR for patients with COPD. Section 3 included two questions regarding patient-related factors that influence referral decisions and process-related factors that influence the decision not to refer COPD patients. These questions used influence as a grading tool: no influence, some influence and strong influence (see online supplemental appendix 1).

Sampling strategy

Professional committees managing respiratory diseases such as Saudi Society of Respiratory Care, Saudi Physical Therapy Association and Saudi Nurses Association, and social networks (Twitter, WhatsApp and Telegram) were used to distribute the survey to reach a greater number of HCPs working in Saudi Arabia. Professional committees posted the survey on their social media pages and sent emails to their members. Additionally, four authors from four different medical institutions in four different regions of Saudi Arabia have participated in the data

collection. Each data collector was responsible for distributing the survey in his/her region to HCPs to ensure that all the geographical areas of Saudi Arabia were covered.

Patient and public involvement statement

Patients were not involved.

Sample size

Convenience sampling techniques were used to recruit the study participants. Nurses, respiratory therapists, physiotherapists, psychologists, occupational therapists and nutritionists involved in managing patients with COPD or who had potential contact with this population were the main targets. Sample size calculation was not required, as this was an exploratory study designed.

Statistical analysis

Data were collected and analysed using the Statistical Package for Social Sciences (SPSS software, V.25). The categorical variables were reported and presented in percentages and frequencies. A χ^2 test was used to assess the statistically significant difference between categorical variables. Statistical significance was considered if the $p < 0.05$.

RESULTS

Overall, 980 HCPs (53.1% men) participated in the online survey between 9 September 2021, and 19 January 2022. Nurses accounted for 40.1% of the participants, followed by respiratory therapists (32.1%), physiotherapists (16.5%) and other healthcare specialties (11.2%) such as nutritionists and occupational therapists. The majority of respondents had 1–2 (30%) or 3–4 (26%) years of clinical experience in caring for patients with COPD, while 15.2% had 5–6 years. Oxygen therapy (57%), inpatient treatment (47.1%), ongoing management (42.1%), diagnosis (38.9%) and outpatient clinics (38.1%) were the main responsibilities for managing patients with COPD (table 1).

HCP' opinions on referring patients with COPD

Most HCPs strongly agreed that PR would improve COPD patients' exercise capacity (589 or 60.1%), and they strongly believed that PR would reduce symptoms of dyspnoea and fatigue (545 or 55.6%). In addition, most HCPs strongly agreed that PR would reduce levels of anxiety and depression (479 or 48.9%), and 571 (58.3%) strongly agreed that PR would improve patients' health-related quality of life. Moreover, 517 (52.8%) strongly agreed that PR would reduce hospital readmission, and 528 (53.9%) strongly agreed that PR would reduce the risk of future COPD exacerbation. Moreover, 440 HCPs (44.9%) strongly agreed that PR would improve patients' nutritional status, and the majority strongly agreed that PR would improve disease self-management in COPD patients (589 or 60.1%) (table 2).

Table 1 Demographic data and characteristics of all study respondents (n=980)

| Demographic variables | Frequency (%) |
|---|---------------|
| Gender | |
| Male | 520 (53.1) |
| Female | 460 (46.9) |
| Profession | |
| Nursing | 393 (40.1) |
| Respiratory therapy | 315 (32.1) |
| Physiotherapy | 162 (16.5) |
| Others | 110 (11.2) |
| Year of experience with patients with COPD | |
| < 1 year | 96 (9.8) |
| 1–2 years | 294 (30) |
| 3–4 years | 255 (26) |
| 5–6 years | 149 (15.2) |
| 7–8 years | 75 (7.7) |
| 9–10 years | 47 (6.5) |
| >10 years | 47 (4.8) |
| Responsibilities for care with patients with COPD | |
| Diagnosis | 381 (38.9) |
| Urgent assessments | 350 (35.7) |
| Non-urgent care | 360 (36.7) |
| Ongoing management | 413 (42.1) |
| Admission prevention | 227 (23.2) |
| Medication check | 360 (36.7) |
| Prescribing | 106 (10.8) |
| Oxygen therapy | 559 (57) |
| In patient treatment | 462 (47.1) |
| Outpatient clinics | 373 (38.1) |
| Primary care | 282 (28.8) |
| Data are presented as frequencies and percentages. COPD, chronic obstructive pulmonary disease. | |

Mode of delivery and components of pulmonary rehabilitation

When asked about the preferred way to deliver a PR programme for patients with COPD, most HCPs believed that in-hospital supervised PR was the preferred method (748 or 76.3%), followed by delivering the PR at home (557 or 56.8%). However, only 275 (28.1%) believed that tailored PR with healthcare provider support over the phone would be the preferred method. Most HCPs believed that the essential components of PR include information about COPD disease (832 or 84.9%), followed by smoking cessation (787 or 80.3%) and COPD symptoms' management (749 or 76.4%), aside from the exercise component (table 3).

Patient-related factors that influence referral decisions to pulmonary rehabilitation

The main factors that strongly influenced the decision to refer patients with COPD to PR from the HCPs' perspective

Table 2 Healthcare providers' perception on referring patients with COPD to pulmonary rehabilitation (n=980)

| Item | Frequency (%) |
|--|---------------|
| Perception on referring patients with COPD to PR | |
| I believe PR will improve patients' exercise capacity | |
| Strongly agree | 589 (60.1) |
| Agree | 260 (26.5) |
| Neutral | 32 (3.3) |
| Disagree | 8 (0.8) |
| Strongly disagree | 91 (9.3) |
| I believe PR would reduce dyspnoea and fatigue | |
| Strongly agree | 545 (55.6) |
| Agree | 297 (30.3) |
| Neutral | 62 (6.3) |
| Disagree | 25 (2.6) |
| Strongly disagree | 51 (5.2) |
| I believe PR will improve patients' anxiety and depression | |
| Strongly agree | 479 (48.9) |
| Agree | 320 (32.7) |
| Neutral | 105 (10.7) |
| Disagree | 29 (3) |
| Strongly disagree | 47 (4.8) |
| I believe PR will improve patients' health-related quality of life | |
| Strongly agree | 571 (58.3) |
| Agree | 283 (28.9) |
| Neutral | 57 (5.8) |
| Disagree | 19 (1.9) |
| Strongly disagree | 50 (5.1) |
| I believe PR will reduce the risk hospital readmission | |
| Strongly agree | 517 (52.8) |
| Agree | 317 (32.3) |
| Neutral | 70 (7.1) |
| Disagree | 28 (2.9) |
| Strongly disagree | 48 (4.9) |
| I believe PR will reduce the risk of future COPD exacerbation | |
| Strongly agree | 528 (53.9) |
| Agree | 305 (31.1) |
| Neutral | 78 (8) |
| Disagree | 18 (1.8) |
| Strongly disagree | 51 (5.2) |
| I believe PR will improve patients' nutritional status | |
| Strongly agree | 440 (44.9) |
| Agree | 341 (34.8) |
| Neutral | 117 (11.9) |
| Disagree | 28 (2.9) |

Continued

Table 2 Continued

| Item | Frequency (%) |
|---|---------------|
| Strongly disagree | 54 (5.5) |
| I believe PR will improve patients' disease self-management | |
| Strongly agree | 589 (60.1) |
| Agree | 260 (26.5) |
| Neutral | 32 (3.3) |
| Disagree | 8 (0.8) |
| Strongly disagree | 91 (9.3) |
| Data are presented as frequencies and percentages. COPD, chronic obstructive pulmonary disease ; PR, pulmonary rehabilitation. | |

included mobility affected by patients' breathlessness (64.10%), followed by low activity levels (61.60%), low exercise tolerance (58.20%), patient fatigue related to COPD (52.90%) and patient anxiety related to COPD (50.70%) (figure 1).

Pulmonary rehabilitation referral barriers

From the HCPs' perspective, the main barriers that strongly affect the referral process for patients with COPD included a lack of available PR centres (61.80%), followed by a lack of trained HCPs who could manage patients with COPD (52.70%) and the lack of authority to refer a patient (44.30%). In addition, 43% reported that patients might refuse the referral process (figure 2).

Table 3 Mode of delivery and component of pulmonary rehabilitation programme (n=980)

| Item | Frequency (%) |
|---|---------------|
| The best way to deliver PR programme for patients with COPD | |
| In hospital supervised programme | 374 (38.16) |
| At home | 276 (28.16) |
| Online programme with healthcare provider support | 192 (19.59) |
| Tailored programme with healthcare provider support through phone | 138 (14.08) |
| Component of PR programme aside from exercise component | |
| Information about COPD disease | 832 (84.9) |
| Smoking cessation | 787 (80.3) |
| Symptoms management | 749 (76.4) |
| Psychological support | 671 (68.5) |
| Information about medications | 648 (66.1) |
| Nutritional counselling | 526 (53.7) |
| Data are presented as frequencies and percentages. COPD, chronic obstructive pulmonary disease ; PR, pulmonary rehabilitation. | |

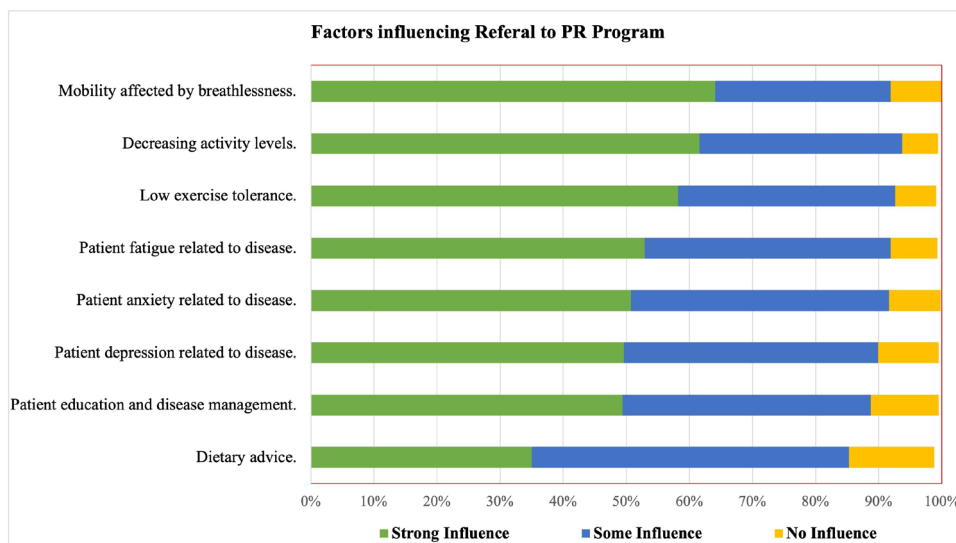


Figure 1 Patient-related factors that influence referral decision to pulmonary rehabilitation (PR), using strong, some or no influence grading (n=980).

DISCUSSION

To the best of our knowledge, this is the first national study that explores assess non-physician HCPs attitudes and expectation toward delivering PR to COPD patients and identify factors and barriers that might influence referral in Saudi Arabia. Findings show that HCPs perceived PR as an effective management strategy in improving clinical outcomes in COPD. While a supervised hospital-based programme was seen as the preferred mode of delivery, the lack of PR centres, well-trained staff, and the authority to refer posed significant barriers to PR referrals. HCPs perceived patients' education about COPD disease, smoking cessation and symptoms management as the most essential components of PR programme next to exercise component.

PR has established a solid position as the cornerstone of the management of patients with COPD. Indeed,

current evidence shows that PR alleviates exercise limitations and dyspnoea, improves nutritional status and psychological well-being and reduces hospitalisations, future COPD exacerbations and mortality rates.^{5 15 16} In our study, HCPs perceived mobility affected by breathlessness, low activity levels and low exercise tolerance as the most common factors that influence referral decision which are in accordance with current international guidelines.^{17 18} According to National Institute for Health and Care Excellence and British Thoracic Society PR should be offered to patients who are short of breath and functionally limited due to breathlessness.^{17 18} All these reported factors that influence referral have been shown to effectively improved in patients with COPD who were enrolled in PR.¹⁹

Despite the current evidence of PR effectiveness, the global referral rate is currently suboptimal.^{13 20 21} Current

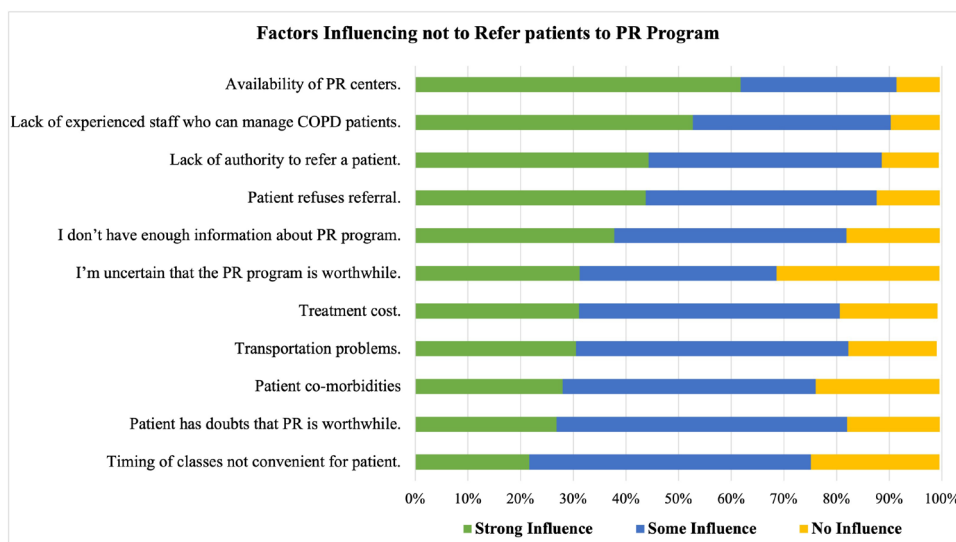


Figure 2 Barriers to referring patients with COPD to PR from HCPs perspective, using strong, some or no influence grading (n=980). COPD, chronic obstructive pulmonary disease; HCPs, healthcare providers; PR, pulmonary rehabilitation.



international COPD guidelines recommend the involvement of experienced HCPs in the referral management of COPD patients; however, referral to PR cannot be performed without physicians' permission in Saudi Arabia.^{11 17 19 21 22} In the current study, nearly half of the participants believed that a lack of authority to refer posed a significant barrier to PR referral. Therefore, experienced HCPs who are part of the PR team or COPD management should promote physicians' knowledge about PR and its potential to enhance the PR referral rate.

Reasons for not referring patients with COPD to PR programmes are likely to be multifactorial; lack of available PR centres is at top of the list, as shown in this study which is in accordance with recent study that included physicians and concluded that limited PR centres was the cause of low PR referral.¹³ Saudi Arabia has a limited number of PR centres, and the number of people who can access these centres is extremely low.⁹ This contrasts, for instance, with the situation in the UK, which has 228 PR services. The gap in the current practice is therefore clear, and the establishment of new PR programmes needs to be facilitated across the country. It is however important to mention that PR programmes can be offered within the existing infrastructure using the incumbent HCPs in the hospitals.²³ It has been previously demonstrated that an outpatient PR programme offered at a small hospital is as effective as a programme offered in a large hospital.²⁴ Current evidence also suggests that PR can be effectively offered using different modalities, including inpatient, community-based, home settings or online.^{24 25} Thus, any of these modes of delivery can be adopted according to the hospital's available resources.

Participants in this study also perceived the lack of well-trained staff as a major barrier to PR referral, in concordance with the current literature.^{13 19 21 26} Studies show that Saudi Arabia suffers from a severe shortage of healthcare professionals and that only limited specialties participate in the management of COPD.^{27 28} Evidence suggests that COPD management is much better if performed by a multidisciplinary team,^{28 29} highlighting the need for an integrated approach. It is however important to mention that the number of specialised physicians and healthcare professionals (eg, respiratory nurses and respiratory physiotherapists) is, overall, low,^{27 28} which could affect the quality of COPD care in the country. Therefore, the healthcare authority in Saudi Arabia should take action to reduce the current shortage by providing training incentives to people willing to specialise in respiratory medicine and encouraging the upskilling of current healthcare workers. In addition, offering high-quality education either inside or outside the country could be a useful approach to stimulate this change.

Almost half of the study participants perceived 'patients might refuse the referral' as a major barrier to refer COPD

patients to PR which is in accordance with recent study included physicians and concluded that 46% perceived patients refuse referral is a major barrier.¹³ This may be due to the lack of patients' knowledge about the PR and its benefit to their condition as well as travel distance to PR.^{19 30 31} Therefore, incorporating patients' preferences of PR delivery mode and increasing awareness of PR and its benefit among COPD population are needed.

Almost 80% of HCPs in this study considered supervised hospital-based programmes the preferred mode of PR delivery, despite the limited number of PR centres in the country. This is likely because of a lack of knowledge about PR services in Saudi Arabia, as only a small proportion of HCPs know what PR is.¹⁰ However, utilising the available resources within the infrastructure of the hospital remains possible for setting up and delivering a PR programme. Alternatively, home settings, which are as effective as conventional PR programmes in improving exercise capacity and respiratory symptoms,³² could be considered a viable option.

In this study, most HCPs believed that information about COPD disease, smoking cessation and symptoms management are the most important components of a PR programme. Indeed, disease-related education contributes to patients' recognition of their symptoms and worsening disease.³³ However, the content of the PR educational programme, who delivers it, and how it is delivered remain unclear. According to the American Thoracic Society/ European Respiratory Society (ATS/ERS) official consensus, smoking cessation is a major component of a PR programme.^{7 14} It is the primary cause of COPD, with the prevalence of COPD smokers ranging from 38% to 77%.³⁴ In addition, smoking contributes to 73% of COPD-related deaths worldwide.³⁵ Smoking is also associated with accelerated lung function declines, higher COPD exacerbations^{36 37} and increased dropout rates from PR. Therefore, support for smoking cessation should be offered throughout the PR programme.

Further research is needed to address COPD patients' attitudes and expectations toward delivering a PR programme and identify factors and barriers of referring. Additionally, future research should also focus on suitable mode of delivering PR as well as essential components from patients' perspective.

Limitations

Convenience sample techniques were used in the study, which may impose a selection bias. In this study, we did not survey or interview physicians who are part of COPD management. Additionally, we have failed to report the geographic distribution of the respondents. Moreover, the exact number of HCPs who involved in PR and with patients with COPD is unclear; therefore, the sample of our study may not represent the general population of HCPs. Finally, the study was conducted during the COVID-19 pandemic, which may have impacted respondents' opinions, especially given that 28% of the total

number of respondents reported that home PR is their preferred method of PR delivery.

CONCLUSION

HCPs across specialties agreed on the effectiveness of PR for patients with COPD. A supervised hospital-based programme is the preferred mode of PR delivery, with information about COPD disease and smoking cessation being considered essential components of PR in addition to the exercise component. The lack of PR centres and well-trained staff and the lack of authority to refer patients were major barriers to the referral of patients with COPD.

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Contributors The study was designed by AA, MA and JSA. Data collection was performed by AAA, IAA, HA and ASA, statistical methodology was performed by AA, and formal analysis was performed by AH, YSA and SMA. The draft of the manuscript was written by AMA, AAA, IAA, RS, EMA and MA, and reviewed and revised by EMA, JSA, HW and SMA. All authors approved the paper for publication. AA is the guarantor of the manuscript and accept full responsibility for the work and conduct of the study, had access to the data, and controlled the decision to publish.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval Institutional Review Board approval for the study was obtained from Jazan University, reference number (HAPO-10-Z-001). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement Data are available upon reasonable request.

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REFERENCES

- Halpin DMG, Criner GJ, Papi A, *et al*. Global initiative for the diagnosis, management, and prevention of chronic obstructive lung disease. The 2020 gold science Committee report on COVID-19 and chronic obstructive pulmonary disease. *Am J Respir Crit Care Med* 2021;203:24–36.
- Alqahtani JS, Njoku CM, Bereznicki B, *et al*. Risk factors for all-cause hospital readmission following exacerbation of COPD: a systematic review and meta-analysis. *Eur Respir Rev* 2020;29. doi:10.1183/16000617.0166-2019. [Epub ahead of print: 30 Jun 2020].
- von Trott P, Oei SL, Ramsenthaler C. Acupuncture for breathlessness in advanced diseases: a systematic review and meta-analysis. *J Pain Symptom Manage* 2020;59:327–38.
- Evans RA, Singh SJ. Minimum important difference of the incremental shuttle walk test distance in patients with COPD. *Thorax* 2019;74:994–5.
- Spruit MA, Singh SJ, Garvey C, *et al*. An official American thoracic Society/European respiratory society statement: key concepts and advances in pulmonary rehabilitation. *Am J Respir Crit Care Med* 2013;188:e13–64.
- Sahin H, Naz I, Varol Y, *et al*. Is a pulmonary rehabilitation program effective in COPD patients with chronic hypercapnic failure? *Expert Rev Respir Med* 2016;10:593–8.
- Holland AE, Cox NS, Houchen-Wolloff L, *et al*. Defining modern pulmonary rehabilitation. An official American thoracic Society workshop report. *Ann Am Thorac Soc* 2021;18:e12–29.
- Alqahtani JS. Prevalence, incidence, morbidity and mortality rates of COPD in Saudi Arabia: trends in burden of COPD from 1990 to 2019. *PLoS One* 2022;17:e0268772.
- Aldhahir AM, Alghamdi SM, Alqahtani JS, *et al*. Pulmonary rehabilitation for COPD: a narrative review and call for further implementation in Saudi Arabia. *Ann Thorac Med* 2021;16:299–305.
- Alsubaie ME, Cafarella PA, Frith PA, *et al*. Barriers for setting up a pulmonary rehabilitation program in the eastern Province of Saudi Arabia. *Ann Thorac Med* 2016;11:121–7.
- Khan JH, Lababidi HMS, Al-Moamary MS, *et al*. The Saudi guidelines for the diagnosis and management of COPD. *Ann Thorac Med* 2014;9:55–76.
- Celli BR, Decramer M, Wedzicha JA, *et al*. An official American thoracic Society/European respiratory Society statement: research questions in chronic obstructive pulmonary disease. *Am J Respir Crit Care Med* 2015;191:e4–27.
- Aldhahir AM, Alqahtani JS, Alghamdi SM, *et al*. Physicians' attitudes, beliefs and barriers to a pulmonary rehabilitation for COPD patients in Saudi Arabia: a cross-sectional study. *Healthcare* 2022;10:904.
- Hill K, Vogiatzis I, Burtin C. The importance of components of pulmonary rehabilitation, other than exercise training, in COPD. *Eur Respir Rev* 2013;22:405–13.
- Vogelmeier CF, Criner GJ, Martinez FJ, *et al*. Global strategy for the diagnosis, management, and prevention of chronic obstructive lung disease 2017 report. Gold executive summary. *Am J Respir Crit Care Med* 2017;195:557–82.
- Aldhahir AM, Rajeh AMA, Aldabayan YS, *et al*. Nutritional supplementation during pulmonary rehabilitation in COPD: a systematic review. *Chron Respir Dis* 2020;17:1479973120904953.
- Bolton CE, Bevan-Smith EF, Blakey JD, *et al*. British thoracic Society guideline on pulmonary rehabilitation in adults. *Thorax* 2013;68 Suppl 2:ii1–30.
- National Institute for Health and Care Excellence. Guidelines in chronic obstructive pulmonary disease in over 16s: diagnosis and management. London National Institute for Health and Care Excellence (NICE) Copyright © NICE 2018; 2019.
- Rochester CL, Vogiatzis I, Holland AE, *et al*. An official American thoracic Society/European respiratory society policy statement: enhancing implementation, use, and delivery of pulmonary rehabilitation. *Am J Respir Crit Care Med* 2015;192:1373–86.
- Milner SC, Boruff JT, Beaurepaire C, *et al*. Rate of, and barriers and enablers to, pulmonary rehabilitation referral in COPD: a systematic scoping review. *Respir Med* 2018;137:103–14.



- 21 Johnston KN, Young M, Grimmer KA, *et al.* Barriers to, and facilitators for, referral to pulmonary rehabilitation in COPD patients from the perspective of Australian general practitioners: a qualitative study. *Prim Care Respir J* 2013;22:319–24.
- 22 Hogg L, Garrod R, Thornton H, *et al.* Effectiveness, attendance, and completion of an integrated, system-wide pulmonary rehabilitation service for COPD: prospective observational study. *COPD* 2012;9:546–54.
- 23 Jenkins S, Hill K, Cecins NM. State of the art: how to set up a pulmonary rehabilitation program. *Respirology* 2010;15:1157–73.
- 24 Ward JA, Akers G, Ward DG, *et al.* Feasibility and effectiveness of a pulmonary rehabilitation programme in a community hospital setting. *Br J Gen Pract* 2002;52:539–42.
- 25 Maltais F, Bourbeau J, Shapiro S, *et al.* Effects of home-based pulmonary rehabilitation in patients with chronic obstructive pulmonary disease: a randomized trial. *Ann Intern Med* 2008;149:869–78.
- 26 Aldhahir AM, Alhotye M, Alqahtani JS, *et al.* Physiotherapists' Attitudes, and Barriers of Delivering Cardiopulmonary Rehabilitation for Patients with Heart Failure in Saudi Arabia: A Cross-Sectional Study. *J Multidiscip Healthc* 2022;15:2353–61.
- 27 Aboshaiqah A. Strategies to address the nursing shortage in Saudi Arabia. *Int Nurs Rev* 2016;63:499–506.
- 28 Alsubaiei ME, Cafarella PA, Frith PA, *et al.* Factors influencing management of chronic respiratory diseases in general and chronic obstructive pulmonary disease in particular in Saudi Arabia: an overview. *Ann Thorac Med* 2018;13:144–9.
- 29 Kuzma AM, Meli Y, Meldrum C, *et al.* Multidisciplinary care of the patient with chronic obstructive pulmonary disease. *Proc Am Thorac Soc* 2008;5:567–71.
- 30 Cox NS, Oliveira CC, Lahham A, *et al.* Pulmonary rehabilitation referral and participation are commonly influenced by environment, knowledge, and beliefs about consequences: a systematic review using the theoretical domains framework. *J Physiother* 2017;63:84–93.
- 31 Lahham A, Holland AE. The need for expanding pulmonary rehabilitation services. *Life* 2021;11:1236.
- 32 McCarthy B, Casey D, Devane D, *et al.* Pulmonary rehabilitation for chronic obstructive pulmonary disease. *Cochrane Database Syst Rev* 2015:CD003793.
- 33 Crisafulli E, Loschi S, Beneventi C, *et al.* Learning impact of education during pulmonary rehabilitation program. An observational short-term cohort study. *Monaldi Arch Chest Dis* 2010;73:64–71.
- 34 Tønnesen P. Smoking cessation and COPD. *Eur Respir Rev* 2013;22:37–43.
- 35 MacNee W. *Chronic obstructive pulmonary disease*. 5th ed. Oxford University Press, 2010: 3311–44.
- 36 Badaran E, Ortega E, Bujalance C, *et al.* Smoking and COPD exacerbations. *Eur Respir J* 2012;40:P1055 https://erj.ersjournals.com/content/40/Suppl_56/P1055.short
- 37 Brown AT, Hitchcock J, Schumann C, *et al.* Determinants of successful completion of pulmonary rehabilitation in COPD. *Int J Chron Obstruct Pulmon Dis* 2016;11:391–7.

Staff Attitudes and Expectations regarding a pulmonary rehabilitation for Chronic obstructive pulmonary disease patients.

We are aiming to understand your attitude and expectations toward delivering a Pulmonary rehabilitation programme for patients with Chronic obstructive pulmonary disease (COPD), and it would be great if you could answer this questionnaire.

Please fill out the survey, be informed that your identity will be completely anonymous and no personal identifying information will be collected and there are no consequences for refusing to participate, your participation is voluntary. This survey will only take 5 minutes to complete.

By answering the first question, you voluntarily agree to participate in this study and give your consent to use your anonymous data for research purposes.

I. Demographic Information

1. Your Gender?

- A. Male
- B. Female

2. Your Profession?

- A. Nurse
- B. Respiratory therapist
- C. Physiotherapist
- D. Other:

3. What responsibilities do you have for the care of people with COPD? Tick all that apply.

- | | | |
|---|---|---|
| <input type="checkbox"/> Diagnosis | <input type="checkbox"/> Prescribing | <input type="checkbox"/> Inpatient treatment |
| <input type="checkbox"/> Non-urgent care | <input type="checkbox"/> Ongoing management | <input type="checkbox"/> Outpatient clinics |
| <input type="checkbox"/> Urgent assessments | <input type="checkbox"/> Admission prevention | <input type="checkbox"/> Primary care |
| <input type="checkbox"/> Oxygen therapy | <input type="checkbox"/> Medication checks | <input type="checkbox"/> Other: please give details |

4. How many years of experience do you have of caring for people with COPD?

Please enter a whole number.

II. Perceptions of a rehabilitation programme

5. For each statement please select the answer that best suits your opinion.

| | Strongly disagree | Disagree | Neutral | Agree | Strongly agree |
|--|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| I believe that pulmonary rehabilitation programme will improve patients exercise capacity. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe that pulmonary rehabilitation programme would be beneficial in reducing dyspnea & fatigue. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe that pulmonary rehabilitation programme will improve patient anxiety and depression | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe that pulmonary rehabilitation programme will improve health-related quality of life. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe that pulmonary rehabilitation programme would help in reducing hospital readmission | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I think that pulmonary rehabilitation will reduce the risk of COPD exacerbation | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe that pulmonary rehabilitation programme will improve patient nutritional status | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I believe that pulmonary rehabilitation programme will improve patient disease self-management | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

6. What do you think that pulmonary rehabilitation programme for individuals with COPD should contain aside from an exercise programme? Tick all that apply.

- | | |
|---|--|
| <input type="checkbox"/> Information about COPD disease | <input type="checkbox"/> Symptoms management |
| <input type="checkbox"/> Nutritional counseling | <input type="checkbox"/> Smoking cessation |
| <input type="checkbox"/> Psychological support | <input type="checkbox"/> Others: please give details |
| <input type="checkbox"/> Information about medications | |

If other, please give details

7. What do you think is the best way to deliver a pulmonary rehabilitation programme for this population.

- At the hospital. Where they can follow a programme supervised by healthcare professionals.
- At home. Where they can follow a programme manual with the support of healthcare professionals.
- By using an online programme with support from a healthcare professional to answer their questions.
- By following a tailored programme with the support of health care professionals through the phone.

III. Referral to rehabilitation programme

8. In your opinion, what factors might influence decision to refer COPD patients to a pulmonary rehabilitation programme?

| | No influence | Some influence | Strong influence |
|--|--------------------------|--------------------------|--------------------------|
| Mobility, affected by breathlessness | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Decreased activity levels | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Low exercise tolerance | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Patient anxiety related to disease | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Depression related to disease | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Patient education and disease management | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Fatigue related to disease | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Dietary advice | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Others please give details | | | |

9. In your opinion, what factors might influence decision Not to refer COPD patients to a pulmonary rehabilitation programme ?

| | No influence | Some influence | Strong influence |
|--|--------------------------|--------------------------|--------------------------|
| I don't have enough information about pulmonary rehabilitation programme | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| I'm uncertain that the programme is worthwhile | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Patient refuses referral | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Patient co-morbidities | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Patient has doubts that rehabilitation is worthwhile | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Transportation problems | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Timing of classes not convenient for patient | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lack of authority to refer patients | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Lack of trained staff who can manage COPD patients during pulmonary rehabilitation | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Treatment cost | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Availability of pulmonary rehabilitation centers | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Others please give details | | | |