

Investigating primary health care practitioners' barriers and enablers to referral of COPD patients to Pulmonary Rehabilitation: an exploratory sequential mixed methods study using the Theoretical Domains Framework

Jane Suzanne Watson

University of Birmingham Institute of Applied Health Research <https://orcid.org/0000-0001-8637-7121>

Rachel Elizabeth Jordan (✉ R.E.Jordan@bham.ac.uk)

University of Birmingham Institute of Applied Health Research

Peymane Adab

University of Birmingham Institute of Applied Health Research

Ivo Vlaev

Warwick Business School, University of Warwick

Alexandra Enocson

University of Birmingham Institute of Applied Health Research

Sheila Greenfield


University of Birmingham Institute of Applied Health Research

Research

Keywords: Chronic Obstructive Pulmonary Disease (COPD), Pulmonary Rehabilitation (PR), Primary Care, Theoretical Domains Framework (TDF). Mixed methods research

Posted Date: October 8th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-87076/v1>

License:  This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

Abstract

Background

Pulmonary rehabilitation is a highly effective, globally recommended intervention for patients with Chronic Obstructive Pulmonary Disease (COPD). Understanding why referral rates remain persistently low is important and enables the development of targeted interventions in order to improve future uptake.

Methods

We undertook an exploratory sequential mixed methods study to investigate the referral practices of Primary Health Care Practitioners (PHCPs) in the United Kingdom (UK). In phase 1 semi structured interviews were undertaken. Content analysis was used to map arising themes to the Theoretical Domains Framework (TDF) and the development of a 54-item TDF based questionnaire.

In Phase 2 we distributed the questionnaire through relevant conferences and organisation memberships, to obtain views from a larger, more generalisable PHCP population. We used descriptive analyses to identify the most important barriers and enablers, and key TDF domains. Mixing of data occurred at 2 time points; instrument design and interpretation.

Results

19 PHCP took part in interviews and 233 responded to the survey. Integrated results revealed that PHCPs with a post qualifying respiratory qualification (154/241; 63.9%) referred more frequently (91/154; 59.1%) than those without (28/87; 32.2%).

There were more barriers than enablers for referral in all 13 mapped TDF domains. Key barriers included: infrequent engagement from PR provider to referrer, concern around patient's physical ability and access to PR (particularly for those in work), assumed poor patient motivation, no clear practice referrer and few referral opportunities. These mapped to the following domains: belief about capabilities, social influences, environment, optimism, skills and social and professional role.

Enablers to referral were observed within the knowledge, social influences memory and environment domains. Many PHCPs believed in the physical and psychological value of PR, and helpful enablers were out-of-practice support from respiratory interested colleagues, dedicated referral time (annual review) and on-screen referral prompts.

Conclusions

Referral to PR is a complex process. Barriers outweighed enablers. Aligning these findings to behaviour change techniques will identify practice-based interventions to overcome current barriers and strengthen enablers, thereby increasing referral of COPD patients to PR as recommended by international COPD guidelines

Contribution To The Literature

- Pulmonary rehabilitation is the most effective and cost-effective intervention to improve the quality of life of COPD patients, and is recommended by all international COPD guidelines
- However, referral to PR from primary care remains poor and new approaches to implementation are needed.
- This mixed methods study provides important explanatory insights that will help inform new interventions to improve implementation Behavioural change interventions should be targeted to increase provider engagement with primary care, provide regular support from specialist respiratory colleagues and structuring annual reviews with effective prompts.

Background

Pulmonary Rehabilitation (PR) is a low cost, high value, internationally recommended intervention for COPD patients which is effective in improving exercise capacity, reducing the impact of symptoms and improving prognosis (1–5). It is a structured multidisciplinary intervention combining individualised exercise with disease-related education (5). Despite the clear evidence of its effectiveness, the proportion of COPD patients receiving PR is persistently low worldwide (6, 7). Our previously published inductive qualitative paper presented the experiences of primary health care practitioners (PHCPs) as key potential referrers to PR (8). We found that there was a generalised awareness of PR, but little detailed knowledge of either the programme or the clinical benefits. Relationships with PR providers were limited, but considered important. Patient characteristics, rather than clinical need, influenced referral offers and referrers frequently believed patients to be poorly motivated. PR was most commonly offered during times of disease stability (usually at COPD annual review) and ease of the referral process and financial incentives positively influenced referral. In summary, referrers reported many barriers but few enablers, which collectively resulted in infrequent discussions about PR and associated referrals.

However, in order to aid the development of appropriate interventions to improve referral rates it is important to establish the generalisability and relative importance of these findings within a broader population of PHCPs. Furthermore, applying theory to identify the psychological and structural drivers that influence behaviour (9, 10) may offer new insights to shape interventions (11).

The Theoretical Domains Framework (TDF) is a well-recognised approach which was derived from a synthesis of behaviour change theories (12, 13), and examines the processes that influence behaviour (12). When applied, it offers explanations for behaviours, highlighting reasons that may inhibit or promote (14, 15) implementation of practice-based change (16).

Using mixed methods, and applying the TDF we sought to assess and explain the reasons for low PR referral by primary health care professionals (PHCPs) for patients with COPD. Our aim was to inform the development of theory informed interventions to improve PR referral rates from primary care in future.

Methods

We used an exploratory sequential design defined by two separate phases (figure 1). The cognitive and practical experiences of PHCP when considering and undertaking referral for patients with COPD were initially explored using a deductive approach by applying the TDF to data from our previously collected qualitative interviews. These findings informed a second quantitative phase, where we tested themes for generalisability using a nationwide survey of PHCP, to highlight the most relevant factors influencing referral (17-19).

Conducting and reporting of data followed the guidelines for conducting and reporting mixed research for counsellor researchers (20) which can be found in (additional file 1).

Figure 1

Both data sets retained independent value and meaning, but were connected at two time points: 1) where the qualitative data was used to construct the questionnaire and 2) where phase 1 and 2 results were integrated to inform interpretation. The exploratory sequential mixed methods design therefore achieves both methodological and content integration (18, 21).

Phase 1 Application of TDF to qualitative interview data.

We re-analysed data from our previously published inductive qualitative study (8) in which 19 PHCPs from two differing geographical regions across Central and East of England were recruited and interviewed to thematic saturation using a pre-designed topic guide. A deductive approach using content analysis was used for re-analysis of the data in order to align the results to the TDF and to offer new insights.

The interview topic guide (Additional file 2) was mapped to the Capability Opportunity Motivation-Behaviour model (COM-B), a model that highlights three critical prerequisites for behaviour change (19). This model was adopted rather than the TDF to guide interviews primarily because of the practical need to reduce interview length without compromising its aim. COM-B is very closely aligned to the TDF and has been utilised as a topic guide and mapped to the TDF in a similar health care professional study (22). The topic guide allowed the researcher (JW) to ensure theoretical informed components were covered including prompts allowing deeper understanding relative to the target behaviour, referral to PR. Photographic images of individuals depicting differing stages of COPD were also used to elicit associative visual responses and to enrich behavioural understanding.

Analysis

All interview transcripts were anonymised and managed using NVivo v12. Barriers and enablers emerging from the interviews via content analysis were mapped to the relevant TDF domain, initially using construct labelling (12) (Additional File 3). Utterances were coded once and to only one TDF domain to reduce duplication. JW undertook the initial coding then 5 transcripts were randomly allocated and distributed throughout the team (RJ, PA, and SG) and independent TDF coding occurred, followed by collaborative team discussion to ensure agreement with the coding. Queries were discussed with a behavioural expert (IV).

Phase 2 Quantitative Methodology

Study Design – Cross sectional survey.

PHCPs were recruited via two main methods. Initially an invitation was included in a fortnightly newsletter emailed to members of the Primary Care Respiratory Society (PCRS). The survey was additionally distributed and shared by PCRS via their organisational Twitter and Facebook accounts. Social media distribution of the survey was further increased by individual and other organisational sharing, including the Facebook accounts of Advanced Practice UK and General Practice Nurse UK. A link for anonymous questionnaire completion was provided to the platform 'Online Survey'(23). This was open between April and December 2019. To increase participation, responders were invited to opt in to a prize draw to win an I-pad.

Simultaneously, paper versions of the questionnaire were distributed at 6 UK conferences between March and November 2019 to attending PHCPs (predominately by hand by JW, and using 'in-conference bag' distribution at one event). Upon self-completion, anonymous questionnaires were placed by participants in a locked ballot box and an optional token of appreciation was offered. Paper questionnaires were manually entered onto 'Online survey' by JW.

As this was exploratory research, no *a priori* sample size calculations were performed. A pragmatic approach to study closure was adopted, this being online availability for a period of 8 months, distribution of the questionnaire at several appropriate PHCP targeted events, and that a representative range of PHCP had responded.

Methodology– Instrument Design

The cross-sectional survey (Additional file 4), collected (1) individual socio-demographic data, (2) current referral experiences, using TDF-based Likert scale questions (n=54) and (3) any new or complementary issues which may not have been previously mentioned, using an optional open question (24).

Socio-demographic data

These included questions on geographical location of practice, job title, post-qualifying respiratory education and estimated frequency of PR referrals, using questions with pre-specified options.

Psychometric data

Barriers and enablers for PR referral identified from the phase 1 qualitative findings were converted into belief statements (12), including some that sought to test direct understanding. All questions were generated and aligned to the TDF by the coder (JW) and validated by other team coders (RJ), including a TDF expert (IV). 54 closed, fully labelled 5-point, Likert scale questions/belief statements were included with responses ranging from 'strongly disagree' to 'strongly agree' and a mid-point rating. Some statements were reversed as an opposite belief to that frequently reported in the phase 1 data. These design elements were purposely selected to improve reliability and validity (25).

The final survey mapped the 54 belief statements and open question section to 12 out of 14 theoretical domains ('emotion' and 'behavioural regulation' was excluded, given its low mapping in phase 1 results). Two rounds of survey piloting were undertaken with five practice nurses and the questionnaire refined to ensure question clarity and clearer completion instructions.

Analysis

All data were exported into an excel spreadsheet and STATAv16 used to conduct simple descriptive statistics (frequencies and percentages), dichotomising into Agree/Strongly Agree vs the remaining options. Free text that directly related to barriers and enablers of referral practice was content-mapped to the TDF and thematic analysis applied (26).

Results

Response rates.

Table 1 shows paper survey distribution (>1100 across 6 events) and return rates for phase 2. 154 questionnaires were returned and 134 (83%) had completed the survey sufficiently and were included. Online, it is unknown how many potential practitioners read the survey invitation, therefore participation rates could not be calculated. 123 participants started the online survey, but only 99 (80.5%) completed it and were included in the analysis.

Table 1 Paper survey distribution

Description of participants

Table 2 presents the socio-demographic characteristics for all participants in the phase 1 qualitative (n=19) and phase 2 quantitative (n=233) studies.

Table 2 Baseline demographics of all participants

Referral to PR by type of healthcare professional

Overall, 109 (49.1%) reported being frequent referrers to PR, with GPs being less likely to refer and other professions including emergency care practitioners and nurse practitioners and ANPs more likely to refer. Referral was also higher among those with one or more continuous practice development (CPD) respiratory qualifications. However, this may be partly related to such qualification being higher among ANPs (82.5% (47/57)) and other grouped professions (58.8% (10/17)) than among GPs (17.9% (5/28)). More than 10 years spent in general practice appeared to marginally increase referral frequency (60.7%; 51.8%).

Table 3 PHCP referral practice*

40/233 (17.2%) responding PHCPs reported never referring to PR, with the largest group being practice nurses (29/40; 72.5%). 33 of 40 PHCPs offered a variety of reasons for non-referral including; not

considering it to be part of their role, not seeing COPD patients or not knowing they could refer (12/33; 36.4%). Others reported it was undertaken by other

respiratory specialist/interested health care professionals across primary and secondary care settings (12/33; 36.4%). Further reported reasons were unsure how to and/or a lack of training (5/33; 15.1%), uncertainty about local service provision (3/33; 9.1%) and 1/33 (3.0%) reported belief that patients were not interested.

Phase 1 Results: TDF analysis of the qualitative interviews

Table 4 shows the referral behaviour of PHCPs mapped to all 14 TDF domains. The most frequently mapped domain was social and professional role (n=287 times) whilst the least mapped was behavioural regulation (n=4).

Table 4: Phase 1 Mapping of barriers and enablers for referral to TDF domain

Phase 2. Questionnaire results: Referral practice beliefs.

Table 5 presents the number and proportion of PHCPs that agreed or strongly agreed with each belief statement by frequency of referral.

Table 5: Phase 2 Results of TDF belief statements by referral frequency.

In general, most PHCPs had some PR knowledge (especially the frequent referrers) and understood the beneficial consequences of PR. However, resources, social influences (such as relationship with PR providers) and pessimism about patient motivations were perceived barriers by a high proportion of PHCPs, irrespective of their referral practice.

There were however, differences in domains between frequent and infrequent PR referrers.

The greatest differences were within the 'Knowledge' domain. Frequent referrers most commonly reported agreement with all 7 statements, when compared to the infrequent referrers. For example, 97.3% reported knowing when to refer to PR and 80.7% being able to answer patients' questions versus 65.5% and 53.3% of infrequent referrers.

Further group differences were demonstrated in the 'Skills' domain and 'Beliefs about (PHCP) capabilities', which showed that infrequent referrers were less confident in encouraging unmotivated patients to attend PR (67.6% versus 83.5% of frequent referrers). Reduced confidence amongst infrequent referrers was further reflected within the 'Optimism' domain and belief statement 'I am confident my local provider offers a good service' (46% against 74.3% of frequent referrers). However, over half (56.9%) of frequent referrers felt that patients in work were not able to attend PR, compared to less than a third (31%) of those who referred infrequently.

The remaining belief statements demonstrated greater group similarities than differences.

Environment, Social and Professional role: Most respondents felt that there was enough time in practice to refer (84.7%) and believed in encouraging PR attendance (96.4%). Yet promotional information on PR was rarely available in practices (29%). There was no clearly identified PR referrer; less than half (48.6%) felt it was the practice nurse's role and (51.8%) reported other practice staff refer.

Social influences: Frequent referrers were slightly more likely to agree with 3 of the 4 domain belief statements than infrequent referrers. Although, collectively the groups reported both PR provider engagement and referral outcome reporting as low at only 22.6% and 29% respectively. PHCPs also reported patients rarely request referral to PR (5%).

Belief about consequences and Optimism: Most PHCPs agreed that PR offers physical health benefits, including improving breathlessness and reducing hospital admissions (91.9%, 89.6%) respectively. Yet far fewer PHCPs believed patients would attend and complete PR (46.2%), with fewer still agreeing that patients are PR motivated (24.2%).

Memory (decision-making): Only a small number of PHCPs reported forgetting to refer patients to PR (11.7%). COPD annual review templates were reported as helpful referral reminders (63.8%) and 25.8% reported the best time to discuss referral with patients was during COPD stability. Patient characteristics such as disease stability and smoking status do not appear to impede PHCP referral decisions as 98.2% reported referring smokers.

Goals, Reinforcement and Intention: in-practice review of eligible patients was not commonly reported (41%) and only (19.8%) reported in-practice targets to improve referral rates. Practice financial reward for referral (pre April 2019) was rarely reported (5%); indeed the implementation of financial reward via national QoF incentives (post April 2019) was considered unlikely to greatly improve referral behaviours, with less than a third (32.6%) stating they would refer more. However, there was general agreement that this incentive would increase practice awareness of PR (70.1%).

Phase 2. Questionnaire: Open questions.

A third of PHCPs (33.8%) responded to the open question at the end of the survey including 5/11 PHCPs who reported referral, but did not specify frequency, (answer length 3-167 words, mean 35). Non-frequent referrers reported more open comments (43/113 38.1%) than frequent referrers (33/109 30.3%)

This gave an additional 94 comments that related directly to PR referral. These were content mapped to all 12 relevant TDF domains. The comments predominately cited referral barriers.

Belief about capabilities had the highest number of comments 36/94 (38.3%) with many encompassing concerns about PR accessibility, particularly transport challenges for patients. For example, '*Location of PR too far for patients to travel and too much commitment. Patients tend to be older adults on generally low incomes. A number of my patients would attend if it was close by with no expense*'. A small number of PHCPs (3.2%) considered a patient's inability to complete pre-PR spirometry as a referral barrier, and 10.6%

of comments related to referral processes, which were reported to be lengthy and as such '*easier simpler*' processes were requested.

Connected results

In order to identify the key factors that inhibit and/or enable PHCP referral to PR, Phase 1 and phase 2 results were merged to allow for data contrast and meta-inference (18) (Table 6).

Most PHCPs believed in PR and encouraging patients to attend. Referral is most likely to be considered at annual review (indeed referral is rarely offered to patients outside of this consultation). On-screen prompts are helpful reminders, but in practice material promoting PR is rare. PHCP PR knowledge is largely gained from networking with other respiratory interested health professionals and/or CPD education. PHCPs report patients have little motivation for PR, rarely ask for referral to PR and view that patients in work are unlikely to be able to attend.

Some findings of the qualitative study were not clearly replicated in the survey results. For example, phase one qualitative data highlighted that some GPs and ANPs felt the practice nurse was best placed to undertake PR referral at the time of annual review, yet respiratory interested GPs and those undertaking annual review did not share this view. The phase two survey data supported the latter position, where 29/129 (22.5%) of practice nurses reported never referring. Therefore responsibility of PR referral is not based on profession, but is undertaken by PHCPs who are respiratory interested and/or conducting the patient's annual review.

Qualitative generalisable findings were limited in a number of areas meaning clear conclusion cannot be drawn, these included; time available to undertake referral, ease of referral process, perceptions of quality of PR programme, referral of patients when COPD symptom burden is increasing and non-referral in order to protect patient relationship.

Where generalisability is clear, a summary of the key behavioural barriers and enablers by TDF domain are shown in figure 2, demonstrating a greater number of barriers than enablers to referral. However, it is also important to report that barriers and enablers most commonly co-exist within the same domains.

Table 6 Integrated results matrix

Figure 2 Key barriers and enablers by TDF domain.

Discussion

Referral to PR from primary care remains poor. Applying the Theoretical Domains Framework in a mixed-methods study to understand the key factors that determine referral to PR by PHCPs highlighted multiple barriers and few enablers. Many (although not all) of the findings from the qualitative study were affirmed by the more generalisable survey.

This is the first time the TDF has been applied to a mixed method study seeking to understand PR referral barriers and enablers for PHCPs. Although Cox et al (27) retrospectively applied the TDF to a number of primary studies, in order to identify the barriers and enablers to PR referral, uptake and adherence across multiple perspectives, the review only included a very small number (n=3) of HCP qualitative referrer focused studies. Cox et al (27) reported PHCP referral facilitators were, PR programme knowledge, patient PR accessibility and successful prior referral these mapped to two domains, knowledge and beliefs about consequences. Our study finds referral facilitators in six TDF domains (as shown in figure 2), and as a primary research study conducted amongst a large PHCP population, its range and mixed methods increase insights and PR referral understanding.

PHCPs reported strongly believing that PR was beneficial for patients and wanting to refer more. They have however, requested greater engagement from providers, with better knowledge of local programmes and improvements in promotion of PR. They also reported that there are rarely active in-practice goals or monitoring of referrals to address the shortfall in patients referred.

However, PHCPs collectively reported low confidence in patients' abilities and motivation to attend PR, a belief likely to be strengthened by reports of few patients self-requesting referral. Furthermore, beliefs about low patient uptake, may explain why referral is commonly offered at times of increasing COPD symptoms, thereby acting as a lever to referral acceptance. Infrequent referrers reported reduced confidence in encouraging un-motivated patients to attend, with similar findings reported in phase 1 data as PHCPs expressed concerns around the protection of relationships with patients. Venue accessibility also appears to be a barrier and whilst the direct question in the survey (question 21) appeared not to overtly agree with this, both phase 1 and the phase 2 open question results highlighted transport as a practical and cost barrier. Studies of patients also affirm this (27).

Variability in referral rate by type of practitioner was an unexpected finding, which offers important suggestions that (1) few PNs refer and (2) where it is considered to be one person's role such as the 'respiratory nurse', referral opportunities may become reduced. Furthermore, the association between frequency of referral and respiratory qualification is a new and novel finding. ANPs were those most likely to refer and to have respiratory qualifications. This educational attainment may reflect current nationwide upscaling of the general practice nursing workforce and Master's education requirements of ANPs (28).

PHCPs within this study have reported multiple intertwined barriers and enablers to referral. Whilst some co-exist within the same behavioural domains, a number of important referral factors align to more than one domain, for example patients declining PR impacted on belief about consequences, optimism and reinforcement domains; this will be an important consideration when aligning effective behaviour change techniques. In order to alter the target behaviour and increase PR referral, multiple TDF domains will need to be addressed.

Strengths And Limitations

Combining qualitative and quantitative methods in a mixed method research approach offered valuable insight into the clinical practice of PHCPs who are expected to refer patients with COPD to PR and is a key strength of this research.

The range and number of PHCPs that have been included from across the UK were broadly representative of the general practice workforce (29). We recognise that predominately respiratory interested participants may have taken part in this study which may skew results, and it is noted that online participants reported higher referral practice and respiratory qualification(s) than their counterparts, which may be a study limitation, suggesting that more emphasis should be placed on the perspective of the infrequent referrers. Indeed, adopting additional recruitment strategies such as via general practice-based conferences is seen as a study strength and one that sought to capture a range of PHCPs views. Demographic similarities in terms of both type of PHCP and CPD education across all 3 recruitment streams highlight study design attempts to reduce participation and sample selection biases.

Questionnaire specific biases relating to participant's self-reporting response is a source of potential weakness, specifically where the participant responds to questions in a manner which is perceived to be 'correct' and 'socially acceptable', otherwise known as social desirability (30). This may offer some explanation around the variation observed particularly in the belief about capabilities domain of the integrated results matrix (see Table 6).

Grouping participants by reported referral frequency is a study strength, particularly as the aim is to understand both what supports and inhibits referral. Observed similarities and differences between frequent and non-frequent referrers highlight behavioural change levers.

Much of the validity of the TDF is gained from its direct application with health care practitioners, as has been utilised here. However transcript content mapping to 84 constructs is complex and time consuming as also described by others (31). Additionally, aligning content to a key domain was challenging, particularly where content could be mapped to more than one domain. This has been previously reported as a framework weakness (14), but its potential impact is unclear. Mapping content to all relevant domains is an alternative approach (12), but was discounted on the basis of practicality and complexity for interpretation.

The TDF offers a particularly functional approach to data analysis, which is likely to be helpful when there is little to no underlying knowledge of the phenomenon under investigation. However, the interrelations between referrer, patient and provider have previously been reported to be important factors in the referral journey (8). Yet, the TDF does not offer causal determinants of behaviour (12) and is a further potential framework limitation. Within the domain "belief about capabilities", the PHCPs beliefs about the patient's capabilities, rather than PHCPs own capabilities affected the referral behaviour.

Consequently, the requirement to align data to predetermined domains as part of the TDF potentially reduces the ability to consider any phenomena falling outside those domains and the likely connecting relations, which has the potential to miss viewing the whole picture.

The survey did not consider or allow for clarity around which PR provider was the target. This is likely to have been a problem where PHCPs may work across differing surgeries and refer to differing PR providers, although this was anticipated to affect only small numbers.

One researcher (JW) is an experienced respiratory nurse specialist which may have altered analysis, although transparency and team analysis sought to reduce potential bias.

Relation to other studies.

This mixed methods TDF based study finds agreement with many key referral factors presented in our previously published inductive qualitative study using the same data (8).

However, it disputes that the practice nurse is the main referrer to PR within primary care, and questions the value of practice based financial reward as a referral incentive. It also highlights that the referral process itself is not necessarily straightforward, but there is time in practice to refer. It has also identified that there are no sanctions for non-referral.

Increasing the population sample and geographical reach in this study is particularly valuable and strengthens current known practice referral barriers including, poor patient motivation, few in-practice resources, perceived venue access difficulties and little awareness of local PR provision (27, 32-35).

Subjective patient assessments including PHCPs perceptions of patients capabilities and motivations have been described as influencing PHCP referral decisions here and that previously published (8). This is a novel finding in relation to PR referral, yet similar health care professional (HCPs) perceptions have been reported in the primary health care management of reducing cardiovascular disease risk in people with serious mental illness (36, 37). Specifically, some of the 43 HCPs held pessimistic attitudes about the capabilities and motivations of people with serious mental illness to address and change their behaviours in order to reduce cardiovascular disease risk. HCPs also described patients as having difficulties in accessing preventative services (36, 37).

Phase one data and inductive data analysis (8) suggested that the offer of PR at the point of COPD symptom increase was common yet this was not confirmed in the survey results. This finding may be a demonstration of social desirability reporting as previous analyses have demonstrated patients to have 1.24 hospitalisations per patient-year 95% CI (0.66-2.34) suggesting that sicker patients are those most likely to be offered PR (38).

However, referral at this time supports both PHCP and patients' concerns about patient's capabilities (8, 27, 39) meaning lower patient acceptance and adherence to PR is likely, and negative PHCP beliefs about outcomes are likely to perpetuate. An alternative approach and one that appears not to be currently undertaken is to refer at the point of an acute exacerbation of COPD, which maybe a referral lever (12, 39).

In our original inductive analysis of the qualitative data (8), we reported that financial incentives may be important, yet results in this current study are mixed and PHCPs appear uncertain of their value. It will be interesting to observe the impact of the newly implemented financial rewards for PR referral in England, but

where similar nationwide QoF rewards were implemented for referral to diabetes programmes, uptake did not greatly improve (40). Additionally, our study found that practice nurses are not necessarily key PR referrers and referral is influenced by holding post graduate respiratory qualifications. The number of staff that have these qualifications is unknown but efforts to increase the number and education of the primary care workforce by Health Education England (41) is encouraging. The literature also supports a general consensus that for patients in employment, PR is largely inaccessible (8)(28). This was reported as a barrier by the frequent referrers more than the infrequent referrers, which questions whether PR knowledge itself is a potential barrier as previously reported (8) and PHCP beliefs are influential to subsequent referral behaviours.

Conclusions

This is the first mixed methods research study to examine the factors that inhibit and enable referral to PR for patients with COPD from a primary care perspective.

Whilst knowledge and respiratory qualification appear to be enablers, many barriers persist which must be overcome to increase referral opportunities for all eligible patients. The most important aspects to address are to increase PR provider engagement with referrers, increase PR awareness and support for potential patients and all PHCPs, including those with respiratory qualifications and to increase PHCP internal motivation for PR referral, particularly for those patients in work and those with less symptom burden. These suggestions are likely to require multi-system changes. Mapping these TDF findings to behaviour change techniques (BCT) are important next steps which will enable clear targeted interventions to be identified and subsequently tested in clinical practice, which will ultimately increase referral to PR, thereby improving COPD patients' health outcomes and reducing health service utilization.

Abbreviations

PR
Pulmonary Rehabilitation
COPD
Chronic Obstructive Pulmonary Disease
PHCP
Primary Health Care Practitioner
TDF
Theoretical Domains Framework

Declarations

Ethics approval and consent to participate

Ethical Approvals: Phase 1 approval granted by Health Research Authority: Project ID: 213367. Phase 2 approval granted by University of Birmingham: ERN_19-0439.

Consent for publication

Not Applicable

Availability of data and material

The datasets during and/or analysed during the current study available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests"

Funding

Not applicable

Authors' contributions

JW collected, analysed and interpreted phase 1 and phase 2 data and was a major contributor in writing the manuscript. RJ, PA, SG and AE contributed to study design, data analysis and interpretation of phase 1 and 2 data. RJ, PA and SG all contributed to the writing of the manuscript. IV supported phase 1 topic guide development, phase 1 data alignment to the TDF and the formulation of the phase 2 questionnaire where behavioural expert consensus was sought. All authors read and approved the final manuscript.

Acknowledgements

The authors thank all participating primary healthcare practitioners for giving up their time, providing the data, and contributing to this study.

References

1. (GOLD) GIfCOLD. Global Strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease. 2020.
2. Yang IA, Brown JL, George J, Jenkins S, McDonald CF, McDonald VM, et al. COPD-X Australian and New Zealand guidelines for the diagnosis and management of chronic obstructive pulmonary disease: 2017 update. *Med J Aust.* 2017;207(10):436-42.
3. Excellence NIfHaC. Chronic obstructive pulmonary disease in over 16s: diagnosis and management. 2018 December.
4. Qaseem A, Wilt, T.J . Weinberger, S E. Hanania, N A. Criner,G. van der Molen, T. Marciniuk, DD., Denberg,T.Schunemann, H. Wedzicha, W. MacDonald, R. & P. Shekelle,, for the American College of Physicians, the American College of Chest Physicians, the American Thoracic Society, and the European Respiratory Society*. Diagnosis and Management of Stable Chronic Obstructive Pulmonary Disease: A Clinical Practice Guideline Update from the American College of Physicians, American

- College of Chest Physicians, American Thoracic Society, and European Respiratory Society. *Ann Intern Med.* 2012;155:12.
5. Bolton CE, Bevan-Smith EF, Blakey JD, Crowe P, Elkin SL, Garrod R, et al. British Thoracic Society guideline on pulmonary rehabilitation in adults. *Thorax.* 2013;68 Suppl 2:ii1-30.
 6. McNaughton A, Weatherall M, Williams G, Delacey D, George C, Beasley R. An audit of pulmonary rehabilitation program. *Clinical Audit.* 2016;Volume 8:7-12.
 7. Steiner M, Holzhauser-Barrie J, Lowe D, Searle L, Skipper E, Welham S, et al. Pulmonary Rehabilitation: Steps to breathe better. National Chronic Obstructive Pulmonary Disease (COPD) Audit Programme: Clinical audit of Pulmonary Rehabilitation services in England and Wales 2015. National clinical audit report. London: RCGP; 2016.
 8. Watson JS AP, Jordan RE, Enocson A & S.Greenfield. Referral of patients with chronic obstructive pulmonary disease to pulmonary rehabilitation: a qualitative study of barriers and enablers for primary healthcare practitioners. *British Journal Of General Practiice.* 2020.
 9. Colquhoun HL, Squires JE, Kolehmainen N, Fraser C, Grimshaw JM. Methods for designing interventions to change healthcare professionals' behaviour: a systematic review. *Implement Sci.* 2017;12(1):30.
 10. Davis R, Campbell R, Hildon Z, Hobbs L, Michie S. Theories of behaviour and behaviour change across the social and behavioural sciences: a scoping review. *Health Psychol Rev.* 2015;9(3):323-44.
 11. Birken SA, Powell BJ, Shea CM, Haines ER, Alexis Kirk M, Leeman J, et al. Criteria for selecting implementation science theories and frameworks: results from an international survey. *Implement Sci.* 2017;12(1):124.
 12. Atkins L, Francis J, Islam R, O'Connor D, Patey A, Ivers N, et al. A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. *Implement Sci.* 2017;12(1):77.
 13. Cane J, O'Connor D, Michie S. Validation of the theoretical domains framework for use in behaviour change and implementation research. *Implementation Science.* 2012;7(37).
 14. Phillips CJ, Marshall AP, Chaves NJ, Jankelowitz SK, Lin IB, Loy CT, et al. Experiences of using the Theoretical Domains Framework across diverse clinical environments: a qualitative study. *J Multidiscip Healthc.* 2015;8:139-46.
 15. Nilsen P. Making sense of implementation theories, models and frameworks. *Implementation Science.* 2015;10(1).
 16. Michie S, Johnston M, Francis J, Hardeman W, Eccles M. From Theory to Intervention: Mapping Theoretically Derived Behavioural Determinants to Behaviour Change Techniques. *Applied Psychology.* 2008;57(4):660-80.
 17. Dyson JL, R. Jackson, C. & F Cheater. Development of a theory-based instrument to identify barriers and levers to best hand hygiene practice among healthcare practitioners. *Implementation Science.* 2013;8(111).

18. Creswell J, Plano Clark V. *Designing and conducting Mixed Methods Research*. 2nd ed. London: SAGE; 2011.
19. Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. *Implement Sci*. 2011;6:42.
20. Leech NL, Onwuegbuzi AJ. Guidelines for Conducting and Reporting Mixed Research in the Field of Counseling and Beyond. *Journal of Counseling & Development*. 2010;88:61-9.
21. Feters MD, Curry LA, Creswell JW. Achieving integration in mixed methods designs-principles and practices. *Health Serv Res*. 2013;48(6 Pt 2):2134-56.
22. Atkins L, Hunkeler EM, Jensen CD, Michie S, Lee JK, Doubeni CA, et al. Factors influencing variation in physician adenoma detection rates: a theory-based approach for performance improvement. *Gastrointest Endosc*. 2016;83(3):617-26 e2.
23. JISC Os. Online Survey Bristol, UK2020 [
24. O'Cathain A, Thomas KJ. "Any other comments?" Open questions on questionnaires - a bane or a bonus to research? *BMC Med Res Methodol*. 2004;4:25.
25. Weijters B, Cabooter E, Schillewaert N. The effect of rating scale format on response styles: The number of response categories and response category labels. *International Journal of Research in Marketing*. 2010;27(3):236-47.
26. Braun V, Clarke V. *Successful Qualitative Research: A Practical Guide for Beginners*. 1st ed. London: SAGE Publications Ltd; 2013.
27. Cox NS, Oliveira CC, Lahham A, Holland AE. 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(2):84-93.
28. Practitioners RCoG, Health Sf. *Core Capabilities Framework for Advanced Clinical Practice (Nurses) Working in General Practice / Primary Care in England*. 2020.
29. Primary Care Workforce Team ND. *General Practice Workforce 31 December 2019*. Health and Social Care Information Centre.; 2020.
30. Fisher R. Social desirability and the validity of direct questioning. *Journal of Consumer Research*. 1993;20:303-15.
31. Cowdell F, Dyson J. How is the theoretical domains framework applied to developing health behaviour interventions? A systematic search and narrative synthesis. *BMC Public Health*. 2019;19(1):1180.
32. Foster F, Piggott R, Riley L, Beech R. Working with primary care clinicians and patients to introduce strategies for increasing referrals for pulmonary rehabilitation. *Prim Health Care Res Dev*. 2016;17(3):226-37.
33. Molin K El, Valentiner L, Lange P & H Langberg. General practitioners' perceptions of COPD treatment: thematic analysis of qualitative interviews. *International Journal of Chronic Obstructive Pulmonary Disease*. 2016;11:1926-37.
34. Johnston K YM, Grimmer K, Antic R & P Firth. Barriers to, and facilitators for, referral to pulmonary rehabilitation in COPD patients from the perspective of Australian general practitioners: a qualitative

- study. Primary Care Respiratory Journal. 2013;22(3):319-24.
35. Harris D HMSA. Improving the uptake of pulmonary rehabilitation in patients with COPD: Qualitative study of experiences and attitudes. . British Journal of General Practice. 2008;58(555):703-10.
 36. Burton A OD, Atkins L, Michie S, Gray B, Stevenson F, Gilbert H, Walters K. Lowering Cardiovascular Disease Risk for People with Severe Mental Illnesses in Primary Care: A Focus Group Study. PloS one. 2015.
 37. Hassan S R, J, Marston L, Burton A, Osborn D, Walters, Kate. A primary care-led intervention to reduce cardiovascular disease risk in people with severe mental illness (PRIMROSE): a secondary qualitative analysis. The Lancet. 2019;394:S50.
 38. Moore E, Palmer T, Newson R, Majeed A, Quint JK, Soljak MA. Pulmonary Rehabilitation as a Mechanism to Reduce Hospitalizations for Acute Exacerbations of COPD: A Systematic Review and Meta-Analysis. Chest. 2016;150(4):837-59.
 39. Moore L, Hogg L, White P. Acceptability and feasibility of pulmonary rehabilitation for COPD: a community qualitative study. Prim Care Respir J. 2012;21(4):419-24.
 40. Health & Social Care Information Centre HQIPDU. National Diabetes Audit 2013-2014 and 2014-2015. Report 1: Care Processes and Treatment Targets. 2016.
 41. Rowland M. The future of primary care : Creating teams for tomorrow. Primary Care Workforce Commission: Health Education England; 2015.

Tables

Table 1 Paper survey distribution

Conference	Attendee number and profile	Number distributed	Number Returned
Conference 1 - GPN	Unable to obtain attendance number (Community & general practice nurses) @ 170	117	33 (28%)
Conference 2 - RCGP	141 (68 GPs inc registrars)	48	24 (50%)
Conference 3 - NIP-N	171 (Community & general practice nurses)	47	26 (55%)
Conference 4 - NIP-M*	382 (Community & general practice nurses)	382 - 400	36 (9.4-9%)
Conference 5 - NIP-C	236 (Community & general practice nurses)	51	31 (61%)
Workshop - PCRS	27 (Community & general practice nurses, 4 GP's, pharmacist x2)	8	4 (50%)
Total	@ 1,127	653-671	154 (23-23.6%)

*Surveys placed in conference bags

GPN = General Practice Nurses, RCGP = Royal College of General Practitioners, NIP = Nursing in Practice (N=Northampton, M =Manchester, C =Cardiff), PCRS = Primary Care Respiratory Society.

Table 2 Baseline demographics of all participants

		Phase 2 Survey (n=233)			
		Phase 1 Interviews (n=19) (%)	Conference Online		Total (n=99) (%)
			(n=134) (%)	(n=233) (%)	
Primary Health Care Practitioner Role	General Practitioner (GP)	6 (32)	18 (13.4)	11 (11.1)	29 (12.5)
	Advanced Nurse Practitioner (ANP)	4 (21)	25 (18.7)	32 (32.3)	57 (24.5)
	Practice Nurse (PN)	7 (37)	-	-	129 (55.4)
	Emergency Care Practitioner (ECP)	-	85 (63.4)	44 (44.5)	2(0.9)
	Pharmacist	1 (5)	1 (0.8)	1 (1)	4 (1.7)
	Health Care Assistant (HCA)	1 (5)	-	4 (4)	1 (0.4)
	Other	19 (100)	-	1 (1)	11 (4.7))
	Total responses		19 (100)	5 (3.7)	6 (6.1)
			134/134 (100)	99/99 (100)	
Sex	Female	14 (74)	115 (91.3)	92 (92.9)	207 (92)
	Male	5 (26)	11 (8.7)	7 (7.1)	18 (8)
	Total responses	19	126/134 (94)	99/99 (100)	225/233 (96.6)
Age (years)	18-29	Data not collected	5 (3.8)	2 (2)	7 (3.0)
	30-39		32 (24)	11 (11.1)	43 (18.5)
	40-49		36 (27.1)	40 (40.4)	76 (32.8)
	50-59		49 (36.8)	40 (40.4)	89 (38.4)
	60 +		11 (8.3)	6 (6.1)	17(7.3)
	Total responses		11 (8.3)	133/134 (99.3)	99/99 (100)
Ethnicity	White British	Data not collected	112 (84.2)	87 (87.9)	199 (85.7)
	White other		8 (6)	4 (4.1)	12 (5.2)
	Asian/Asian British				10 (4.3)

	Mixed Multiple Ethnic Groups		7 (5.3)	3 (3)	3 (1.3)
	Black/African/Caribbean/Black British		1 (0.7)	2 (2)	2 (0.9)
	Other ethnic group		2 (1.4)	-	6 (2.6)
	Total responses		3 (2.4)	3 (3)	232/233(99.6)
			133/134 (99.3)	99/99 (100)	
Practice Geographical Location	Scotland	-	1 (0.8)	3 (3)	4 (1.7)
	England North East and West Yorkshire and the Humber	-	31 (23.6)	15 (15.1)	46 (20)
	Midlands (East and West)	9 (45)	8 (6.1)	6 (6.1)	14 (6)
	East of England	10 (55)	20 (15.3)	16 (16.1)	36 (15.8)
	Wales	-	23 (17.5)	18 (18.2)	41 (17.8)
	London	-	31 (23.6)	-	31 (13.5)
	South (East and West)	-	-	-	9 (3.9)
	Total responses	19 (100)	3 (2.4)	6 (6.1)	49 (21.3)
			14 (10.7)	35 (35.4)	230/233(98.7)
		131/134 (97.8)	99/99 (100)		
Years in General Practice	< 5	Data not collected	39 (29.9)	23 (23.2)	62 (27)
	6- 10		26 (19.8)	25 (25.3)	51 (22.2)
	11-15		18 (13.7)	18 (18.2)	36 (15.7)
	16-20		22 (16.8)	14 (14.1)	36 (15.7)
	21 +		26 (19.8)	19 (19.2)	45 (19.4)
	Total responses		131/134 (97.8)	99/99 (100)	230/233(98.7)
Currently see COPD patients	Acute Management	Data not collected	9 (6.7)	5 (5)	14 (6)
	Chronic Management		30 (22.6)	26 (26.3)	56 (24)
	Acute and Chronic management		81 (60.9)	67 (67.6)	148 (64)
				14 (6)	

	Don't see COPD patients		13 (9.8)	1 (1)	232/233(99.6)
	Total responses		133/134 (99.3)	99/99 (100)	
CPD Respiratory Qualifications*	None	7 (36.8)	62 (46.3)	19 (19.2)	81 (34.8)
	COPD Diploma	-	28 (20.9)	50 (50.5)	78 (33.5)
	Asthma Diploma	-	38 (28.4)	52 (50.5)	90 (38.6)
	ARTP Spiro	-	34 (25.4)	40 (40.4)	74 (31.8)
	Other	12(63.2)**	32 (23.9)	51 (51.5)	42 (18)
	> one qualification	-	210	238	83 (35.6)
	Total responses	19	16 (11.9)	26 (26.3)	448
Reported PR referral practice	Yes (frequency not specified)	-	-	11 (11.1)	11 (4.7)
	Weekly	1 (5.3)	16 (12)	32 (32.3)	48 (20.7)
	Monthly	10 (52.6)	40 (30.1)	21 (21.2)	61 (26.3)
	< Monthly	9 (47.4)	43 (32.3)	29	72 (31)
	None	0	34 (25.6)	6 (6.1)	40 (17.3)
	Total	19	34 (25.6)	133/134 (99.3)	232/233(99.6)
				99/99 (100)	

* Participants were able to select more than one respiratory qualification

**individual respiratory qualifications were not asked of this population

Table 3 PHCP referral practice*

	Frequent Referral n (%) (weekly or monthly) Total n=109	Infrequent referral n (%) (>monthly or no referral) Total n=113
Staff type		
GP (n=28)	10 (35.7)	18 (64.3)
PN (n=120)	57 (47.5)	63 (52.5)
ANP (n=57)	32 (56.1)	25 (43.9)
Other (ECP/NP/Pharm/HCA) (n=17)	10 (58.8)	7 (41.2)
CPD Respiratory Qualification	84 (77.1)	59 (52.2)
Years in Practice > 10 years**	65/107 (60.7)	58/112 (51.8)

*11/99 online PHCPs specified that they referred to PR but did not specify referral frequency and were removed from this analysis.

** 107/109 and 112/113 reported time spent in general practice

Table 4: Phase 1 Mapping of barriers and enablers for referral to TDF domains

TDF Domain (construct mapping frequency)	Content mapping (n)	Key points	Evidence supporting
<p>1.Social and Professional Role</p> <p>(A coherent set of behaviours and displayed personal qualities of an individual in a social or work setting)</p>	(n=289)	<p>Referral was considered everyone's role, however it was considered best undertaken by the PHCP during disease stability and at annual review. It was often considered to be the practice nurses' role, but also respiratory-interested others.</p> <p>Most PHCPs considered it their duty of care to motivate patients.</p> <p>Only 1 of 19 PHCPs described implementing practice leadership to improve PR awareness and/or referral.</p>	<p><i>It is largely the nurses' job to see stable COPD patients at an annual review and that is the most appropriate time to refer to pulmonary rehabilitation, not during an acute exacerbation' – GP5</i></p> <p><i>No, I think it's everybody's role, I mean I'm not sure about my non-respiratory colleagues. PN2</i></p> <p><i>So we've put forward a proper business case for it. (Local PR service). GP4</i></p>
<p>2.Knowledge</p> <p>(An awareness of the existence of something)</p>	(n=256)	<p>17 of 19 PHCPs knew of the existence of PR and a generalised understanding of its purpose. PR Knowledge was reported to be gained through post qualification education and networking events.</p> <p>Local PR knowledge such as programme timing, waiting list (if any), and availability of patient transport, was often unknown and were described as inhibitors to referral discussions.</p> <p>The referral criteria Medical Research Council (MRC) dyspnoea Score ≥ 3 was frequently cited as a referral prompt, although some PHCPs wanted to refer patients with MRC scores of 2 & felt unable to.</p>	<p><i>I think it's a fundamental treatment and I think it's better than drugs. PN7</i></p> <p><i>Do you currently refer to PR? P -I wouldn't know where. GP2</i></p> <p><i>I don't know how to describe pulmonary rehab to a patient. GP3</i></p> <p><i>I just feel that we don't know enough about the program to confidently hand on your heart sell it. PN1</i></p> <p><i>'We've also got the barrier of we can only refer if their MRC is 3 or 4 or 5' PN5</i></p>
<p>3. Environment</p> <p>(Any circumstance of a person's situation or</p>	(n=195)	<p>PR referral was often considered inappropriate in non-COPD focused consultations or when a patient was consulting for an acute exacerbation. Clinical time constraints were often described</p>	<p><i>I think in our role when you're treating potentially acutely unwell people in a really limited time span then it's, it is realistically going to be hard to</i></p>

<p>environment that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behaviour)</p>		<p>as inhibiting referral, although annual review considered appropriate time because of its clinical focus, template design and longer consultation time.</p> <p>PHCPs often stated little PR promotional material was available in practice for patients or staff; there were however mixed views on the potential value of this.</p> <p>3 practices had initiated an in-practice 12 weekly, 1 hour generic exercise group, this appeared to be seen as equivalent to PR by 1 PN.</p>	<p><i>cover everything, really hard.</i> ANP2</p> <p>-</p> <p><i>On the annual review well I follow the template and when I get to the pulmonary rehab I mention it then and I say, 'Would you like to go?'</i> PN3</p> <p><i>It would be useful for our local organisation I think to give us some little leaflets about what they do so we can give that to patients about the local service</i> ANP4</p> <p><i>I'm not against a leaflet but have you seen how many posters and leaflets we have on our walls?</i> GP2</p>
<p>4. Belief about capabilities (Acceptance of the truth, reality, or validity about an ability, talent, or facility that a person can put to constructive use)</p>	<p>(n=141)</p>	<p>Individual PHCP PR referral confidence varied, with particular uncertainty expressed in how to best 'sell PR' and how to motivate un-motivated patients. Although most were confident in reassuring patients that PR would improve breathlessness.</p> <p>PHCPs with positive non-pharmacological and exercise beliefs appeared to have greater confidence in PR benefit and patients' abilities</p> <p>A number of PHCPs described COPD patients as uninterested in improving their health and some PHCPs emphasised patients needed to be committed to PR. Whilst some PHCPs described 'knowing' which patients would accept referral, others described undertaking subjective patient assessment and expressed concerns about patients' exercise capability in the presence of breathlessness.</p>	<p><i>I would need to feel confident, before I speak to this patient about it.</i> ANP4</p> <p><i>I quite like... Non-medicinal treatment... think if you're excited by it then it's easier for patients to get excited by it as well.</i> GP4</p> <p><i>They are also very very clear that there not going to take anyone on their course unless there is 100% commitment at the beginning that they are going to complete the course.</i> ANP1</p> <p><i>You look at the ones that you think would more likely go.</i> ANP4</p> <p>-</p> <p><i>It's really basically where I see a need, where I see they can benefit –</i> ANP1</p>

		<p>For patients receiving oxygen therapy there was much uncertainty of the benefit of PR and an assumption that</p> <p>Oxygen/secondary care teams would have previously offered this.</p> <p>Most PHCPs considered key environmental factors such as session timing, venue accessibility, patient financial hardship, as barriers for most patients. Patients in work, or those able to take the dog for a walk/wearing walking boots were considered 'too well' for PR.</p>	<p><i>If the patients already on oxygen therapy, then it's likely that they've already been seen by them. HCA</i></p> <p><i>The main stumbling block is that you come across is "I'm not going every week for x number of weeks, I can't afford it, I haven't got that much time, how do you expect me to get therenot a huge number of our patients drive. GP4</i></p> <p><i>There's some patients that I would like to refer but they can't go because of work commitments. PN3</i></p> <p><i>'It's quite surprising that some patients are still working at odd jobs and things like that and keep them very active. So, for those patients it's not so important.' PN3</i></p>
<p>5.Memory (Inc: Decision making)</p> <p>(The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives)</p>	<p>(n= 118)</p>	<p>Some PHCPs reported forgetting to refer patients to PR, however, embedded system reminders often found in COPD review templates or on-screen prompts were cited as important for most PHCPs.</p> <p>Patient behaviour and clinical presentation altered decision making processes for some PHCPs for example not referring current smokers, or remembering PR in light of increasing COPD symptom burden and disease deterioration, whilst earlier concerns for patient capability and commitment became less apparent.</p>	<p><i>I do need a reminders because my head's full, so as I say, I don't want to tick boxes but I do need a prompt.' PN7</i></p> <p>-</p> <p><i>That's something that we do, so we have a prompt that pops up saying has this patient been referred to pulmonary rehab. GP5</i></p> <p><i>I think I go through phases, I'll do it really well for a while and somebody has motivated me and then I'll forget that and do something else. PN7</i></p> <p><i>Breathlessness and exacerbations, I think, would be the key factors. GP3</i></p>
<p>6.Optimism</p> <p>(The confidence that things will</p>	<p>(n=110)</p>	<p>PHCPs frequently reported that patients did not want to attend PR, citing disease stigma and</p>	<p><i>The first thing you think, 'Are they going to do it? ANP4</i></p>

<p>happen for the best or that desired goals will be attained)</p>		<p>lack of activation as underlying reasons.</p> <p>Negative patient responses appeared to dampen PHCPs optimism and reduce subsequent referral offers. Positive patient experience however had the opposite effect.</p> <p>Positive and negative perceptions of PR providers were also reported on the basis of service quality and frequency of referral acceptance, this appeared to influence referral behaviour.</p>	<p><i>Patients don't want it. PN5</i></p> <p><i>Even if you then said what the evidence was and how you could improve, it's – I think that group of people are really difficult to engage. GP3</i></p> <p><i>If they're negative anyway everything you suggest they sort of have an answer, 'Oh no that won't work. PN4</i></p> <p><i>The longer the wait time, the less likely they are to turn up. HCA</i></p> <p><i>I don't think it's the greatest service, it does have an impact because I'm not going to tell my patients to go. PN7</i></p>
<p>7. Belief about consequences (Acceptance of the truth, reality, or validity about outcomes of a behaviour in a given situation)</p>	<p>(n=107)</p>	<p>There was a general sense that PR is positive with many health and psychological benefits, but beliefs captured in other domains impacted on PHCP belief about consequences of referral offer.</p> <p>A small number of PHCPs expressed concern that PR might worsen patient's depression and/or anxiety, particularly for those socially isolated.</p>	<p><i>I've seen patients that have been... their lives have been transformed in the first year. PN7</i></p> <p><i>Might have prevented the exacerbation if they'd gone PN5</i></p> <p><i>I will say that when I'm talking to patients, say it's better than drugs, but I still get a closed reaction. PN7</i></p> <p><i>If we can improve patient's breathing they're less likely to get anxious, that makes them less likely to dial 999 or likely to do something about it. And perhaps use their rescue packs more appropriately. ANP4</i></p> <p><i>I wouldn't want to mention it if it ended up being that I'm saying there's this really good helpful programme but actually if she's</i></p>

			<i>so effected by her disease that she doesn't leave the house then I wouldn't want to have mentioned it and then not for her not to be able to go. ANP2</i>
8.Social Influences (Those interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviours)	(n=84)	<p>Out of practice engagement from PR providers and PR advocates were important in increasing overall awareness and positively influencing referral behaviour.</p> <p>Almost all PHCPs described little to no engagement from providers themselves, and described not knowing what had happened to completed referrals.</p> <p>PHCPs also reported that positive patient PR experiences positively influenced PHCPs referral behaviour and that family can be influential, yet patients rarely ask for PR.</p> <p>PHCPs described a need to increase PR's profile publicly and for it to be marketed similarly to pharmacological treatments. The name PR itself was considered by some PHCPs to be a negative influence as 'rehab' was deemed to have undesirable connotations.</p>	<p><i>Our referral rate has gone up a lot since the respiratory MDT's because every single one of those patients has subsequently had a referral. GP4</i></p> <p><i>At the moment I wouldn't know how many people we refer, is that referral going up, Nobodies giving us feedback from the rehab team about how we are doing as a surgery. PN1</i></p> <p><i>If patients that have been to it you know express a positive experience that is something you can share with other people that you are trying to refer. GP1</i></p> <p><i>I asked him to talk to his wife, because I knew she'd want him to go, because I know her through a different channel, and erm... he's come back and said 'Ooo I'll give it a shot. PN5</i></p> <p><i>Nobody has picked up a leaflet and walked in with it and said can you refer me, nobody has. ANP1</i></p>
9.Skills (An ability or proficiency acquired through practice)	(n=79)	<p>The physical act of referring patients to PR were described as largely straightforward by most PHCPs, although there was no standardised process across the 2 regions.</p> <p>Most undertook this action independently, although there were descriptions of practice administrators helping.</p> <p>However, frequency of referral to PR when described in interviews,</p>	<p><i>Do you currently refer people to pulmonary rehab? Some, some. PN7</i></p> <p><i>I've been at this practice for nearly three years now and it's sort of something that falls really far down on your list of things that you do on your COPD review, so it's always the last thing that you come to. GP4</i></p> <p><i>It's very easy. It's a form erm it's a just a single sheet. PN2</i></p>

		was far lower than that which was documented on the returned research interest form.	<i>Quicker, easier referral, much easier referral method PN7</i>
10.Reinforcement (Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus)	(n=59)	<p>There appeared to be no direct sanctions for non-referral of patients, although practice financial rewards in one region appeared to enhance awareness and referral.</p> <p>Outside of these practices there was a suggestion that financial incentives would be advantageous, additionally calculating health cost benefit for PR attendance was suggested as potential enabler.</p> <p>Additionally reinforcements such as those offered by social influences and patients were also described to be valuable.</p>	<p><i>We've got this thing called A** that we're doing for, you know it was the QOF before, so like A** has taken over that so I think because of the A** the doctor who is the lead A** leader he discusses that a lot because of course you get points, you still get the points for it like QOF. So the more we refer is the more points we get so there's an incentive there for the practice. PN6</i></p> <p><i>Yeah if they did something on the BBC or something they might all be in the next day saying, 'Oh I wanna do that'. PN4</i></p> <p><i>If you spent 5 minutes with somebody then at the end of that they agreed to go and then they attended, then you would be motivated to do it again. GP5</i></p>
11.Goals (Mental representations of outcomes or 'end states' that an individual wants to achieve)	(n=47)	<p>Referral to PR was a low-level goal for most PHCPs, but one that varied by consultation type and was not considered during an acute exacerbation review. However, referral appeared to become a goal in the presence of worsening patient symptoms.</p> <p>Some PHCPs described wanting to refer more patients and learning strategies to improve patient acceptance, but described frequent discord between PHCP and patient goals which PHCPs found challenging.</p>	<p><i>As a practice, when we do the acute exacerbation we're pretty much focus on the acute exacerbation. GP4</i></p> <p><i>I refer a few to pulmonary rehab but I don't do as many as I feel I should. PN7</i></p> <p><i>She was more receptive because she'd had a few flares up, not after the first one but because she's had a few. And I think that makes them more receptive to doing that sort of thing. ANP4</i></p> <p><i>One hand I'm wanting them to engage with the disease process so that actually they've</i></p>

		No PHCPs discussed set practice PR referral targets although one GP reported plans to set up a programme geographically closer to practice (captured as leadership in the domain social & professional.)	<i>got more skills to self-manage and that's going to actually keep them much better for the rest of their whole of their life, on the other hand they don't want to be classified as ill. ANP1</i>
12.Intentions (A conscious decision to perform a behaviour or a resolve to act in a certain way)	(n=39)	Some PHCPs have described adopting patient-aimed strategies that included persistence and warnings against overreliance and/or possible reduced effectiveness of pharmacological treatments in an effort to move patients to a state ready for PR referral. There also appeared to be an understanding that acceptance for many patients takes time.	<i>I said you know you've used those rescue packs a lot you know if we could get your breathing a bit better, perhaps you wouldn't be so bad...., and she said, alright then I'll see, do the referral. ANP4</i> <i>How would you feel about something that's not medicine based but will probably help you as much as the inhalers that we've put you on, she was suddenly very interested in. GP4</i> <i>I look for that chink of interest and then I'll try and worm my way in then. PN7</i> <i>He was very adamant that he didn't want to go, then I gave him the booklet. PN5</i>
13.Emotion (A complex reaction pattern, involving experiential, behavioural, and physiological elements, by which the individual attempts to deal with a personally significant matter or event)	(n=6)	PHCPs emotion was rarely discussed although some said they felt annoyed with providers if a referral had been rejected. There were high levels of empathy towards patients particularly amongst nurses; a small number described not wanting to offer the hope of PR to patients and for PR providers to reject referral, this appeared to be a particular concern for patients with high disease burden.	<i>Most of our patients are reasonably trusting and say well you seem quite excited by it so shall we give it a try. GP4</i> <i>They're gonna meet all these people they don't know and be told to lift this walk here, do that and they're frightened, its... I'd be terrified. PN5</i> <i>I just don't want to raise – if you raise patients' hopes and say – and offer it, then it can make them – you know, if they're already depressed because of the COPD, it could just make the depression worse you know, so I</i>

			<i>don't want to impact on their mental wellbeing. ANP1</i>
14. Behavioural regulation (Anything aimed at managing or changing objectively observed or measured actions)	(n=4)	Some PHCPs saw events such as hospital admissions/out-patient appointments as good opportunities for patients to change behaviours but for staff in those settings to instigate referral. PHCP personal behavioural regulation was low, many did not know how many they had referred or what, post referral, the patient's journey had become. One participant described the research interview as helpful in allowing them to consider how to change their referral approach, but most PHCPs did not vocalise intentions to change or modify current or future PR referral behaviours.	<i>I don't know how much is done in secondary care, but very often when stuff, when you've been in anywhere near secondary care people really its often quite a sit up moment, gosh this is serious enough for me to have to go to hospital, even if it an outpatient appointment. ANP1</i> <i>This is one of your treatment choices' and perhaps I need to change, thinking about it, my approach in – er, how I word it. ANP4</i> <i>It's trying to make it a priority. ANP4</i>

Table 5: Phase 2 Results of TDF belief statements by referral frequency.

TDF Domain	TDF Questions (n=54)	Frequent referral n=109 (%) (weekly/monthly)	Infrequent referral n=113(%) (>monthly or no referral)	Total n=222(%)
1.Knowledge	I am aware of the content of Pulmonary Rehabilitation (PR) Programmes	97/109 (89.0)	72/113(63.7)	169/222 (76.1)
	I am aware of PR programme objectives.	99/109 (90.8)	75/113 (66.4)	174/222 (78.4)
	I am unsure of the evidence base for PR	18/109(16.5)	30/113 (26.5)	49/222(21.6)
	I know where geographically my local PR programme is delivered	92/109 (84.4)	70/113(61.9)	162/222 (73.0)
	I know when it is appropriate to refer a patient with COPD to PR	106/109 (97.3)	74/113 (65.5)	180/222 (81.1)
	I can answer questions patients have about PR	88/109 (80.7)	60/113 (53.1)	148/222 (66.7)
	I know how to contact my local PR provider	91/109(83.2)	68/113 (60.2)	159/222 (71.6)
2.Skill	It is easy to refer a patient to PR	87/109 (80.0)	48/113 (42.5)	135/222 (60.8)
3.Social & Professional Role	Referral to PR is the practice nurse role	63/109 (57.8)	45/113 (39.8)	108/222(48.6)
	Other General Practice staff in my practice (excluding Practice Nurse) refer patients to PR	52/109(47.7)	63/113(55.8)	115/222 (51.8)
	I believe in encouraging patients to attend PR	109/109 (100)	104/112 (92.9)	213/221 (96.4)

4.Environment	Resources about PR (i.e written information) are readily available	39/109 (35.7)	25/112 (22.3)	64/221 (29.0)
	There is not enough time in practice to refer	12/109 (11.0)	22/113 (19.5)	34/222(15.3)
5.Social Influences	My local PR providers regularly engage with me	31/109 (28.4)	17/113 (15.0)	48/222 (22.6)
	PR is something that patients ask for	3/109 (2.8)	8/112 (7.1)	11/221 (5.0)
	There are good relationships in practice with PR providers	44/109 (40.4)	28/112 (25.0)	72/221 (32.6)
	PR providers are good at communicating outcomes of referrals I have made	39/109 (35.8)	25/112 (22.3)	64/221 (29.0)
6.Optimism (including pessimism)	I am confident my local PR provider offers a good service for my patients.	81/109 (74.3)	52/113 (46.0)	135/222 (60.8)
	I don't believe patients will attend PR after I have referred	16/109 (14.7)	16/113(14.2)	32/222(14.4)
	Patients who smoke are not motivated to take part in PR	7/109 (6.4)	7/113 (6.2)	14/222 (6.3)
	Patients who live alone won't like to take part in group PR	5/109 (4.6)	2/113 (1.8)	7/222 (3.2)
	Patients are motivated to attend PR	23/109 (21.6)	30/111 (27.0)	53/219 (24.2)
7.Belief about Capabilities (self)	I am confident in my ability to encourage patients to attend PR, even when they are not motivated	91/109(83.5)	73/113 (67.6)	164/222 (73.9)
	I do not find it easy to discuss PR with patients.	8/109(7.3)	25/113 (22.1)	36/222(16.2)

Belief about capabilities (patients)	Patients without their own transport won't be able to get to PR	40/109(36.7)	26/113 (23.0)	66/222 (29.7)
	Patients in work are not able to attend PR	62/109 (56.9)	35/113 (31.0)	97/222 (43.7)
	Patients who use home oxygen are unable to take part in PR	4/109(3.7)	6/113 (5.3)	10/222 (4.5)
8.Belief about consequences	If I keep pushing patients to attend PR this will disadvantage my relationship with them.	10/109 (9.2)	10/112 (8.9)	20/221 (9.0)
	I believe patients may be harmed by taking part In PR	1/109 (0.9)	1/113 (0.9)	2/222(0.9)
	I believe most patients will attend and complete PR following my referral	55/109 (50.4)	47/112 (42.0)	102/221 (46.2)
	PR is not beneficial to patients who are breathless	3/109(2.8)	3/113(2.7)	6/222 (2.7)
	PR is best suited to those patients with worsening breathlessness	29/109 (26.6)	29/112 (25.9)	58/221 (26.2)
	PR is best suited to those who have frequent exacerbations	27/109 (24.8)	28/112 (25.0)	55/221 (24.9)
	PR reduces hospital admissions	101/109 (92.7)	97/112 (86.6)	198/221 (89.6)
	PR reduces risk of mortality	85/109 (78.0)	82/112 (73.2)	167/221 (75.6)
	If patients attend PR this will reduce their general practice visits	73/109 (67.0)	78/112 (69.6)	151/221 (68.3)
	PR reduces exacerbations	88/109 (80.7)	84/112 (75.0)	172/221 (77.8)

	PR improves breathlessness	103/109 (94.5)	100/112 (89.3)	203/221 (91.9)
	PR reduces a patient's anxiety and/or depression.	97/108 (89.8)	96/112 (85.7)	193/220 (87.7)
9..Goals	Referring patients to PR is something I have been advised to do	95/107(88.8)	57/112(50.9)	152/219 (69.4)
	My practice regularly reviews COPD registers to ensure eligible COPD patients are offered PR	51/109 (46.8)	40/113 (35.4))	91/222 (41.0)
	There are set targets within the practice to improve PR referral rates	23/109 (21.1)	21/113 (18.6)	44/222 (19.8)
10. Memory (Inc.Decision Making)	I often forget to refer patients with COPD to PR	3/109 (2.8)	23/113 (20.4)	26/222 (11.7)
	Prompts to refer patients to PR within annual review templates are important reminders for me	72/109 (66.1)	69/112 (61.6)	141/221 (63.8)
	I only refer patients if they have quit smoking	1/109 (0.9)	3/113 (2.7)	4/222 (1.8)
	I only refer patients if they are optimised on their respiratory medication	17/109 (15.6)	12/113 (10.6)	29/222 (13.1)
	PR is most suited to COPD patients who have frequent exacerbations	20/109 (18.3)	20/113 (17.7)	40/221 (18.1)
	The best time to discuss PR referral with patients is when they are stable.	32/109 (29.4)	25/112 (22.3)	57/221 (25.8)
11.Reinforcement	More health care practitioners will discuss	75/109 (68.8)	73/112 (65.2)	148/221 (67.0)

	PR with patients because of the QoF incentive.			
	My practice receives financial incentives for referral to PR (Before April 2019)	6/108 (5.6)	5/113 (4.4)	11/221 (5.0)
	I believe patient attendance to PR will increase because of the QoF Incentive.	41/109 (37.6)	58/112 (51.8)	99/221 (44.8)
	I believe the QoF incentive will not increase patients PR attendance	29/109 (26.6)	25/112 (2.3)	54/221 (24.4)
	There will be greater awareness of PR within practices because of the new QoF incentives.	84/109 (77.1)	71/112 (63.4)	155/221 (70.1)
12.Intentions	I will refer more patients to PR now there are practice QoF incentives (from April 2019)	30/109 (27.5)	42/112 (37.5)	72/221 (32.6)

Table 6 Integrated results matrix

- ✓ Enabler and agreement with Phase 1 data.
- ✗ Barrier and agreement with Phase 1 data.

TDF Domain	Phase 1 Qualitative study Main Factors	Phase 2 Survey Main Factors	Barrier - ✗ / Enabler - ✓
Social and Professional Role	It is largely seen as the practice nurse role, or staff undertaking COPD review. The best time to refer a patient is when they are stable Most PHCPs believe in encouraging patients to attend	Not Clearly PNs role, but PHCP doing annual review is most likely referrer. Disagree Agree	PHCP undertaking annual review (not necessarily the PN). ✓ Not generalizable in quantitative data. ✓
Knowledge	Generally a good basic knowledge Little detailed local programme knowledge Knowledge is largely gained from CPD/networking	Agree (Generally higher in frequent referrers) Disagree (Higher local knowledge in frequent referrers) Agree	Enabler – but room for improvement ✓ ✓
Environment	There is a lack of time in practice. Referral is only considered during non-acute COPD focused consultations There is a lack of PR promotional material available in practices	Disagree Agreed (some infrequent referrers reported not to see COPD patients) Agree	Not generalizable in the quantitative data. ✗ ✗
Memory	On screen reminders are important Referral prompted when patients have symptoms that are worsening	Agree Disagree	✓ Not generalizable in the quantitative data.
Optimism	Patients do not want PR, are not motivated PR providers do not offer a good service.	Agree Some agreement more so with infrequent referrers	✗ ✗
Belief about consequences	PR is good for patient's physical and psychological health. PR may harm patients (psychologically) Pushing PR might harm my relationship Patients will not always attend and complete post referral	Agree Disagree Disagree General agreement.	✓ Not generalizable in the quantitative data. Not generalizable in the quantitative data. ✗
Belief about capability	Talking to patients about PR is challenging Patients in work are unable to attend PR. Transport is a barrier Not for patients with oxygen Not for patients who smoke Best suited to those who have frequent exacerbations	Some agreement more so with infrequent referrers. Agree Agree (Open question) Disagree Disagree Disagree	✗ ✗ ✗ Not generalizable in the quantitative data. Not generalizable in the quantitative data. Not generalizable in the quantitative data
Social influences	Lack of PR provider engagement and feedback to referrer Patients do not ask for PR.	Agree Agree	✗ ✗
Skills	Referral to PR by PHCP is low Referral process is relatively easy	Agree Disagreement, particularly by infrequent referrers.	✗ Likely barrier
Reinforcement	Financial reward increases referral rates Patients decline PR. Financial reward increases practice awareness	Most don't think this would change behaviour. Not captured explicitly Agree	Not generalizable in the quantitative data Likely barrier ✓
Goals	No set in-practice process to improve or review referral rates	Agree	✗
Intentions	Referral acceptance takes time General desire to refer more patients.	Not captured explicitly Not captured explicitly	Likely barrier Likely enabler
Emotion	PHCPs are fearful on behalf of patients Frustration with PR providers	Concern over access abilities (expressed in free text, may capture PHCP fear) Not captured explicitly.	✗ ✗
Behavioural Regulation	PHCPs do not know how many patients they have referred. PHCPs have no planned intentions to change behaviour	Agree Largely agree, although some emerging interventions (free text)	✗ Likely barrier

Figures

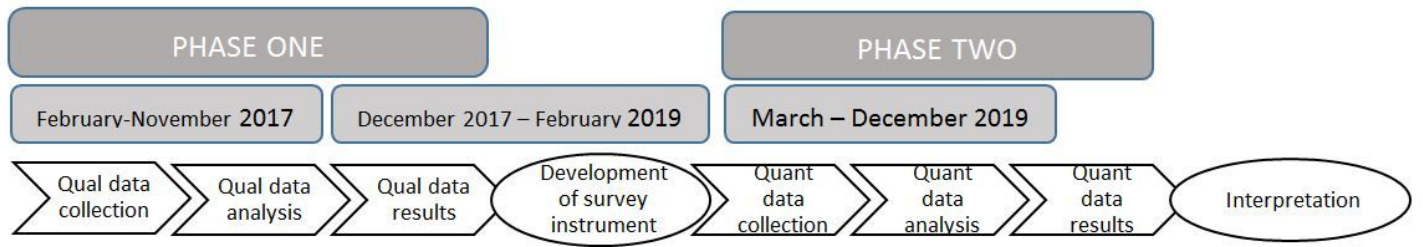


Figure 1

Exploratory sequential design

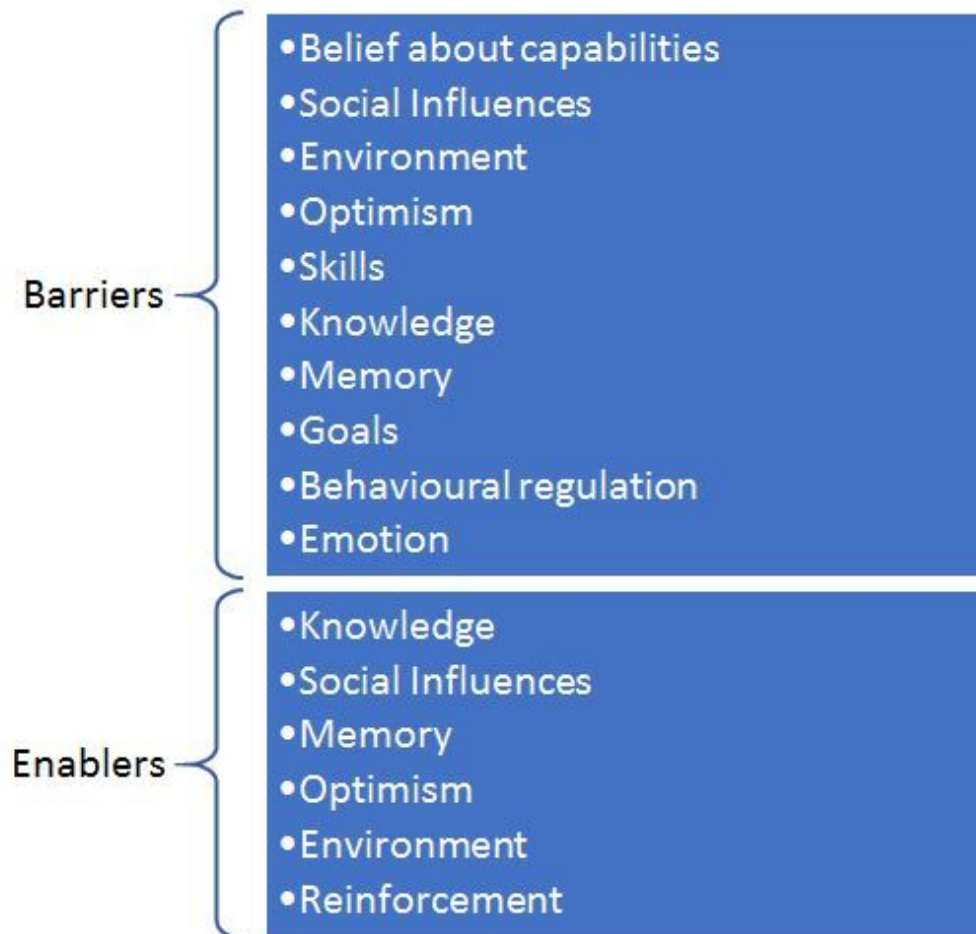


Figure 2

Key barriers and enablers by TDF domain.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [AdditionalFile4QuestionnairePR.pdf](#)
- [Additionalfile3.TDFconstructtable.pdf](#)
- [Additionalfile2TopicGuidelS.pdf](#)
- [Additionalfile1reportingguidelinessubmissionJW.pdf](#)