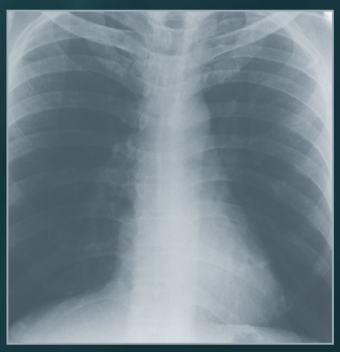
National COPD Audit Programme



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
February 2016

Prepared by:

Royal College of Physicians

British Thoracic Society

In partnership with:

PCRS UK – Primary Care Respiratory Society UK

RCGP Royal College of General Practitioners

British Lung Foundation

Commissioned by:

Working in wider partnership with:

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Document purpose	To disseminate the results of the national clinical audit of Pulmonary Rehabilitation services in England and Wales 2015
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Author	Steiner M, Holzhauer-Barrie J, Lowe D, Searle L, Skipper E, Welham S, Roberts CM (on behalf of the National COPD Audit Programme: pulmonary rehabilitation workstream)
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Audience	Healthcare professionals, NHS managers, chief executives and board members, service commissioners, policymakers, voluntary organisations and patient support groups
Description	This is the second of the COPD Pulmonary Rehabilitation audit reports, published as part of the National COPD Audit Programme. This report details national data relating to Pulmonary Rehabilitation delivered in England and Wales. It also documents attainment against relevant Pulmonary Rehabilitation guidelines and quality standards as published by the British Thoracic Society (BTS) in 2013 and 2014. The report is relevant to anyone with an interest in COPD. It provides a comprehensive picture of Pulmonary Rehabilitation services, and will enable lay people, as well as experts, to understand how COPD services function currently, and where change needs to occur. The information, key findings and recommendations outlined in the report are designed to provide readers with a basis for identifying areas in need of change and to facilitate development of improvement programmes that are relevant not only to Pulmonary Rehabilitation programmes but also to commissioners and policymakers.
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Related publications	• *Pulmonary Rehabilitation: Time to breathe better. National Chronic Obstructive Pulmonary Disease (COPD) Audit Programme: Resources and organisation of pulmonary rehabilitation services in England and Wales 2015*. London: RCP, 2015. www.rcplondon.ac.uk/projects/outputs/pulmonary-rehabilitation-time-breathe-better • Department of Health. *An outcomes strategy for people with chronic obstructive pulmonary disease (COPD) and asthma in England*. London: DH, 2011. www.gov.uk/government/publications/an-outcomes-strategy-for-people-with-chronic-obstructive-pulmonary-disease-copd-and-asthma-in-england • NHS England. *NHS Outcomes Framework – 5 domains resources* [accessed November 2015]. www.england.nhs.uk/resources/resources-for-ccgs/out-frwrk/ • British Thoracic Society. *BTS guideline on pulmonary rehabilitation in adults*. London: BTS, 2013. www.brit-thoracic.org.uk/guidelines-and-quality-standards/pulmonary-rehabilitation-guideline/ • British Thoracic Society. *BTS quality standards for pulmonary rehabilitation in adults*. London: BTS, 2014. www.brit-thoracic.org.uk/guidelines-and-quality-standards/pulmonary-rehabilitation-quality-standards/ • National Institute for Health and Clinical Excellence. Chronic Obstructive Pulmonary Disease in over 16s: diagnosis and management *(CG101)*. London: NICE, 2010. www.nice.org.uk/guidance/CG101 • National Institute for Health and Clinical Excellence. *Chronic obstructive pulmonary disease quality standard (QS10)*. London: NICE, 2011. www.nice.org.uk/Guidance/QS10
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Report preparation

This report was written by the following, on behalf of the national COPD pulmonary rehabilitation audit 2015 workstream group. (The full list of workstream group members is included at Appendix F.)

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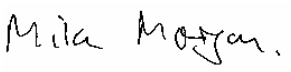
Foreword

It is an honour to provide some preliminary comments for this report which forms the second part of the Pulmonary Rehabilitation component of the National COPD Audit. In this case the report documents the clinical outcomes of patients undergoing Pulmonary Rehabilitation in England and Wales. The audit is the largest dataset of patients undergoing Pulmonary Rehabilitation that has ever been published and the authors are to be congratulated on this truly magnificent achievement.

Pulmonary Rehabilitation is one of the few clinical services where patient outcomes are routinely measured, and in this case the programmes do not disappoint with over 90% of patients undergoing rehabilitation having had an objective outcome assessment. The majority of patients who undergo Pulmonary Rehabilitation have a demonstrable improvement in exercise capacity and health status. The audit therefore confirms that pulmonary rehabilitation is an effective treatment and that real-life pulmonary rehabilitation has benefits that are equivalent to those in the underlying research trials.

It is clear, however, that there are still improvements that can be made. The fact that waiting times beyond 3 months are commonplace suggests that we still lack capacity and that awareness of the benefits of Pulmonary Rehabilitation remains low. Although rehabilitation is effective for those that complete the programme there is a significant attrition in patients who are referred but do not subsequently enrol or complete treatment. This suggests that there is a lack of awareness or a clear knowledge among health professionals of the benefits of rehabilitation, although access in terms of transport or locality may also be an issue.

There are some other interesting illuminations of the service, including the fact that rolling programmes appear to be more efficient than cohort programmes and should be recommended where possible. There may also be some perverse case selection such that the more disabled patients who may have the most to gain are not recruited. This is probably a reflection of the confidence of the staff as well as lack of physical access. The programmes themselves are clearly capable of using the outcome data to lever quality improvement and this should form a basis for discussion with commissioners to ensure that high-quality services evolve. In all, this is an audit to be proud off, in terms of its ambition and scale. The results are welcome, but they do show that in spite of generally good outcomes there is still room for improvement.



Professor Mike Morgan
National Clinical Director for Respiratory Services in England

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Executive summary

Pulmonary Rehabilitation (PR) is a multi-component healthcare intervention that improves symptoms, exercise performance and quality of life in people with chronic obstructive pulmonary disease (COPD) and other long-term respiratory conditions.

This report details the second part of the PR component of the National COPD Audit Programme. The audit presents clinical outcomes of a cohort of 7413 patients who were assessed for PR by 210 programmes across England and Wales over 3 months in early 2015. This represents the largest PR audit dataset available to date worldwide. Data are presented on the clinical characteristics of enrolled patients, the care received and clinical outcomes measured at assessment and discharge. The findings and recommendations in the clinical audit are linked to those presented in the 2015 audit of the resources and organisation of PR services (1).

There is a strong evidence base to support the provision of PR as part of standard treatment offered to patients with COPD. This evidence is summarised in the British Thoracic Society (BTS) PR guidelines (2) which subsequently informed the development of BTS quality standards (QSs) for PR (3). It is against these quality standards that the performance of PR services is assessed in both this audit report and the audit of the resources and organisation of PR.

Summary of recommendations

These recommendations are directed collectively to commissioners, provider organisations, referrers for PR and to PR practitioners themselves. They are also relevant to patients, patient support groups and voluntary organisations. Implementing these recommendations will require discussions between commissioners and providers, and we suggest that the findings of the audit are considered promptly at board level in these organisations so that these discussions are rapidly initiated. Commissioners and providers should ensure they are working closely with patients, carers and patient representatives when discussing and implementing these recommendations. This report identifies two broad areas for improvement: firstly action to improve referral and access to PR; and secondly action to improve the quality of treatment when patients attend PR.

1. **Improving access to PR**
    a. **Providers and commissioners should ensure that robust referral pathways for PR are in place and that PR programmes have sufficient capacity to assess and enrol *all* patients within 3 months of receipt of referral.**
    b. **Referral pathways should be developed to ensure *all* patients hospitalised for acute exacerbations of COPD are offered referral for PR and that those who take up this offer are enrolled within 1 month of discharge.**
    c. **Providers and commissioners should work together to make referrers (including those working in general practice and community services) and patients fully aware of the benefits of PR, to encourage referral.**
    d. **PR programmes should take steps to ensure their services are sufficiently flexible to encourage patients who are referred for PR to complete treatment.**

2. **Improving the care provided by PR programmes**
    a. **All PR programmes should examine and compare their local data with accepted thresholds for clinically important changes in the clinical outcomes of PR and with the national picture. For *all* programmes, this should prompt the development of a local plan aimed at improving the quality of the service provided.**

b. **PR programmes locally should review their processes to ensure *all* patients attending a discharge assessment for PR are provided with a written, individualised plan for ongoing exercise.**
c. **PR programmes locally should review their processes to ensure all outcome assessments are performed to acceptable technical standards (4).**

The data presented in this audit report provide insight into the experiences of patients with COPD who attend PR services across England and Wales. The data demonstrate that, in line with the published literature on the effectiveness of PR, patients are likely to achieve clinically important improvement in exercise performance and health status if they take up and complete PR. This is the first time patient outcomes from treatment provided in routine clinical practice across the country have been audited, confirming that the findings of clinical trials of PR are deliverable in real-life clinical settings. Programme participation and case acquisition rates were high – a testament to the widespread culture of objective outcome measurement in PR practice in the UK and the commitment of PR programmes to using data to inform and improve services.

Inevitably, the scale and frequency of individual patient benefit varies substantially between patients and between programmes. As well as providing a national picture of the overall effectiveness of PR services, the data offer a unique opportunity for individual programmes to compare outcomes locally with the national picture and with accepted clinically important changes in validated outcome measures such as exercise capacity and health status. Where these outcomes are lower than expected, we urge local programmes to review and revise their processes as part of an action plan aimed at improving the quality of service provided and thereby the benefits accrued by patients. However, we believe *all* programmes should use the opportunity provided by this audit to develop and improve the quality and outcome of their service.

The audit also identifies areas where the care that patients experience could be improved and highlights the need to widen access to treatment so that a greater number of patients receive these benefits. Waiting times for assessment for PR show considerable variation, with significant numbers (37%) waiting longer than the 3 months mandated in BTS Quality Standard 1 (QS1). Unacceptably long waits for treatment are more prevalent in cohort programmes (perhaps unsurprisingly because patients have to wait until the start of the next scheduled programme to commence treatment) but the problem is not restricted to programmes of this design. We urge commissioners and providers to take action to shorten waiting times so that *all* patients receive an offer to commence PR within 3 months of receipt of referral. QS1 identifies the longest a patient should be expected to wait for treatment, but we believe PR services should take steps to reduce waiting times further where possible.

Data from the 2015 audit of resources and organisation of PR (1) suggest that there is significant under-referral of eligible patients with COPD for PR. This applies both to PR offered routinely to patients with stable disease and to patients after discharge from hospital following acute exacerbations of COPD. The available evidence suggests that successful completion of PR in both these settings reduces subsequent healthcare utilisation (such as days spent in hospital). In line with the recommendations of the resources and organisation of PR audit report, we hope and expect that action will be taken to increase referral rates of eligible patients. It will therefore also be crucial that PR services are sufficiently resourced to meet this demand while ensuring individual waits for treatment are acceptable and in line with quality standards.

The clinical audit confirms reports in the scientific literature that many patients who are referred for PR either do not enrol or do not complete treatment (40% of those assessed). We recognise this is a complex and multifactorial problem but we believe concerted action is needed by both referring and provider organisations to provide greater awareness of the benefits of completing PR to both referring medical practitioners (in hospitals and general practice) and to patients. Discussions about referral for PR should take a high priority in consultations both in primary and secondary care, and patients should be encouraged to ask about referral for PR when they see their doctor. Attending PR is demanding on patients' time and

effort, and barriers to successful completion of treatment should be proactively anticipated and overcome where possible. For example, we encourage providers to take steps to make PR services more accessible to patients by ensuring that transport for treatment is available to patients who find travel difficult and that sufficient flexibility in scheduling of sessions is provided for patients who have other work or family commitments.

In line with the 2015 report of the resources and organisation of PR services (1), the data in this report identify aspects of treatment provision that could be improved. For example, outcome assessment of exercise performance was not always performed to accepted technical standards and ongoing exercise plans were not provided to all patients when they were discharged from the service. This latter measure is particularly important if the benefits of PR are to be sustained beyond the end of the course. We have made recommendations in this report that these deficiencies are actively addressed.

The provision of PR is widely mandated in health policy documents and initiatives for people with COPD including National Institute for Health and Care Excellence (NICE) quality standards (5) and clinical commissioning group (CCG) outcomes indicator sets for both England and Wales (2015/16) (6,7). The findings of the audit confirm the broadly high standards of care and commitment of healthcare staff working in PR services across England and Wales. We hope the findings of this and other PR audit reports will drive broader access to PR, service improvement and enhanced patient outcomes for patients with COPD. The enthusiasm with which PR programmes have participated in the audit suggests that the UK PR community is well placed to achieve these objectives.

BTS quality standards for Pulmonary Rehabilitation in adults (2014)

Summary of quality statements

No.	Quality Statement
1	Referral for pulmonary rehabilitation: a. People with COPD and self reported exercise limitation (MRC dyspnoea 3-5) are offered pulmonary rehabilitation. b. If accepted, people referred for pulmonary rehabilitation are enrolled to commence within 3 months of receipt of referral.
2	Pulmonary rehabilitation programmes accept and enrol patients with functional limitation due to other chronic respiratory diseases (for example bronchiectasis, ILD and asthma) or COPD MRC dyspnoea 2 if referred.
3	Referral for pulmonary rehabilitation after hospitalisation for acute exacerbations of COPD: a. People admitted to hospital with acute exacerbations of COPD (AECOPD) are referred for pulmonary rehabilitation at discharge. b. People referred for pulmonary rehabilitation following admission with AECOPD are enrolled within one month of leaving hospital.
4	Pulmonary rehabilitation programmes are of at least 6 weeks duration and include a minimum of twice-weekly supervised sessions.
5	Pulmonary rehabilitation programmes include supervised, individually tailored and prescribed, progressive exercise training including both aerobic and resistance training.
6	Pulmonary rehabilitation programmes include a defined, structured education programme.
7	People completing pulmonary rehabilitation are provided with an individualised structured, written plan for ongoing exercise maintenance.
8	People attending pulmonary rehabilitation have the outcome of treatment assessed using as a minimum, measures of exercise capacity, dyspnoea and health status.
9	Pulmonary rehabilitation programmes conduct an annual audit of individual outcomes and progress.
10	Pulmonary rehabilitation programmes produce an agreed standard operating procedure.

British Thoracic Society. *Quality standards for pulmonary rehabilitation in adults*. London: BTS, 2014. www.brit-thoracic.org.uk/guidelines-and-quality-standards/pulmonary-rehabilitation-quality-standards/

Key findings

In total, 7413 individual patient audit records from 210 PR programmes were provided during the 3-month audit enrolment period. From data provided by the audit of resources and organisation of PR services, we estimate that 73% of eligible patients who were assessed for PR within the enrolment period were audited. For this audit, each patient was asked to provide written consent for his or her data to be included and uploaded. We estimate that of those approached, 87% of patients provided such consent.

The audit findings are measured against the BTS quality standards for PR. Not all quality standards were assessed in the clinical audit, and the reader is directed to the audit of the resources and organisation of Pulmonary Rehabilitation services in England and Wales (2015) for assessment against these other standards (1).

QS1: Referral for pulmonary rehabilitation:

a. **People with COPD and self reported exercise limitation (MRC dyspnoea 3-5) (see Appendix G) are offered pulmonary rehabilitation.**

b. **If accepted, people referred for pulmonary rehabilitation are enrolled to commence within 3 months of receipt of referral.**

- Some patients are waiting too long to start PR, with 37% waiting longer than the minimum of 3 months (90 days) set out in QS1.
- There is significant variation between programmes in waiting times to commence PR. The average waiting time for cohort programmes is 1 month longer than for rolling programmes (see Appendix H: Glossary of terms for definitions).
- Patients with a full range of self-reported exercise limitation were assessed and enrolled to PR. However, the number of patients with the most severe disability (MRC 5) was low (9%).

QS2: Pulmonary rehabilitation programmes accept and enrol patients with functional limitation due to other chronic respiratory diseases (for example bronchiectasis, ILD and asthma) or COPD MRC dyspnoea 2 if referred.

- Fifteen per cent of cases enrolled were assessed as MRC grade 2.
- Audit data about the enrolment of patients with other respiratory diseases were provided in the 2015 report of the audit of resources and organisation of PR (1).

QS3: Referral for pulmonary rehabilitation after hospitalisation for acute exacerbations of COPD:

a. **People admitted to hospital with acute exacerbations of COPD (AECOPD) are referred for pulmonary rehabilitation at discharge.**

b. **People referred for pulmonary rehabilitation following admission with AECOPD are enrolled within one month of leaving hospital.**

- The audit indicates that few patients (2%) are referred as part of a defined post-exacerbation PR pathway.
- Patients in this setting may be referred through routine referral pathways and we were unable to assess whether QS3 (that enrolment occurred within 1 month) was met.

QS4: Pulmonary rehabilitation programmes are of at least 6 weeks duration and include a minimum of twice-weekly supervised sessions.

- The majority (83%) of patients were scheduled to attend a minimum of 12 sessions in line with QS4.

QS5: Pulmonary rehabilitation programmes include supervised, individually tailored and prescribed, progressive exercise training including both aerobic and resistance training.

- The provision of walking (95%) and cycling (70%) aerobic training to patients was widespread.
- Similarly, provision of resistance training (89%) was also frequent.

QS6: Pulmonary rehabilitation programmes include a defined, structured education programme.

- Audit data about the provision of structured education are provided in the 2015 report of the audit of resources and organisation of PR (1).

QS7: People completing pulmonary rehabilitation are provided with an individualised structured, written plan for ongoing exercise maintenance.

- In total, 26% of patients attending a discharge assessment were not provided with a written ongoing, individualised exercise plan.

QS8: People attending pulmonary rehabilitation have the outcome of treatment assessed using as a minimum, measures of exercise capacity, dyspnoea and health status.

- The majority (over 90%) of patients completing PR have a discharge assessment where the outcome of treatment is recorded.
- Despite the widespread provision of resistance training, strength is measured at assessment in only 15% of patients.
- Practice tests for measures of exercise capacity were only performed in 22% of cases, suggesting that outcome assessments are not always performed to acceptable technical standards.

QS9: Pulmonary rehabilitation programmes conduct an annual audit of individual outcomes and process.

- Significant numbers of patients attending an assessment for PR do not complete treatment (40%). Of those who enrol to PR following this assessment, 71% complete treatment (Fig 1).

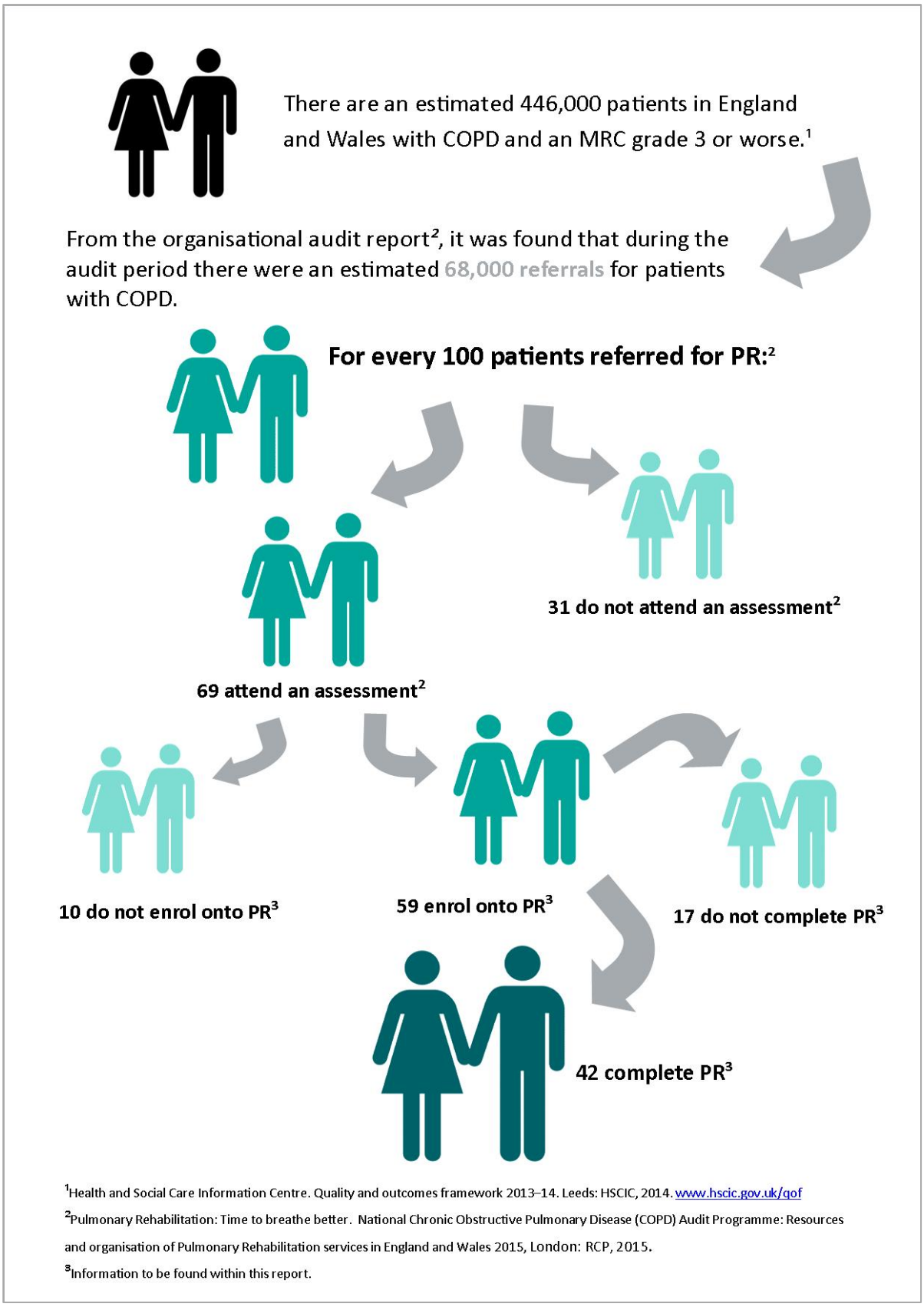


Fig 1: Patient referral and drop-out rates from PR

- For those who complete treatment, clinically and statistically significant increases in walking performance were seen (median change in incremental shuttle walk test (ISWT) 50 metres; endurance shuttle walk test (ESWT) 196 seconds; 6-minute walk test (6MWT) 50 metres).

- Depending on the exercise measure used, 57% achieved an improvement greater than the accepted Minimal Clinically Important Difference (MCID) for the ISWT and 70% achieved an improvement greater than the accepted MCID for the 6MWT (Fig 2).
- Improvements were also seen in measures of health status that overall were of clinical and statistical significance (see Section 4 for detailed data and Fig 2).

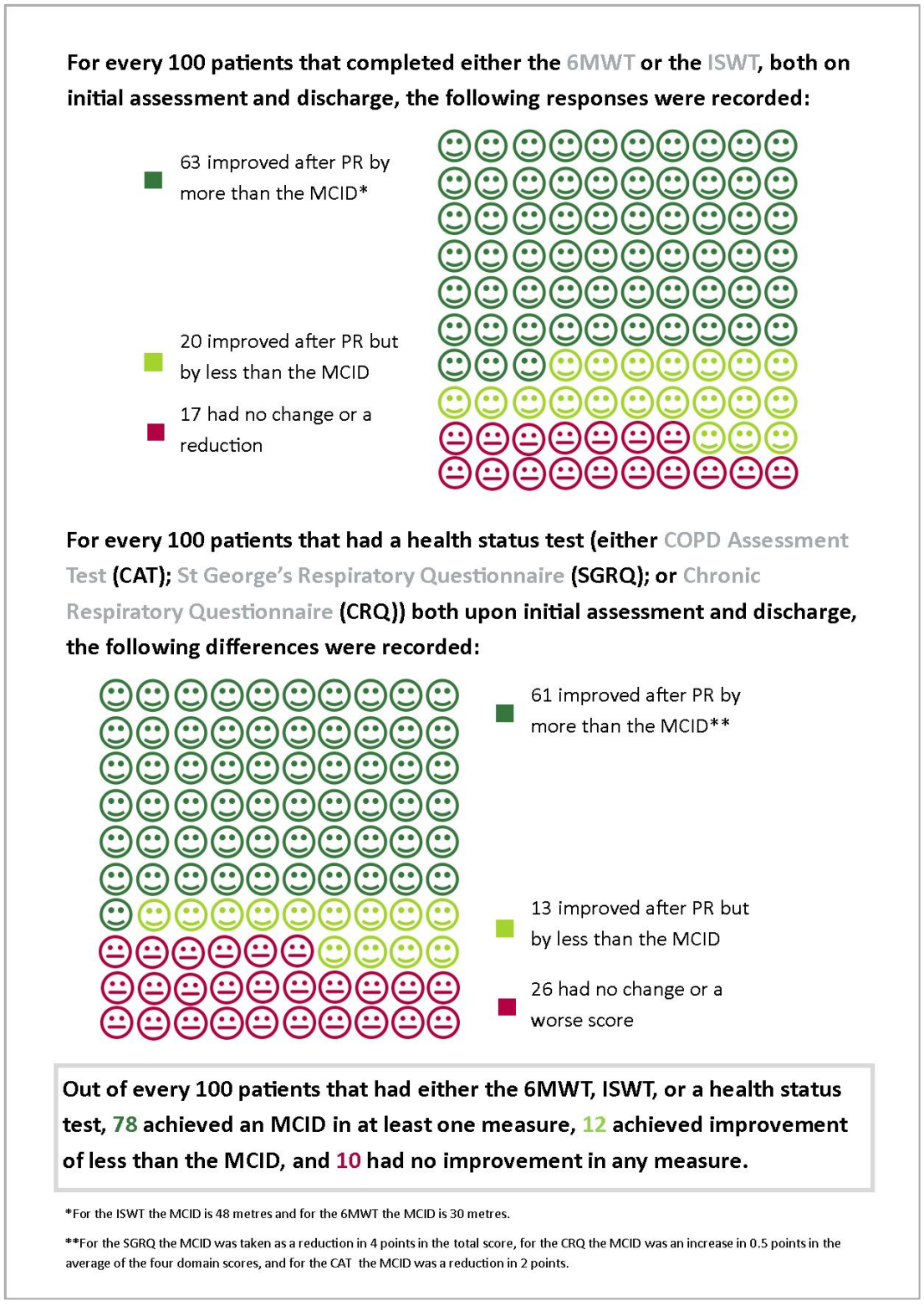


Fig 2: Changes in exercise measures/health status

- Improvement in some outcome measures of exercise performance and health status were lower for patients enrolled to cohort programmes than rolling programmes but the magnitude of these differences was small and of uncertain significance.
- The recording of key clinical information at assessment for PR was frequently absent (particularly spirometry (recorded in 62% of cases) and body mass index (BMI) (recorded in 66% of cases)).
- Other key clinical information at assessment was not recorded in some cases (MRC grade 8%; oxygen use 2%; smoking status 2%; and haemoglobin saturation at rest 6%).

QS10: Pulmonary rehabilitation programmes produce an agreed standard operating procedure.

- Audit data about the production of a standard operating procedure (SOP) are provided in the 2015 report of the audit of resources and organisation of PR (1).

Recommendations (and future auditable standards)

These recommendations are relevant to both commissioners and providers of PR services across England and Wales, and to health professionals providing care for people with COPD who refer patients to PR. They are also relevant to patients and patient support groups in voluntary organisations. They are made in parallel with those in the report on the audit of resources and organisation of PR services 2015 (1). We believe action is needed to improve both access to PR and the quality of the service provided as follows:

1. Timely assessment and enrolment

- **Providers and commissioners should ensure that robust referral pathways for PR are in place and that PR programmes have sufficient capacity to assess and enrol *all* patients within 3 months of receipt of referral.**
- **Specific referral pathways should be developed to ensure *all* patients discharged from hospital after an acute exacerbation of COPD are offered referral for PR. The offer of referral in this setting and enrolment of those that take up this offer within 1 month should be a future auditable standard.**
- **Providers offering cohort programmes should pay particular attention to how long patients referred to their service are waiting to enrol, as this was on average 1 month longer for programmes of this design.**
- **Providers should ensure PR programmes have the facilities and staff to treat patients with more severe self-reported exercise limitation (MRC grade 5).**

Although the majority of patients (63%) are enrolled to PR within 3 months (QS1), too many patients are waiting longer than this maximum time and there is substantial variation in performance of PR services in meeting this metric. For this standard, it is not sufficient for programmes simply to measure performance against the national average. Commissioners and providers should take immediate steps to examine their referral processes and ensure *all* patients meet this standard. The quality standard sets out the longest time a patient should be expected to wait for enrolment and we urge all organisations to make efforts to reduce waiting times to the minimum possible. Waiting times were on average 1 month longer for cohort programmes compared with rolling programmes (see Appendix H Glossary of terms for a definition). The nature of cohort design builds in waiting for patients as they cannot start treatment until the start of the next programme. Cohort design may be the only feasible way of providing access to treatment for patients in localities where referral rates are low. However, the data from this audit suggest particular attention is needed by cohort programmes to ensure that this does not result in excessive waits for treatment. As outlined in the audit of resources and organisation of PR (1), we estimate that there is significant under-referral of eligible patients for PR. We hope and expect that the COPD Audit Programme will drive an increase in referral rates, which will require a concomitant increase in PR service capacity. In this context, commissioners and providers will need to ensure services continue to assess and treat patients without excessive waits for treatment and in line with the quality standard.

It is unclear from this audit how many patients are being referred to PR following discharge from hospital where the wait for treatment should not be longer than 1 month (QS3). Data from the audit of the resources and organisation of PR (1) indicate that not all programmes accept referrals following hospitalisation for COPD and that those that do are frequently unable to enrol patients within this time frame. Moreover, data from the secondary care component of the National COPD Audit Programme (8) indicate that onward referral to PR following discharge was inadequate. We recommend that specific referral pathways for PR following discharge from hospital are developed locally, so this can be a future auditable standard.

The data suggest that overall numbers of patients being assessed for PR in the most disabled category (MRC 5) are low (indeed lower than the numbers for those with MRC 2 breathlessness for whom referral is

discretionary). This population has the greatest burden of disease and the greatest rehabilitation need. We cannot determine directly from the audit whether too many patients in the MRC 5 category are not being referred but we recommend that PR services and referring organisations examine their practices to ensure local programmes are equipped to manage these more severely ill patients. Some community-based programmes may find managing more complex and severe patients difficult (because of a lack of onsite medical facilities) and we recommend that if this is the case, they form partnerships with other services (for example hospital programmes) to ensure equity of PR provision.

2. Quality of care provided

- **PR programmes should examine their processes and ensure they are performing exercise outcome measures to accepted standards, including the performance of practice exercise tests where this is recommended.**
- **PR programmes should examine their processes to ensure all patients discharged from PR receive a written, individualised, ongoing exercise plan.**
- **PR programmes should ensure they record key clinical information at assessment.**

The audit is notable for showing that the majority of PR services are offering programmes of a content, duration and frequency that are in line with the evidence-based guidelines and quality standards. However, there are some areas of programme provision that require improvement. Objective measurement of the clinical outcome of treatment was widespread but the data suggest improvement is needed in the measurement of exercise outcomes; for example, the conduct of practice exercise tests at assessment. These are required to ensure an accurate and valid measure is recorded and to support the accurate prescription of exercise training. Evidence-based guidance on the standardisation and conduct of these assessments is available, and we recommend PR programmes examine their processes and ensure they conduct outcome measures in line with this guidance (4). We suggest that detail on local processes used to assess exercise performance is included in local SOPs, which should be established by each programme in line with QS10. We note the high prevalence of the provision of resistance training during PR but also note that the measurement of limb muscle strength is infrequently performed. We believe accurate prescription of exercise training requires a measurement of baseline performance and we recommend PR programmes take steps to incorporate measurements of limb muscle strength both to assist with resistance training prescription and to measure the outcome of therapy. These recommendations are in line with the findings of the 2015 audit of the resources and organisation of PR (1), which identified frequent deficiencies in the rigour of exercise prescription.

Sustained improvement in symptoms, exercise capacity and health status beyond the end of PR requires the maintenance of exercise and physical activity by the patient. This is recognised in QS7, which requires *all* patients who are discharged from PR to be provided with an individualised, written, ongoing exercise plan. The audit indicates that this is not provided in 26% of patients who attend a discharge assessment. We recommend that PR programmes examine their processes to ensure this is provided universally and that the format and provision of this plan is documented in their local SOP.

The audit indicates that important clinical information (such as spirometry, BMI, oxygen usage and MRC dyspnoea score) is often not recorded at assessment for PR. We believe the recording of such information is crucial for a PR assessment of sufficient breadth to correctly record the primary respiratory diagnosis and judge the suitability and safety of PR. It is not necessarily a requirement for programmes to make these measurements (for example spirometry) themselves but, if they are not performed, information should be requested from referrers and recorded. We recommend that programmes locally take steps to ensure that local SOPs and referral paperwork are revised to ensure such information is captured. The development of agreed clinical assessment metrics should be part of local and national quality improvement initiatives so that this can become a future auditable standard.

3. Improving clinical outcomes

- **Action is required to improve the uptake and completion of treatment for patients who are referred and assessed for PR. This is the responsibility of both referring organisations and providers.**
    1. **Referrers and patients should be provided with up-to-date and clear written information about the benefits of attending and completing PR. The offer of referral for PR to *all* eligible patients (as set out in the quality standards) should be supported by provision of clear guidance on eligibility and clear, easily accessible referral pathways.**
    2. **Programmes should ensure programme provision is sufficiently flexible to encourage patients referred for PR to attend and complete treatment (for example, flexibility about times and days of PR sessions and availability of transport for patients who find travel difficult).**
- **Programmes should compare outcomes (including completion rates, changes in exercise capacity and health status) with the national picture and with accepted MCIDs where these exist. All programmes (particularly where these outcomes are lower than expected) should review and revise their processes of care to identify where these can be improved.**

The data indicate that many patients who are assessed for PR do not enrol or complete treatment (40% in total). The audit of the resources and organisation of PR indicates that in addition many eligible patients with COPD are not being referred for PR. It is clear from these findings that many patients with COPD are not receiving the benefits of a therapy that has been demonstrated in clinical trials (and in this audit) to deliver substantial improvements in symptoms and health status. Suboptimal uptake and adherence to treatment is a long-standing problem for PR services but it is not unique to this area of healthcare. The reasons are myriad (both patient and service factors) and not all solvable by changes in the healthcare system. However, we believe improvements can be made through changes to the culture and practice among referrers and programmes.

A crucial first step is ensuring that referrers (both in primary and secondary care) are aware of the benefits of PR for their patients and give referral for PR a high priority when discussing therapeutic options with patients. In an increasingly time-pressured healthcare system, referral needs to be easy with a minimum of paperwork or bureaucracy. Written information about the content, organisation and location of local programmes should be available to referrers and patients in primary and secondary care, and emphasis placed on the initial assessment by the expert rehabilitation practitioner who will provide advice on the suitability of PR for the individual patient. We note that the audit suggests that completion of PR was not lower in those patients who had previously not completed treatment and this should not be a barrier to further referral, if appropriate.

Completing PR is demanding on patients' time and effort. People with COPD need to be made aware of the benefits they are likely to accrue from making this effort; but treatment also needs to be sufficiently accessible and flexible to reduce the burden of attendance. For example, transport should be available to patients who struggle to travel to programmes, and flexibility on days of treatment should be as broad as possible so as to make attendance feasible for patients who have other work, social and family commitments.

The national data confirm that patients who complete PR are likely to derive clinically important improvements in exercise performance and health status. Not all patients respond to treatment, and inevitably there is variation between programmes on the magnitude and consistency of these benefits. By providing comparative data on a robust statistical basis (see funnel plots below, for example on p28), the audit provides the opportunity for all programmes to examine how their local outcomes measure against the national picture and accepted thresholds for clinically meaningful changes in performance and health status. All programmes should be using their local data to examine and improve their processes of care, but this is particularly important for programmes where outcomes fall short of these thresholds or are lower than the national average.

4. Quality improvement

Although the audit provides encouraging data about the quality and effectiveness of PR services across England and Wales, we urge the healthcare community to use the data to develop and improve services. All programmes should review the care they provide and produce an action plan outlining how they plan to bring about this improvement. As highlighted above, such plans will require prompt and proactive collaboration with commissioners and local provider organisations. We believe a national focus for quality improvement is also needed, which will be offered by the newly established BTS Pulmonary Rehabilitation Quality Improvement Advisory Group (PRQIAG). This group will also be able to facilitate the dissemination of examples of good practice and encourage learning from programmes where outcomes are particularly good. The complex, multicomponent nature of PR means that attention to maintaining the quality of the intervention is required, particularly in times of economic constraint. The aforementioned BTS PRQIAG, in collaboration with the RCP, is developing and piloting tools to support future accreditation of PR programmes. Ongoing audit of PR organisation and clinical outcomes (preferably using continuous data acquisition) will be a key part of this process.

The audit indicates a clear need to raise awareness of the benefits of PR among referrers and patients. This will require the development of learning programmes and educational/self-assessment material for healthcare professionals who look after people with COPD. Materials already exist along these lines from bodies such as IMProving and Integrating RESpiratory Services in the NHS (IMPRESS) (9), which could be extended and disseminated. PR should take a higher priority when discussions about therapeutic options are undertaken with patients both in general practice and in hospitals, and we would like to see the rates of PR referral incentivised in CCG and NHS England contracts. Undertaking PR is demanding on patients' time and effort, and may be daunting for people who may have experienced difficulty and discomfort associated with physical activity for many years. The demonstration in this audit of the clinical benefits that are likely to accrue from successful completion of PR needs wide dissemination to patients with COPD. Patient support groups and the voluntary sector have a crucial role in highlighting these benefits, encouraging patients to ask about referral when they meet their healthcare team and completing treatment when they attend PR.

1. Introduction

The National COPD Audit Programme, commissioned by the Healthcare Quality Improvement Partnership (HQIP) on behalf of the NHS in England and Wales as part of the National Clinical Audit Programme (NCA), sets out an ambitious programme of work that aims to drive improvements in the quality of care and services provided for COPD patients in England and Wales. For the first time in respiratory audit, the programme is looking at COPD care across the patient pathway, both in and out of hospital, bringing together key elements from the primary, secondary and community care sectors.

The programme is led by the Royal College of Physicians (RCP), working in partnership with the British Thoracic Society (BTS), the British Lung Foundation (BLF), the Primary Care Respiratory Society UK (PCRS-UK), the Royal College of General Practitioners (RCGP) and the Health and Social Care Information Centre (HSCIC).

There are four programme workstreams:

1. Primary care audit: collection of audit data from general practice patient record systems in Wales – delivered by the RCP and the HSCIC, working with the PCRS-UK and the RCGP.
2. Secondary care audit: audits of patients admitted to hospital with COPD exacerbation, and outcomes at 30 and 90 days, plus organisational audits of the resourcing and organisation of COPD services in acute units admitting patients with COPD exacerbation – delivered by the BTS, working with the RCP.
3. Pulmonary rehabilitation: audits of patients attending PR (including outcomes at 180 days), plus organisational audits of the resourcing and organisation of PR services for COPD patients – delivered by the BTS, working with the RCP.
4. Patient Reported Experience Measures (PREMs): 1-year development work exploring the potential/feasibility for PREMs to be incorporated into the programme in the future – delivered by the British Lung Foundation (BLF) working with Picker Institute Europe (10).

Reported here are data from the 2015 clinical audit of PR services in England and Wales.

Background

This is the first national audit of PR services in England and Wales. Prior to this audit, there was no comprehensive list of where PR was being provided, and the BTS project team was therefore tasked with mapping PR services in England and Wales.

For the purposes of the mapping exercise (and the audit), all services describing themselves as 'pulmonary rehabilitation' were included, and a total of 230 services were identified. Details of this mapping exercise are given in Appendix A. We believe this to be a comprehensive picture of services in England and Wales but we cannot rule out the possibility that PR services exist that were not identified and contacted, and therefore did not participate in the audit. Participation in the clinical audit for those programmes who were assessing patients within the audit period was high (195/211 English programmes, 15/19 Welsh programmes).

For the purposes of the audit, we have used the term '*PR programme*' to mean a PR service with a shared pool of staff and central administration where referrals are received (a PR programme may operate at several different sites). The organisations delivering these PR programmes are termed a '*provider*' – these range from NHS trusts and health boards to community interest companies (CICs) and other private providers. Many providers deliver more than one PR programme.

Clinical audit case definition – inclusion criteria

Programmes were instructed to audit all patients with a primary respiratory diagnosis of COPD who attended an initial assessment for PR (or where there was no separate initial assessment, attended a first PR appointment) between 12 January and 10 April 2015. Inclusion in the audit was subject to obtaining patient consent.

2. Results

Presentation of results

This report gives national results for all programmes participating in this audit.

Each section is preceded by a short summary of key messages and of areas that need improvement. The executive summary, earlier in this report, provides an overview of all the key messages and recommendations, particularly in relation to published standards of care for COPD patients.

For the main audit analyses there were a small number of exclusions: triplicate entries for the same patient (only a single replication was needed for the reliability analyses) and records with assessment outside the audit period. Thus one record per patient was included in the main analyses.

There was some data cleansing required to account for unnecessary completion of nested questions and also to account for illogical data. There was a sizeable amount of data cleaning required of 'other' free-text entries, as it was apparent that some auditors gave free text that should have been recorded as one of the listed options. Occasionally there were missing data, resulting in data cells being blank.

In tables and text, please note that when categories are combined to give a combined percentage, it is the numbers that are added and not the percentages.

Visual methods are used to convey programme variation in some results. Some of the graphics are what are known as 'funnel plots', which are diagrams that show programme results plotted against programme sample size, in comparison to a line that indicates the overall national result and dotted lines that indicate limits of control. Control limits are often shaped like a 'funnel' and serve as boundaries, and any results falling above the upper boundary or below the lower boundary are considered to be outliers. The chance of results being outside these limits due to chance alone is very small (5% for the inner and 0.2% for the outer limits), so when programme results do fall outside, these are inconsistent with the overall national result in relation to their sample size. This implies that something else is happening, non-random in nature, probably systematic organisational differences rather than randomness of scatter.

Results are organised according to the four broad audit questions that this audit sought to address:

- audit sampling / patient referral
- patient characteristics
- treatment provided
- clinical outcome.

Individual table numbers refer to the numbering of the audit questions.

Reliability analysis

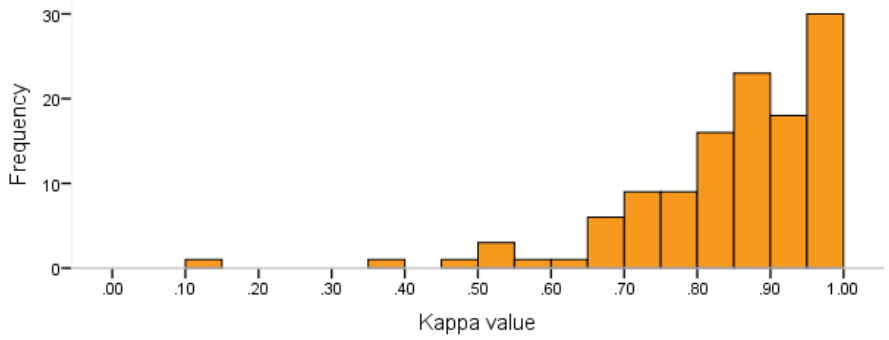
Reliability (agreement between auditors) is not the same as validity (accuracy of measure). However, establishing good agreement between auditors is an important part of the process of validation, as valid data by definition will have to be reliable. Units were asked to re-audit their first five cases using a different auditor: 1056 cases from 199 programmes.

For categorical data, the kappa statistic was used to measure agreement. Kappa values of 0.41 to 0.60 are said to indicate moderate agreement, values of 0.61–0.80 indicate good agreement while values of over 0.80 are very good. In practice, any value of kappa much below 0.50 will indicate inadequate agreement. Often, agreement is an amalgamation of separate components. One component is the agreement between auditors about whether or not they find the required information, and another is agreement in data when both auditors have found relevant information. Where possible, this distinction is made.

The kappa statistic does not measure the nature of any disagreement between auditors and for this we need to inspect the raw data tables. Any future attempt to improve on the reliability of any audit item (ie when planning a repeat audit) will bear most fruit if it focuses on the more frequent discrepancies in judgement.

For numerical data, the percentage with exact auditor agreement is reported, as is the quantification of the extent of disagreement between auditors.

To summarise: levels of agreement were found to be generally 'very good', with 94% of kappa values over 0.60, 89% over 0.70 and 75% over 0.80. Agreement about change in exercise performance and health status outcome scores was notably strong. Of 126 kappa values computed, their median (interquartile range – IQR) was 0.88 (0.79-0.95), distribution as below:



Data items with an overall kappa value below 0.60 were few and largely in regard to whether auditors could find the relevant information:

- 3.4 modes of exercise performed in programme: neuromuscular electrical stimulation (NMES) (kappa=0.14)
- 2.7 auditor agreement in knowing whether transport was arranged for the patient to attend (kappa=0.37)
- 3.5 auditor agreement in knowing whether the patient received supplemental O_2 during exercise (kappa=0.47)
- 2.10 auditor agreement in knowing if the patient was breathing supplemental O_2 when saturation recorded (kappa=0.51)
- 3.4 modes of exercise performed in programme: upper limb (aerobic or resistance) (kappa=0.52)
- 4.1 auditor agreement in knowing whether a discharge assessment was arranged and attended (kappa=0.53)
- 1.5 auditor agreement in whether ethnicity was known (kappa=0.56).

See Appendix B for further detail on individual data items. Individual variable tables of agreement are available at www.rcplondon.ac.uk/COPD.

Results 2015

1. Audit sampling / patient referral

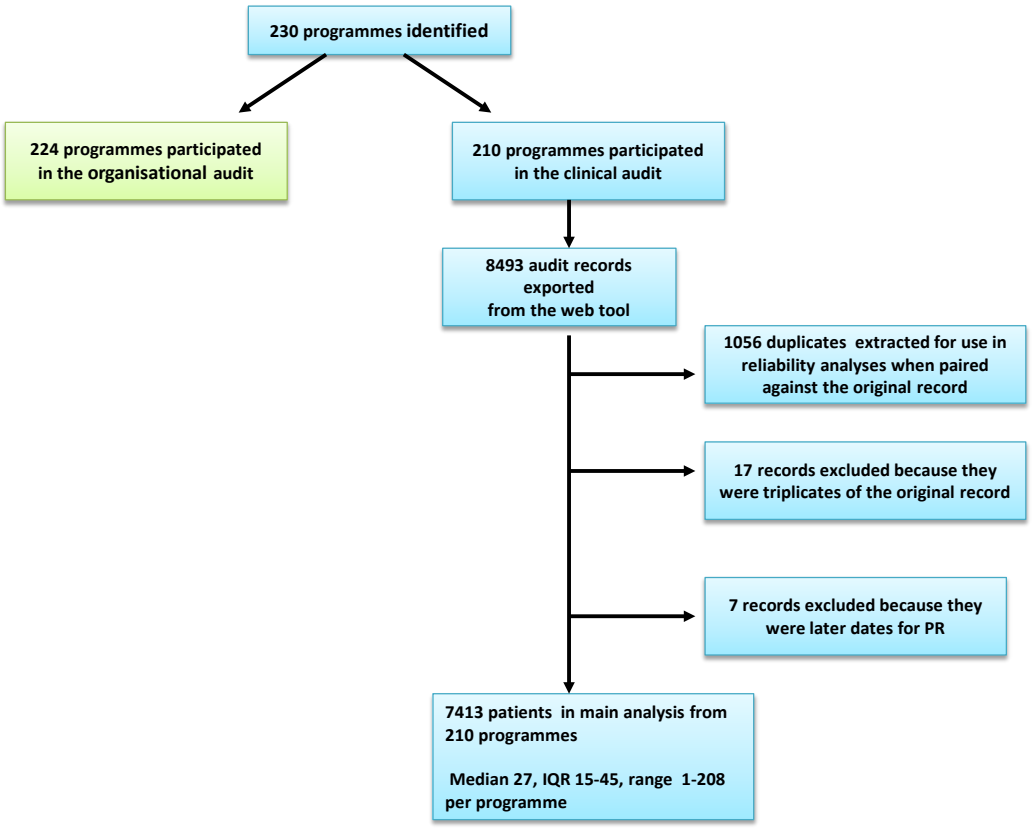
KEY FINDINGS

- In total, 7413 individual patient audit records from 210 PR programmes were provided during the 3-month audit enrolment period and are included in the main analysis.
- Waiting times for enrolment to PR (from receipt of referral) are highly variable, with a significant number (37%) of patients having to wait longer than 3 months (90 days) **(QS1)**.
- Waiting times for cohort programmes were longer than for rolling programmes, with a greater proportion of patients waiting longer than 90 days. The average wait for enrolment to a cohort programme was 1 month longer than for a rolling programme **(QS1)**.
- Fifty-one per cent of patients were referred from general practice.
- Few patients were clearly identified as being referred as part of a post-discharge early PR pathway (2%) **(QS3)**.
- Twenty-two per cent of patients were known to have attended PR previously **(QS1)**.
- From the clinical audit dataset, 85% of patients who attend an assessment are enrolled to the programme.
- From caseload data provided as part of the audit of resources and organisation of PR (1), we estimate that 73% of eligible patients were audited and that, of patients approached to provide consent for their data to be used in the audit, 87% provided such consent.

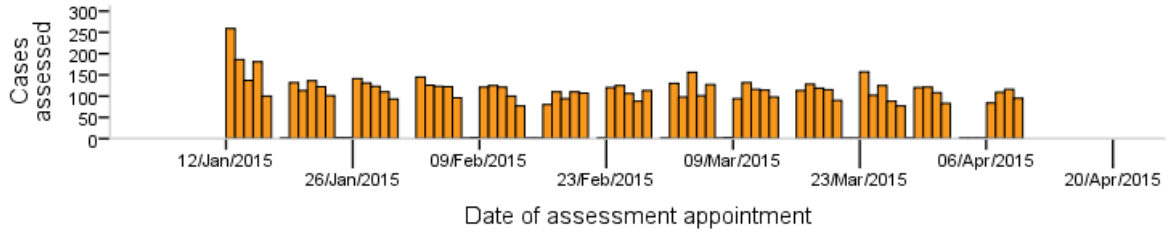
AREAS IDENTIFIED AS NEEDING IMPROVEMENT

- Improvement is needed in waiting times for enrolment to PR, as a substantial number of patients are having to wait longer than 3 months to start treatment.
- All programmes, regardless of whether the percentage of enrolments that meet the quality standard is in line with the national picture (see funnel plots below – p28), should examine their processes with the aim of ensuring 100% of patients are enrolled within 3 months.
- Cohort programmes particularly should address how they manage waiting times.
- There should be clear identification of patients who have been referred for PR following discharge from hospital, so that performance against **QS3** (that this group should be enrolled within 1 month) can be audited.

Participation



Patients included in the audit had initial assessments between 12 January 2015 and 10 April 2015. The numbers audited per day are shown in the daily graphic below. The larger numbers in the first week probably reflects the increased workload following the Christmas and New Year break, and the fairly uniform numbers thereafter is encouraging because it suggests no drop off due to auditor fatigue.

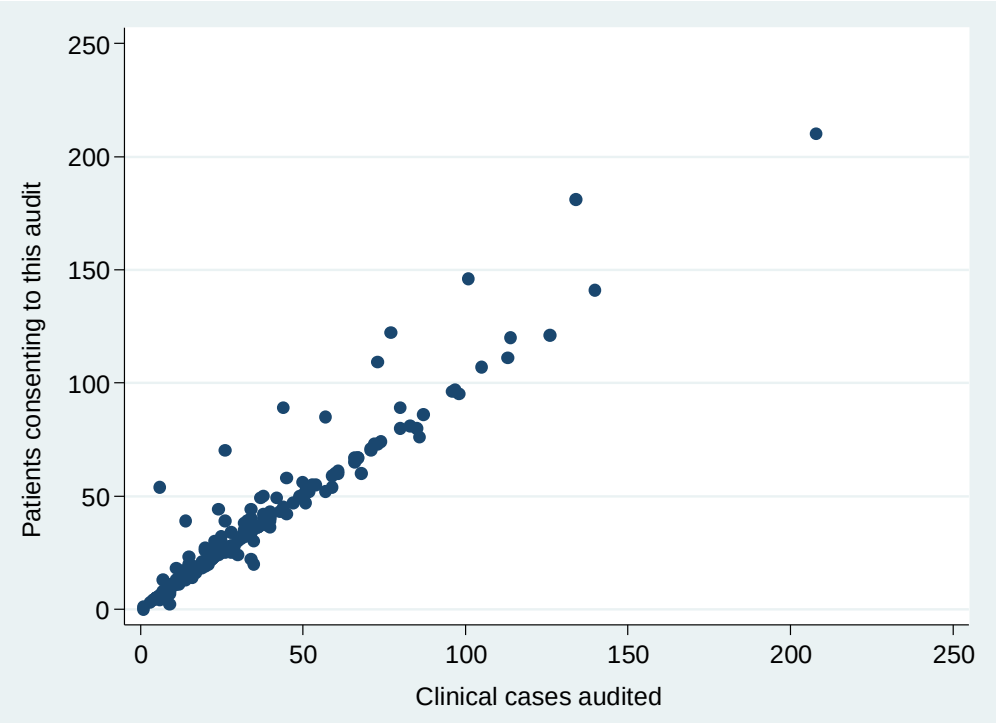


The main results derive from 7413 audit records from 210 PR programmes.

Estimates of response

In total, 195 programmes submitted data to both the organisational and clinical audits that enable the response to be estimated. From the organisational audit of these programmes, we estimate that 9402 patients were eligible for the clinical audit, that 8444 had been approached for consent (90%) and that 7320 of those who were approached had given their consent (87%). These programmes submitted audit data on 6825 patients, which represents 73% of our estimate of eligible patients and 93% of those providing consent.

Programme variation in the number of patients audited (X axis) compared with the number of patients consented (Y axis) is shown below, with each dot representing one programme.



Most programmes audited close to all the patients they obtained consent from – this is indicated by the near straight line at 45° running diagonally across the graph. There were a few programmes however that did not quite manage this, as shown by those dots (programmes) above and to the left of the diagonal line. At worst, this appears to be 10 programmes, ie about 5% of all programmes, which indicates that 95% of programmes were successful in auditing nearly all the patients they obtained consent from.

QS1	National audit (7413)		
	Median	IQR	N
Days from referral date to assessment	56	30-107	7413
Days from receipt of referral to assessment	50	26-100	7020
Days from referral date to receipt of referral	1	0-5	7020

	National audit (n=7413)	
1.9 Where was the patient referred from? (more than one response option possible)		
Hospital consultant (or member of clinical team)	21%	1521
Hospital specialist COPD team	11%	841
Specified post-AECOPD early PR pathway	2%	174
Community services	12%	903
GP/practice team	51%	3810
Other*	3%	219

*Other included: internal referral from PR team (26 cases); referral from other specialities (14 cases); respiratory or other allied health professional (AHP) – setting unknown (86 cases); self referral (41 cases); oxygen services (11 cases); not known (41 cases).

	National audit (n=7413)	
1.10 Was the patient enrolled on your PR programme?		
Yes	85%	6319

	National audit (n=6319)	
1.13 If enrolled, what type of programme was the patient enrolled on?		
Rolling	53%	3357
Cohort	44%	2766
Other	3%	196

QS1	National audit (6319)		
	Median	IQR	N
Days from date of referral to enrolment	76	44-128	6319
Days from receipt of referral to enrolment (QS1)	69	40-120	5896
Days from assessment to enrolment	7	2-21	6319

For rolling programmes, the median (IQR) days from receipt of referral to enrolment was 58 (36-98) days, n=3172, as compared with 89 (51-147) days, n=2619, for cohort programmes: p<0.001 Mann–Whitney test.

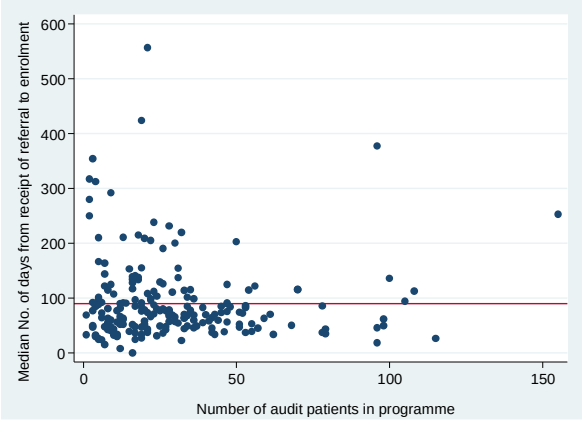
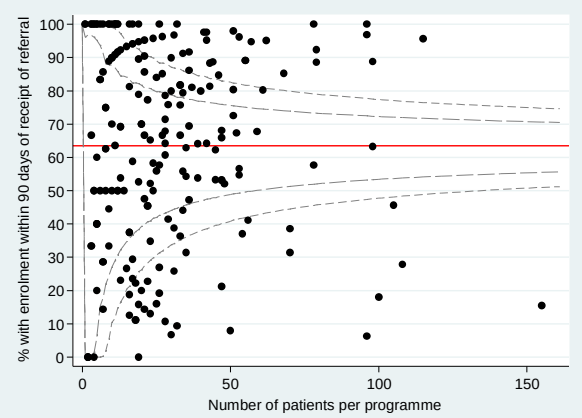
QS1 indicates that patients should be enrolled within 3 months (90 days) of receipt of referral. The percentage of patients who were enrolled within 90 days was 63% (3800/5986). The percentage for rolling programmes was 72% (2280/3172) and for cohort programmes it was 52% (1350/2619): p<0.001 Fisher's exact test.

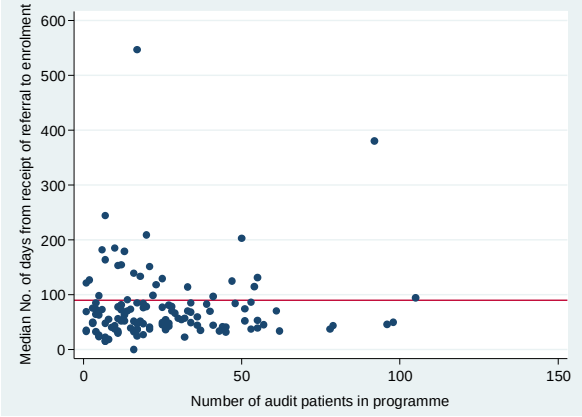
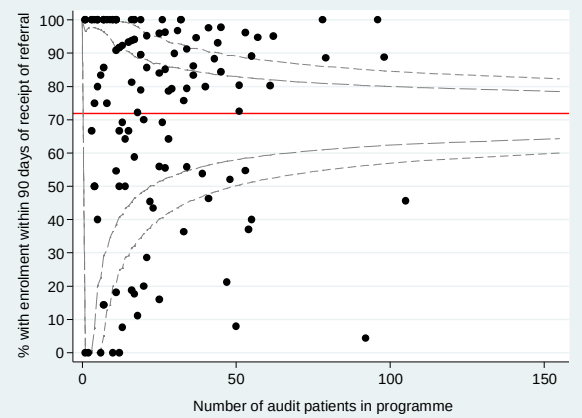
Programme variation is shown in the graphics below.

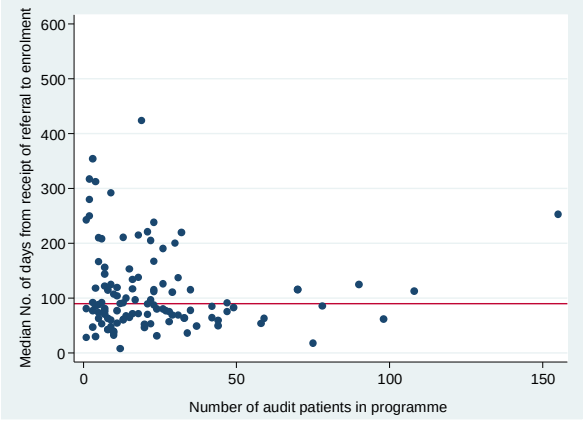
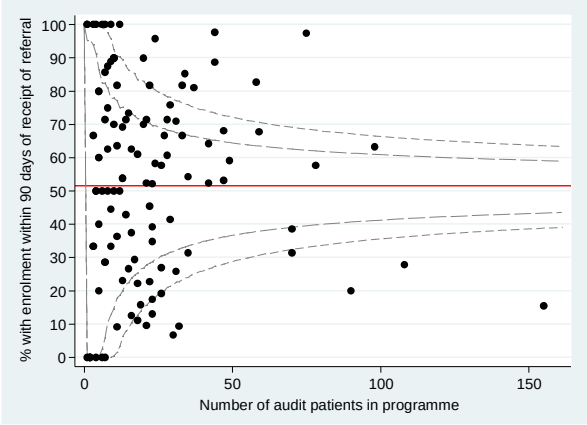
Left-hand panels: Scatterplots of the median number of days from receipt of referral to enrolment (for each programme). The red reference lines represent the quality standard of 90 days from receipt of referral to enrolment.

Right-hand panels: Funnel plots presenting the percentage of patients who were enrolled within 3 months of receipt of referral for each participating programme (QS1). The red reference line represents the overall percentage of programmes that are achieving this standard for all patients. Control limits are often shaped like a 'funnel' and serve as boundaries. Any results that fall above the upper boundary or below the lower boundary are considered to be outliers. The chance of results being outside these limits due to chance alone is very small (5% for the inner and 0.2% for the outer limits), so when programme results do fall outside, these are inconsistent with the overall national result in relation to their sample size. This implies that something else is happening (non-random in nature), eg systematic organisational differences or quality of care etc.

Both statistics are plotted against the number of audit patients in the programme. Data are presented for all patients and for patients enrolled to rolling and cohort programmes respectively.

Median no. of days per programme from receipt of referral to enrolment overall	% of programme patients enrolled within 3 months of receipt of referral overall
	

Median no. of days per *rolling* programme from receipt of referral to enrolment	% of *rolling* programme patients enrolled within 3 months of receipt of referral
	

Median no. of days per *cohort* programme from receipt of referral to enrolment	% of *cohort* programme patients enrolled within 3 months of receipt of referral
	

	National audit (n=1094)
1.12 If assessed but not enrolled, what was the reason? (tick all that apply)	
Did not wish to attend / did not feel PR would be of benefit	305
PR not clinically appropriate	162
Co-morbidities	158
Other commitments	95
COPD exacerbation	43
Exercises at home	43
Hospitalised	37
PR arranged elsewhere	33
Problems with transport	26
Psycho-social problems	26
Died	14
Other*	71
Not known	266

*Other included: patients awaiting medical tests before enrolment (14 cases); patients assessed but enrolled after close of audit period (47 cases).

QS1	National audit (n=7413)	
1.14 Has the patient attended a PR programme previously?		
Yes – completed	16%	1175
Yes – not completed	5%	339
Yes – completion unknown	1%	102
No	72%	5311
Not known	7%	486

2. Sample characteristics and recording of key clinical information

KEY FINDINGS

- Slightly more males were enrolled (53%) than females (47%).
- The mean age was 69 years.
- The sample is relatively deprived (based on Index of Multiple Deprivation (IMD) quintiles derived from postcodes). In total, 27% of the sample is in the most deprived quintile of the IMD, compared with 15% in the least deprived quintile.
- The median FEV_1 was 53% predicted.
- Co-morbidity is frequent, with 76% having at least one of the 23 specified medical conditions.
- FEV_1 (% predicted) was known at assessment in only 62% of cases, and BMI was known in 66% of cases.
- In some cases, home oxygen use (2%), smoking status (2%), MRC grade (8%) and haemoglobin saturation at rest (6%) were not recorded.

AREAS IDENTIFIED AS NEEDING IMPROVEMENT

- The recording of key clinical information that is required for a comprehensive PR assessment was often incomplete.

Socio-demographic characteristics

Gender
The audit sample comprised 53% males (3948) and 47% females (3465).

Age
Mean (standard deviation – SD) age was 69 years (9), median (IQR) was 70 (64-76). Thirty per cent (2200) were aged under 65 years, 42% (3109) were 65-74 years old, 25% (1825) were 75-84 years old and 4% (279) were 85 years or older.

Ethnicity
Ethnicity was known for 94% (6973) of the audit sample. When known, 94% (6523) were recorded as being white British.

Indices of deprivation

England

The English Indices of Deprivation 2010 is based on the concept that deprivation consists of more than just poverty. The Indices of Deprivation 2010 is the collective name for a group of indices that all measure different aspects of deprivation. The most widely used of these is the Index of Multiple Deprivation (IMD), which combines other indices to give an overall score for the relative level of multiple deprivation experienced in every neighbourhood in England. The indices relate to areas and not individuals – within each area there will be individuals who are deprived and individuals who are not. Details of the derivation of the IMD are given in Appendix C.

Index of Multiple Deprivation measures by national quintile: England (n=6990 postcodes)

	% of audit sample living in postcode areas within English national quintiles*				
	Most deprived quintile Q1	Q2	Q3	Q4	Least deprived quintile Q5
Index of Multiple Deprivation (IMD 2010)	27% (1853)	21% (1496)	20% (1423)	17% (1198)	15% (1020)
Income deprivation	26% (1822)	22% (1563)	21% (1433)	17% (1183)	14% (989)
Employment deprivation	28% (1924)	22% (1514)	20% (1421)	17% (1168)	14% (963)
Health deprivation and disability	27% (1899)	22% (1544)	19% (1340)	17% (1185)	15% (1022)
Education, skill and training deprivation	25% (1753)	23% (1628)	20% (1397)	18% (1261)	14% (951)
Barriers to housing and services	19% (1331)	19% (1353)	20% (1367)	20% (1379)	22% (1560)
Crime	23% (1586)	22% (1554)	20% (1371)	19% (1314)	17% (1165)
Living environment deprivation	21% (1435)	20% (1383)	20% (1405)	21% (1438)	19% (1329)

*The 32482 small areas of England were grouped into quintiles (20% categories), thus: 1-6496 (most deprived quintile), 6497-12993, 12994-19489, 19490-25985, 25986-32482 (least deprived quintile). A patient could live in different quintiles depending on the domain considered, eg in the worst national quintile for income but in the best quintile for barriers to housing and services.

If the COPD PR audit sample residing in England was comparable to England as a whole, then we would expect 20% of the sample to live in postcode areas within each national quintile. If the sample has more than 20% in the most deprived quintile, then the sample can be considered to be relatively deprived. Forty-eight per cent of the COPD audit sample lived in postcode areas within the two most deprived quintiles; only 15% lived in areas within the 'least deprived' national quintile. Relative to the national distribution of deprivation rankings, the COPD audit sample was deprived in respect of income, employment, health deprivation/disability and education/skills/training.

Wales

The Welsh Index of Multiple Deprivation (WIMD) 2011 is the official measure of relative deprivation for small areas in Wales. It was produced by the Welsh Government. The index was developed as a tool to identify and understand deprivation in Wales, so that funding, policy and programmes can be effectively focused on the most disadvantaged communities.

Index of Multiple Deprivation measures by national quintile: Wales (273 postcodes)

	% of audit sample living in postcode areas within Welsh national quintiles*				
	Most deprived quintile Q1	Q2	Q3	Q4	Least deprived quintile Q5
Index of Multiple Deprivation (IMD 2011)	23% (62)	27% (74)	19% (53)	21% (58)	10% (26)
Income	22% (61)	27% (75)	21% (57)	15% (40)	15% (40)
Employment	23% (63)	26% (72)	23% (63)	17% (47)	10% (28)
Health	18% (49)	29% (80)	25% (67)	19% (51)	10% (26)
Education	24% (65)	27% (73)	21% (56)	20% (54)	9% (25)
Housing	27% (75)	21% (58)	19% (51)	21% (58)	11% (31)
Physical environment	22% (61)	19% (52)	18% (48)	23% (64)	18% (48)
Geographical access to services	18% (49)	20% (55)	24% (66)	18% (49)	20% (54)
Community safety	20% (55)	19% (51)	25% (69)	23% (63)	13% (35)

*The 1896 small areas of Wales were grouped into quintiles (20% categories), thus: 1-379 (most deprived quintile), 380-758, 759-1138, 1139-1517, 1518-1896 (least deprived quintile). A patient could live in different quintiles depending on the domain considered, eg in the worst national quintile for income but in the best quintile for access to services.

If the COPD audit sample residing in Wales was comparable to Wales as a whole, then we would expect 20% of the sample to live in postcode areas within each national quintile. If the sample has more than 20% in the most deprived quintile, then the sample can be considered relatively deprived. Half (50%) of the audit sample lived in postcode areas within the two most deprived quintiles; only 10% lived in areas within the 'least deprived' national quintile. Relative to the national distribution of deprivation rankings, the COPD audit sample was deprived in respect of income, employment, health, housing and education.

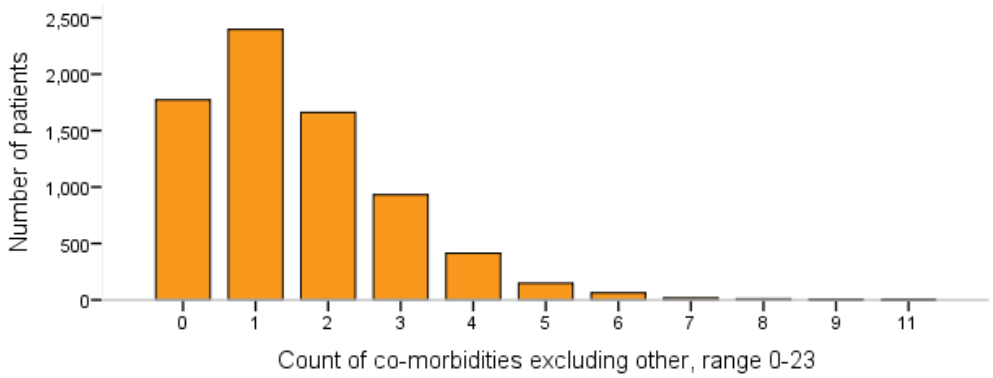
Further information on indices of deprivation is set out at Appendix C.

	National audit (n=7413)	
2.1 Smoking status		
Current smoker	22%	1614
Ex-smoker	70%	5179
Never smoked	6%	449
Not recorded	2%	171

	National audit (n=7413)	
2.2 Does the patient have any other significant medical conditions? (tick all that apply)		
Alcohol-related condition	1%	97
Atrial fibrillation	7%	482
Cor pulmonale	0.7%	49
Dementia/confusion	0.7%	54
Diabetes	13%	987
Gastrointestinal condition	10%	705
Hearing impairment	4%	302
Hypertension	30%	2234
Ischaemic heart disease	11%	835
Kidney disease	4%	289
Learning disability	0.1%	6
Left heart failure (LVF)	3%	190
Locomotor problems	12%	856
Lung cancer	1%	105
Mental health disorder	7%	542
Neurological condition	3%	205
Osteoporosis	8%	567
Stroke	4%	299
Thromboembolic disease (pulmonary embolism (PE), deep-vein thrombosis (DVT))	3%	206
Visual impairment	4%	295
Other respiratory disease	11%	804
Other cardiovascular disease	11%	780
Other endocrine disorder	3%	248
Other malignant disease	5%	360
Other*	31%	2332
No other medical conditions	14%	1016

* Auditors were not asked to specify what these were.

Overall, in the view of the auditors, 14% were identified as having 'no other medical conditions'. There were 23 specified conditions and also an 'other' group: 24% (1771/7413) did not have any of these 23 specific diagnoses (but may have had 'other' medical problems).



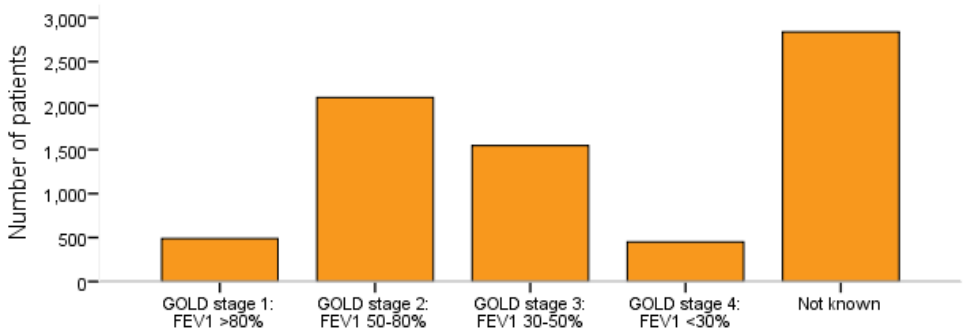
	National audit (n=7413)	
2.3 How many times has the patient been hospitalised for AECOPD in the past 12 months? Stated for 6320 (85%).		
0	69%	4382
1	21%	1330
2	6%	356
3	2%	139
4-14	2%	113

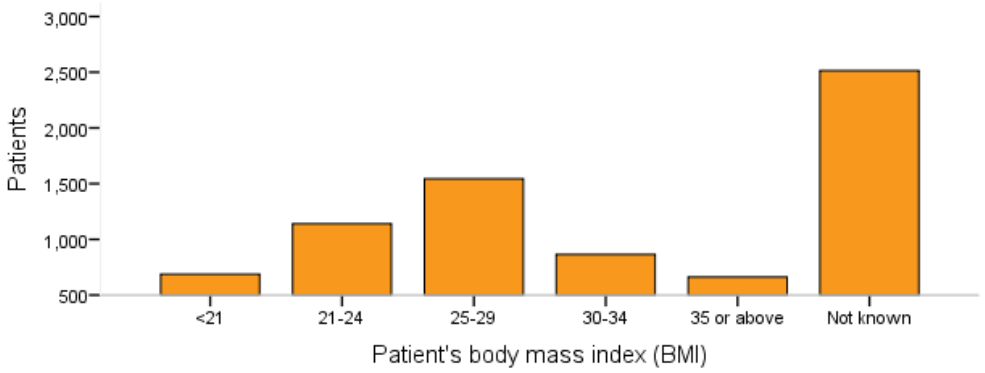
	National audit (n=7413)	
2.4 Was the patient receiving oxygen therapy at home at the time of assessment? (tick all that apply)		
No	90%	6676
Yes – ambulatory oxygen	5%	355
Yes – long-term home oxygen	4%	296
Yes – short burst / palliative use	0.8%	56
Yes – type not known	0.2%	16
Not known	2%	149

	National audit (n=7413)	
2.5 Was the patient receiving non-invasive ventilation (NIV) at home at the time of assessment?		
Yes	2%	115
No	97%	7168
Not known	2%	130

	National audit (n=7413)	
2.6 What are the patient's living arrangements?		
House/flat with another person	62%	4593
House/flat alone	28%	2100
Sheltered accommodation	1%	91
Residential placement	0.2%	18
Community hospital/rehab ward or equivalent	0.1%	4
Other	0.6%	46
Not recorded	8%	561

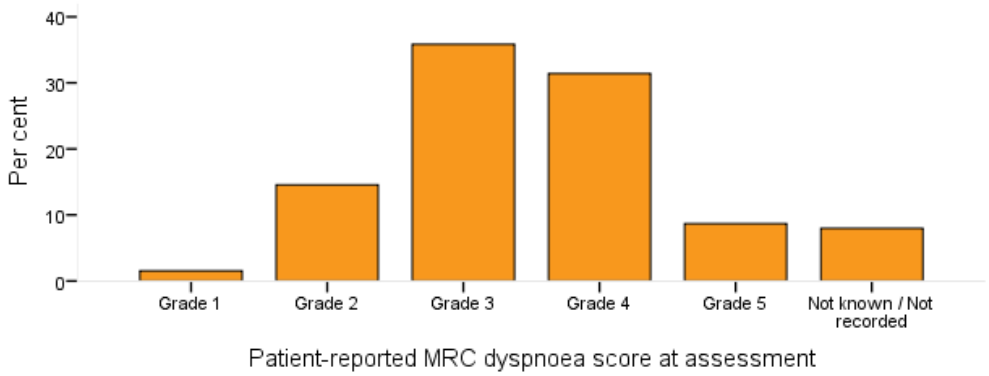
	National audit (n=7413)		
2.8 What was the most recent value available for the following:			
	Median	IQR	N
FEV_1 (L)	1.3	0.92-1.71	4440
FEV_1% predicted	53	40-68	4575
Patient's BMI	27	23-31	4898





Global Initiative for Chronic Obstructive Lung Disease (GOLD) stages refer to categories of lung function impairment based on measurement of FEV_1 compared with the predicted value – GOLD Stage 1: FEV_1 >80%, GOLD Stage 2: FEV_1 50-80%, GOLD stage 3: FEV_1 30-50%, GOLD Stage 4 FEV_1 <30%.

	National audit (n=7413)	
2.12 What was the patient-reported MRC dyspnoea score at assessment?		
Grade 1	2%	115
Grade 2	15%	1080
Grade 3	36%	2656
Grade 4	31%	2328
Grade 5	9%	643
Not known / not recorded	8%	591



	National audit (n=7413)		
2.9 What was the patient's oxygen saturation at rest?			
	Median	IQR	N
Oxygen saturation at rest	95	94-97	6944

Note that oxygen saturation was not known for 6% of patients.

	National audit (n=7413)	
2.10 Was the patient breathing supplemental oxygen when the saturation was recorded?		
Yes	5%	366
No	94%	6936
Not known	2%	111

	National audit (n=366)		
2.11 If yes (2.10), what was the recorded flow rate (L/min)?			
	Median	IQR	N
Oxygen saturation at rest	2	2-3	326
	%		N
0.5	2%		6
1.0 or 1.5	11%		38
2.0 or 2.5	48%		161
3.0	15%		49
≥4.0	2%		72

3. Treatment provided

KEY FINDINGS

- The majority of patients who are subsequently enrolled to PR have an assessment of exercise capacity (98%) and health status (92%) at assessment for PR **(QS8)**.
- Practice tests for measures of exercise capacity were only used in 22% of cases **(QS8)**.
- Provision of aerobic and resistance training was very high (see the table for audit question 3.4) **(QS5)**.
- Only 15% of patients undergo an assessment of muscle strength, despite the provision of resistance training being widespread.
- The majority of patients were scheduled for and (if they completed the programme) attended PR sessions in a frequency and duration that are in line with **QS4** (see the table for audit questions 3.1 to 3.3).
- In total, 26% of patients attending a discharge assessment were not provided with a written ongoing, individualised exercise plan **(QS7)**.

AREAS IDENTIFIED AS NEEDING IMPROVEMENT

- Lack of practice tests is widespread, which raises concern that accepted methodology for exercise testing is not being used **(QS8)**.
- A standardised measurement of exercise performance is crucial for rigorous exercise prescription during PR and it requires improvement **(QS5)**.
- The provision of written discharge exercise plans should be universal for patients completing PR **(QS7)**.

	National audit (n=7413)	
2.7 Was transport arranged for the patient by your programme / health service to enable the patient to attend?		
Yes	6%	473
No	91%	6748
Not known	3%	192

QS8	National audit (n=7413)	
2.13 Was exercise performance assessed at the initial assessment?		
YES*	93%	6864
If yes, please provide values for all that apply: values given for 6784		
	Median	IQR	N
Incremental shuttle walk test (ISWT) (metres)	180	90-270	3819
Endurance shuttle walk test (ESWT) (seconds)	198	132-316	770
Six-minute walk test (6MWT) (metres)	250	160-330	2863

4-metre gait speed test was used for 98 cases by 1 programme only, median 4.7, IQR (3.9-5.8) seconds; treadmill or cycle ergometry tests were done for seven cases. Other tests noted in free-text comprised: non-standardised walk tests (27 cases); sit to stand tests (219 cases); ESWT given in metres (63 cases), and others (12 cases).

*For patients who were enrolled (6319), exercise performance was assessed for 98% (6180).

QS8	National audit (n=7413)	
2.14 Was a practice test performed at the initial assessment?		
Yes	22%	1666
No	77%	5689
Not known	0.8%	58

Of the 1666 performing a practice test at the initial assessment, 60% (1004) recorded a value for the ISWT at the initial assessment, 40% (668) recorded a value for the 6MWT. Only 1% (23) had values for both ISWT and 6MWT tests.

	National audit (n=7413)	
2.15 Was muscle strength measured at the initial assessment?		
Yes	15%	1094
No	85%	6271
Not known	0.6%	48

	National audit (n=7413)		
2.16 Were any health status questionnaires completed?			
YES*		88%	6490
If yes, please provide values for all that apply: values given for 5946			
	Median	IQR	N
St George's Respiratory Questionnaire (SGRQ):			
• Symptoms score (1-100)	68	50-82	355
• Activity score (1-100)	73	54-86	352
• Impacts score (1-100)	39	23-55	359
• Total score (1-100)	56	39-68	366
Chronic Respiratory Questionnaire (CRQ):			
• Dyspnoea average score (1.0-7.0)	2.6	2.0-3.4	2443
• Fatigue average score (1.0-7.0)	3.3	2.3-4.3	2434
• Emotion average score (1.0-7.0)	4.3	3.3-5.3	2434
• Mastery average score (1.0-7.0)	4.3	3.3-5.5	2429
COPD Assessment Test (CAT):			
• Total score (0-40)	22	17-28	3915

*For patients who were enrolled (6319), health status questionnaires were completed for 92% (5822).

	National audit (n=7413)	
2.17 Were any of the following outcomes recorded as part of the programme? (tick all that apply)		
Psychological status	74%	5466
Measure of patient experience	47%	3458
Activities of daily living	34%	2496
Patient knowledge	28%	2100
Physical activity monitor	11%	814
Physical activity questionnaire	10%	729
None	11%	835
Not known	3%	205

Questions 3.1-3.5 were only to be completed if answering 'Yes' to question 1.10 (Was the patient enrolled on your PR programme?) (N=6319).

QS4	National audit (n=6319)		
	Median	IQR	N
3.1 Total number of supervised PR sessions attended	11	6-12	6306
3.2 Total number of supervised PR sessions scheduled	12	12-14	6318
3.3 Days from enrolment to last supervised PR session	45	35-56	6318

Overall, 83% (5239) of those enrolled were scheduled to receive 12 or more sessions.

QS4 For those completing the programme (Q4.3)	National audit		
	Median	IQR	N
3.1 Total number of supervised PR sessions attended	12	10-13	4454
3.2 Total number of supervised PR sessions scheduled	12	12-14	4456
3.3 Days from enrolment to last supervised PR session	49	42-60	4456

Of those completing the programme, 83% (3711/4456) were scheduled to receive 12 or more sessions, while 78% (2892/3711) of those scheduled to receive 12 or more sessions actually attended sessions over a period of at least 42 days (6 weeks) between enrolment and the last supervised session.

QS4 For those *not* completing the programme (Q4.3)	National audit		
	Median	IQR	N
3.1 Total number of supervised PR sessions attended	4	2-7	1852
3.2 Total number of supervised PR sessions scheduled	12	12-15	1862
3.3 Days from enrolment to last supervised PR session	21	7-42	1862

QS5	National audit (n=6319)	
3.4 Which modes of exercise were performed by the patient during the programme? (tick all that apply)		
Walking aerobic training	95%	6004
Upper limb (aerobic or resistance)	92%	5839
Resistance training	89%	5602
Cycle aerobic training	70%	4429
Interval training	44%	2758
Other	9%	494

Neuromuscular electrical stimulation (NMES) was performed for 52 cases (by 26 programmes). Other modes of exercise noted in free-text included: breathing retraining (12 cases); other aerobic exercise platforms such as cross-training/rowing (21 cases); Sit to stand or step up exercises (77 cases); circuit exercises (66 cases); balance or flexibility exercises (52 cases); uncategorised lower limb exercise (226 cases).

	National audit (n=6319)	
3.5 Did the patient receive supplemental oxygen during exercise?		
Yes	9%	552
No	90%	5704
Not known	1%	63

QS8	National audit (n=6319)	
4.1 Was a discharge assessment arranged and attended?		
Arranged and attended	69%	4353
Arranged but not attended	7%	427
Not arranged	23%	1468*
Not known	1%	71

*Note that 1421 of these 1468 were patients who did not complete the programme. Of the 4456 who completed the programme, 96% (4297) had a discharge assessment.

QS8	National audit (n=4353)	
4.2 Discharge assessment performed		
	Median	IQR
Days from enrolment to discharge assessment	52	44-65
Days from initial assessment to discharge assessment	65	53-84

Results for audit question 4.5 are given only for those completing the programme (4456 patients). See Section 4 and audit question 4.3 for more detail about completion.

QS7	National audit (n=4456)	
4.5 Was a written discharge exercise plan provided for the patient?		
Yes	73%	3238
No	26%	1143
Not known	2%	75

4. Clinical outcomes

KEY FINDINGS

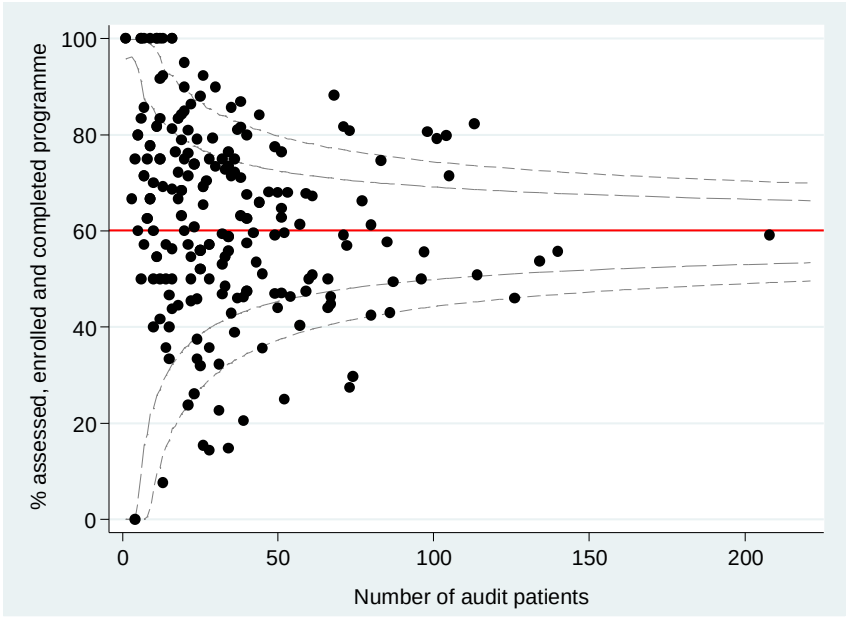
- Significant numbers of patients assessed for PR do not complete treatment (40%). Of those who enrol, 71% complete treatment **(QS9)**.
- The majority of programmes are conducting a discharge assessment where exercise performance (97%) and health status (93%) are recorded **(QS8,9)**.
- For those having a discharge assessment, clinically and statistically significant increases in walking performance were seen (median change in ISWT 50 metres; ESWT 196 seconds; 6MWT 50 metres) **(QS8,9)**.
- Where performed, 57% achieved an improvement greater than the accepted MCID (Minimal Clinically Important Difference) for ISWT, and 70% achieved an improvement greater than the accepted MCID for the 6MWT **(QS8,9)**.
- There were substantial numbers of patients who demonstrated an improvement greater than the accepted MCIDs for outcome measurements of health status (see tables below for detailed figures).
- There are indications that improvement in some outcome measures are lower for patients enrolled to cohort programmes than those enrolled to rolling programmes, although the magnitude of these differences in the national figures is small and of uncertain importance.

AREAS IDENTIFIED AS NEEDING IMPROVEMENT

- Where possible, action is needed to increase the uptake and completion of treatment for patients referred and assessed for PR.
- Programmes where improvements in exercise performance and health status are lower than expected should examine their processes of care and identify where these can be improved.

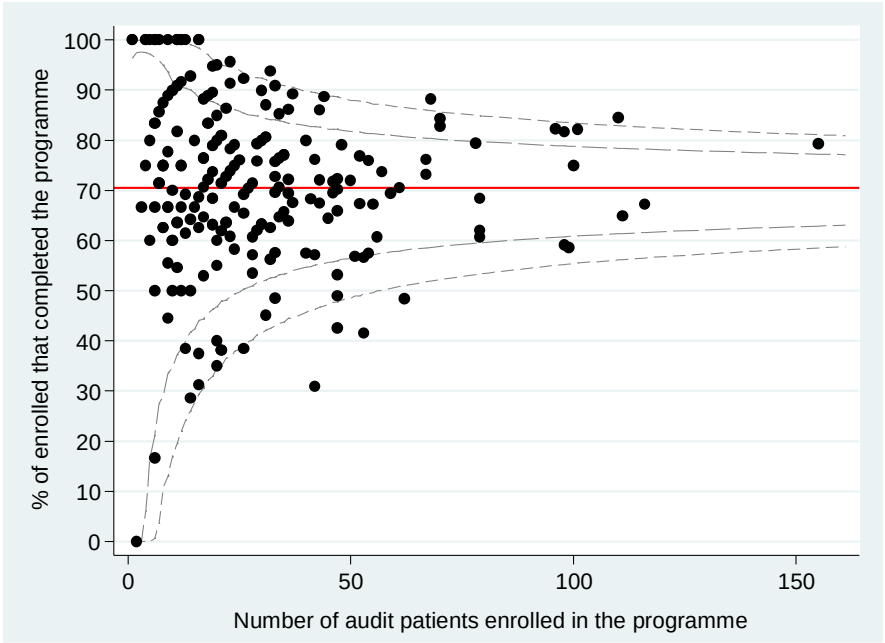
QS9	National audit (n=7413)	
Completion of programme:		
Assessed but not enrolled	15%	1094
Assessed, enrolled, but did not complete	25%	1863
Assessed, enrolled and completed	60%	4456

Variation between programmes in the percentage of patients *assessed* for PR who subsequently enrolled and completed treatment is shown in the graph below. Each dot represents a programme, and the red line represents the overall national percentage of 60%.



	National audit (n=6319)	
4.3 Of those enrolled, did the patient complete the programme?		
Yes	71%	4456
No	29%	1863

Variation between programmes in the percentage of patients *enrolled* for PR who subsequently completed treatment is shown in the graph below. Each dot represents a programme, and the red line represents the overall national percentage of 71%.



Of the 266 patients who had previously attended a PR programme and did not complete it (audit question 1.14), 59% (158) did complete the programme that was audited.

	National audit (n=1863)
4.4 If the patient did not complete the programme, what was the reason? (tick all that apply)	
Co-morbidities	440
Still enrolled as at 10 July 2015	373
Did not wish to attend / did not feel PR was of benefit	313
COPD exacerbation	247
Other commitments	182
Hospitalisation	107
Attended programme but did not attend discharge or follow-up appointment	100
Psycho-social problems	68
Problems with transport	40
Exercises at home	32
Died	17
Other*	40
Not known	229

*Other included: patients receiving an alternative intervention such as education only or 'brief intervention' (19 cases), PR arranged elsewhere or on another occasion (21 cases).

From this point onwards, the results are shown for the 4353 patients who attended a discharge assessment (see earlier table for audit question 4.1). This number is slightly different from those who completed the programme (4456, table for audit question 4.3), as there were some patients who were recorded as completing but not having had a discharge assessment.

	National audit (n=4353)	
4.6 What was the patient-reported MRC dyspnoea score at discharge?		
Grade 1	4%	173
Grade 2	23%	994
Grade 3	28%	1220
Grade 4	13%	566
Grade 5	2%	94
Not known / not recorded	30%	1306

		4.6 What was the patient-reported MRC dyspnoea score at discharge?						
		Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Not known / not recorded	Total
2.12 What was the patient-reported MRC dyspnoea score at assessment?	Grade 1	45	12	-	-	-	13	70
	Grade 2	67	398	50	11	1	163	690
	Grade 3	40	413	698	45	4	469	1669
	Grade 4	18	141	409	412	12	310	1302
	Grade 5	-	20	45	93	77	77	312
	Not known / not recorded	3	10	18	5	-	274	310
Total		173	994	1220	566	94	1306	4353

MRC grade was known at both initial and discharge assessments for 3011 patients. In 41% (1246), the MRC grade improved (blue shading), in 54% (1630), it stayed the same (yellow shading) and in 4% (135), it was worse (pink shading).

QS8	National audit (n=4353)	
4.7 Was exercise performance assessed at discharge?		
YES	97%	4221

If yes, please provide values for all that apply: values known for 4179 (96% of 4353)

	Median	IQR	N
Incremental shuttle walk test (ISWT) (metres)	250	160-360	2299
Endurance shuttle walk test (ESWT) (seconds)	382	227-684	490
Six-minute walk test (6MWT) (metres)	330	240-400	1720

4-metre gait speed test was used for 77 cases by 1 programme only, median 3.8, IQR (3.2-4.8) seconds; treadmill or cycle ergometry tests were done for 4 cases. Other tests noted in free-text comprised: non-standardised walk tests (19 cases); sit to stand tests (154 cases); ESWT given in metres (21 cases).

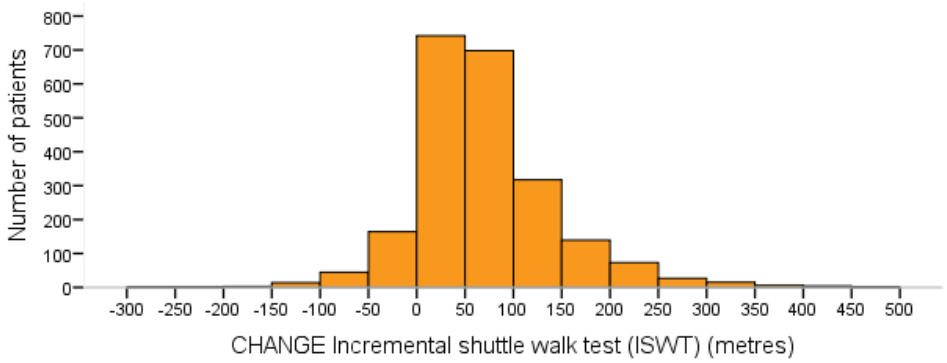
	National audit (n=4353)		
Difference between initial assessment and discharge – change data for (ISWT, ESWT or 6MWT) known for 3906.			
	Median	IQR	N
Incremental shuttle walk test (ISWT) (metres)	50	20-100	2255
Endurance shuttle walk test (ESWT) (seconds)	196	55-455	508
Six-minute walk test (6MWT) (metres)	50	20-90	1685

4-metre gait speed test was used for 77 cases by 1 programme only, median change -0.5, IQR (-1.2, -0.1) seconds.

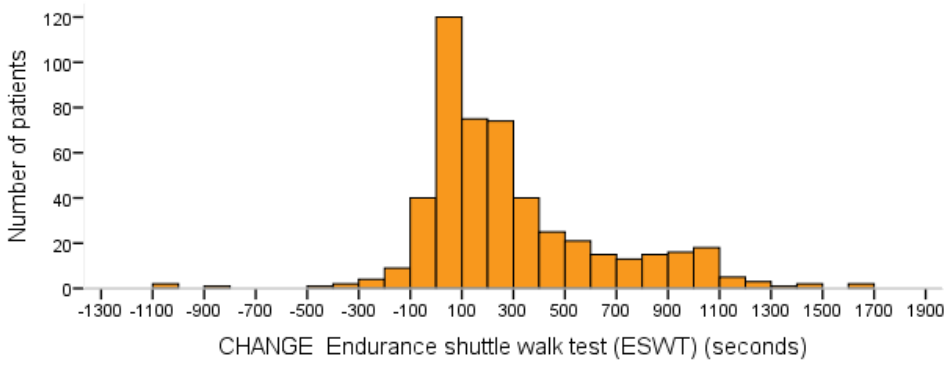
Wilcoxon matched pairs test between initial assessment and discharge results gave $p<0.001$ for each of the four tests.

The scientific evidence provides thresholds for changes in these outcome measures that are judged to be important by patients (termed the Minimal Clinically Important Difference (MCID)). For the ISWT, the MCID is 48 metres and for the 6MWT the MCID is 30 metres. For the ESWT, the scientific evidence for the MCID is less clear and is therefore not used in this audit.

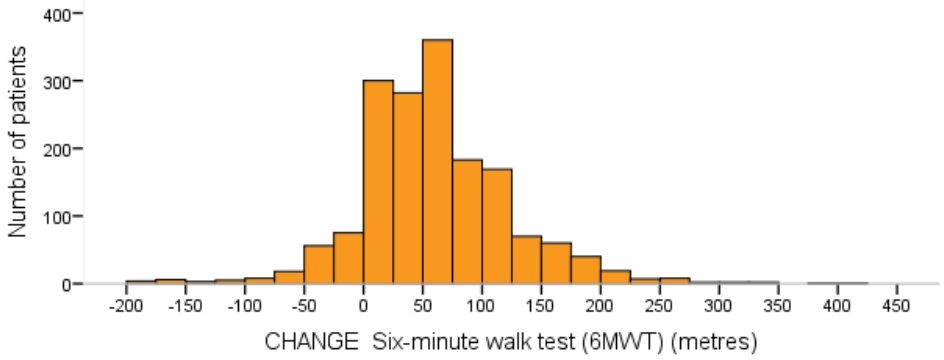
Fifty-seven per cent of patients reached the 48 metres MCID for the ISWT, while 70% reached the 30-metre MCID for 6MWT:



Note that the MCID for ISWT is an improvement of 48 metres.



Note that there is no accepted MCID for ESWT.



Note that the MCID for 6MWT is an improvement of 30 metres.

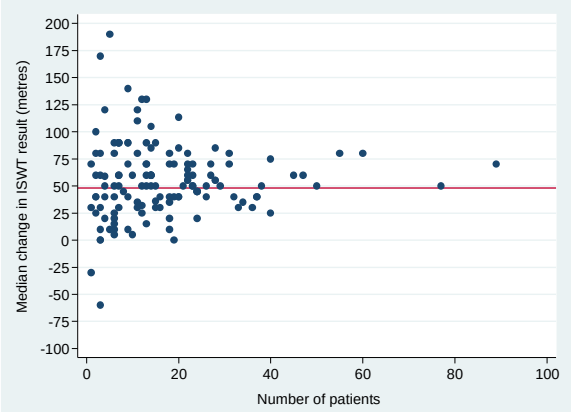
	National audit (n=4353)	
Difference between initial assessment and discharge – change data for ISWT, ESWT or 6MWT (known for 3906).		
Incremental shuttle walk test (ISWT) (metres): N=2255		
• Reduction / no change in distance	18%	416
• Increased distance of <48 metres	25%	555
• Increased distance of at least 48 metres	57%	1284
Six-minute walk test (6MWT) (metres): N=1685		
• Reduction / no change in distance	16%	271
• Increased time of <30 metres	14%	233
• Increased distance of at least 30 metres	70%	1181

Graphics showing programme variation in change in exercise performance

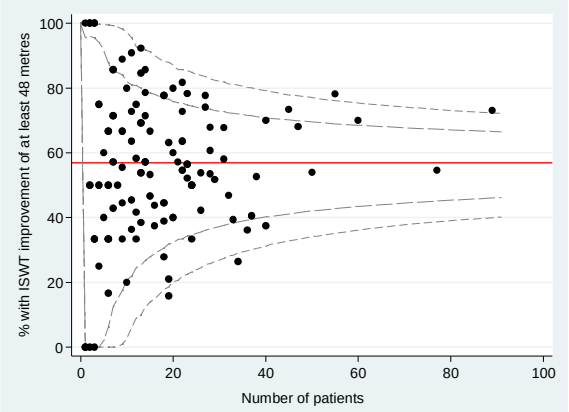
Left-hand panel: These show median changes in each exercise outcome measure plotted against the number of patients who were audited for each programme. The horizontal red lines represent the MCID (where known).

Right-hand panel: These show funnel plots where the numbers of patients reaching the MCID for the given measure are plotted against the number of patients audited. The horizontal red lines represent the overall percentage reaching these MCIDs.

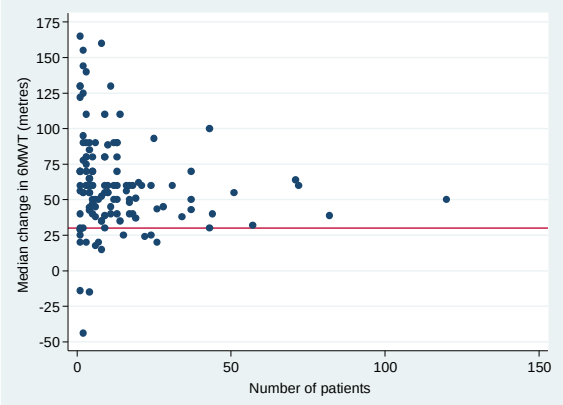
Median change in ISWT result by programme



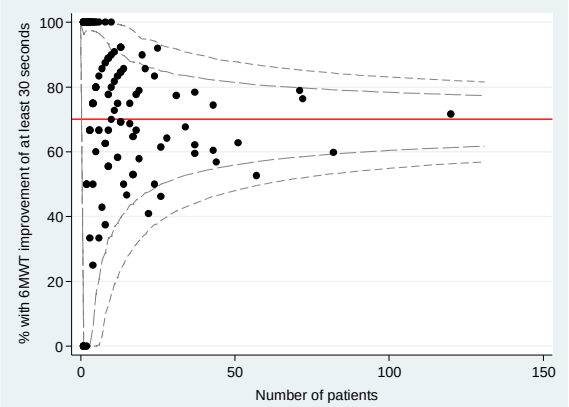
Change in ISWT result of at least 48 metres by programme



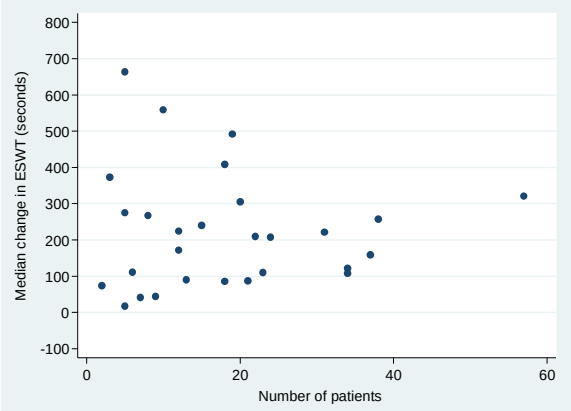
Median change in 6MWT result by programme



Change in 6MWT result of at least 30 seconds by programme



Median change in ESWT result by programme



	National audit (n=4353)	
4.8 Was muscle strength measured at discharge assessment?		
YES	12%	515/4353

	National audit (n=4353)		
4.9 Were any health status questionnaires completed at discharge?			
YES	93%		4033
If yes, please provide values for all that apply: values known for 3779 (87% of 4353)			
	Median	IQR	N
St George's Respiratory Questionnaire (SGRQ):			
• Symptoms score (1-100)	60	42-75	262
• Activity score (1-100)	67	49-83	262
• Impacts score (1-100)	31	16-44	265
• Total score (1-100)	46	33-59	263
Chronic Respiratory Questionnaire (CRQ):			
• Dyspnoea average score (1.0-7.0)	3.6	2.6-4.6	1569
• Fatigue average score (1.0-7.0)	4.3	3.5-5.3	1582
• Emotion average score (1.0-7.0)	5.1	4.1-6.0	1582
• Mastery average score (1.0-7.0)	5.3	4.3-6.3	1581
COPD Assessment Test (CAT):			
• Total score (0-40)	18	13-23	2464

	National audit (n=4353)		
Difference between initial assessment and discharge – change data known for 3664.			
	Median	IQR	N
St George's Respiratory Questionnaire (SGRQ):			
• Symptoms score (1-100)	-3.6	-15.0, 4.7	248
• Activity score (1-100)	-5.9	-13.5, 0.1	247
• Impacts score (1-100)	-5.0	-14.6, 2.8	251
• Total score (1-100)	-4.9	-12.0, 1.6	250
Chronic Respiratory Questionnaire (CRQ):			
• Dyspnoea average score (1.0-7.0)	0.8	0.0-1.6	1529
• Fatigue average score (1.0-7.0)	0.7	0.0-1.5	1543
• Emotion average score (1.0-7.0)	0.5	0.0-1.2	1543
• Mastery average score (1.0-7.0)	0.5	0.0-1.3	1543
COPD Assessment Test (CAT):			
• Total score (0-40)	-3	-6, 1	2396

Wilcoxon matched pairs test between initial assessment and discharge results gave $p<0.001$ for each of the nine tests.

The scientific literature provides thresholds for changes in these health status outcome measures that are judged to be important by patients (termed the Minimal Clinically Important Difference (MCID)). For the SGRQ the MCID is a reduction in 4 points (for each domain and the total score) (11). For the CRQ, the MCID is an increase in 0.5 points for each domain (12). For the CAT, the MCID is a reduction in 2 points (13).

Results in relation to these MCIDs are shown in the next table.

	National audit (n=4353)	
Difference between initial assessment and discharge – change data known for 3664.		
St George's Respiratory Questionnaire (SGRQ): Symptoms score n=248		
• Increase / no change in score	40%	100
• Improvement of <4.0	11%	28
• Improvement of ≥4.0	48%	120
St George's Respiratory Questionnaire (SGRQ): Activity score n=247		
• Increase / no change in score	43%	105
• Improvement of <4.0	4%	11
• Improvement of ≥4.0	53%	131
St George's Respiratory Questionnaire (SGRQ): Impacts score n=251		
• Increase / no change in score	35%	89
• Improvement of <4.0	12%	29
• Improvement of ≥4.0	53%	133
St George's Respiratory Questionnaire (SGRQ): Total score n=250		
• Increase / no change in score	30%	76
• Improvement of <4.0	18%	44
• Improvement of ≥4.0	52%	130
Chronic Respiratory Questionnaire (CRQ): Dyspnoea average score n=1529		
• Decrease / no change in score	29%	437
• Improvement of <0.5	13%	201
• Improvement of ≥0.5	58%	891
Chronic Respiratory Questionnaire (CRQ): Fatigue average score n=1543		
• Decrease / no change in score	31%	472
• Improvement of <0.5	10%	152
• Improvement of ≥0.5	60%	919
Chronic Respiratory Questionnaire (CRQ): Emotion average score n=1543		
• Decrease / no change in score	31%	481
• Improvement of <0.5	17%	266
• Improvement of ≥0.5	52%	796
Chronic Respiratory Questionnaire (CRQ): Mastery average score n=1543		
• Decrease / no change in score	34%	529
• Improvement of <0.5	9%	136
• Improvement of ≥0.5	57%	878
COPD Assessment Test (CAT): N=2396		
• Increase / no change in score	32%	775
• Improvement of 1	7%	167
• Improvement of ≥2	61%	1454

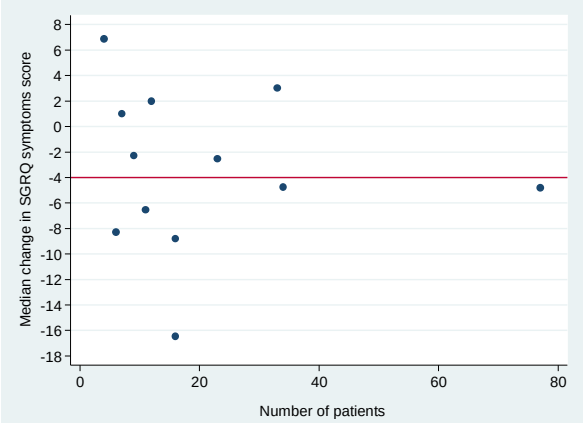
Graphs showing programme variation in change in health status

Left-hand panel: These show median changes in each health status outcome measure, plotted against the number of patients audited for each programme. The horizontal red lines represent the MCID (where known).

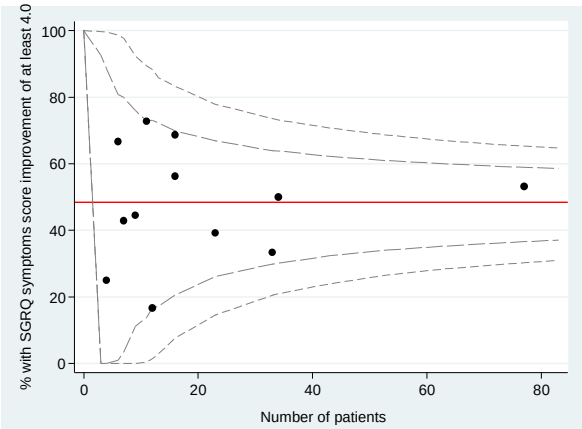
Right-hand panel: These show funnel plots where the numbers of patients reaching the MCID for the given health status measure are plotted against the number of patients audited. The horizontal red lines represent the overall percentage reaching these MCIDs.

St George's Respiratory Questionnaire (SGRQ)

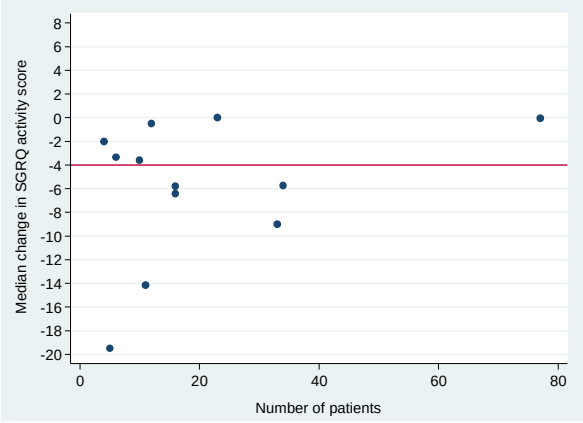
Median change on the SGRQ symptoms score by programme



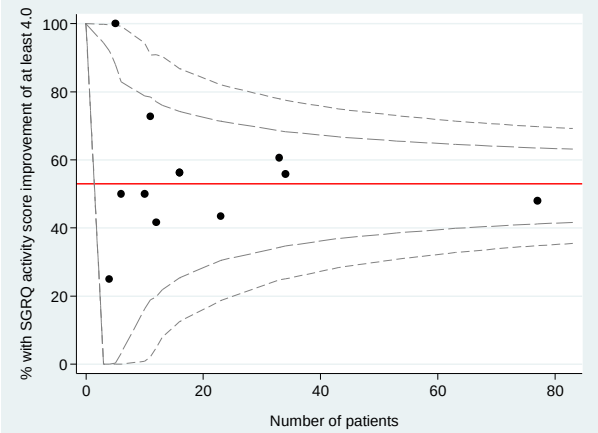
% improving by 4.0 or more on the SGRQ symptoms score by programme



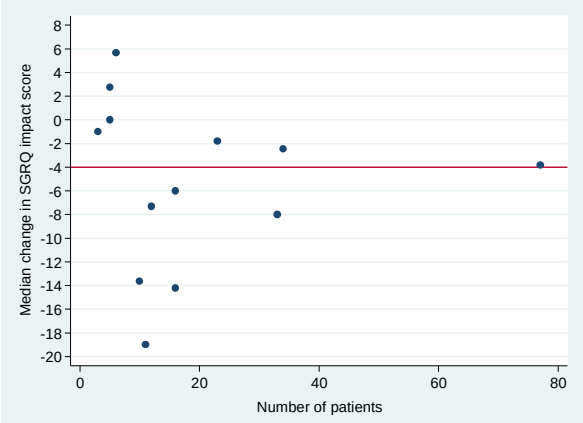
Median change on the SGRQ activity score by programme



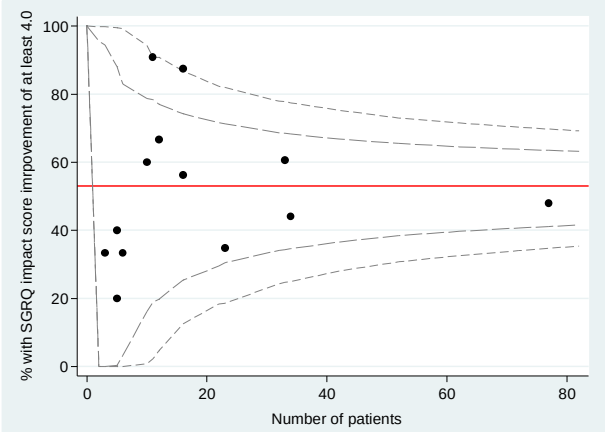
% improving by 4.0 or more on the SGRQ activity score by programme



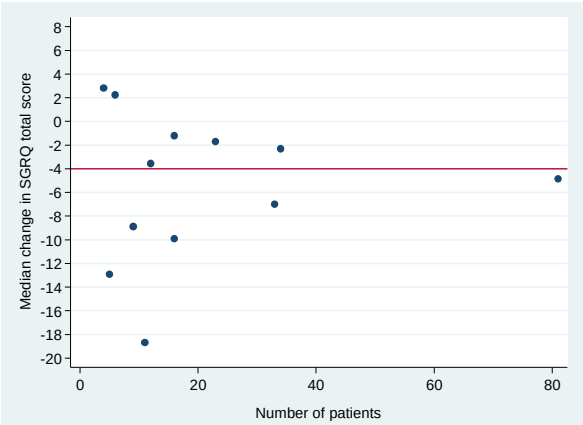
Median change on the
SGRQ impact score by programme



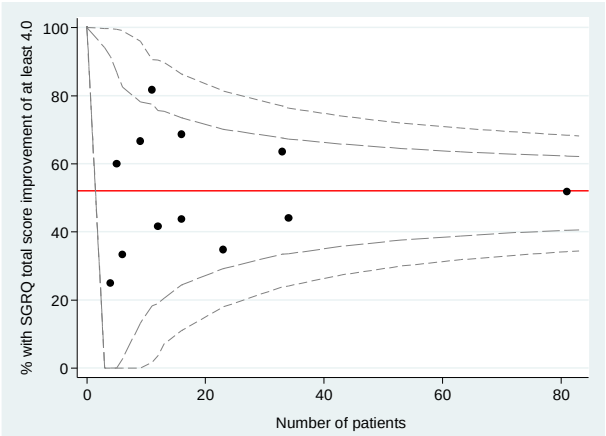
% improving by 4.0 or more on the
SGRQ impact score by programme



Median change on the
SGRQ total score by programme

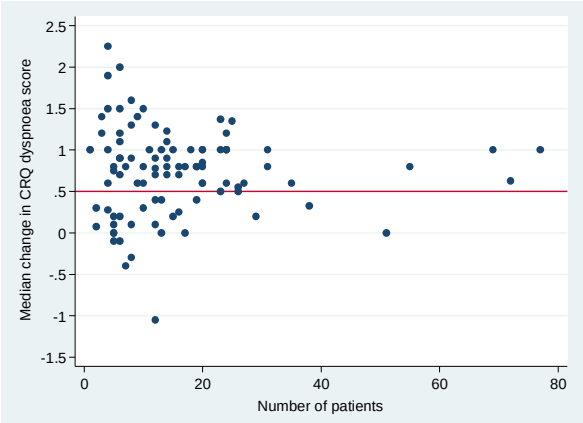


% improving by 4.0 or more on the
SGRQ total score by programme

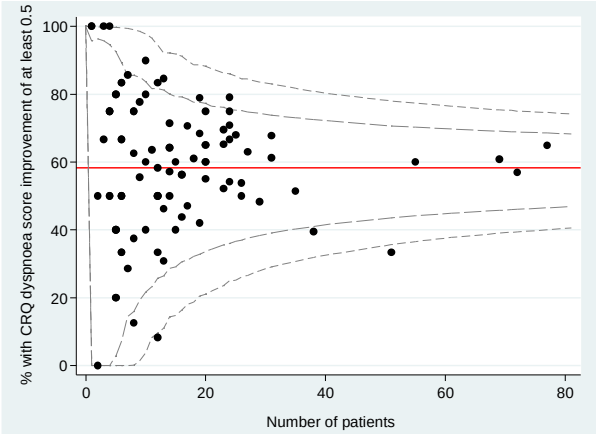


Chronic Respiratory Questionnaire (CRQ)

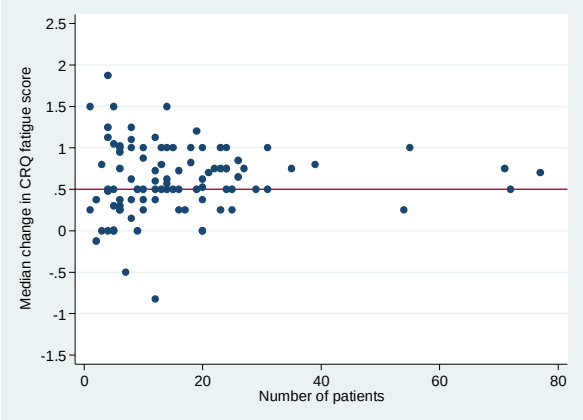
Median change on the CRQ dyspnoea score by programme



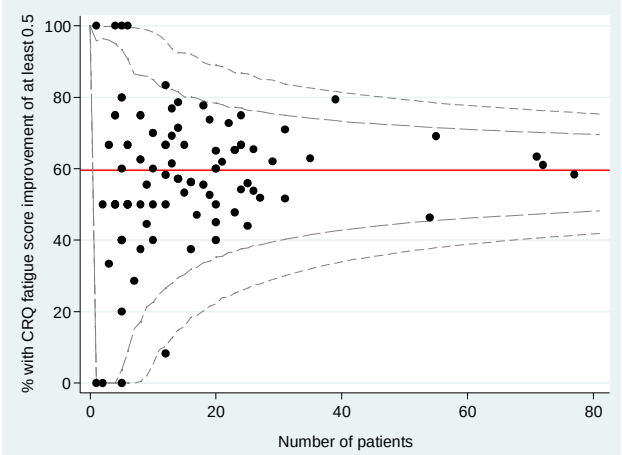
% improving by 0.5 or more on the CRQ dyspnoea score by programme



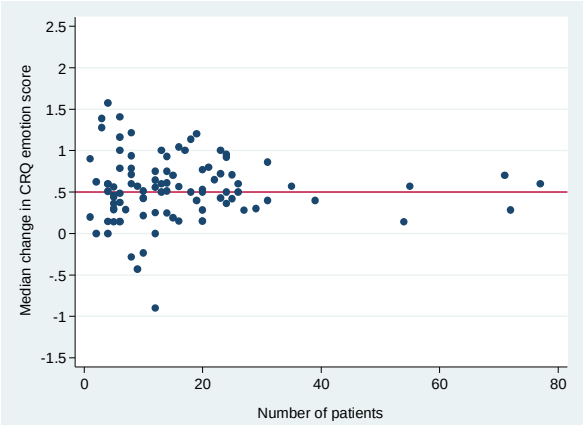
Median change on the CRQ fatigue score by programme



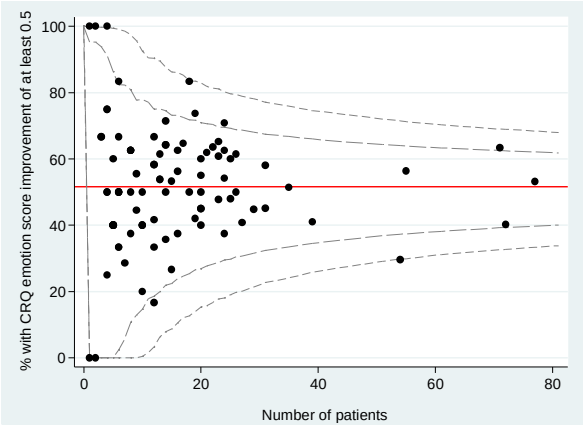
% improving by 0.5 or more on the CRQ fatigue score by programme



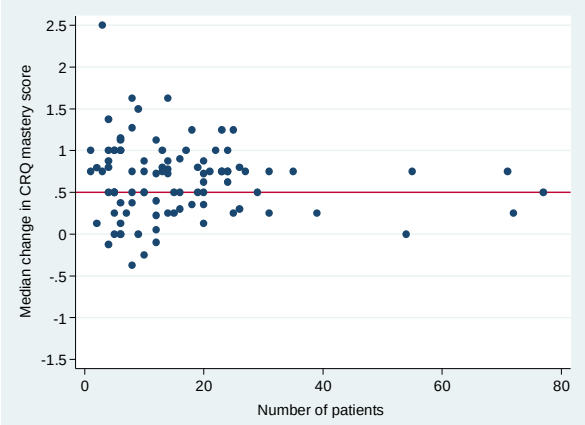
Median change on the CRQ emotion score by programme



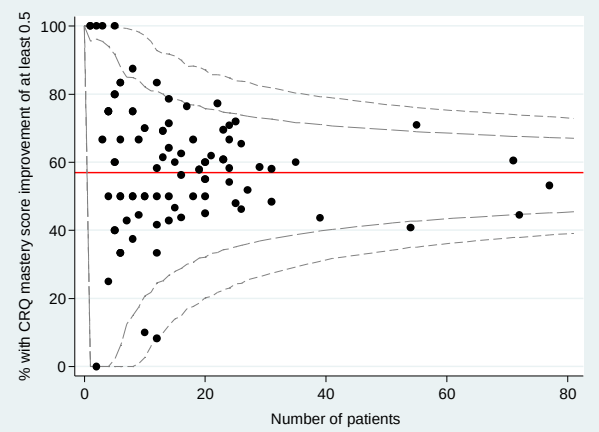
% improving by 0.5 or more on the CRQ emotion score by programme



Median change on the
CRQ mastery score by programme

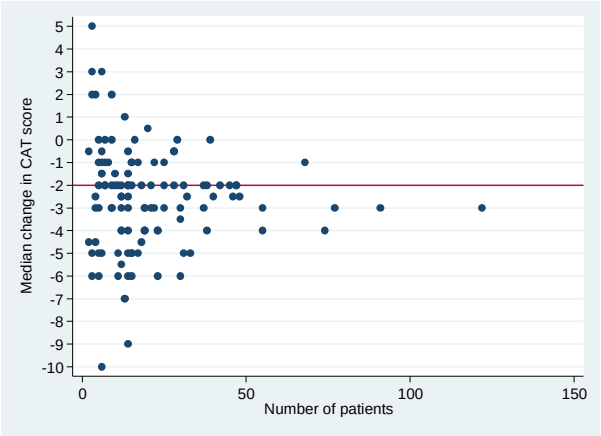


% improving by 0.5 or more on the
CRQ mastery score by programme

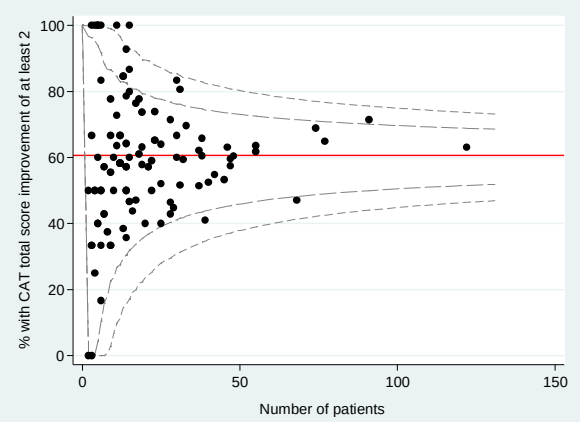


COPD Assessment Test (CAT)

Median change on the
CAT score by programme



% improving by 2 or more on the
CAT score by programme



Additional analysis regarding programme design (cohort vs rolling)

Summary tables:

	CHANGE in test score: Median (IQR), N		Mann–Whitney
	Rolling	Cohort	test P value
Incremental shuttle walk test (ISWT) (metres)	60 (20-100), n=1130	50 (10-90), n=1079	0.004
Endurance shuttle walk test (ESWT) (seconds)	219 (61-451), n=280	179 (43-466), n=228	0.46
Six-minute walk test (6MWT) (metres)	50 (20-90), n=852	50 (20-91), n=810	0.99
St George's Respiratory Questionnaire (SGRQ):			
• Symptoms	-2.7 (-11.7, 9.5), n=93	-4.4 (-17.5, 2.8), n=155	0.10
• Activity	-7.5 (-19.8, 0.0), n=155	-2.1 (-12.8, 6.0), n=154	0.007
• Impact	-6.0 (-16.1, 2.2), n=93	-4.5 (-14.2, 2.8), n=158	0.67
• Total	-6.2 (-14.8, 2.0), n=93	-3.8 (-11.1, 1.0), n=157	0.34
Chronic Respiratory Questionnaire (CRQ):			
• Dyspnoea	0.8 (0.0-1.6), n=808	0.6 (0.0-1.6), n=716	0.45
• Fatigue	0.8 (0.0-1.5), n=816	0.6 (0.0-1.5), n=722	0.57
• Emotion	0.6 (0.0-1,3), n=816	0.4 (-0.1, 1.1), n=722	0.004
• Mastery	0.8 (0.0-1.5), n=816	0.5 (0.0-1.3), n=722	0.003
COPD Assessment Test (CAT)	-3 (-6, 1), n=1127	-3 (-6, 1), n=1204	0.62

3. Quality improvement planning

We recommend that PR programmes begin to develop improvement plans that are relevant to their programme-specific needs, guided by their programme-specific data and recommendations within the national audit reports. Discussions should take place not only within a programme's management, governance and improvement groups, but also with managerial and clinical colleagues in primary and secondary care. Programmes should develop an improvement plan, agreed by, and supported formally at board and/or CCG / local health board (LHB) level, based upon the recommendations within the national report and their site-specific report. The plan should contain clear timelines for change, and provide the basis for successful re-audit.

The National COPD Audit Programme has collated a limited range of materials to assist with local improvement work. A selection of these is listed below, and further resources will be available on our website (www.rcplondon.ac.uk/copd) in due course.

Planning templates

- BTS clinical audit action plan: www.brit-thoracic.org.uk/audit-and-quality-improvement/bts-audit-programme-reports/
- Australian Children's Education & Care Quality Authority QI plans: www.acecqa.gov.au/quality-improvement-plan_1
- NHS Improvement (archived site) service improvement tools and techniques: http://webarchive.nationalarchives.gov.uk/20130221101407/http://www.improvement.nhs.uk/lung/ServiceImprovementTools/tabid/92/Default.aspx
- Suite of tools available from the NHS Institute for Innovation and Improvement: www.institute.nhs.uk/quality_and_service_improvement_tools/quality_and_service_improvement_tools/quality_and_service_improvement_tools_for_the_nhs.html
- The NHS Improvement System: http://improvementsystem.nhsiq.nhs.uk/ImprovementSystem/Login.aspx?ReturnUrl=%2fImprovementSystem%2fdefault.aspx.

Smoking cessation

- BTS materials, including a return on investment calculator and links to the NICE smoking cessation guidelines and quality standards: www.brit-thoracic.org.uk/clinical-information/smoking-cessation/
- *BTS recommendations for hospital smoking cessation services for commissioners and health care professionals* (Stop Smoking Champions): www.brit-thoracic.org.uk/document-library/clinical-information/smoking-cessation/bts-recommendations-for-smoking-cessation-services/.

Integrating care

- NHS Improving Quality, *Pioneering integrated care and support*: www.nhsiq.nhs.uk/resource-search/publications/integrated-care-leaflet.aspx.

COPD general

- NHS Improvement's COPD resources – including a Model for Improvement (archived site): http://webarchive.nationalarchives.gov.uk/20130221101407/http://www.improvement.nhs.uk/lung/NationalProjects/ManagingCOPD/Howtogetstarted/tabid/191/Default.aspx.

Respiratory Futures

- A virtual networking and information platform, seed funded by the BTS and NHS England. The website features a searchable knowledge portal and other resources, and it is intended that this site will grow to include further content and develop activities such as webinar debates and

innovative knowledge sharing to demonstrate best practice in respiratory healthcare: www.respiratoryfutures.org.uk/.

IMPRESS breathlessness resources

- Hosted by NHS Networks, this online resource is aimed at clinicians, patients and the public on the prevalence and incidence of long-term breathlessness in adults. The site draws together evidence on and experience of COPD, heart failure, anxiety, obesity and anaemia: www.networks.nhs.uk/nhs-networks/impress-improving-and-integrating-respiratory/news/impress-breathlessness-resources.

4. Appendices

- **Appendix A**
  - Audit methodology
  - Mapping
  - Recruitment
  - Development of the audit questions
  - Definitions
  - Information governance
  - Patient consent
  - Data collection period
  - Data collection
  - Telephone and email support
- **Appendix B**
  - Reliability analysis
- **Appendix C**
  - Indices of deprivation
- **Appendix D**
  - Participating and non-participating PR providers and programmes
- **Appendix E**
  - BTS online audit tools website
- **Appendix F**
  - National COPD Audit Programme governance
  - National COPD Audit Programme board members
  - National COPD Audit Programme steering group members
  - National COPD Audit Programme pulmonary rehabilitation workstream group
- **Appendix G**
  - Medical Research Council (MRC) dyspnoea scale
- **Appendix H**
  - Glossary of terms and abbreviations
- **Appendix I**
  - References

Appendix A

Audit methodology

The National COPD Audit Programme builds on previous national COPD audits which took place in 1997, 2003 and 2008. These involved audits of the resourcing and organisation of care at NHS units across the UK, as well as clinical audits of COPD admissions to those units. The 2008 audit introduced several additional elements designed to explore the COPD care pathway: a sample of the patients were sent an anonymous survey; a survey was sent to GPs of the first 30 patients audited at each unit; and primary care organisations were asked to complete a questionnaire. The National COPD Audit Programme has expanded the cross-pathway approach by including clinical and organisational audits of PR services for COPD patients. This is the first time that PR services have been audited at a national level.

The current iteration of the National COPD Audit Programme has been commissioned by HQIP, on behalf of NHS England and Wales as part of the National Clinical Audit Programme (NCA), and is therefore restricted to England and Wales, unlike previous rounds which covered the whole of the UK. A new aspect of the programme is that it includes the collection of patient identifiable data. In the case of the PR clinical audit, this is to allow outcome data to be extracted and linked by the Health and Social Care Information Centre (HSCIC) without the need for participants to carry out any subsequent notes audit. It will also allow data to be linked between the workstreams.

The new PR audit 2015 comprised two distinct elements:

- an audit of the resourcing and organisation of PR services during the period of clinical case ascertainment
- an audit of all patients with a primary respiratory diagnosis of COPD who were assessed (or if not assessed, began PR) between 12 January and 10 April 2015.

To achieve sufficient case numbers for meaningful site comparisons, participating PR programmes were instructed to audit all eligible cases, subject to obtaining patient consent.

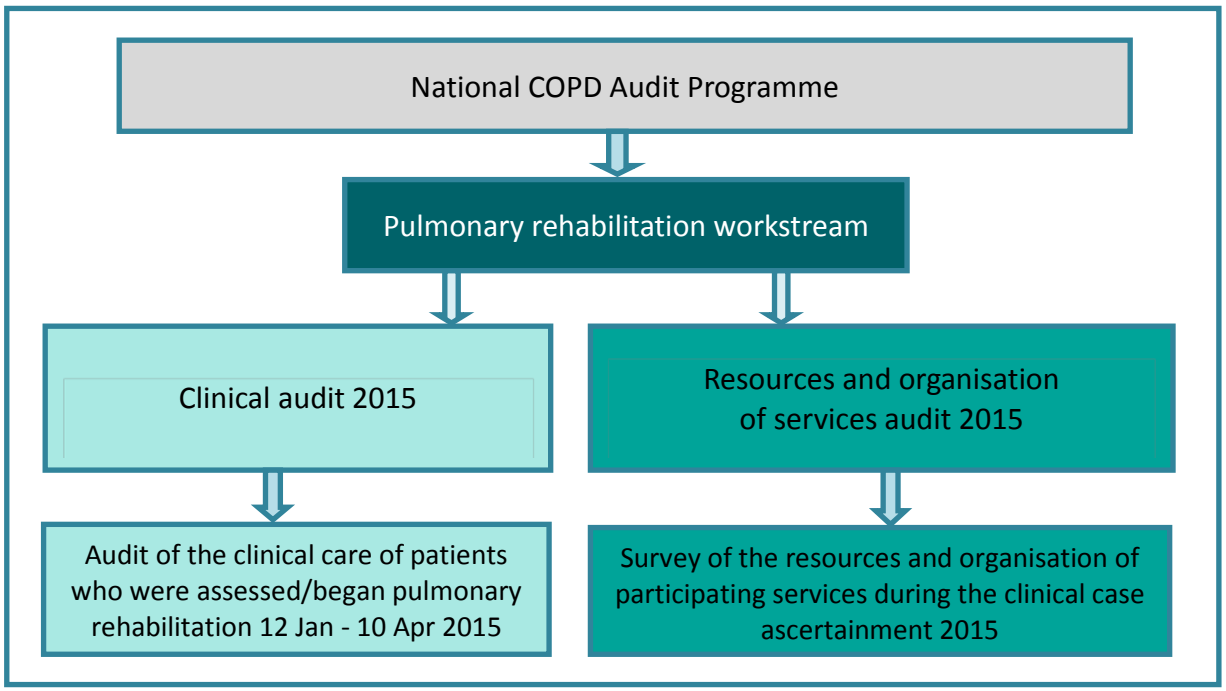


Fig 3: National Pulmonary Rehabilitation COPD Audit methodology

Mapping of Pulmonary Rehabilitation programmes in England and Wales

This is the first time a comprehensive national audit of PR services has been undertaken. Prior to this, there was no established list or database of PR services and, therefore, before registration could start, the BTS project team was tasked with identifying and mapping PR services in England and Wales.

For the purposes of the mapping exercise, PR was not tightly defined in terms of national or international guideline documents. The objective of the mapping exercise was to identify all services describing themselves as PR programmes, so the breadth and quality of clinical care provided under this description was audited.

Contact with healthcare professionals involved with PR began in late 2013, and information about the audit was disseminated via professional organisations such as the Association of Respiratory Nurse Specialists (ARNS) and the Association of Chartered Physiotherapists in Respiratory Care (ACPRC). The audit was also promoted via the RCP and the BTS websites, at specialist conferences and through social media (eg Twitter). In October 2014, letters were sent to the chief executives / medical directors of all NHS trusts and health boards, notifying them of the audit and enclosing a list of PR services mapped at that point. If the trust / health board provided any PR service that did not appear on the list, they were asked to reply identifying their programme(s) along with programme lead contacts or, if they did not provide any PR, they were asked to confirm this.

Identification of PR programmes continued throughout 2014 and included several approaches to CCGs to request information on the services they commission. CCGs were then sent freedom of information (FOI) requests where this information had not already been provided.

At the end of this mapping exercise, 230 programmes were identified within 158 different providers (see Figs 4 and 5 below); providers included acute and community NHS trusts and health boards, charities and private healthcare providers.

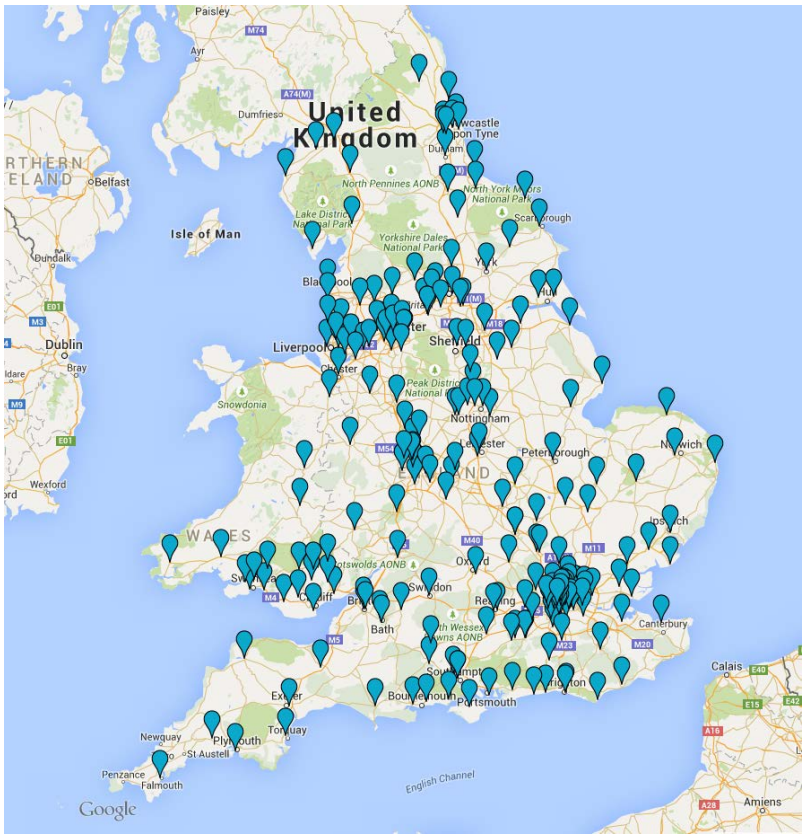


Fig 4: PR programmes in England and Wales

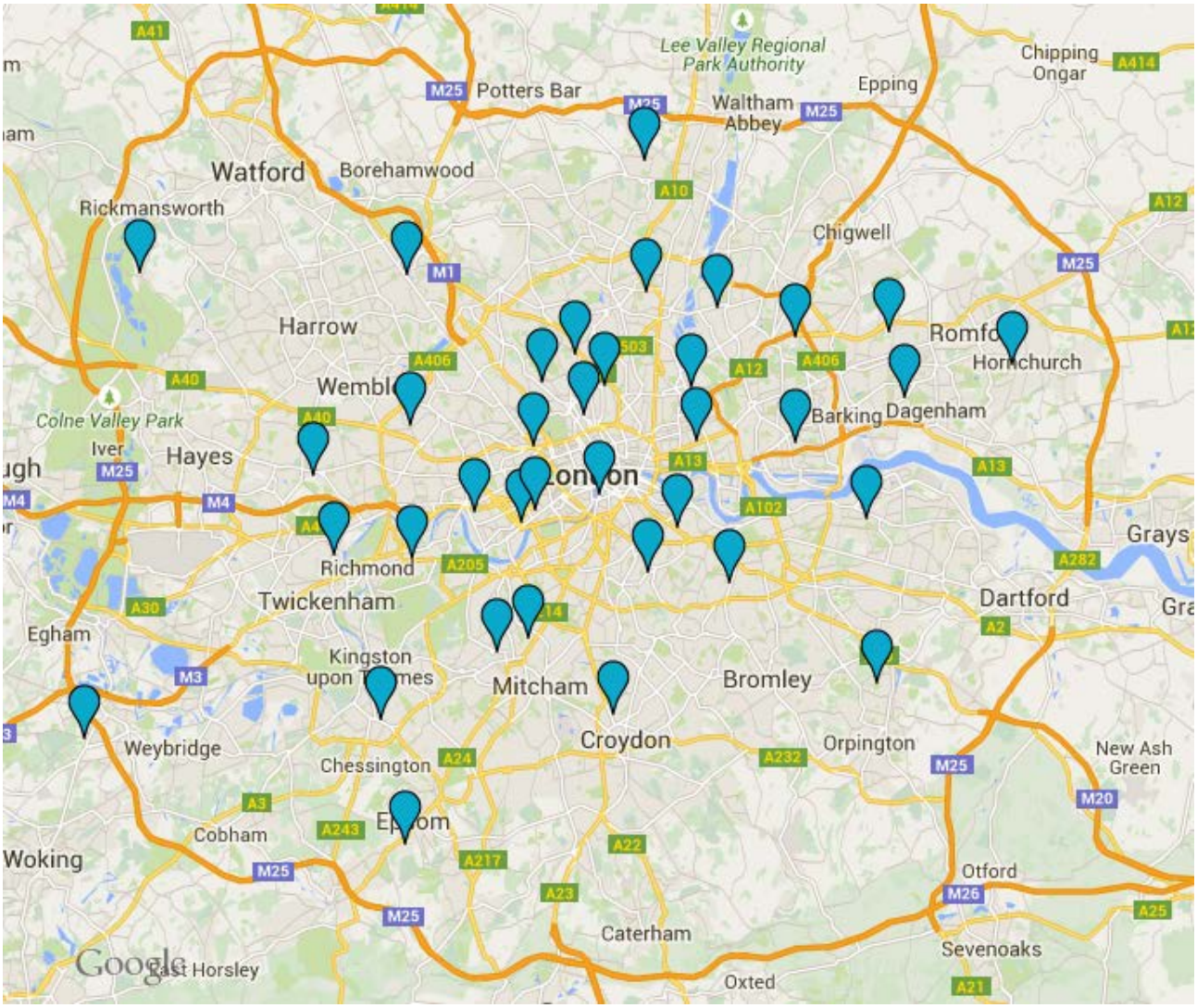


Fig 5: PR programmes in London

Recruitment

Registrations were collected throughout the mapping process described above.

Of the 230 programmes identified, 210 PR programmes went on to participate in the clinical audit (195/211 English PR programmes and 15/19 Welsh PR programmes). Participation at programme level in England and Wales was 92% and 79% respectively.

We believe this to be a comprehensive picture of services in England and Wales, but we cannot rule out the possibility that PR services exist that were not identified and contacted, and therefore did not participate in the audit.

Development of the audit questions

The clinical and organisational datasets were developed by the PR workstream group, in consultation with COPD experts across England and Wales. Copies of both datasets are available to download from the programme website: www.rcplondon.ac.uk/COPD. Questions included in both datasets were ordered broadly around four audit questions:

1. questions identifying clinical characteristics of individual audit cases to allow adjustment for case mix
2. questions outlining the treatment provided to patients by PR programmes
3. questions assessing clinical outcomes for patients who received treatment by PR programmes
4. questions identifying resources available to PR programmes for the provision of care.

The clinical audit questions covered a number of domains of care, to ensure that general data were collected but also information about specific areas including the referral process, initial assessment and discharge. Similarly, the organisational dataset focused on areas including patient intake, content of programme, staffing and record keeping. To ensure PR care was audited against accepted standards, audit questions were also mapped to the recently published BTS PR quality standards (which in turn arose from the BTS PR guideline document that made recommendations for evidence-based PR practice). A specific effort was made to ensure that each question could be mapped to a quality standard, and conversely that each quality standard was represented within the audit datasets.

Feedback on both datasets was invited during a pilot clinical audit that took place in June 2014. Subsequent modifications were made to both datasets, and improvements were also made to the functionality of the online web tool.

Definitions

Programme: a PR service with a shared pool of staff and central administration where referrals are received. A programme may operate at several sites.

Site: the physical location where the PR services are provided, eg a hospital gym or church hall.

Date of referral: the date given in the referral letter. A referrer may be a GP, consultant, community team, early discharge team etc.

Date of receipt of referral: the date a referral letter is received by the programme.

Date of assessment: the date the patient attends an appointment to be assessed before beginning PR sessions. If there was no separate assessment appointment, programmes were asked to enter the date of the first appointment/session.

Date of enrolment: the date of the first PR session attended.

Information governance

The PR clinical audit involved the collection of patient identifiable data, which meant that it was necessary to either obtain individual patient consent or obtain an exemption under section 251 of the NHS Act 2006. It is considered best practice to opt for patient consent wherever practicable, and the Health Research Authority Confidentiality Advisory Group (CAG) therefore requested that patient consent was trialled as part of the pilot clinical audit. This did not have a significant impact on the numbers of patients included in the pilot audit, and patient consent was therefore adopted for the main audit. To support the consent process, a consent form and patient information leaflet were developed with input from patient groups, and these were ultimately approved by the Health and Social Care Information Centre (HSCIC) Data Access Advisory Group (DAAG).

Additionally, Caldicott Guardian consent was also obtained from each provider organisation before access was given to participants to allow them to submit data via the online data collection tool.

Patient consent

Participating programmes were asked to approach all eligible patients for written consent, preferably at their initial assessment (ie the point when a patient became eligible for the audit). Any delay in obtaining consent risked the patient dropping out from the programme before consent could be obtained, in which case their data could not be used.

The person taking the consent was instructed to provide the patient with a patient information leaflet and a brief explanation of the audit, and then give the patient the opportunity to ask questions before asking them to sign a consent form. Programmes were asked to keep a record of their total number of eligible patients, the number of patients approached for consent and the number of patients who consented so that this data could be entered in the organisational audit.

Data collection period

The case ascertainment period for the clinical audit ran from 12 January to 10 April 2015, with a further 3-month period (to 10 July 2015) to allow the patients who had been recruited and consented to complete their PR and for data to be entered onto the online data collection tool. The organisational audit ran concurrently with the clinical case ascertainment, with a further 2 weeks (to 24 April 2015) to allow data to be finalised and entered after final patient numbers were known.

Data collection

Data were collected by PR staff at each participating PR programme, with support from audit and administrative staff. Data were submitted via the BTS web-based audit data collection system, developed in 2009 by Westcliff Solutions Ltd (Appendix E).

Documentation to support participation in the audit was posted on the RCP National COPD Audit Programme website (www.rcplondon.ac.uk/projects/national-copd-audit-programme-pulmonary-rehabilitation-workstream), including audit instructions, data collection sheets, datasets with help notes and consent documentation. Regular email updates were also sent to audit participants in the run up to the audit and throughout the audit period with information about the audit and reminders about deadlines.

Towards the end of the data collection period, reminders were sent to PR programmes that had not entered as many cases as they had reported having consented in the organisational audit, and the BTS made contact with the PR programmes that had started records that had not been submitted, to ensure that those records were finalised and included in the national dataset. During and after the closure of the audits, the BTS also contacted units where data were missing or appeared to be incorrect, so that this could be corrected.

Telephone and email support

The BTS project team provided dedicated support to deal with queries from participants throughout the audit: a telephone helpline was available from Monday to Friday during office hours, and queries could be emailed directly to the BTS project team. Queries were then logged for future learning.

Appendix B: Reliability analysis

Summary tables for categorical data, dates and numerical data are presented below, with the data items being as closely aligned as possible to the way they are presented in the main report.

Categorical data

Kappa statistic	Overall as relevant
K<0.00	
0.00≤ K<0.10	
0.10≤ K<0.20	• 3.4 Modes of exercise performed in programme: Neuromuscular electrical stimulation (NMES)
0.20≤ K<0.30	
0.30≤ K<0.40	• 2.7 Auditor agreement in knowing whether transport was arranged for patient to attend
0.40≤ K<0.50	• 3.5 Auditor agreement in knowing whether patient received supplemental O_2 during exercise
0.50≤ K<0.60	• 1.5 Auditor agreement in whether ethnicity known • 2.10 Auditor agreement in knowing if patient breathing supplemental O_2 when saturation recorded • 3.4 Modes of exercise performed in programme: upper limb (aerobic or resistance) • 4.1 Auditor agreement in knowing whether a discharge assessment was arranged and attended
0.60≤ K<0.70	• 1.12 Reason not enrolled: Psycho-social problems • 1.12 Reason not enrolled: Problems with transport • 1.12 Reason not enrolled: Exercises at home • 3.4 Modes of exercise performed in programme: Walking aerobic training • 4.4 Reason programme NOT completed: PR arranged elsewhere • 4.4 Reason programme NOT completed: Exercises at home • 4.5 Auditor agreement in knowing whether a written discharge exercise plan was provided for patient
0.70≤ K<0.80	• 1.5 Ethnicity (if both auditors 'knew') • 1.9 Patient was referred from OTHER • 1.12 Reason not enrolled: PR arranged elsewhere • 1.12 Reason not enrolled: Patient hospitalised • 1.12 Reason not enrolled: COPD exacerbation • 1.12 Reason not enrolled: Co-morbidities • 1.14 Had patient attended a PR programme previously • 2.2 Other significant medical conditions: Locomotor problems • 2.2 Other significant medical conditions: Neurological condition • 2.2 Other significant medical conditions: Visual impairment • 2.2 Other significant medical conditions: Other respiratory disease • 2.2 Other significant medical conditions: OTHER • 2.2 Count of co-morbidities (0,1,2,3,4 or more) excluding OTHER • 2.2 Count of co-morbidities (0,1,2,3,4 or more) including OTHER • 3.4 Modes of exercise performed in programme: Resistance training • 4.4 Reason programme NOT completed: attended programme but did not attend discharge or follow-up apt • 4.4 Reason programme NOT completed: Hospitalised • 4.4 Reason programme NOT completed: Problems with transport
0.80≤ K<0.90	• 1.9 Patient was referred from hospital consultant • 1.9 Patient was referred from hospital specialist COPD team • 1.9 Patient was referred from specified post-AECOPD early PR pathway • 1.9 Patient was referred from community services • 1.12 Reason not enrolled: PR not clinically appropriate • 1.12 Reason not enrolled: Did not wish to attend / did not feel PR would be of benefit • 1.12 Reason not enrolled: Other commitments • 2.2 Other significant medical conditions: None • 2.2 Other significant medical conditions: Alcohol related • 2.2 Other significant medical conditions: Gastrointestinal condition • 2.2 Other significant medical conditions: Ischaemic heart disease • 2.2 Other significant medical conditions: Kidney disease • 2.2 Other significant medical conditions: Mental health disorder • 2.2 Other significant medical conditions: Osteoporosis

	• 2.2 Other significant medical conditions: Stroke • 2.2 Other significant medical conditions: Thromboembolic disease (PE, DVT) • 2.2 Other significant medical conditions: Other cardiovascular disease • 2.2 Other significant medical conditions: Other endocrine disorder • 2.2 Other significant medical conditions: Other malignant disease • 2.4 Patient receiving O_2 at home at time of assessment: Ambulatory O_2 • 2.4 Patient receiving O_2 at home at time of assessment: Short burst O_2/palliative use • 2.4 Patient receiving O_2 at home at time of assessment: None • 2.6 Patient's living arrangements • 2.8 Auditor agreement in knowing values for FEV_1, %predicted FEV_1, height, weight • 2.10 Auditor agreement in knowing MRC dyspnoea score at initial assessment • 2.16 Auditor agreement in finding any health questionnaire results at initial assessment • 3.4 Modes of exercise performed in programme: Interval training • 3.4 Modes of exercise performed in programme: OTHER • 4.4 Reason programme NOT completed: Did not wish to attend / did not feel PR was of benefit • 4.4 Reason programme NOT completed: COPD exacerbation • 4.4 Reason programme NOT completed: Co-morbidities • 4.4 Reason programme NOT completed: Psych-social problems • 4.4 Reason programme NOT completed: Other commitments • 4.5 A written discharge exercise plan was provided for patient (if both auditors 'knew') • 2.13/4.7 Change in ESWT exercise results (three categories) between initial and discharge assessment • 4.8 Muscle strength measured at discharge assessment
K ≥0.90	• Gender • Age • IMD overall and domain quintiles, England and Wales • Month of admission • 1.9 Patient was referred from GP / practice team • 1.10 Patient enrolled • 1.12 Reason not enrolled: patient died • 1.13 What type of programme patient was enrolled on • 2.1 Smoking status • 2.2 Other significant medical conditions: Atrial fibrillation • 2.2 Other significant medical conditions: Cor pulmonale • 2.2 Other significant medical conditions: Dementia / confusion • 2.2 Other significant medical conditions: Diabetes • 2.2 Other significant medical conditions: Hearing impairment • 2.2 Other significant medical conditions: Hypertension • 2.2 Other significant medical conditions: Learning disability • 2.2 Other significant medical conditions: Left heart failure (LVF) • 2.2 Other significant medical conditions: Lung cancer • 2.3 N of times (0,1,2,3,4 or more) patient hospitalised for COPD exacerbation in past 12 months • 2.4 Patient receiving O_2 at home at time of assessment: Long-term home O_2 • 2.7 Transport arranged for patient to attend (if both auditors 'knew') • 2.8 GOLD stage for % predicted FEV_1 • 2.8 Auditor agreement in finding values for BMI • 2.8 BMI (<21.0, 21.0-24.9, 25.0-29.9, 30.0-34.9, ≥35.0) • 2.10 Patient breathing supplemental O_2 when saturation recorded (if both auditors 'knew') • 2.10 MRC dyspnoea score at initial assessment ((if both auditors 'knew') • 2.13 Exercise performance assessed at initial assessment • 2.13 Auditor agreement in finding values for ISWT, ESWT, 6MWT exercise results at initial assessment • 3.4 Modes of exercise performed in programme: Cycle aerobic training • 3.5 Patient received supplemental O_2 during exercise (if both auditors 'knew') • 4.1 Discharge assessment was arranged and attended (if both auditors 'knew') • 4.3 Did patient complete the programme • 4.4 Reason programme NOT completed: Still enrolled as at 10 July 2015 • 4.4 Reason programme NOT completed: Patient died • 4.4 Reason programme NOT completed: OTHER • 4.6 Auditor agreement in knowing MRC dyspnoea score at discharge • 4.6 MRC dyspnoea score at initial assessment (if both auditors 'knew') • 4.7 Auditor agreement in finding values for ISWT, ESWT, 6MWT exercise results at discharge • 2.13/4.7 Change in ISWT exercise results (three categories) between initial and discharge assessment

	• 2.13/4.7 Change in 6MWT exercise results (three categories) between initial and discharge assessment • 4.9 Auditor agreement in finding any health questionnaire results at discharge assessment • 2.16/4.9 Change in SGRQ health status SYMPTOMS score (three categories) between baseline and discharge • 2.16/4.9 Change in SGRQ health status ACTIVITY score (three categories) between baseline and discharge • 2.16/4.9 Change in SGRQ health status IMPACTS score (three categories) between baseline and discharge • 2.16/4.9 Change in SGRQ health status TOTAL score (three categories) between baseline and discharge • 2.16/4.9 Change in CRQ health status DYSPNOEA score (three categories) between baseline and discharge • 2.16/4.9 Change in CRQ health status FATIGUE score (three categories) between baseline and discharge • 2.16/4.9 Change in CRQ health status EMOTION score (three categories) between baseline and discharge • 2.16/4.9 Change in CRQ health status DYSPNOEA score (three categories) between baseline and discharge • 2.16/4.9 Change in CAT health status TOTAL score (three categories) between baseline and discharge

Dates

	Exact agreement	Nature of disagreement
Referral	91% (961/1056)	14 (1 day), 17 (2-4 days), 13 (5-9 days), 29 (10-49 days), 22 (≥50 days)
Receipt of referral	91% (860/950)	20 (1 day), 17 (2-4 days), 12 (5-9 days), 24 (10-49 days), 17 (≥50 days)
Initial assessment	95% (1007/1056)	5 (1 day), 9 (2-4 days), 9 (5-9 days), 24 (10-49 days), 2 (≥50 days)
Enrolment	89% (824/926)	5 (1 day), 20 (2-4 days), 37 (5-9 days), 33 (10-49 days), 7 (≥50 days)
Last supervised PR session	91% (844/925)	5 (1 day), 30 (2-4 days), 16 (5-9 days), 23 (10-49 days), 7 (≥50 days)
Discharge assessment when done	91% (654/716)	8 (1 day), 18 (2-4 days), 15 (5-9 days), 15 (10-49 days), 6 (≥50 days)
Days from referral to initial assessment	87% (922/1056)	18 (1 day), 24 (2-4 days), 18 (5-9 days), 50 (10-49 days), 24 (≥50 days)
Days from receipt of referral to initial assessment	87% (830/950)	21 (1 day), 22 (2-4 days), 19 (5-9 days), 39 (10-49 days), 19 (≥50 days)
Days from referral to receipt of referral	89% (848/950)	31 (1 day), 25 (2-4 days), 20 (5-9 days), 20 (10-49 days), 6 (≥50 days)
Days from referral to enrolment	83% (768/926)	13 (1 day), 28 (2-4 days), 35 (5-9 days), 52 (10-49 days), 30 (≥50 days)
Days from receipt of referral to enrolment	83% (684/828)	21 (1 day), 21 (2-4 days), 36 (5-9 days), 43 (10-49 days), 23 (≥50 days)
Days from initial assessment to enrolment	86% (797/926)	8 (1 day), 25 (2-4 days), 42 (5-9 days), 45 (10-49 days), 9 (≥50 days)
Days from enrolment to last supervised PR session	83% (769/925)	11 (1 day), 43 (2-4 days), 45 (5-9 days), 47 (10-49 days), 10 (≥50 days)
Days from initial assessment to discharge assessment	88% (630/716)	12 (1 day), 22 (2-4 days), 20 (5-9 days), 26 (10-49 days), 6 (≥50 days)
Days from enrolment to discharge assessment	82% (587/716)	8 (1 day), 31 (2-4 days), 43 (5-9 days), 37 (10-49 days), 10 (≥50 days)

Numerical data

	Exact agreement	Nature of disagreement
Age in years	94% (985/1052)	54 (within one year), and 13 (more than one year – range 2-52).
Number of co-morbidities excluding other	81% (853/1056)	158 (one), 34 (two), 11 (three, four or five)
Number of co-morbidities including other	79% (830/1056)	182 (one), 33 (two), 11 (three, four or five)
Rank of English IMD score	98% (637/651)	6 (<5000), 8 (5000-9924)
Rank of Welsh IMD score	93% (39/42)	99, 173, 528
Number of times hospitalised for a COPD exacerbation in past 12 months	97% (786/812)	21 (one), 2 (two), 3 (three, four or five)
FEV_1	95% (613/643)	16 (within 0.10), 3 (within 0.11-0.20), 11 (more than 0.20)
FEV_1 predicted	96% (623/650)	4 (within 1.0%), 9 (within 1.1-5.0%), 5 (within 5.1-10.0%), 9 (more than 10.0%)
Height (m)	93% (623/671)	24 (within 0.01m), 11 (within 0.011-0.020), 9 (within 0.021-0.05), 4 (more than 0.05)
Weight (kg)	92% (629/681)	32 (within 1.0 kg), 5 (within 1.1-2.0), 15 (more than 2.0)
BMI	84% (581/689)	86 (within 1.0), 15 (within 1.1-2.0), 7 (more than 2.0)
Patients oxygen saturation at rest	95% (889/937)	16 (one), 9 (two), 18 (three, four or five), 5 (>five)
Total number of supervised PR sessions attended	94% (865/925)	48 (one), 7 (two), 2 (three, four or five), 3 (>five)
Total number of supervised PR sessions scheduled	96% (891/925)	16 (one), 4 (two), 7 (three, four or five), 7 (>five)
Baseline Incremental shuttle walk test (ISWT) (metres)	97% (544/559)	4 (within 10m), 5 (within 11-30m), 6 (>30m)
Baseline endurance shuttle walk test (EWST) (seconds)	93% (108/116)	3 (within 30s), 1 (within 30-60s), 4 (>60s)
Baseline six-minute walk test (6MWT) (metres)	98% (376/385)	3 (within 10m), 1 (within 11-30m), 5 (>30m)
Discharge ISWT (metres)	98% (366/372)	2 (within 10m), 0 (within 11-30m), 4 (>30m)
Discharge EWST (seconds)	93% (83/89)	2 (within 30s), 0 (within 30-60s), 4 (>60s)
Discharge 6MWT (metres)	97% (253/260)	1 (within 10m), 1 (within 11-30m), 5 (>30m)
Change in ISWT (metres)	96% (348/361)	3 (within 10m), 3 (within 11-30m), 7 (>30m)
Change in EWST (seconds)	86% (74/86)	3 (within 30s), 3 (within 30-60s), 6 (>60s)
Change in 6MWT (metres)	95% (242/254)	3 (within 10 m), 1 (within 11-30m), 8 (>30m)
St George's Respiratory Questionnaire SGRQ:		
Baseline: Symptoms	94% (51/54)	2 (within 1.0), 1 (1.1-2.0)
Baseline: Activity	96% (50/52)	2 (within 1.0)
Baseline: Impacts	98% (52/53)	1 (>4.0)
Baseline: Total	98% (55/56)	1 (>4.0)
Discharge: Symptoms	93% (41/44)	2 (within 1.0), 1 (1.1-2.0), 0 (2.1-3.0), 0 (3.1-4.0), 0 (>4.0)
Discharge: Activity	91% (40/44)	2 (within 1.0), 2 (>4.0)
Discharge: Impacts	95% (42/44)	1 (within 1.0), 1 (>4.0)
Discharge : Total	95% (42/44)	1 (within 1.0), 1 (2.1-3.0)
Change: Symptoms	91% (39/43)	2 (within 1.0), 2 (>4.0)

Change: Activity	90% (37/41)	1 (within 1.0), 1 (1.1-2.0), 2 (>4.0)
Change: Impacts	95% (40/42)	2 (>4.0)
Change: Total	95% (39/41)	1 (2.1-3.0), 1 (>4.0)
Chronic Respiratory Questionnaire CRQ:		
Baseline: Dyspnoea	97% (379/392)	5 (0.01-0.49),4 (0.50-0.99), 4 (≥1.0)
Baseline: Fatigue	93% (363/390)	16 (0.01-0.49),6 (0.50-0.99), 5 (≥1.0)
Baseline: Emotion	91% (356/390)	29 (0.01-0.49),1 (0.50-0.99), 4 (≥1.0)
Baseline: Mastery	93% (363/389)	16 (0.01-0.49),2 (0.50-0.99), 8 (≥1.0)
Discharge: Dyspnoea	98% (290/296)	2 (0.01-0.49),2 (0.50-0.99), 2 (≥1.0)
Discharge: Fatigue	95% (280/296)	10 (0.01-0.49),1 (0.50-0.99), 5 (≥1.0)
Discharge: Emotion	92% (273/296)	18 (0.01-0.49),3 (0.50-0.99), 2 (≥1.0)
Discharge: Mastery	96% (285/296)	6 (0.01-0.49),1 (0.50-0.99), 4 (≥1.0)
Change: Dyspnoea	95% (275/289)	8 (0.01-0.49),2 (0.50-0.99), 4 (≥1.0)
Change: Fatigue	91% (265/290)	14 (0.01-0.49),3 (0.50-0.99), 8 (≥1.0)
Change: Emotion	86% (250/290)	32 (0.01-0.49),3 (0.50-0.99), 5 (≥1.0)
Change: Mastery	91% (264/290)	15 (0.01-0.49),3 (0.50-0.99), 8 (≥1.0)
Baseline COPD assessment test (CAT) total score	98% (522/532)	4 (one), 2 (two), 0 (three, four or five), 4 (>five)
Discharge CAT total score	97% (360/370)	1 (one), 2 (two), 3 (three, four or five), 4 (>five)
Change in CAT total score	96% (345/358)	4 (one), 2 (two), 3 (three, four or five), 4 (>five)

Appendix C: Indices of deprivation

England and Wales produce their own indices of multiple deprivation. These are not directly comparable because they are produced for different geographies, they are on different timescales, indicators are made up differently, different policy drivers have driven change and, as devolution has evolved, differences have grown.

England

The English Indices of Deprivation 2010 is based on the concept that deprivation consists of more than just poverty. The Indices of Deprivation 2010 is the collective name for a group of indices that all measure different aspects of deprivation. The most widely used of these is the Index of Multiple Deprivation (IMD), which combines other indices to give an overall score for the relative level of multiple deprivation experienced in every neighbourhood in England. The indices relate to areas and not individuals – within each area there will be individuals who are deprived and individuals who are not.

Thirty-eight separate indicators are grouped into seven domains, each of which reflects a different aspect of deprivation, and these are used to produce an overall IMD score for each of the 32482 small areas in England. These can be ranked from 1 (most deprived area) to 32482 (least deprived area). Each small area is defined by a set of postcodes and so, for this audit, patient postcodes were used to obtain a set of deprivation indices data pertaining to the area in which the patient lived at the time of their admission to hospital.

The overall IMD 2010 score is constructed by combining seven weighted standardised domain scores: income deprivation (22.5%); employment deprivation (22.5%); health deprivation and disability (13.5%); education, skills and training deprivation (13.5%); barriers to housing and services (9.3%); crime (9.3%); and living environment deprivation (9.3%). Scores for different domains cannot be compared, as they have different ranges, and different minimum and maximum values. Comparisons can however be made across the domains by using the ranks.

For further information, go to:

- www.neighbourhood.statistics.gov.uk/dissemination/MetadataDownloadPDF.do?downloadId=27507&nsjs=true&nsck=false&nssvg=false&nswid=977
- www.gov.uk/government/uploads/system/uploads/attachment_data/file/6222/1871538.pdf

Wales

The Welsh Index of Multiple Deprivation (WIMD) 2011 is the official measure of relative deprivation for small areas in Wales. It was produced by the Welsh Government. The index was developed as a tool to identify and understand deprivation in Wales, so that funding, policy and programmes can be effectively focused on the most disadvantaged communities.

'Multiple' deprivation refers to the different types of deprivation that might occur. Eight types of deprivation, or domains, are included in the index. These are: employment, income, education, health, community safety, geographical access to services, housing and physical environment. The index is produced as a set of ranks, with a rank of 1 assigned to the most deprived area. The ranks of the index are calculated for each of the 1896 lower layer super output areas (LSOAs) of Wales. Although the geographical size of these small areas varies quite widely, and depends on the local population density, the populations are intended to be roughly the same in each LSOA, with an average population of 1500 people.

The WIMD 2011 is constructed from a weighted sum of the deprivation score for each domain: income (23.5%), employment (23.5%), health (14%), education (14%), geographical access to services (10%), community safety (5%), physical environment (5%) and housing (5%). The domains are in turn built up from sets of indicators.

For further information, go to:
http://wales.gov.uk/statistics-and-research/welsh-index-multiple-deprivation/?lang=en.

Appendix D: Participating and non-participating PR providers and programmes

Participating PR providers and programmes

Provider	Programme
5 Boroughs Partnership NHS Foundation Trust	St Helens PR Programme
Abertawe Bro Morgannwg (ABM) University Health Board	Bridgend PR Programme Llwchwr PR Programme Morriston Hospital PR Programme Port Talbot PR Programme
Aintree University Hospitals NHS Foundation Trust	Aintree PR Programme
Airedale NHS Foundation Trust	Craven PR Programme
Aneurin Bevan University Health Board	Blaenau Gwent PR Programme Nevill Hall PR Programme Newport PR Programme
Anglian Community Enterprise CIC	Anglian Community PR Programme (Essex)
Barts Health NHS Trust	Barts ARCARE PR Programme Barts Newham PR Programme
Bedford Hospital NHS Trust	Bedford PR Programme
Berkshire Healthcare NHS Foundation Trust	Berkshire West PR Programme
Berkshire Healthcare NHS Foundation Trust and Frimley Health NHS Foundation Trust	East Berkshire PR Programme
Betsi Cadwaladr University Health Board	BCUHB PR Programme
Birmingham Community Healthcare NHS Trust	Birmingham Community PR Programme
Blackpool Teaching Hospitals NHS Foundation Trust	Wyre and Fylde PR Programme
BOC Healthcare	BOC Hounslow PR Programme BOC North East Hampshire and Farnham PR Programme BOC Somerset Community PR Programme BOC South Nottingham PR Programme BOC Staffordshire PR Programme BOC West Norfolk PR Programme
Bolton NHS Foundation Trust	Bolton PR Programme
Bradford District Care Trust	Better Breathing for Better Living PR Programme
Bridgewater Community Healthcare NHS Trust	Bridgewater PR Programme
Brighton and Sussex University Hospitals NHS Trust	Royal Sussex PR Programme
Bristol Community Health CIC	Bristol Community Health PR Programme
Bromley Healthcare CIC	Bromley PR Programme
Buckinghamshire Healthcare NHS Trust	Bucks PR Service

Provider	Programme
Calderdale and Huddersfield NHS Foundation Trust	Calderdale Home PR Programme Calderdale PR Programme Greater Huddersfield PR Programme
Cambridgeshire Community Services NHS Trust	Cambridge and Huntingdon PR Programme
Cardiff and Vale University Health Board	Llandough PR Programme
Care Plus Group	Grimsby Care Plus PR Programme
Central and North West London NHS Foundation Trust	Camden PR Programme Milton Keynes Community PR Programme
Central London Community Healthcare NHS Trust	Barnet Community PR Programme Hammersmith and Fulham PR Programme West Herts Community PR Programme
Central Manchester University Hospitals NHS Foundation Trust	Manchester Community PR Programme Manchester Royal Infirmary PR Programme
Chelsea and Westminster Hospital NHS Foundation Trust	Chelsea and Westminster Hospital PR Programme
Cheshire and Wirral Partnership NHS Foundation Trust	Cheshire and Wirral PR Programme
City Health Care Partnership CIC	City Health Care PR Programme (Hull)
County Durham and Darlington Foundation NHS Foundation Trust	North Durham PR Programme South Durham PR Programme
Croydon Health Services NHS Trust	Croydon PR Programme
CSH Surrey	CSH Surrey PR Programme
Cumbria Partnership NHS Foundation Trust	Carlisle Community PR Programme Copeland Community PR Programme Furness Community PR Programme Solway PR Programme South Lakes Community PR Programme
Cwm Taf University Health Board	Cwm Taf North PR Programme Cwm Taf South PR Programme
Derbyshire Community Health Services NHS Trust	Breathe Ability (South Derbyshire) PR Programme Erewash PR Programme North Derbyshire PR Programme
Dorset County Hospital NHS Foundation Trust	Weymouth and Dorchester PR Programme
Dorset Healthcare University NHS Foundation Trust	Dorset Healthcare PR Programme
East Cheshire NHS Trust	East Cheshire PR Programme
East Lancashire Hospitals NHS Trust	East Lancashire Hospitals PR Programme
East Sussex Healthcare NHS Trust	East Sussex PR Programme
Enfield Community Services (Barnet Enfield and Haringey Mental Health Trust (MHT))	Enfield PR Programme
First Community Health and Care CIC	East Surrey Community PR Programme
Gateshead Health NHS Foundation Trust	Gateshead Hospital PR Programme

Provider	Programme
George Eliot Hospital NHS Trust	George Eliot PR Programme
Glenroyd Medical	Glenroyd Medical PR Programme (Blackpool)
Gloucestershire Care Services NHS Trust	Gloucestershire PR Programme
Great Western Hospitals NHS Foundation Trust	PACE Wiltshire Community PR Programme
Guy's and St Thomas' NHS Foundation Trust	St Thomas' Hospital PR Programme
Harrogate and District NHS Foundation Trust	Harrogate Hospital PR Programme
Heart of England NHS Foundation Trust	Heart of England PR Programme Solihull Community PR Programme
Hertfordshire Community NHS Trust	Hertfordshire Community PR Programme
Homerton University Hospital NHS Foundation Trust	Homerton Hospital PR Programme
Hounslow and Richmond Community Healthcare NHS Trust	Hounslow and Richmond PR Programme
Humber NHS Foundation Trust	East Riding PR Programme
Hywel Dda University Health Board	Pembrokeshire PR Programme Carmarthenshire PR Programme
Isle of Wight NHS Trust	St Mary's Hospital PR Programme
James Paget University Hospitals NHS Foundation Trust	James Paget Community B.E.E.T. PR Programme
Kent Community Health NHS Trust	Kent Community Health PR Programme
Kettering General Hospital NHS Foundation Trust	Kettering Rocket PR Programme
King's College Hospital NHS Foundation Trust	Lambeth and Southwark Community and King's College Hospital PR Programme
Lancashire Care NHS Foundation Trust	Blackburn PR Programme Preston and Chorley PR Programme
Lawrence Hill Health Centre	North Bristol CLEAR PR Programme
Leeds Community Healthcare NHS Trust	Leeds Community PR Programme
Leicestershire Partnership NHS Trust	Leicestershire Community Programme
Lewisham and Greenwich NHS Trust	Lung Exercise and Education Programme (LEEP) Lewisham PR Programme
Lincolnshire Community Health Services NHS Trust	Lincolnshire South West PR Programme
Liverpool Community Health NHS Trust	Liverpool Community PR Programme
Liverpool Heart and Chest Hospital NHS Foundation Trust	Knowsley Community PR Programme Liverpool PR Programme
London North West Healthcare NHS Trust	Brent PR Programme Ealing PR Programme
Luton and Dunstable University Hospital NHS Foundation Trust	Luton and Dunstable PR Programme
Maidstone and Tunbridge Wells NHS Trust	West Kent Community PR Programme
Medway Community Healthcare CIC	Medway Community PR Programme

Provider	Programme
Norfolk and Norwich University Hospitals NHS Foundation Trust	Norfolk and Norwich PR Programme
Norfolk Community Health and Care NHS Trust	Norfolk Community PR Programme
North Bristol NHS Trust	Bristol LEEP PR Programme
North Cumbria University Hospitals NHS Trust	North Cumbria Hospitals PR Programme
North East London NHS Foundation Trust	NEL FT Barking and Dagenham PR Service NEL FT Havering PR Service NEL FT Redbridge PR Service NEL FT Waltham Forest PR Service
North Somerset Community Partnership CIC	North Somerset Community PR Programme
North Tees and Hartlepool NHS Foundation Trust	Stockton and Hartlepool PR Programme
Northampton General Hospital NHS Trust	Northampton Respiratory Therapy Acute Response Team (RESTART) PR Programme
Northern Devon Healthcare NHS Trust	Devon CREADO PR Programme
Northumbria Healthcare NHS Foundation Trust	North Tyneside Hospital PR Programme Northumbria Community PR Programme Wansbeck Hospital PR Programme
Nottingham CityCare Partnership CIC	Nottingham CityCare PR Programme
Nottinghamshire Healthcare NHS Trust	Ashfield and Mansfield PR Programme Cotgrave and Bingham PR Programme Nottingham North and East PR Programme
Oxford Health NHS Foundation Trust	Oxford Health PR Programme
Oxleas NHS Foundation Trust	Greenwich PR Programme
Papworth Hospital NHS Foundation Trust	Papworth Hospital PR Programme
Peninsula Community Health CIC	Cornwall Community PR Programme East Cornwall Community PR Programme
Pennine Care NHS Foundation Trust	Trafford Inspire PR Programme HMR PR Programme
Peterborough and Stamford Hospitals NHS Foundation Trust	Peterborough PR Programme
Plymouth Community Healthcare CIC	Plymouth Community PR Programme
Powys Teaching Health Board	Mid Powys PR Programme South Powys PR Programme
Provide CIC	Mid Essex PR Programme Cambridgeshire PR Programme
Royal Berkshire NHS Foundation Trust	Royal Berkshire Hospital PR Programme
Royal Brompton and Harefield NHS Foundation Trust	Harefield Hospital PR Programme Royal Brompton Hospital PR Programme
Royal Devon and Exeter NHS Foundation Trust	Royal Devon and Exeter PR Programme
Royal Free London NHS Foundation Trust	Royal Free Hospital PR Programme
Royal Surrey County Hospital NHS Foundation Trust	Royal Surrey PR Programme

Provider	Programme
Royal United Hospitals Bath NHS Foundation Trust	Royal United PR Programme
Salford Royal NHS Foundation Trust and Salford Community Leisure	Salford's Breathing Better PR Programme
Salisbury NHS Foundation Trust	Salisbury LEEP PR Programme
Sandwell and West Birmingham Hospitals NHS Trust	Sandwell PR Programme
Sheffield Teaching Hospitals NHS Foundation Trust	Sheffield Community PR Programme
Shropshire Community Health NHS Trust	Shropshire and Telford PR Programme
Sirona Care and Health CIC	Bath and Somerset PR Programme
Solent NHS Trust	Solent Hampshire PR Programme Solent Portsmouth PR Programme
Solent NHS Trust / University Hospital Southampton NHS Foundation Trust	Southampton Integrated COPD Team PR Programme
South Devon Healthcare NHS Foundation Trust	Torbay PR Programme
South Doc Services Limited	South Doc PR Programme (Birmingham)
South Essex Partnership University NHS Foundation Trust (SEPT)	SEPT PR Programme
South Tees Hospitals NHS Foundation Trust	East Cleveland and James Cook PR Programme Friarage and Friary PR Programme
South Tyneside NHS Foundation Trust	Gateshead Community PR Programme South Tyneside Acute PR Programme Sunderland Community PR Programme
South Warwickshire NHS Foundation Trust	South Warwickshire PR Programme
South West Yorkshire Partnership NHS Foundation Trust	Barnsley PR Programme
Southend University Hospital NHS Foundation Trust	Southend PR Programme
Southern Health NHS Foundation Trust	Southern Health PR Programme
Southport and Ormskirk Hospital NHS Trust	West Lancashire PR Programme
St George's Healthcare NHS Trust	St George's PR Programme
Staffordshire and Stoke on Trent Partnership NHS Trust	Cannock and Rugeley PR Programme East Staffs PR Programme Stafford PR Programme Stoke Community PR Programme
Stockport NHS Foundation Trust	Ashton Under Lyne and Glossop PR Programme Stockport PR Programme
Suffolk Community Healthcare (Serco Limited)	Suffolk Community PR Programme
Sussex Community NHS Trust	Brighton Hospital PR Programme Crawley, Horsham and Haywards Heath PR Programme Rustington PR Programme

Provider	Programme
Sutton and Merton Community Services (The Royal Marsden)	SMCS PR Programme
Swindon Borough Council	Healthy Lives PR Programme
Taunton and Somerset NHS Foundation Trust	Musgrove Park PR Programme
The Dudley Group NHS Foundation Trust	Dudley Group PR Programme
The Mid Yorkshire Hospitals NHS Trust	MY Therapy Services PR Programme North Kirklees PR Programme
The Newcastle upon Tyne Hospitals NHS Foundation Trust	Newcastle upon Tyne PR Programme
The Pennine Acute Hospitals NHS Trust	Fairfield PR Programme North Manchester PR Programme Oldham PR Programme
The Rotherham NHS Foundation Trust	Breathing Space PR Programme
The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust	Christchurch Hospital PR Programme
The Royal Wolverhampton NHS Trust	New Cross Hospital PR Programme
University Hospital of South Manchester NHS Foundation Trust	South Manchester PR Programme
University Hospital Southampton NHS Foundation Trust	University Hospital Southampton PR Programme
University Hospitals of Leicester NHS Trust	Glenfield and Leicester Hospitals PR Programme
Virgin Care	Farnham PR Programme
Walsall Cardiac Rehabilitation Trust	Walsall PR Programme
Walsall Healthcare NHS Trust	Walsall Manor PR Programme
Warrington and Halton Hospitals NHS Foundation Trust	Halton Runcorn and Widnes PR Programme Warrington Wolves PR Programme
Western Sussex Hospitals NHS Foundation Trust	Chichester and Bognor Regis PR Programme Worthing and Southlands PR Programme
Whittington Health NHS Trust	Haringey Community PR Programme Islington Community PR Programme Whittington Hospital PR Programme
Wirral University Teaching Hospital NHS Foundation Trust	Wirral PR Programme
Worcestershire Acute Hospitals NHS Trust	Worcestershire PR Programme
Wye Valley NHS Trust	Herefordshire PR Programme
York Teaching Hospital NHS Foundation Trust	Ryedale PR Programme Scarborough PR Programme Whitby PR Programme York Community PR Programme
Your Healthcare CIC	Royal Borough of Kingston PR Programme

Non-participating PR providers and programmes

Provider Programme	**Reason**
ABM University Health Board Singleton Hospital PR Programme	 No eligible patients within the audit period
Aneurin Bevan University Health Board Caerphilly PR Programme Torfaen PR Programme	 No eligible patients within the audit period Declined to take part in the clinical audit
Ashford and St Peter's Hospitals NHS Foundation Trust St Peter's PR Programme	 No eligible patients within the audit period
Atrium Health Limited Atrium PR Programme	 Identified at the end of the audit period
Cambridgeshire Community Services NHS Trust Luton PR Programme	 Declined to take part in the clinical audit
Colchester Hospital University NHS Foundation Trust Colchester Hospital PR Programme	 No eligible patients within the audit period
Doncaster and Bassetlaw Hospitals NHS Foundation Trust	Declined to take part in both audits
Imperial College Healthcare NHS Trust Kensington, Chelsea and Westminster PR Programme	 Declined to give Caldicott Guardian approval
Inform Health and Fitness Limited, London	Declined to take part in both audits
Lincolnshire Community Health Services NHS Trust Lincolnshire North East PR Programme Lincolnshire North West PR Programme Lincolnshire South East PR Programme	 Declined to take part in the clinical audit No eligible patients within the audit period Declined to take part in the clinical audit
Milton Keynes Hospital NHS Foundation Trust	Declined to take part in both audits
North East London NHS Foundation Trust South West Essex PR Programme	 Took over service mid-way through the audit
Northern Lincolnshire and Goole Hospitals NHS Foundation Trust Northern Lincolnshire and Goole PR Programme	 No eligible patients within the audit period
Nottinghamshire Healthcare NHS Trust Bassetlaw PR Programme	 Identified after the audit period
Old Orchard Clinic, Eastbourne	Declined to take part in both audits
Powys Teaching Health Board North Powys PR Programme	 No eligible patients within the audit period
Salisbury Plain Health Partnership South Wiltshire Community PR Programme	 No eligible patients within the audit period

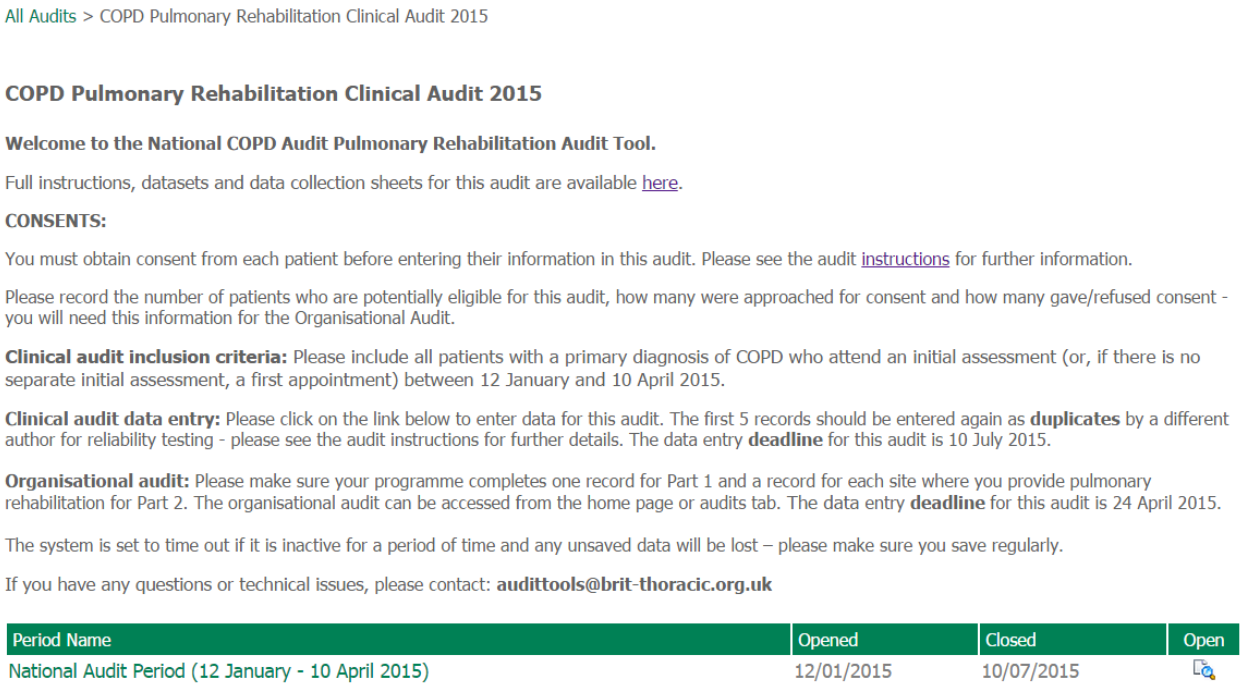
Appendix E: BTS audit tools website

Access to the BTS audit tools website is by individual username and password. Audit participants (users) were required to register for an account and registrations were approved by nominated BTS head office staff.

The PR audit tool was only made available to users who had been specifically granted access to this audit. Existing users of the website who had registered for the PR audit were granted access to the PR audit tool upon receipt of approval from their Caldicott Guardian. New users' accounts were approved for access to the PR audit tool on request (subject to receipt of Caldicott Guardian approval).

Accounts were linked to a named PR programme within a named provider organisation. Accounts would normally only be approved for access to one PR programme (and the user would only be able to access data for that PR programme). However, some users were granted access to multiple PR programmes within their provider organisation, if necessary.

Once a user's account had been authorised and access had been given to the PR audit tool, they could access the landing page for the PR audit (Fig 6), which contained brief instructions for the audit, links to full instructions on the RCP audit website and contact details for the BTS audit team for questions or technical issues.


All Audits > COPD Pulmonary Rehabilitation Clinical Audit 2015

COPD Pulmonary Rehabilitation Clinical Audit 2015

Welcome to the National COPD Audit Pulmonary Rehabilitation Audit Tool.

Full instructions, datasets and data collection sheets for this audit are available here.

CONSENTS:

You must obtain consent from each patient before entering their information in this audit. Please see the audit instructions for further information.

Please record the number of patients who are potentially eligible for this audit, how many were approached for consent and how many gave/refused consent - you will need this information for the Organisational Audit.

Clinical audit inclusion criteria: Please include all patients with a primary diagnosis of COPD who attend an initial assessment (or, if there is no separate initial assessment, a first appointment) between 12 January and 10 April 2015.

Clinical audit data entry: Please click on the link below to enter data for this audit. The first 5 records should be entered again as **duplicates** by a different author for reliability testing - please see the audit instructions for further details. The data entry **deadline** for this audit is 10 July 2015.

Organisational audit: Please make sure your programme completes one record for Part 1 and a record for each site where you provide pulmonary rehabilitation for Part 2. The organisational audit can be accessed from the home page or audits tab. The data entry **deadline** for this audit is 24 April 2015.

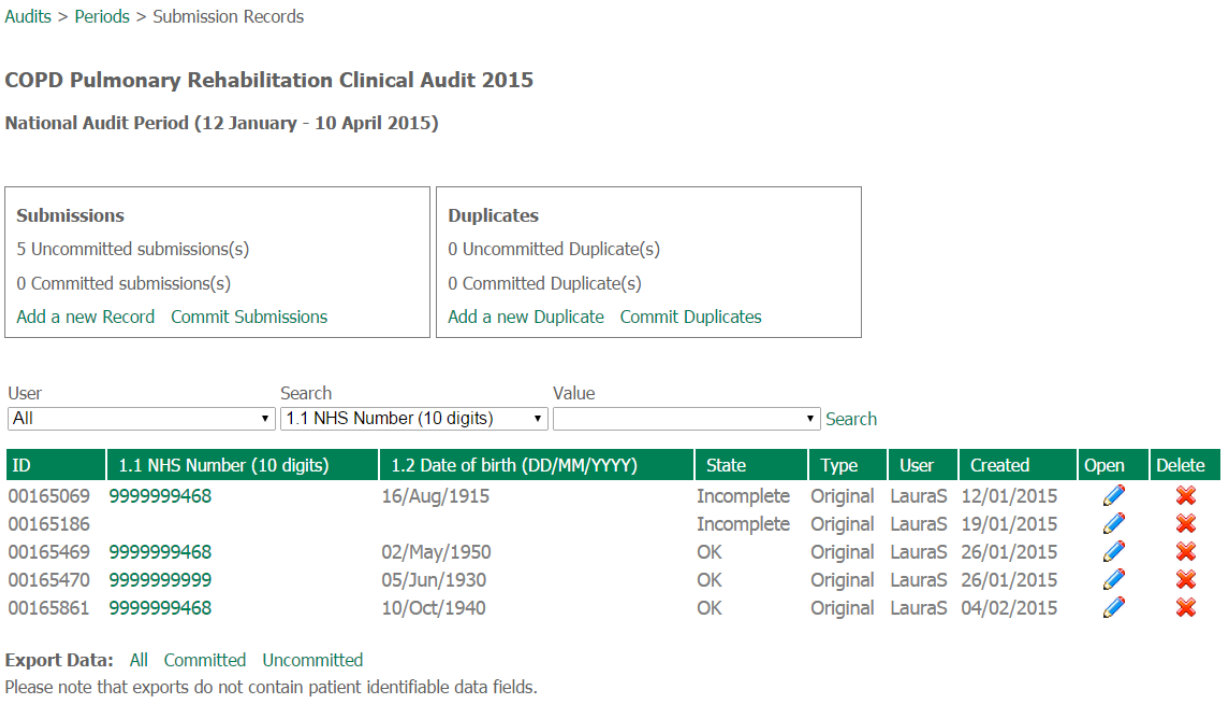
The system is set to time out if it is inactive for a period of time and any unsaved data will be lost – please make sure you save regularly.

If you have any questions or technical issues, please contact: **audittools@brit-thoracic.org.uk**

Period Name	Opened	Closed	Open
National Audit Period (12 January - 10 April 2015)	12/01/2015	10/07/2015	

Fig 6: Landing page for the PR audit tool

Users would then click through to the data entry summary page (Fig 7), which contained the links to 'Add a new Record' or 'Add a new Duplicate'. The table at the bottom of Fig 7 displayed all records created by users for that PR programme. Users could view and edit records created by colleagues, but only the user who created the record could commit or delete records. The table showed: the record ID; the patient NHS number and date of birth to avoid inadvertent duplication of records; the record state ('Incomplete', 'OK' or 'Committed'); the record type (original or duplicate); and which user created it.



Audits > Periods > Submission Records

COPD Pulmonary Rehabilitation Clinical Audit 2015

National Audit Period (12 January - 10 April 2015)

Submissions	**Duplicates**
5 Uncommitted submissions(s)	0 Uncommitted Duplicate(s)
0 Committed submissions(s)	0 Committed Duplicate(s)
Add a new Record Commit Submissions	Add a new Duplicate Commit Duplicates

User: All | Search: 1.1 NHS Number (10 digits) | Value: | Search

ID	1.1 NHS Number (10 digits)	1.2 Date of birth (DD/MM/YYYY)	State	Type	User	Created	Open	Delete
00165069	9999999468	16/Aug/1915	Incomplete	Original	LauraS	12/01/2015		
00165186			Incomplete	Original	LauraS	19/01/2015		
00165469	9999999468	02/May/1950	OK	Original	LauraS	26/01/2015		
00165470	9999999999	05/Jun/1930	OK	Original	LauraS	26/01/2015		
00165861	9999999468	10/Oct/1940	OK	Original	LauraS	04/02/2015		

Export Data: All Committed Uncommitted

Please note that exports do not contain patient identifiable data fields.

Fig 7: Example of a data entry summary page

Fig 8 shows a partially complete record. The clinical audit questions were divided into four sections, indicated by tabs across the top of the record: general information; key clinical information at time of assessment; key clinical information relating to the programme; and key clinical information at discharge. Text in the section tabs turned from red when data entry was incomplete, to green when the section had been completed. Users could move between sections using the 'Previous Section' or 'Next Section' icons. The organisational audit was similarly structured.

The data entry fields comprised a mixture of check boxes, dropdown lists, number fields, date fields and free text boxes. Help note '?' icons beside questions contained clarification and suggestions for sources of data, where appropriate. Additional red text was used to prompt users to complete all mandatory fields, and red text was also used to alert users to range restrictions and logic restrictions, eg the date of assessment must be after the date of referral.

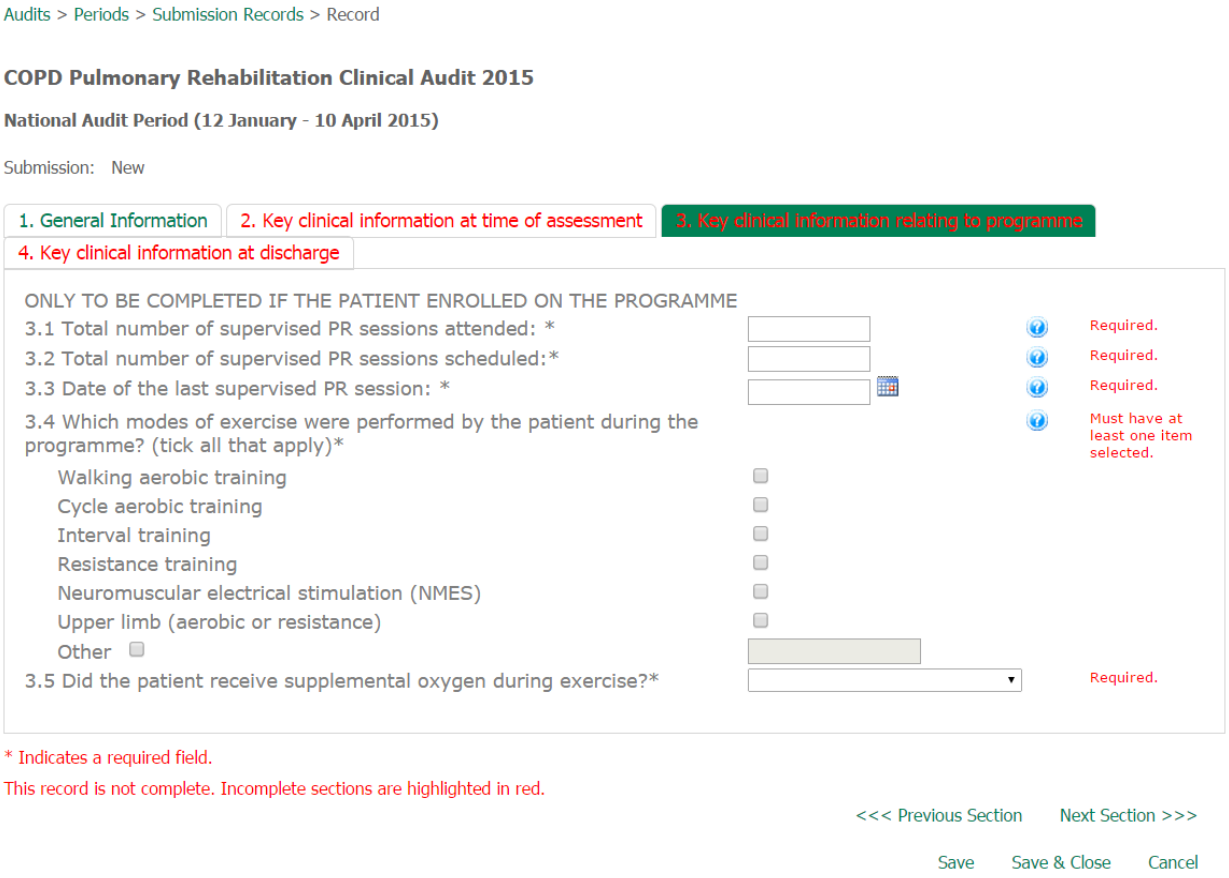


Fig 8: Example of a partially completed record

Records could be saved and returned to at any point by clicking the 'Save' or 'Save & Close' icons. When the record was complete, this was confirmed by clicking 'Commit submissions'. Only committed data went forward for analysis.

After the record was committed, it could not be edited. However, BTS head office staff could commit or uncommit records on request, but they would not make any corrections or delete data.

Appendix F: National COPD Audit Programme governance

The National COPD Audit Programme is led by the Clinical Effectiveness and Evaluation Unit (CEEU) of the Royal College of Physicians (RCP), working in partnership with the British Thoracic Society (BTS), the British Lung Foundation (BLF), the Primary Care Respiratory Society UK (PCRS-UK) and the Royal College of General Practitioners (RCGP).

The programme is guided by a programme board, consisting of programme delivery partners, and a wider programme steering group (membership listed below). Both groups are chaired by Professor Mike Roberts, overall clinical lead for the programme. Within the programme, each workstream is led by a dedicated clinical lead and workstream advisory group.

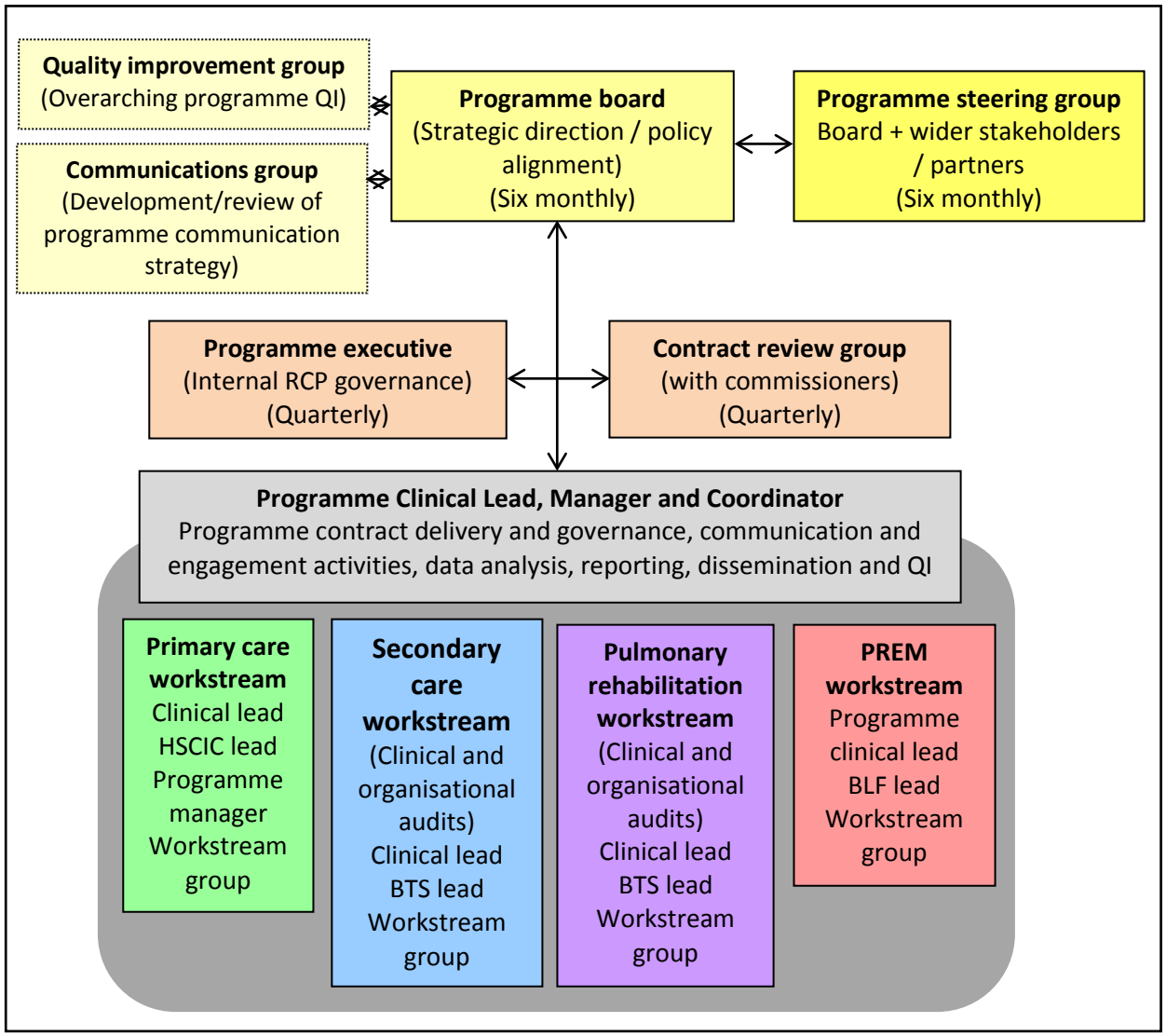


Fig 9: National COPD Audit Programme governance structure

- The programme board meets at least twice yearly, to provide strategic direction and to ensure that the National COPD Audit Programme achieves its objectives. It comprises the programme and workstream clinical leads, and representatives from the programme delivery team (RCP, BTS, BLF and HSCIC).

- The programme steering group meets twice yearly, to ensure the National COPD Audit Programme's relevance to those receiving and delivering COPD services in England and Wales. It comprises the programme strategic partners and wider representation from organisations such as the Royal College

of Nursing (RCN), the Association of Respiratory Nurse Specialists (ARNS), NHS Wales and Picker Institute Europe.

- The workstream advisory groups are tasked with the development and day-to-day running of their specific element of the programme. Membership of the PR workstream group is drawn from the steering group, supported by expert representatives from respiratory medicine, nursing and physiotherapy. The workstream group meets quarterly or as necessary to monitor progress, and to support and direct the project, with more frequent communications between the BTS project team and the PR clinical lead.

The National COPD Audit Programme is commissioned by the Healthcare Quality Improvement Partnership (HQIP) as part of the National Clinical Audit Programme (NCA).

Any enquiries in relation to the National COPD Audit Programme should be directed to: COPD@rcplondon.ac.uk.

National COPD Audit Programme board members

Programme clinical leadership

- Professor C Michael Roberts, National COPD Audit Programme – Programme Clinical Lead; and Consultant Respiratory Physician, Whipps Cross University Hospital NHS Trust, Barts Health, Barts and The London School of Medicine and Dentistry, Queen Mary University of London
- Dr Rupert Jones, National COPD Audit Programme Clinical Lead – Primary Care Workstream; Senior Clinical Research Fellow, Centre for Clinical Trials and Population Research, Plymouth University Peninsula School of Medicine and Dentistry; and General Practitioner
- Professor Michael Steiner, National COPD Audit Programme Clinical Lead – Pulmonary Rehabilitation Workstream; Consultant Respiratory Physician, University Hospitals of Leicester; and Honorary Clinical Professor at Loughborough University
- Dr Robert A Stone, National COPD Audit Programme Clinical Lead – Secondary Care Workstream; and Consultant Respiratory Physician, Taunton and Somerset NHS Foundation Trust, Musgrove Park Hospital, Taunton

British Thoracic Society

- Miss Sally Welham, Deputy Chief Executive and BTS Project Lead for the National COPD Pulmonary Rehabilitation Audit
- Ms Laura Searle, Project Coordinator, National COPD Pulmonary Rehabilitation Audit

British Lung Foundation

- Dr Penny Woods, Chief Executive
- Mr Mike McKevitt, Head of Patient Services

Health and Social Care Information Centre

- Mr James Duffy, Clinical Audit Manager, Clinical Audit Support Unit (CASU)

Royal College of Physicians

- Rhona Buckingham, Operations Director, Clinical Effectiveness and Evaluation Unit, Care Quality Improvement Department
- Dr Ian Bullock, Executive Director, Care Quality Improvement Department; and Chief Operating Officer, National Clinical Guideline Centre

- Ms Juliana Holzhauer-Barrie, National COPD Audit Programme Coordinator, Clinical Effectiveness and Evaluation Unit, Care Quality Improvement Department
- Mrs Emma Skipper, National COPD Audit Programme Manager, Clinical Effectiveness and Evaluation Unit, Care Quality Improvement Department
- Dr Kevin Stewart, Clinical Director, Clinical Effectiveness and Evaluation Unit, Care Quality Improvement Department

National COPD Audit Programme steering group members

Programme clinical leadership

- Professor C Michael Roberts, National COPD Audit Programme – Programme Clinical Lead; and Consultant Respiratory Physician, Whipps Cross University Hospital NHS Trust, Barts Health, Barts and The London School of Medicine and Dentistry, Queen Mary University of London
- Dr Rupert Jones, National COPD Audit Programme Clinical Lead – Primary Care Workstream; Senior Clinical Research Fellow, Centre for Clinical Trials and Population Research, Plymouth University Peninsula School of Medicine and Dentistry; and General Practitioner
- Professor Michael Steiner, National COPD Audit Programme Clinical Lead – Pulmonary Rehabilitation Workstream; Consultant Respiratory Physician, University Hospitals of Leicester, and Honorary Clinical Professor at Loughborough University
- Dr Robert A Stone National COPD Audit Programme Clinical Lead – Secondary Care Workstream; and Consultant Respiratory Physician, Taunton and Somerset NHS Foundation Trust, Musgrove Park Hospital, Taunton

Association of Chartered Physiotherapists in Respiratory Care

- Ms Catherine Thompson, Association of Chartered Physiotherapists in Respiratory Care (ACPRC) Chair; and Head of Patient Experience for Acute Services, NHS England

British Lung Foundation

- Dr Penny Woods, Chief Executive
- Mr Mike McKevitt, Head of Patient Services

British Geriatrics Society

- Dr Chris Dyer, Consultant Geriatrician, Royal United Hospitals, Bath; Chair of BGS respiratory specialist interest group (from April 2015)

British Thoracic Society

- Ms Laura Searle, Project Coordinator, National COPD Pulmonary Rehabilitation Audit
- Dr Nick Hopkinson, Reader in Respiratory Medicine, the National Heart and Lung Institute of Imperial College, London; Honorary Consultant Chest Physician, Royal Brompton Hospital, London
- Miss Sally Welham, Deputy Chief Executive; and BTS Project Lead for the National COPD Pulmonary Rehabilitation Audit

Health and Social Care Information Centre

- Ms Emma Adams, Clinical Audit Project Lead, Clinical Audit Support Unit (CASU) (until Dec 2014)
- Mr James Duffy, Clinical Audit Manager, Clinical Audit Support Unit (CASU) (from Jan 2015)

Healthcare Quality Improvement Partnership

- Ms Yvonne Silove, National Clinical Audit Development Manager (until Dec 2014)
- Mrs Jane Ingham, Chief Executive (from Jan 2015)

NHS England

- Mr Alex Porter, Clinical Informatics Network Support Manager, Medical Directorate, NHS England (until Jan 2015)

NHS Wales

- Dr Patrick Flood-Page, Welsh Health Boards Representative; Consultant Respiratory Physician, Royal Gwent Hospital; Chair of the British Lung Foundation in Wales; Lecturer at Cardiff University; Training Programme Director for Respiratory Medicine at the Wales Deanery; and part of the Royal College Specialist Advisory Committee for Respiratory Medicine

Patient Representative

- Ms Suzie Shepherd, Chair of Leeds Occupational Health Advisory Service; Patient Advisor to the Leeds Rheumatology Scientific Advisory Board; Vice Chair of the Clinical Accreditation Alliance; and Patient Lead on the RCP Future Hospitals Programme

Picker Institute Europe

- Mr Chris Graham, Director of Research and Policy

Primary Care Respiratory Society UK

- Dr Rupert Jones, Primary Care Respiratory Society UK Executive and Research Lead; National COPD Audit Programme Clinical Lead – Primary Care Workstream; Senior Clinical Research Fellow, Centre for Clinical Trials and Population Research, Plymouth University Peninsula School of Medicine and Dentistry; and General Practitioner

Royal College of Nursing

- Ms Caia Francis, Senior Lecturer, Nursing and Midwifery Department, Faculty of Health and Applied Sciences, University of the West of England

Royal College of Physicians

- Rhona Buckingham, Operations Director, Clinical Effectiveness and Evaluation Unit, Care Quality Improvement Department
- Ms Jane Ingham, Clinical Standards Director, Clinical Standards Department (to November 2014)
- Dr Ian Bullock, Executive Director, Care Quality Improvement Department; and Chief Operating Officer, National Clinical Guideline Centre (from April 2014)
- Ms Juliana Holzhauer-Barrie, National COPD Audit Programme Coordinator, Clinical Effectiveness and Evaluation Unit, Care Quality Improvement Department
- Professor Derek Lowe, Medical Statistician, Care Quality Improvement Department
- Mrs Emma Skipper, National COPD Audit Programme Manager, Clinical Effectiveness and Evaluation Unit, Care Quality Improvement Department
- Dr Kevin Stewart, Clinical Director, Clinical Effectiveness and Evaluation Unit, Care Quality Improvement Department

Royal College of General Practitioners

- Dr Kevin Gruffydd-Jones, Respiratory Clinical Lead, Royal College of General Practitioners; Honorary Lecturer at University of Bath; and General Practitioner

- Ms Megan Lanigan, Programme Manager, Clinical Innovation and Research Centre (CIRC) (until Feb 2015)
- Ms Nicola O'Reilly, Interim Programme Manager, Clinical Innovation and Research Centre (CIRC) (from May 2015)
- Dr Imran Rafi, Chair of the Clinical Innovation and Research Centre (CIRC); Senior Lecturer in Primary Care Education, St George's University of London; and General Practitioner

National COPD Audit Programme pulmonary rehabilitation workstream group

- Professor Michael Steiner, National COPD Audit Programme Clinical Lead – Pulmonary Rehabilitation Workstream; Consultant Respiratory Physician, University Hospitals of Leicester; and Honorary Clinical Professor at Loughborough University
- Mrs Katy Beckford, Community Respiratory Team Lead, Berkshire Healthcare NHS Foundation Trust, Bracknell
- Dr Elaine Bevan-Smith, Community COPD Team Clinical Lead (retired), Worcestershire Acute Hospitals NHS Trust
- Dr John Blakey, Senior Clinical Lecturer at the Liverpool School of Tropical Medicine; and Consultant Respiratory Physician, Aintree University Hospital, Liverpool
- Dr Charlotte Bolton, Senior Lecturer at the University of Nottingham; and Consultant Respiratory Physician, Nottingham City Hospital, Nottingham
- Dr Sarah Elkin, Consultant Respiratory Physician, St Mary's Hospital, London
- Mrs Sian Goddard, Specialist Respiratory Physiotherapist, Royal Cornwall Hospitals NHS Trust, Truro
- Dr Neil Greening, Clinical Lecturer in Respiratory Medicine, University of Leicester; and Specialist Registrar, Glenfield Hospital, Leicester
- Mrs Karen Heslop, Nurse Consultant, Royal Victoria Infirmary, Newcastle upon Tyne
- Ms Juliana Holzhauer-Barrie, National COPD Audit Programme Coordinator, Clinical Effectiveness and Evaluation Unit, Care Quality Improvement Department, Royal College of Physicians, London
- Professor Derek Lowe MSc, C.Stat Medical Statistician, Care Quality Improvement Department, Royal College of Physicians, London
- Dr Will Man, Consultant Respiratory Physician, Harefield Hospital, London
- Mr Mike McKevitt, Head of Patient Services, British Lung Foundation
- Professor C Michael Roberts National COPD Audit Programme – Programme Clinical Lead; and Consultant Respiratory Physician, Whipps Cross University Hospital NHS Trust, Barts Health, Barts and The London School of Medicine and Dentistry, Queen Mary University of London
- Ms Laura Searle, Project Coordinator, National COPD Pulmonary Rehabilitation Audit, British Thoracic Society, London
- Dr Louise Sewell, Occupational Therapist; Senior Lecturer in Occupational Therapy, Coventry University
- Professor Sally Singh, Head of Pulmonary and Cardiac Rehabilitation, Glenfield Hospital, Leicester
- Mrs Emma Skipper, National COPD Audit Programme Manager, Clinical Effectiveness and Evaluation Unit, Care Quality Improvement Department, Royal College of Physicians, London
- Dr Paul Walker, Consultant Respiratory Physician, Aintree University Hospital, Liverpool
- Mrs Sandy Walmsley, Respiratory Nurse Specialist, Heart of England NHS Foundation Trust, Birmingham
- Miss Sally Welham, BTS Deputy Chief Executive; and BTS Project Lead for the National COPD Pulmonary Rehabilitation Audit, British Thoracic Society, London
- Dr Penny Woods, Chief Executive, British Lung Foundation

Appendix G: Medical Research Council (MRC) dyspnoea scale

MRC dyspnoea scale	
Grade	**Degree of breathlessness related to activity**
1	Not troubled by breathless except on strenuous exercise
2	Short of breath when hurrying on a level or when walking up a slight hill
3	Walks slower than most people on the level, stops after a mile or so, or stops after 15 minutes' walking at own pace
4	Stops for breath after walking 100 yards, or after a few minutes on level ground
5	Too breathless to leave the house, or breathless when dressing/undressing

Adapted from Fletcher CM. The clinical diagnosis of pulmonary emphysema – an experimental study. *Proc R Soc Med* 1952;45:577-584. [Accessed via PCRS-UK website: www.pcrs-uk.org/mrc-dyspnoea-scale]

Appendix H: Glossary of terms and abbreviations

AECOPD	Acute exacerbation of chronic obstructive pulmonary disease
AHP	Allied health professional
An outcomes strategy for chronic obstructive pulmonary disease (COPD) and asthma in England	Sets out the outcomes that need to be achieved in COPD and asthma to deliver the government's commitment to improve health outcomes and reduce inequalities: Department of Health. *An outcomes strategy for chronic obstructive pulmonary disease (COPD) and asthma in England*. London: DH, 2011. www.gov.uk/government/uploads/system/uploads/attachment_data/file/216139/dh_128428.pdf
Audit	A process that measures care against set criteria, to identify where changes can be made to improve the quality of care
BMI	Body mass index
CAT	COPD Assessment Test
Chronic obstructive pulmonary disease (COPD)	A collection of lung diseases including chronic bronchitis, emphysema and chronic obstructive airways disease, which cause difficulties with breathing, primarily due to narrowing of the airways
CIC	Community interest company: a type of company introduced in 2005, designed for social enterprises that want to use their profits and assets for the public good
Clinical commissioning group (CCG)	Clinical commissioning groups organise the delivery of NHS services in England
Cohort PR programme	A PR programme where patients all start and finish the programme at the same time
CRQ	Chronic Respiratory Questionnaire
Domains	The NHS Outcomes Framework sets out five domains focusing on improving health and reducing health inequality that the NHS should be aiming to improve: **Domain 1** – Preventing people from dying prematurely **Domain 2** – Enhancing quality of life for people with long-term conditions **Domain 3** – Helping people to recover from episodes of ill health or following injury **Domain 4** – Ensuring that people have a positive experience of care **Domain 5** – Treating and caring for people in a safe environment and protecting them from avoidable harm
DVT	Deep-vein thrombosis
ESWT	Endurance shuttle walk test

FEV_1	Forced expiratory volume in 1 second
Fisher's exact test	A statistical significance test used in the analysis of contingency tables; although in practice it is employed when sample sizes are small, it is valid for all sample sizes
GOLD	Global Initiative for Chronic Obstructive Lung Disease
GP	General practitioner
ILD	Interstitial lung disease
IMD	Index of Multiple Deprivation
Interquartile range (IQR)	The IQR is the range between 25th and 75th centile which is equivalent to the middle half of all values
ISWT	Incremental shuttle walk test (Singh *et al*. Minimum clinically important improvement for the incremental shuttle walking test. *Thorax* 2008;63:775–7)
L	Litre
LHB	Local health board: LHBs plan, secure and deliver healthcare services in Wales
LSOA	Lower layer super output area
LVF	Left ventricular failure
m	Metre
Mann–Whitney test	A non-parametric test of the null hypothesis that two samples come from the same population against an alternative hypothesis, especially that a particular population tends to have larger values than the other. It can be applied on unknown distributions contrary to t-test which has to be applied only on normal distributions.
MCID	Minimal Clinically Important Difference – a threshold for a change in outcome measure that is judged by patients to be important
Mean	The mean is the average value of the data (ie the data values are added together and then divided by the number of data items)
Median	The median is the middle point of a data set: half of the values are below this point, and half are above this point.
MRC	Medical Research Council
MWT	Minute walk test (Singh *et al*. An official systematic review of the European Respiratory Society/American Thoracic Society: measurement properties of field walking tests in chronic respiratory disease. *Eur Respir J* 2014; 44:1447–1478)
n	Number

NICE guideline on COPD	Guidance for the care and treatment of people with COPD in the NHS in England and Wales: http://guidance.nice.org.uk/CG101 (NICE, 2010)
NICE quality standard for COPD	Defines clinical best practice within this topic area, covering the assessment, diagnosis and clinical management of COPD in adults: http://guidance.nice.org.uk/QS10 (NICE, 2011)
NMES	Neuromuscular electrical stimulation
Non-invasive ventilation (NIV)	Breathing support provided in hospital or at home via a face mask that delivers a slightly pressurised airflow
Palliative care	Treating symptoms at the end of life
PE	Pulmonary embolism
PEPR	Post-exacerbation pulmonary rehabilitation
Post AECOPD early discharge pathway	A service providing enhanced support to COPD patients in the community so that their discharge from hospital can be expedited
PREM	Patient Reported Experience Measure
Primary care	Local healthcare delivered by GPs, NHS walk-in centres and others, which is provided and managed by CCGs/LHBs
Pulmonary rehabilitation	A programme, typically including patient education, exercise training and advice, which is designed to improve the health of patients with chronic breathing problems including COPD
QS	Quality standard
Rolling PR Programme	A continual cycle of PR sessions, with patients joining when there is a space and leaving when the course is completed
SD	Standard deviation: a measure of the variation or dispersion of data. An SD close to 0 indicates that the data points tend to be very close to the mean, while a high SD indicates that the data points are spread out over a wider range of values.
SGRQ	St George's Respiratory Questionnaire
Secondary care	Planned and unplanned care that is provided in hospitals
Spirometry	A test measuring lung function, specifically the amount (volume) and/or speed (flow) of air that can be exhaled, and which is used to diagnose COPD
WIMD	Welsh Index of Multiple Deprivation

Appendix I: References

1. Steiner M, Holzhauer-Barrie J, Lowe D, Searle L, Skipper E, Welham S, Roberts CM. *Pulmonary Rehabilitation: Time to breathe better. National Chronic Obstructive Pulmonary Disease (COPD) Audit Programme: Resources and organisation of pulmonary rehabilitation services in England and Wales 2015.* London: RCP, 2015. www.rcplondon.ac.uk/projects/outputs/pulmonary-rehabilitation-time-breathe-better

2. British Thoracic Society. *BTS guideline on pulmonary rehabilitation in adults*. London: BTS, 2013. www.brit-thoracic.org.uk/guidelines-and-quality-standards/pulmonary-rehabilitation-guideline/

3. British Thoracic Society. *BTS quality standards for pulmonary rehabilitation in adults*. London: BTS, 2014. www.brit-thoracic.org.uk/guidelines-and-quality-standards/pulmonary-rehabilitation-quality-standards/

4. Holland A, Spruit M, Troosters T *et al*. An official European Respiratory Society/ American Thoracic Society technical standard: field walking tests in chronic respiratory disease. *Eur Respir J* 2014;44:1428–1446. www.thoracic.org/statements/resources/copd/FWT-Tech-Std.pdf

5. National Institute for Health and Clinical Excellence. *Chronic obstructive pulmonary disease quality standard (QS10)*. London: NICE, 2011. www.nice.org.uk/Guidance/QS10

6. NHS England. *CCG outcomes indicator set 2015/16: At-a-glance guide*. London: NHS England, 2015 www.england.nhs.uk/wp-content/uploads/2012/12/ccg-ois-2015-glance.pdf

7. Welsh Government. *Together for health – A respiratory health delivery plan*. Cardiff: Welsh Government, 2014. http://gov.wales/docs/dhss/publications/140429respiratoryen.pdf

8. Stone RA, Holzhauer-Barrie J, Lowe D, Searle L, Skipper E, Welham S, Roberts CM. *COPD: Who cares? National Chronic Obstructive Pulmonary Disease (COPD) Audit Programme: Resources and organisation of care in acute NHS units in England and Wales 2014. National organisational audit report.* London: RCP, November 2014. www.rcplondon.ac.uk/projects/outputs/copd-who-cares-organisational-audit-2014

9. NHS Networks. IMPRESS breathlessness resources, 2014. www.networks.nhs.uk/nhs-networks/impress-improving-and-integrating-respiratory/news/impress-breathlessness-resources [accessed November 2015]

10. Skipper E, on behalf of the National COPD Audit Programme. *National COPD Audit Programme: Patient Reported Experience Measures (PREMs): development work and feasibility report*. London: RCP, August 2014. www.rcplondon.ac.uk/projects/outputs/copd-prems-development-work-feasibility-report

11. Schünemann H, Puhan M, Goldstein R, Jaeschke R, Guyatt G. Measurement properties and interpretability of the chronic respiratory disease questionnaire (CRQ). *COPD* 2005;2:81–89.

12. Jones P. St George's respiratory questionnaire: MCID. *COPD* 2005;2:75–79.

13. Kon S Canavan J, Jones S *et al*. Minimum clinically important difference for the COPD assessment test. *Lancet Respir Med* 2014;2:195–203.

For further information on the overall audit programme or any of the workstreams, please see our website or contact the national COPD audit team directly:

National Chronic Obstructive Pulmonary Disease (COPD) Audit Programme
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www.rcplondon.ac.uk/copd

@NatCOPDAudit
#COPDaudit #COPDPRaudit
#COPDPRbreathebetter

We also have a quarterly newsletter, so please send us your email address and contact details if you would like to join the mailing list.

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