



# Journal of the Association of Chartered Physiotherapists in Respiratory Care

Volume 53 • Issue 2 • 2021

[www.acprc.org.uk](http://www.acprc.org.uk)



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## Editor foreword

Welcome to Volume 53, Issue 2, of the journal of the Association of Chartered Physiotherapists in Respiratory Care, which is our 3rd publication of 2021. We have received a very high number of submissions to the journal over the past 6 months, meaning that this issue is the largest since the journal moved from an annual publication. We would like to extend our gratitude to both the authors for submitting their work to the journal, and to the reviewers for giving their time in providing feedback.

This edition of the journal reflects the diversity of the areas in which respiratory physiotherapists work and includes a variety of service evaluations and original research. The challenges and innovations that COVID has both brought and created are investigated in a variety of settings through three papers by Kelliher et al., Palit et al., and Davis et al. Rehabilitation after critical illness programmes is evaluated through mixed methods and qualitative investigations in 2 articles by Wilson et al. and Hannah Brown. There are 3 papers exploring interstitial lung disease and COPD by George and Kerr, Gale et al. and Asciak et al. Finally, Chloe Tait evaluates physiotherapy following thoracic surgery and Ruth Johnson evaluates the introduction of animal assisted therapy in ICU.

We are extremely pleased to include the 1st 2 outputs from the ACPRC editorial board, led by Dr Una Jones. The editorial board is tasked with leading the scoping, commissioning, co-ordination and delivery of all new ACPRC guidance documents and resources. The first is a position statement on physiotherapists use of lung ultrasound, which is an exciting and rapidly developing area of clinical practice in cardiorespiratory physiotherapy. The 2nd is a commentary on chest wall trauma. We would like to extend a huge thank you to all of the contributors to these pieces.

You will also see that included in this volume is the *ACPRC Statement and considerations for the remote delivery of pulmonary rehabilitation services during the COVID-19 pandemic*. The work was led by Lucy Gardiner and involved many physiotherapists from across the United Kingdom.

We hope that you enjoy reading this issue of the ACPRC journal, and that you are inspired to write up and submit your work. We have now made a change to the submission process, with two submission windows per year closing on the 1st April and 1st November followed by 2 publications per year. Submission guidelines are available on the ACPRC website [www.acprc.org.uk](http://www.acprc.org.uk) and are due to undergo some updates, so please review them prior to submitting to the journal. Please remember that we also provide members with support through the research officer and as editors we are very happy to discuss any potential article ideas with you too.

Kind regards

Owen Gustafson (MSc Res. MCSP) and Amy Bendall (MSc. MCSP)

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# Service evaluation of an outpatient exercise class after critical illness

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## Abstract

### Objective

To evaluate an outpatient exercise rehabilitation programme following critical illness and make recommendations to improve the service for patients.

### Design

Mixed-method design using qualitative interviews with people who have recently completed the programme and audit data from the preceding two years. The programme is hosted within a UK district general hospital outpatient therapy department.

### Participants

Adults who completed the physical rehabilitation programme between June 2016 and June 2018 were eligible to participate. Participants were interviewed in their own homes using a semi-structured format ( $n = 8$ ). Audit data included 25 sets of participant data within this time frame which equates to around 3% of patients discharged from the critical care unit in the same period.

### Outcome measures

Interviews were transcribed verbatim and analysed using grounded theory methodology. The primary outcome measure from audit data was exercise capacity (*6-minute walk test*). Secondary outcome measures were Health-Related Quality of Life (HRQOL), Anxiety and Depression (HADS).

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## Keywords

Rehabilitation, physiotherapy, qualitative interviews, service evaluation.

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## Results

Participants struggled for independence and described the physical and psychological challenges associated with this. Audit data showed significant improvements in physical function, anxiety, depression, and HRQOL following the programme.

## Conclusions

Physical and emotional challenges, recruitment, accessibility to resources and delivery of information to patients were barriers to implementation of an outpatient exercise programme. This service may promote physical function and vitality for patients, but findings are not generalisable due to small sample size and limited demographic information.

## Introduction

Every year approximately 200,000 people are admitted to critical care units in the United Kingdom (UK) (ICNARC 2017) many presenting with ongoing weakness, loss of energy, physical impairments, anxiety, depression, post-traumatic stress and other difficulties after hospital discharge (Dowdy et al. 2005; NICE 2009). This group is largely heterogenous; an estimated 58% are over 65's and 13% over 80's (Groeger et al. 1993; Bagshaw et al. 2009). However, commonality can be found in their struggle to recover, which can take up to 12 years for some individuals. This journey has a profound impact on the quality of life, healthcare utilisation and economic productivity of individuals (Dowdy et al. 2005; Mhyren et al. 2010; Lone et al. 2018). Exercise-based interventions are well evidenced to increase physical activity levels in other chronic disease populations, with studies in critical care populations showing some promise (McWilliams et al. 2009; Jones et al. 2015; McWilliams et al. 2016). Current guidelines for critical care rehabilitation following discharge from hospital (CG83) recommends patients with rehabilitation needs are reviewed 2–3 months after discharge from critical care including functional assessment (NICE 2009). However, research shows that few hospitals meet this requirement, most of whom offer follow up in a clinic format (Connolly 2014). This service evaluation explored the experiences of patients who have completed a novel outpatient exercise class following critical illness and analysed outcome measures to consider how physical and psychological measures of health were impacted after participation. A behaviour change model (Cane et al. 2012) was used to contextualise findings within the scope of a complex intervention and guide recommendations for improving the current service.

## Research questions

- What are the main concerns and challenges faced by critical care survivors after hospital discharge?
- What are patients' experiences of an exercise intervention and how does this impact their recovery?
- Do exercise capacity, quality of life, anxiety and depression measures change before and after attending the intervention?

## Methods

### Setting

An outpatient exercise-based group class runs once a week in a District General Therapy department for the benefit of people who have overcome critical illness. The class includes strengthening, balance, and cardiovascular exercises designed to improve the physical function of participants. It is structured in a circuit format and includes 40 minutes of activity followed by a 20 minute education session. The education component includes topics from the multidisciplinary team aimed at informing participants of challenges often faced when recovering from critical illness. These include chronic pain, weakness, fatigue, psychological stress and the use of exercise, diet, and wider support structures in coping with these challenges. A physiotherapist and rehabilitation assistant facilitate the delivery of the class which is run over 6 weeks. No formal training is provided for group facilitators and no formal facilitation style is stipulated. Individuals are identified by a specialist critical care nurse once discharged from the intensive care unit and then followed up via telephone to confirm their attendance for an initial assessment. The initial assessment includes completion of outcome measures and screening for suitability for the class. These measures are then repeated upon completion of the class after 6 weeks.

### Design

This service evaluation used a mixed-method design to capture the complex nature of this population. Outcome measures were paired with interview data to elaborate on the quantitative findings and give insight to the mechanisms of participation in the intervention. A grounded theory approach was used for the design of the qualitative arm of the evaluation with a realist epistemological perspective (Lomborg & Kirkevold 2003). The University of East Anglia Health Sciences Department supported the conduct of the project and provided faculty ethics approval (reference 2017/18 98). The reporting of this intervention adheres to the Medical Research Council's guidance for conducting process evaluations (Moore et al. 2015). NHS research ethics approval was deemed not to be required as this was structured as a service evaluation.

### Participants

Participants for the qualitative element were recruited face to face using convenience sampling from a local critical care support group hosted by the national charity, ICU Steps.

These patients had attended and completed the exercise group in the year preceding the evaluation and gave consent to discuss their experiences after meeting the research team.

### **Inclusion criteria for interviews**

- Adults >18 years.
- Previously admitted to critical care.
- Completed the 6-week physical rehabilitation programme between June 2016–2018.

### **Exclusion criteria**

- Any ongoing conflicting treatment.

All participants gave informed consent to take part. Interviews were organised in the participant's own homes as determined convenient for them.

### **Data collection procedures**

The main method of data collection for this evaluation were the interviews with participants which were conducted using a semi-structured format, audio-recorded and transcribed verbatim. This method of data collection was used to explore the views, experiences, beliefs and motivations of individual participants recovering from critical illness as is supported in current literature (Gill et al. 2008). Author S. Wilson carried out interviews as part of an MSc thesis; and has a clinical background as a physiotherapist with special interest in critical care. A relationship was not established prior to the evaluation commencement; however, patients were familiar with the relevance of the professional role of physiotherapists within critical care. Using a mixed methodology design in this service evaluation shaped the emerging conceptual theory during analysis and informed the structure of interviews to further refine this theory. The researcher was able to question and analyse specific elements of recovery relating to the quantitative outcome measures and explore the context of these areas for participants.

Outcome measures were analysed retrospectively from class records by the author for the two years preceding the evaluation (June 2016–2018). This included basic demographic information and Health related outcome measures detailed below.

#### *Outcome measures*

Measures are taken by a physiotherapist at two timepoints; prior to commencing the rehabilitation programme and at the 6th or final session. Outcome measures were chosen to reflect outcomes that are important to patients (Dinglas et al. 2018).

### **6-minute walk test**

The *6-minute walk test (6MWT)* is a validated, standardised, self-paced test of exercise capacity (ATS Committee 2002; Brooks et al. 2003) which has previously been used for assessing exercise capacity in the critical care population (McWilliams et al. 2016).



## Hospital anxiety and depression questionnaire

The *Hospital anxiety and depression (HADS) questionnaire* is a widely used, validated (Zigmond & Snaith 1983), appropriate measure for assessing the symptom severity of anxiety disorders and depression in primary care patients and the general population (Bjelland et al. 2002).

## Short form 36 questionnaire

The *Short form 36 (SF-36) questionnaire* classifies quality of life (QOL) and has 36 questions evaluating 8 separate domains:

- Physical functioning.
- Physical role.
- Bodily pain.
- General health.
- Vitality.
- Social functioning.
- Emotional role.
- Mental health.

The responses for each domain are scored and transformed to a 0–100 scale, with higher scores reflecting better QOL (Mahler & Mackowiak 1995).

## Analysis

Statistical analysis of outcome measures was conducted using SPSS software. A *p*-value <0.05 with a 95% confidence interval (*CI*) was deemed significant.

Interviews were transcribed and analysed using a *Grounded theory methodology*, which involves coding and comparing transcripts for similarities and concepts (Glaser 1996). The researcher compared transcripts of interviews organising excerpts into codes. These were then reanalysed and compared to reveal an overarching main concern. Results were interpreted using a framework for behaviour change theory (Cane et al. 2012; Michie et al. 2011) which incorporated qualitative and quantitative results to contextualise findings and guide recommendations for promoting engagement with the service.

Using a mixed methodology design in this service evaluation shaped the emerging conceptual theory during analysis and informed the structure of interviews to further refine this theory. The researcher was able to question and analyse specific elements of recovery relating to the quantitative outcome measures and explore the context of these areas for participants. Using this iterative process during analysis gave participants the opportunity to clarify some of the interpretations made by the researcher and add detail to areas not previously considered.

## Results

Table 1 shows the demographic information for participants. Data included was limited due to the scope of the service evaluation.

Table 1: Cohort characteristics.

Characteristics	Interviews ( <i>n</i> = 8)	Cohort ( <i>n</i> = 25)
Age in years, mean ( <i>SD</i> )	73 (11.8)	71.2 (10.2)
<b>Gender (%)</b>		
Male	3 (37.5)	14 (56)
Female	5 (62.5)	11 (44)
<b>Admitting condition (%)</b>		
Post-operative admission	4 (50)	6 (24)
Exacerbation of COPD	2 (25)	4 (16)
Respiratory insufficiency	0 (0)	4 (16)
Pleural effusion	0 (0)	2 (8)
Pulmonary embolism	0 (0)	1 (4)
Trauma	1 (12.5)	0 (0)
Not documented	1 (12.5)	8 (32)

### Interview data

Following in-depth analysis of interview transcripts, the data revealed a range of challenges faced by participants during recovery from critical illness. By discussing the various elements of these challenges, participants explored the coping mechanisms they used to navigate their recovery journey. Data showed an identification with losing independence during recovery as a main concern, which was multifaceted and included various physical, psychological and social aspects. Parry et al. (2017) suggested that behaviour change research models may help identify solutions which can be used to increase physical activity levels in critical care survivors. They discussed the use of the Behaviour Change Wheel COM-B Model in this population and felt this framework could be helpful in identifying specific strategies to solidify behaviour change based on individual barriers to engagement. For this evaluation, generated themes were mapped onto the COM-B model, illustrated in Table 2, to highlight the key discussion points and guide recommendations for service improvement. No participants withdrew from this phase of the evaluation.

Table 2: Interview results mapped to BCW COM-B Model.

COM-B component	Sub-themes	Quotes
<b>Capability:</b> Physical restrictions	Fatigue	‘I still do get very tired at times’ ‘I did sleep an awful lot’ 507.  ‘I wanted to do some housework, and I did one room and I was shattered, and I thought I’d be able to do more’ 506.
	Weakness	‘I became very handicapped with the fact that I was weak’ 501
	Frustration	‘Sometimes I get very frustrated, because I can’t get on my feet’ (502).
	Impact on confidence	‘I’m so very nervous about slipping over’ (503).  ‘Previously I could get in the car and drive wherever I want to be, I could get in the car and go. Now I can’t’ (505).
<b>Opportunity:</b> Accessibility	Practicalities	‘If they’d been around the corner we might’ve gone, but they’re a fair way away’ (502) pp. 8.
	Social isolation	‘I did feel a bit on my own in the end’ ‘I stay at home, these are my four walls’ (504).
	Support structures	‘It was causing my husband a bit of hassle to get there so I just decided not to do it anymore’ (504).  ‘To get there you need to be taken’ (505).
<b>Motivation:</b> Peer support	Group cohesion	‘It’s having the people that are in the class as well that help you’ (504).  ‘With the company, it’s easier and nicer because you have people to talk to. Sometimes when you’re doing the exercises, you can do a bit more’ (506).
	Milestones	‘They couldn’t sometimes see it, but I said: well last week you couldn’t walk across that side, you only did half. They couldn’t remember that, and they were quite surprised’ (506).

## Capability

Participants identified challenges with managing weakness and fatigue with daily functional tasks such as cooking, washing, dressing and walking. Participants described how simple tasks would need careful planning and regular breaks to complete.

‘I wanted to do some housework, and I did one room and I was shattered, and I thought I’d be able to do more’ (506).

‘I couldn’t get up the stairs, so I slept downstairs. I couldn’t lift a kettle up or make cups of tea. I couldn’t do the normal things that everybody does like Hoover or clean. I couldn’t even wash myself properly. It was down to my husband to do that. My husband took over all the chores really. I still struggle with things now. Like the hoovering. I do it, but it’s not as good as I used to be able to do it’ (504).

Individuals found the class helpful in improving some of their daily tasks and described a sense of achievement with making progress, however small.

‘I must admit when I started (the class) it was exhausting. I’d come home and I’d have a lie down for an hour. Of course, as I grew stronger, I was out with the dog, and I gained the strength. Setting off, yeah, it was difficult, but I was determined to do it, you know. And it was, good, I enjoyed it’ (501).

Participants found the programme useful for regaining functional ability. They described the physical benefit of the sessions but also revealed how weakness and fatigue could act as barriers to participation.

## Opportunity

Qualitative data revealed some of the challenges faced by participants gaining access to the rehabilitation programme; the main concerns being related to practicalities, such as parking, transport and personal expense. 1 participant described his worry at paying the bills and felt he could not continue with rehabilitation due to the expense of travelling there:

‘To get to (the hospital) is a 30-mile round trip’ ‘There’s other things I need to pay for’ ‘Everything goes up; gas, electricity, telephone’ (503).

These factors describe the environmental context and resources available to the individual, which reflects the physical construct of the opportunity aspect of the COM-B model (Cane et al. 2012).

## Motivation

Participants in this evaluation explained how the group structure of the programme enhanced their drive to regain function, and how they were able to act as a motivator for others. Participants described how patients in the group shared their experiences and how this facilitated a cohesion within the class.

‘Some people told us their story, how ill they were, and you do encourage each other’ (506).

‘When I first went, I was in a wheelchair, and I was exhausted, you know. I thought, “Oh I’m never going to do that”. And there was a lady there, (she) came over to me and she said, “Oh I was just like you” I said, but you are probably a lot younger than me. She said: “Well I don’t know how old you are but I’m 80 next year”. And I said, what! She really gave me confidence because she was 80 and she was really so good. And I thought, blimey, if she can do that at 80, I can. She gave me confidence to move on when I saw what she could do.’ (501)

By facilitating an open, supportive environment, participants could relate to each-other’s experiences. There was a sense of group cohesion and encouragement from staff and other patients, which facilitated participants’ own motivation to progress.

### Rehabilitation class data

Within the hospital between June 2016–June 2018, 787 adult patients survived critical illness with a survival rate of 82%. Of the patients who survived, 55 patients (7%) were referred for rehabilitation and 25 subsequently attended an initial assessment and were included in this dataset. 16 patients completed the full 6-week course and submitted complete data for at least one outcome measure.

Table 3 shows descriptive statistics for outcome measures before and after the rehabilitation programme. *Short form 36* and HADS outcomes had 13 complete sets of data, and the 6MWT had 8 complete sets of data.

Table 3: Descriptive statistics.

	<i>N</i>	Pre-hoc	Post-hoc
<b>Short form 36, mean (SD)</b>			
Physical functioning	13	37.4 (27.2)	53.5 (23.8)
Physical health	13	19.2 (38.4)	32.7 (38.7)
Emotional stresses	13	46.2 (51.9)	53.8 (48.2)
Energy	13	46.8 (22.3)	69.2 (20.6)
Emotional wellbeing	13	71.7 (19.1)	80.0 (16.7)
Social functioning	13	53.8 (31.6)	72.1 (24.0)
Pain levels	13	66.2 (31.1)	75.2 (29.8)
General health	13	56.2 (25.6)	64.6 (20.3)
<b>6-minute walk distance (m), mean (SD)</b>			
	8	228.5 (161.5)	406.2 (162.4)
<b>Hospital anxiety and depression scale</b>			
Anxiety	13	6.8 (4.7)	4.2 (2.8)
Depression	13	5.8 (4.3)	3.9 (3.9)

Table 4 shows the results of statistical analysis using the Wilcoxon non-parametric test for differences between groups. The unadjusted *p*-values, mean differences, and 95% confidence intervals are included in the table. This is to test whether there was a significant difference between the measures taken before the rehabilitation programme, compared to afterwards.

The 6-minute walk test scores increased by 177.8m on average following the rehabilitation programme compared to before (CI 121.8, 233.7). This difference was statistically significant (*p* = 0.012) and is more than the minimally clinically important increase of 54–80m.

Table 4: Paired outcomes pre- and post rehabilitation.

	<i>n</i>	Mean difference (SD)	95% CI	<i>p</i> -value
<b>Short form 36</b>				
Physical functioning	13	16.1 (22.6)	2.5, 29.7	0.026
Physical health	13	13.5 (19.4)	1.7, 25.2	0.038
Emotional stresses	13	7.7 (45.5)	-19.8, 35.2	0.581
Vitality	13	22.5 (20.1)	10.3, 34.6	0.003
Emotional wellbeing	13	8.3 (10.9)	1.7, 14.9	0.021
Social functioning	13	18.3 (30.5)	-0.1, 36.7	0.070
Pain levels	13	9.0 (15.4)	-0.3, 18.3	0.063
General health	13	8.5 (13.9)	0.1, 16.8	0.046
<b>6-minute walk test (m)</b>	<b>8</b>	<b>177.8 (66.9)</b>	<b>121.8, 233.7</b>	<b>0.012</b>
<b>Hospital anxiety and depression scale</b>				
Anxiety	13	2.6 (3.9)	0.3, 5.0	0.035
Depression	13	1.9 (3.0)	0.1, 3.7	0.021

Significant improvements in the *Hospital anxiety and depression scale* were seen following rehabilitation compared to before. Likewise, components of the *Short form 36* also improved significantly, including physical health, physical functioning, vitality, emotional wellbeing, and general health.

## Discussion

The evaluation was designed with the aim of identifying components of current practice that require attention to improve the user experience and to better meet the complex needs of this population. Significant improvements were seen in all outcome measures analysed however the clinical relevance of these findings was limited by the small sample size and low adherence to the programme. Qualitative interviews provided insight into the barriers and facilitating factors affecting participation and highlighted the complex needs of this population during recovery.

The benefits of physical activity in regaining physical function are well supported by evidence in other clinical areas but remain limited in the critical care population (Connolly et al. 2015). The difficulties with physical function and capability described by participants was substantiated by current evidence, with a systematic review by Parry et al. (2017) emphasising concerns regarding participants' physical capability to perform daily tasks. Significant improvements in outcome measures from this evaluation may well be attributable to the normal recovery trajectory of this population, however, this continues to highlight the challenges faced by this population. As suggested by current evidence, clinicians need to consider how physical restrictions may impact capability to participate in physical rehabilitation and adjust activities accordingly (Cane et al. 2012). The evidence gathered for this service evaluation supported the role of a rehabilitation programme in recovering independent function and meeting NICE recommendations. Evidence for enhanced physical rehabilitation in this population remains conflicting (Taito et al. 2019) and there is further need for studies to confirm the efficacy of physical rehabilitation interventions for this population. The literature available to guide clinical practice remains insufficient; this evaluation hopes to guide local changes in this service and inform future studies in this population.

Accessing the programme was identified as a main barrier to participation in the programme. Extensive research has been done regarding the impact of socioeconomic factors on individuals engaging with physical activity programmes in the community (Lindström & Rosvall 2018; Salvo et al. 2018). These concerns combined with the poor uptake to the programme highlight the need to review recruitment strategies to better engage patients and families in physical rehabilitation. Future improvements to the service need to consider the barriers to engagement with rehabilitation and determine how best to address this using evidenced behaviour change theory.

Motivation has been defined in the context of behaviour change theory as all the brain processes that energise and direct behaviour; these can be automatic or reflective (Michie et al. 2011b). Participants in this evaluation identified barriers to motivation during their recovery period, including challenges with their self-esteem, confidence, identity, and emotions. Well evidenced behaviour change concepts such as goal setting may be applicable in this regard, as evidenced by previous research in this population (Corner et al. 2019). Losing independence was difficult to quantify emotionally, with participants describing an extensive mix of feelings which were often difficult to manage. Agard et al. (2012) found that training, perseverance, and continued hope for recovery were the vehicles that moved the process of struggling for independence forward for critical care survivors. This was echoed in the experiences of participants in this evaluation who felt that the service provided an environment conducive to meeting realistic milestones by means of physical activity in the form of exercise training. It has been suggested that recovery in other disease processes can be facilitated by peer support (Davis et al. 2014; Mikkelsen et al. 2016), which could apply to some of the dynamics described by participants in this evaluation. Cane et al. (2012)

outlines how a group setting can enhance motivation by developing an individual's social role and identity as part of that group. The sense of empathy from fellow patients resonated with participants in this evaluation and supports the argument for group-based interventions in this population.

### **Limitations**

As previously discussed, the findings of this evaluation are limited by several important factors. The samples in both the qualitative and quantitative elements are limited in both size and diversity and therefore may not reflect the experiences of the wider population. The inclusion of individuals who had either not completed or chosen not to take part in the programme may have provided valuable insight regarding barriers to participation and provided a balanced perspective to inform recommendations. It is acknowledged that this evaluation is designed to impact change locally, and therefore any wider conclusions must be drawn with caution.

This evaluation used a retrospective before and after design for the quantitative element of the project. It is therefore impossible to make any inferences about the impact of this intervention or make comparisons with the natural recovery trajectory of this population. In addition to this the evaluation method could have been better focused on a single element as opposed to dividing resources between qualitative and quantitative elements. Furthermore, there was variation in quantitative data collection in terms of outcome measure administration and incomplete measures due to changes in staffing over time. This then finally leads to questionable rigour of the data collected and the relevance to wider clinical practice. It is acknowledged that this evaluation is designed to impact change locally, and therefore any wider conclusions must be drawn with caution.

### **Conclusions**

The long-term effects of critical illness were far-reaching and life-changing for participants. From this evaluation it is clear this is a population which faces a range of challenges on their road to recovery, showing great resilience and perseverance to continue improving. The main concern for participants in this evaluation emerged as their loss of independence, which was multifaceted and posed a range of physical, social, and psychological challenges. The interviewees' perceptions echoed existing research while offering novel insight into the complex challenges faced by this population. This work explores how these challenges impacted their capability, opportunity, and motivation to engage with the intervention. The service was found to help improve physical function and vitality, enhancing the motivation of participants by means of group cohesion and peer support, although findings should be interpreted with caution due to limitations. Behaviour change theory may be helpful in guiding recommendations and implementing changes to the service to respond to the complex needs of this population.

The findings of this evaluation will inform local changes and engage stakeholders to target engagement strategies to mitigate barriers to participation. Future research needs to



consider the complex and multifaceted nature of recovery for this population while using participant samples that better reflect the demographic of this group. Current guidelines do not specify how best to support this population, highlighting the need to continue engaging patients and families in future research and intervention development.

### **Key points**

- 1 Participants struggled for independence and described challenges with physical, psychological, and social functioning.
- 2 It was difficult to engage with the outside world after discharge from hospital and participants described feelings of isolation and poor self-confidence.
- 3 An outpatient exercise class may improve physical function, anxiety, depression, and health-related quality of life in people recovering from critical illness.

### **Acknowledgements**

The author would like to thank the participants who volunteered their time to take part in this evaluation. Also, the NIHR (National Institute for Health Research) and UEA (University of East Anglia) for providing the resources and opportunities to complete this project. Thanks to Dr Jane Cross who provided a balance of clinical and academic support to guide me through the many phases to reach completion. Additionally, thanks to West Suffolk NHS Foundation Trust, UK, specifically the therapy department, critical care department, and the Embedded Librarian Service.

### **Contributors**

Suzahn Wilson is first author. Jane Cross is senior author. Helen Else contributed significantly to the study design and writing or revision of the manuscript. All authors contributed to the revision of the manuscripts and approved the final manuscript for submission.

### **Funding**

This project was funded by the National Institute for Health Research/HEE (Health Education England) Integrated Clinical Academic Programme.

### **Competing interests**

None declared.

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# Evaluation of the outcomes of adjunctive awake-proning as a novel approach to the management of COVID-19 pneumonitis in a level 1 hospital ward setting

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## Abstract

In response to pressure on United Kingdom health-care services due to the COVID-19 pandemic, a decision was made to pre-emptively awake-prone hypoxic patients with COVID-19 pneumonitis in a non intensive care unit (ICU) setting, with the aim of improving oxygenation and patient outcomes. This approach was trialled over 30 days from 30th March 2020, awake-proning patients for up to 15 hours a day in the first 72 hours of commencement. This case series was retrospectively analysed to characterise patients who tolerated the intensive regime (group A) versus those who ceased awake-proning early (group B). Additionally, length of stay in days was evaluated in the two groups. In total, 36 patients were proned – with an average of 2% point increase in oxygen saturations. Of these, 21 patients tolerated the intensive regime (average 1878 minutes/72 hours). Of the 15 people who ceased early (971 minutes/72 hours), only 4 were due to intolerable side effects. There were no major significant differences in baseline clinical characteristics between the two groups. Length of stay was significantly reduced in group A over group B even when adjusted for confounding of ICU stay (7.2 compared to 15.2 days  $p = 0.049$ ). In conclusion awake-proning was successfully delivered in a level 1 setting, requiring the addition of 2 extra physiotherapy staff only. Further exploration is needed to explore the association of intensive regimes with reduced length of stay

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## Keywords

COVID-19, awake-proning, ward setting.

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## Introduction

In March 2020, the numbers of hypoxic patients with COVID-19 pneumonitis admitted to Sheffield Teaching Hospitals began to rise at pace. Local audit data for the infectious diseases (ID) unit (with level 1 care capabilities) showed the number of patients requiring oxygen went from 0 to 13 then 22 patients (out of a 24 bed capacity), from early to mid then late March respectively. Optimal management with regards to other medical treatments were still being explored via research trials at this time. Finding efficient and effective treatment methods for patients with COVID-19 pneumonitis in order to prevent an intensive care unit (ICU) admission became paramount.

At this time adult respiratory distress syndrome (ARDS) was increasingly recognised as a major complication of COVID-19 pneumonitis, affecting up to 40% of patients (Wang et al. 2020; Wu et al. 2020). There was pre-existing data on the benefit of proning, where patients are assisted to lie on their front, in patients with ARDS arising from other conditions (Ding et al. 2020; Henderson et al. 2014; Pérez-Nieto et al. 2020); these studies were conducted in high acuity settings where patients were ventilated and sedated. According to the Intensive Care Society, the suggested physiological benefits of proning include improved ventilation and perfusion (V/Q) matching; reduced hypoxaemia; reduced shunting; recruitment of the posterior lung segments due to reversal of atelectasis and improved secretion clearance (Bamford et al. 2020).

Historically there was limited data on the efficacy of proning in patients who were not sedated and ventilated (Scaravilli et al. 2015), and this treatment had not previously been routinely used outside of ICU settings. However, towards the end of March there were increasing anecdotal reports on respiratory medical and physiotherapy social media forums of its use in people with COVID-19. A single article Sun et al. (2020) studying a Chinese cohort described the beneficial use of *awake-proning* – supporting awake patients to lie on their front – their rationale being that awake-proning reduced incidence of alveolar collapse and the ARDS-like picture emerging in COVID-19 pneumonitis. Importantly this awake-proning was commenced under the supervision of intensivists. They attributed their lower mortality rates compared to neighbouring provinces, in part, to this practice.

At this time there was high pressure on resources due to demand on hospital beds, staffing, equipment, personal protective equipment, oxygen supply and critical care beds, with an unknown timescale of how long the peak of the pandemic would last. Using the prone position for awake patients would be simple, cheap and, if effective, could potentially improve patient outcomes and decrease hospital length of stay.

After reviewing the available evidence across the multi-disciplinary team, it was decided to undertake a trial of awake-proning of patients with COVID-19 pneumonitis on the ID ward, supervised by physiotherapists and supported by ID medics rather than intensivists. Formal guidance from the Intensive Care Society regarding awake-proning was issued

part way through this local trial (Bamford et al. 2020) – however a recommended length of time was not issued – just a suggested time of ‘as long as possible’ with timed position changes. By introducing awake-proning as an adjunct to the treatment of patients with COVID-19 on the ward, the aim was to reduce the number of ICU admissions and length of stay (LOS) by improving overall patient oxygenation. The objectives were to effectively initiate an intensive proning regime in a level 1 setting with a minimum of additional resources, given the constraints at the time. This paper describes a retrospective evaluation of this intervention.

## Method

### Setting

The evaluation took place in the ID unit of a large urban teaching hospital. It has a maximum capacity of 33 beds but at the time of the study, functional capacity was limited by staffing to 24 beds. To cope with the high rates of patients admitted with hypoxia, physiotherapy staffing was increased from normal levels (1 band 5), to 1 band 5 physiotherapist plus a further band 6 and band 7 physiotherapist.

### Recruitment

Recruitment began over a 30-day period commencing 30th March 2020. Admissions were reviewed daily by the physiotherapy team to identify suitability for awake-proning.

### Inclusion and exclusion

#### *Inclusion criteria*

All patients with confirmed or clinically suspected COVID-19 were considered. Priority was given to those with worsening early warning score (EWS); bilateral chest radiograph changes and severe lymphopaenia. Hypoxia was defined as an oxygen saturation of  $\leq 94\%$  (off supplemental oxygen) in patients with no background of  $\text{CO}_2$  retention.

#### *Exclusion criteria*

Patients with a respiratory rate  $>35$ ; immediate need for intubation; agitation; systolic blood pressure  $<60\text{mmHg}$ ; cardiac arrhythmia; unstable spine; recent thoracic or abdominal surgery or an inability to self-prone.

### Intervention

Medical care was given as per standard of care during that time which included medication as part of the RECOVERY trial (The RECOVERY Collaborative Group 2021). For the first 7 days of recruitment, awake-proning was commenced on selected patients for 3 sessions of 30 – 90 minutes depending on tolerance. After successful outcomes for initial patients and local ICU units nearing capacity, regimes were intensified to include 3 dedicated time slots 10:30–12:00, 15:00–16:30, and 19:00–07:00 (next day).

All patients had a 30-minute direct 1-to-1 physiotherapist supervision at initiation. In this, initial observations including fraction of inspired oxygen ( $\text{FiO}_2$ ) respiratory rate (RR) and oxygen saturations ( $\text{SpO}_2$ ) were measured. The process was explained to the patient and they

were assisted to find an initial comfortable prone position. Patients were monitored for 30 minutes and repositioned if acute clinical deterioration was observed. Observations were repeated after 30 minutes. At this point the patient was given a proning regime to follow, with additional support available from the ward nurses if required, or the decision made to stop if clinically appropriate. Patients were reviewed daily by physiotherapists – their adherence to the regime was noted and further recommendations made. If the patient was unable to tolerate the regime, modifications were either made to their positioning (including the introduction of additional pillows or use of side-lying) or to the time spent in the prone position.

Proning was continued until resolution of hypoxia, defined by maintaining SpO<sub>2</sub> >94% on room air.

### **Cessation**

Reasons for early cessation of proning within the first 72 hours (independent of clinical improvement) were recorded under 4 categories.

- Acute clinical deterioration (for example, witnessed deterioration during initial supervised 30 minutes).
- General clinical deterioration requiring escalation to level 2/3 care.
- Lack of patient engagement (not complying with regime when unsupervised).
- Patient discomfort or other side effects.

### **Data collection**

Data were collected retrospectively using patient case notes and online e-observations charts in 4 categories:

- Patient demographics (age, sex, ethnicity).
- Clinical Characteristics (COVID-19 swab results, nadir lymphocyte count and co-morbidity). Patients were defined as co-morbid if they had a Charlston co-morbidity score of 1 or greater.
- Observations (FiO<sub>2</sub>, SpO<sub>2</sub> and RR were measured on admission and immediately prior to commencement of awake-proning. FiO<sub>2</sub> and SpO<sub>2</sub> were repeated 30 minutes into proning).
- Outcomes ( minutes spent in prone position in first 72 hours, admission to ICU, LOS in days).

### **Analysis**

#### *Comparison of regime tolerance*

Patients were divided into 2 groups based on their tolerance of the proning protocol. Patients who maintained full compliance with the regime, ceasing proning only due to clinical improvement, were assigned to group A. Patients who ceased proning early (within 72 hours) due to one of the 4 reasons given above were assigned to group B.



Statistical analysis was performed using the analysis ToolPak within Microsoft Excel (Excel version 14.0.7266.5000, 32 bit). Skewness of data was assessed using Microsoft Excel summary statistics function. Clinical characteristics and observations between groups A and B assuming a normal distribution were analysed using the student unpaired *t*-test. Given the sample size, Fisher's exact test was used to compare proportions where appropriate between the two groups.

Two outcomes were measured for these groups – hospital length of stay in days (LOS) and admission to ICU. 1 patient with complex post-COVID-19 rehabilitation needs who was still an inpatient at the time of analysis was excluded from the length of stay analysis.

An ICU admission was necessary if the patient required non-invasive ventilation or intubation. ICU admission rates for the 2 groups are presented as percentages for comparison. Patients who underwent awake-proning following an ITU admission, without subsequent readmission to ITU, were not included in figures for admission to ITU post-proning.

#### *Comparison with non-intervention*

Given the nature of the study there was no fully matched comparator group or patients who did not receive the intervention. We therefore undertook additional analysis of patients admitted to the ID unit in the 2 weeks preceding this study, when awake-proning was not offered. Baseline characteristics, length of stay and ITU admissions of this group of patients were compared to those of the intervention group. In addition to the decision to prone, 30th March 2020 also marked the commencement of a geriatric pathway for COVID-19 admissions (so not all elderly COVID-19 patients were admitted to the ID ward). Given the potential for confounding due to this operational change and post-hoc nature of this analysis, gross figures are presented for interest.

## **Results**

Over a period of 30 days, 104 patients were referred for physiotherapy of which 36 met the study inclusion criteria.

The proning regime was tolerated by 21 patients (58%), who were thus allocated to group A, and was not tolerated by 15 patients (42%) who were thus allocated to group B. The clinical and demographic characteristics of the 2 groups are shown in [Table 1](#).

Of the 36 patients, median age across groups A and B groups was 54 years (IQR 48–62) and 25 (69%) were male. A third of patients were from BAME background. There was no significant difference in clinical and demographic characteristics between the 2 groups with regards to clinical status on admission, comorbidity and observations on hospital admission, see [Table 1](#).

Patients selected for proning were tachypnoeic on admission – with mean respiratory rate (RR) 25, maintaining SpO<sub>2</sub> of 96% on FiO<sub>2</sub> 36%. The mean time from symptom onset to commencement of regime was 9 days.

Table 1: Clinical and demographic characteristics.

	Group A (tolerated proning) (n = 21)	Group B (did not tolerate) (n = 15)	All (n = 36)	Signifi- cance
<b>Demographics</b>				
Age, median (IQR), y	52 (42–61)	59 (50–62)	54 (48–62)	
Male Sex – no. (%)	15 (71%)	10 (67%)	25 (69%)	
BAME – no. (%)	8 (38%)	5 (33%)	13 (36%)	
<b>Clinical characteristics</b>				
Positive COVID-19 swab – no. (%)	11 (52%)	12 (80%)	23 (64%)	<i>p</i> = 0.159*
Nadir lymphocytes – mean (range), ×10 <sup>9</sup> /L	0.82 (0.28–1.71)	0.76 (0.24–1.68)	0.68 (0.24–1.71)	<i>p</i> = 0.378**
Charlson co-morbidity index ≥1, no. (%)	10 (48%)	9 (60%)	19 (53%)	<i>p</i> = 0.516*
<b>Observations on admission to hospital</b>				
SpO <sub>2</sub> , mean (range), %	96 (91–100)	96 (88–100)	96 (88–100)	<i>p</i> = 0.826**
FiO <sub>2</sub> , mean (range), %	37 (21–100)	32 (21–100)	36 (21–100)	<i>p</i> = 0.571**
Respiratory rate, mean (range), bpm	25 (19–49)	24 (18–36)	25 (18–49)	<i>p</i> = 0.563**
<b>Observations at onset of proning regime</b>				
Day since symptom onset, mean (range)	8 (1–15)	9 (4–17)	9 (1–17)	<i>p</i> = 0.378**
SpO <sub>2</sub> , mean (range), %	95 (92–98)	96 (91–99)	95 (91–99)	<i>p</i> = 0.323**
FiO <sub>2</sub> , mean (range), %	41 (21–100)	44 (24–100)	42 (21–100)	<i>p</i> = 0.650**
Respiratory rate, mean (range), bpm	23 (18–30)	24 (18–32)	24 (18–32)	<i>p</i> = 0.457**

\* – 2 tailed Fisher’s Exact test; \*\* – unpaired student *t*-test.

BAME: black and minority ethnic; SpO<sub>2</sub> – oxygen saturations; FiO<sub>2</sub> – fraction of inspired oxygen; bmp – breaths per minute.

Table 2 shows the outcomes of the proning regimes. Over a 72-hour period the range of time patients tolerated awake-proning was 10–2790 minutes. The regime was tolerated by 21 patients (58%) who achieved a mean of 1898 minutes (31.6 hours) in a 72-hour period. The 15 patients in group B of who ceased the regime within 72 hours tolerated a mean of 971 minutes (16.2 hours) in that period.

📄 **Table 2: Proning outcomes.**

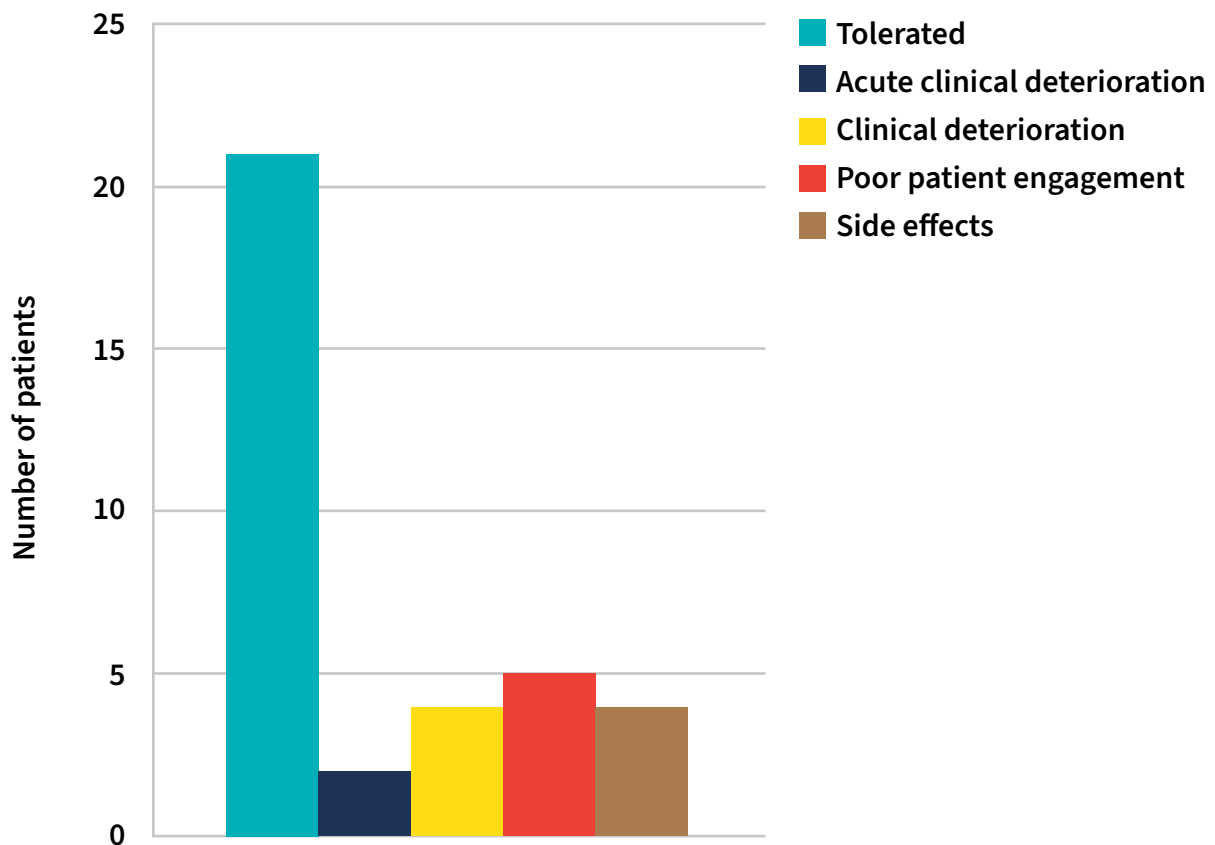
	<b>Group A (tolerated proning) (n = 21)</b>	<b>Group B (did not tolerate) (n = 15)</b>	<b>All (n = 36)</b>	<b>Signifi- cance</b>
Minutes prone/72 hour mean (range)	1898 (420–2790)	971(10–1980)	1512 (10-2790)	* <i>p</i> = 0.0007 <sup>‡</sup>
Length of stay mean (range), days	7.2 (3–16)	17.1 (4–54)**	10.8 (3–54)	* <i>p</i> = 0.050 <sup>‡</sup>
LOS/days (excluding patients admitted to ITU)	6.8 (3–16)	15.3 (4–54)	9.26 (3–54)	* <i>p</i> = 0.049 <sup>‡</sup>
ITU admission – no. (%)	1 (5)	6 (40)	7 (19)	
SpO <sub>2</sub> , mean (range), %	97 (95–100)	97 (88–100)	97 (88–100)	<i>p</i> = 0.754 <sup>‡</sup>
FiO <sub>2</sub> , mean (range), %	37 (21–60)	40 (24–60)	38 (21–60)	<i>p</i> = 0.630 <sup>‡</sup>

† – 2 tailed Fisher’s Exact test; ‡ – unpaired student *t*-test.

BAME: black and minority ethnic; SpO<sub>2</sub> – oxygen saturations; FiO<sub>2</sub> – fraction of inspired oxygen; bmp – breaths per minute.

\*\*1 patient still inpatient at time of writing.

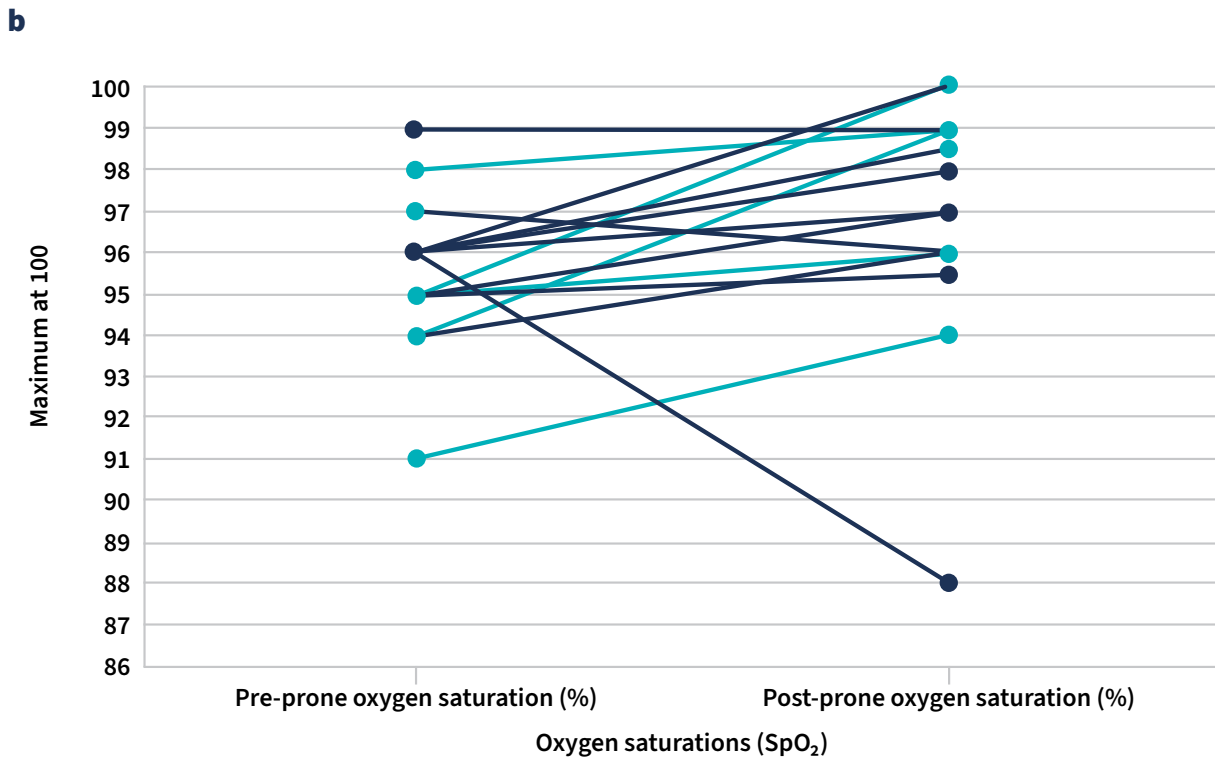
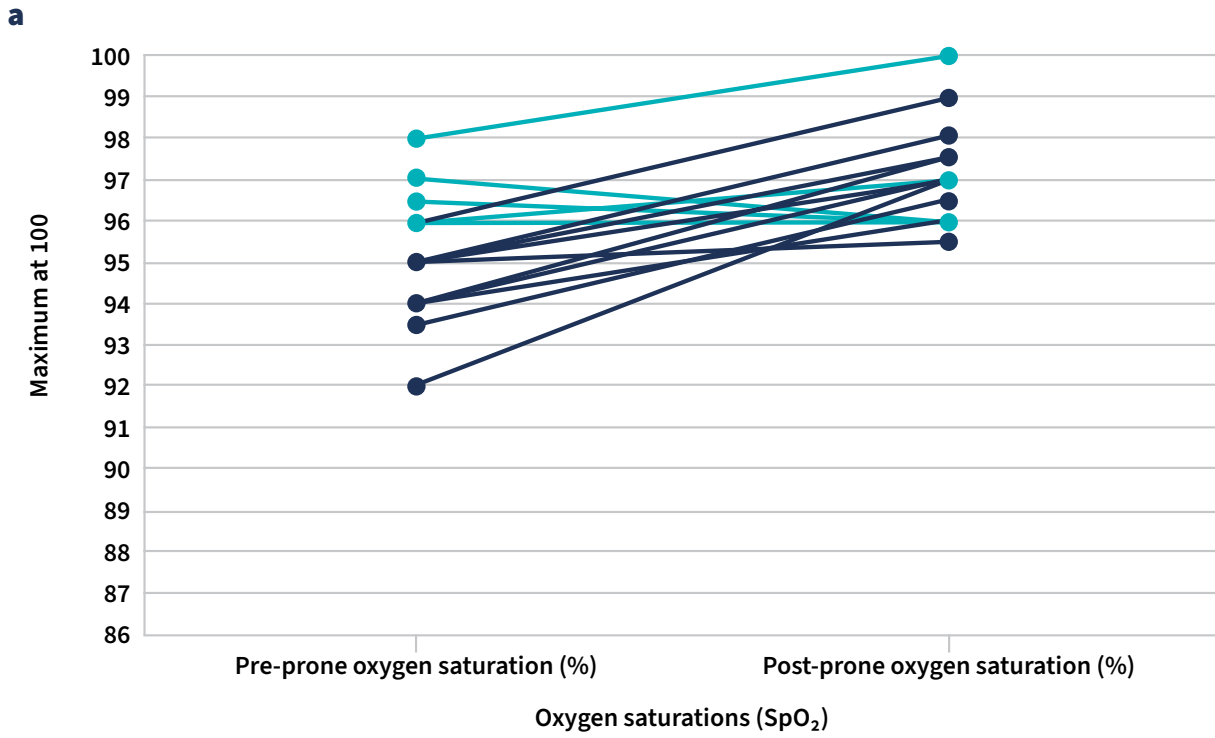
Reasons for failure to tolerate the proning regime are shown in Figure 1. Clinical deterioration (acute and general) accounted for 6 patients, 5 patients did not comply with the regime when not under direct supervision. Finally of the 4 patients who stopped proning early due to side effects, 2 stated intolerable back pain, 1 developed nosebleeds and 1 patient had exacerbation of migraines.



**Figure 1: Outcomes of all patients prone with reasons for early cessation.**

ICU admission was required in 5% of patients in group A required compared to 40% in group B. Statistically significantly greater length of stay was noted in group B compared to group A (17.1 compared to 7.2 days,  $p = 0.05$ ). Given the possible confounding of ICU admission on this figure, even when patients admitted to ITU were excluded from the analysis, length of stay was statistically significantly lower in group A (15.3 compared to 6.8 days,  $p = 0.049$ ) compared to group B.

There was no significant difference between  $SpO_2$  and  $FiO_2$  in group A and group B after the proning regime. However across both groups, mean  $SpO_2$  increased by 2 percentage points (from 95%–97%) between the onset of proning and when  $SpO_2$  was recorded after 30 minutes, and mean  $FiO_2$  fell from 42% to 38% across the same period. Figure 2a and 2b shows the change in oxygen saturation for individual patients in group A and group B across the intervention.



📌 **Figure 2a and 2b: Pre and 30 minutes post proning oxygen saturations.**

## Comparison with non-intervention

When compared with a group of 14 patients admitted to the ward before the awake-proning regime was introduced, the group who underwent proning had a reduced length of stay (10.8 days compared to 18.6) and reduced ICU admission rates (19% compared to 29%). Data for these two groups is shown in Table 3.

Table 3: Characteristics of patients before and after introduction of awake-proning.

	Admitted prior to proning regime (n = 14)	Included in proning regime (n = 36)
<b>Demographics</b>		
Age, median (IQR), y	74 (63–83)	54 (48–62)
Male sex – no. (%)	9 (64%)	25 (69%)
<b>Clinical characteristics</b>		
Positive COVID-19 swab – no. (%)	13 (93%)	23 (64%)
Nadir lymphocytes – mean (range), ×10 <sup>9</sup> /L	0.75 (0.08–1.75)	0.68 (0.24–1.71)
<b>Observations on admission to hospital</b>		
SpO <sub>2</sub> , mean (range), %	94 (90–97)	96 (88–100)
FiO <sub>2</sub> , mean (range), %	27 (21–40)	36 (21–100)
Respiratory Rate, mean (range), bpm	21 (17–28)	25 (18–49)
<b>Longer term outcomes</b>		
Length of stay mean (range), days	18.6 (6–49)	10.8 (3–54)
ICU admission – no. (%)	29%	19%

## Discussion

An intensive awake-proning regime in hypoxic COVID-19 patients was tolerated by just over half the patients. In the first 72 hours of initiation, patients who were able to tolerate the intensive regime achieved 31.6 hours in the prone position (1898 minutes). Only 1 patient demonstrated acute deterioration in SpO<sub>2</sub> on proning and required almost immediate intubation (see Figure 2 – group B).

There was an association between reduced length of stay for those who tolerated an intensive proning regime, together with lower rates of admission to ICU. Awake-proning was shown to successfully increase mean oxygen saturations by 2 percentage points after 30 minutes with a small reduction in FiO<sub>2</sub>, regardless of how long proning was eventually sustained. The following month Thompson et al. (2020) followed a cohort of 29 patients in which oxygen saturations were measured one hour post proning – they demonstrated a

higher increase in SpO<sub>2</sub> post proning (7%) although similar to our study, data as to whether there was a sustained improvement in SpO<sub>2</sub> were unavailable. In addition, they did not report on length of time spent in the prone position, in their study 13 out of the 29 patients went on to be intubated. We postulate the increase in SpO<sub>2</sub> is to be physiologically expected due to better recruitment of the posterior lung segments. However similar to the Thompson et al. (2020) study it is unclear whether this improvement in oxygen saturations is sustained and/or contributory to the lower ICU admission rates observed. Given patients in group B were in part, defined by their clinical deterioration, it is difficult to unpick the role awake-proning played as opposed to other factors such as ethnicity, nature of co-morbidity (for example, diabetes) and other medications given including steroids and antivirals.

A systematic review conducted by Anand et al. (2021) reviewed published data on awake-proning in COVID-19 up to July 2020 and reviewed 210 cases. All studies were case reports, case series or prospective cohort studies. Duration of proning length varied in studies, with intense regimes (>10 hours daily), limited to case reports only. Intubation rates across all cases were 23%. Our findings correlated with others with regards to improvement in oxygen saturations whilst proning – our general intubation rates were lower although overall small sample sizes in all reported studies make it difficult to draw any conclusions regarding this.

### **Limitations**

This was an evaluation of service and therefore there was no predesigned control group. Monitoring and patient observations were limited to those routinely collected during ward-based care. This data were collected at a time when optimal medical management for COVID-19 patients was still under investigation, and treatments which would now be recognised as the standard of care (dexamethasone, remdesivir, tocilizumab) were given to only certain patients as part of the RECOVERY trial.

### **Conclusion**

Awake-proning on a level 1 ward is an effective intervention that was deliverable with a minimum of additional specialist staff input and resulted in an initial increase of oxygen saturations. We have demonstrated that an intensive regime of proning (with a morning, evening and overnight session) is achievable in the majority of patients. We have demonstrated that ICU admission rates and length of stay were significantly lower in patients who tolerated an intensive proning regime. Subsequent to this evaluation, our trust has issued guidance to allow other healthcare professionals (for example, doctors and nurses) to initiate awake-proning on the wards. Further work, ideally through a randomised control trial, needs to be undertaken in a level 1 setting to fully assess the true benefit of awake-proning.

### **Key points**

- Intensive (>10 hours/day) awake-proning is achievable in over 50% of hypoxic COVID-19 patients in a level 1 setting.

- This intervention can be effectively administered in a level 1 setting, but requires additional dedicated physiotherapist support.
- There is an association between tolerating intensive awake-proning and reduced length of stay which needs further exploration.

### Funding

This project received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

### Ethical approval

This evaluation was conducted under the service evaluation framework of Sheffield Teaching Hospitals. Clinical consent was obtained from patients for all interventions.

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# Physiotherapy-led awake proning for a frail elderly patients with COVID-19: A case study

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## Abstract

Coronavirus disease (COVID-19) can cause significant damage to the lungs, potentially resulting in acute respiratory distress syndrome (ARDS) (Weatherald et al. 2020). An adjunct of treatment for this is awake proning to improve oxygenation and may prevent intubation (Paul et al. 2020).

This case report describes a self-ventilating 85-year-old gentleman with COVID-19 and acute hypoxemia, who experienced significant improvements in oxygenation with proning. His ceiling of care was high flow oxygen therapy (HFNC) on the ward and it was deemed clinically appropriate to commence a trial of physiotherapy led awake proning. Although the patient failed to meet the criteria outlined by the Intensive Care Society (ICS) guidelines for awake proning, after multi-disciplinary (MDT) discussion, it was felt a trial of awake proning should be piloted in the patient's best interest.

He was on 15L oxygen via non-rebreather mask for a number of days as he was acutely delirious and not tolerating HFNC. With proning, an average reduction in oxygen of nearly 20% was noted with an increase in SpO<sub>2</sub> of 4.6%. Over a 3-week period his oxygen requirements and saturation levels improved dramatically which could be associated with awake proning.

Our case study illustrates that awake proning can form a vital part of the COVID-19 management plan. It played a crucial role in the patient's recovery despite not meeting the criteria set out by the ICS. This highlights that guidelines are recommendations and

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## Keywords

COVID-19, awake proning, conscious proning, physiotherapy, frail.

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need to be considered on a case-to-case basis along with clinical judgement and MDT discussion.

## Introduction

COVID-19 is the disease caused by the most recently discovered severe acute respiratory syndrome coronavirus (SARS-CoV-2) (Wiersinga et al. 2020). COVID-19 can cause significant damage to the lungs and airways, potentially resulting in ARDS (Weatherald et al. 2020). While there is strong evidence to support prone positioning for mechanically ventilated patients with moderate to severe ARDS (Guérin et al. 2013), there is limited evidence for prone positioning in awake self-ventilating patients (McNicholas et al. 2020). Awake proning has shown to improve oxygenation and may prevent mechanical ventilation (Paul et al. 2020).

To date, there are no published randomised control trials (RCTs) on awake proning for non-intubated COVID-19 patients. A literature review by Weatherald et al. (2020) found 29 studies on the use of awake proning in COVID-19 patients, which included 364 patients in 11 prospective cohorts, 13 retrospective cohorts, and 5 case reports. Only 1 study by Zang et al. (2020) included data from a control group and this was submitted as a letter to the editor of the journal *Intensive Care Medicine*. The studies all varied in the proning protocols implemented, the setting and outcomes, the duration of follow-up and severity of hypoxemia. This heterogeneity demonstrates the limited quality of available evidence for awake proning for non-intubated COVID-19 patients. Nevertheless, this review reports that all but one of the studies demonstrated improvements in oxygenation in the prone position although, in many cases these improvements were not sustained after returning to the supine position. It was not possible for the authors of the review to make any conclusions based on the data about the impact of improved oxygenation on clinical outcomes such as survival (Weatherald et al. 2020).

The UK ICS (Bamford et al. 2020) has developed guidance for awake proning for suspected or confirmed COVID-19 patients. The guidelines were developed based on a review of the literature by Jiang et al. (2020), which is illustrated in [Table 1](#).

📌 **Table 1: Criteria for awake proning as per the UK Intensive Care Society<sup>1</sup>**

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"><li>• Patient with suspected or confirmed COVID-19 and an oxygen requirement of &gt;4 L NC.</li><li>• On a stretcher.</li><li>• On continuous-pulse oximetry monitor.</li><li>• Awake with a normal mental status.</li><li>• Able to follow instructions.</li><li>• Able to tolerate changes in position.</li><li>• Able to call for help or have call bell within reach.</li><li>• Able to self-prone or change position with minimal assistance.</li></ul>	<ul style="list-style-type: none"><li>• Normal oxygen saturation without need for supplemental oxygen source.</li><li>• Altered mental status.</li><li>• Inability to independently change position or tolerate positional changes.</li><li>• Hemodynamic instability.</li><li>• Inability to follow instructions or communicate with care team.</li><li>• In a setting where patient is unable to be closely monitored.</li></ul>

## Case presentation

An 85-year-old male presented with fever, a productive cough with brown sputum, decreased appetite and lethargy. Past medical history included ischaemic heart disease, hypertension, prostate cancer and an ex-pipe smoker of 20 years. He was living alone and at baseline mobilised independently and had a Clinical Frailty Scale (CFS) (Rockwood et al. 2005) of 3 (Figure 1).

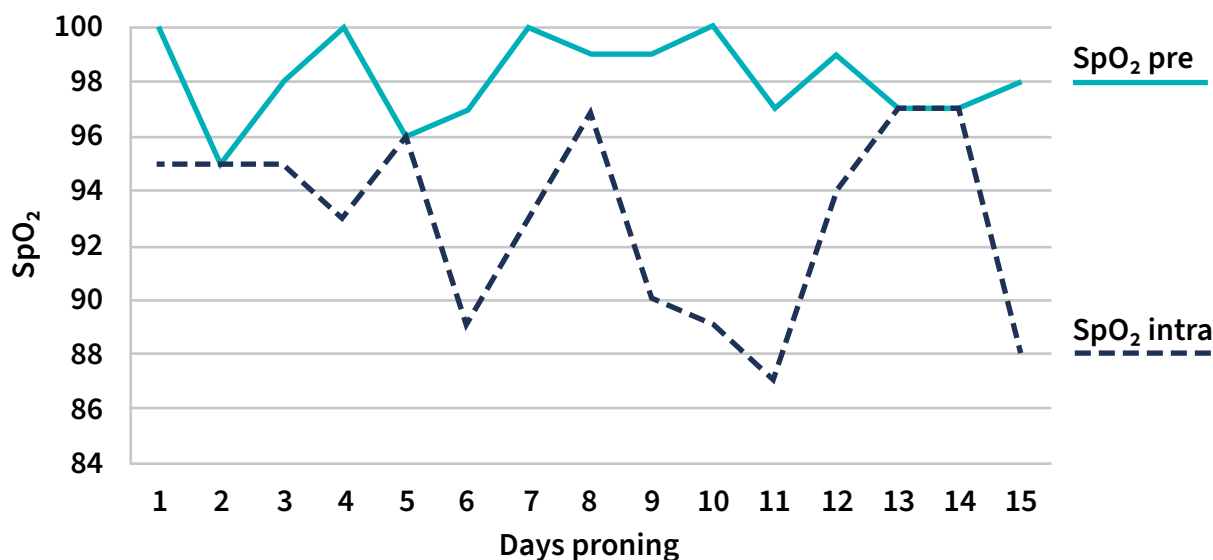


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📌 **Figure 1: Clinical frailty scale (Rockwood et al. 2005).**

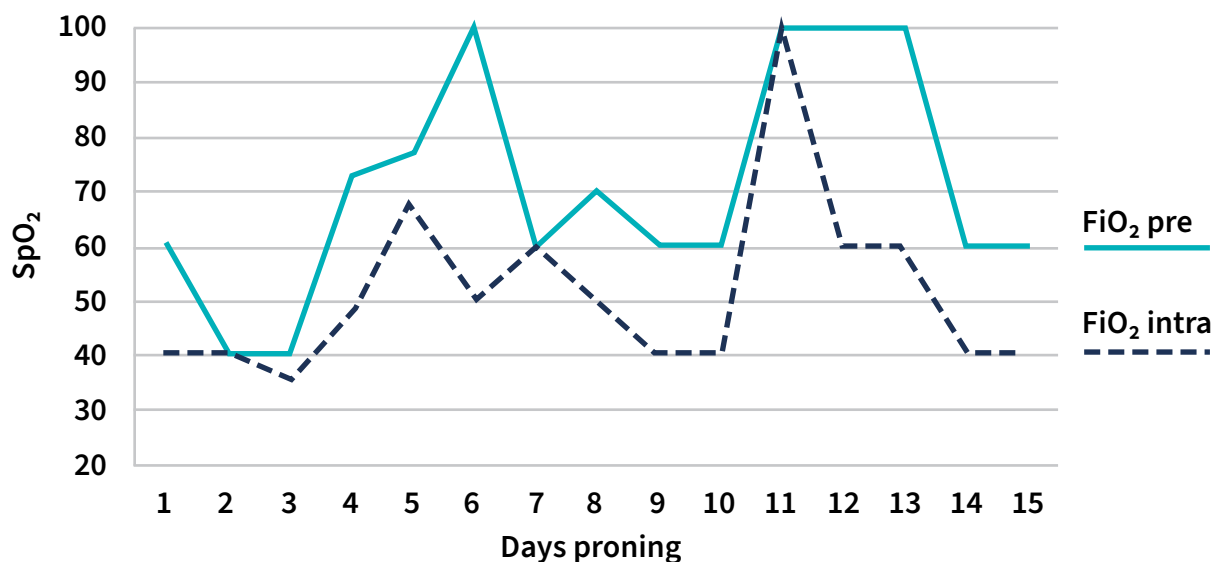


**Figure 2: SpO<sub>2</sub> versus days proning. Dotted line shows SpO<sub>2</sub> levels pre-proning and continuous line shows SpO<sub>2</sub> levels intra-proning.**

He tested positive for COVID-19 and required 3L/min oxygen via nasal prongs to maintain target oxygen saturations (SpO<sub>2</sub>) of ≥94%. His chest x-ray showed right basal infiltrates with left pleural effusion. He became more delirious, pyrexial and his oxygen requirements dramatically increased to 15L.

After MDT discussion, his ceiling of care was HFNC on the ward and it was deemed clinically appropriate to commence a trial of physiotherapy led awake proning. The patient failed to meet the criteria outlined in the ICS guidelines (Bramford et al. 2020) for awake proning as he required assistance to prone and he was delirious. It was felt a trial of awake proning should be piloted in this patient's best interest. The team also decided that he would not be for escalation to the intensive care unit (ICU).

The trial of physiotherapy led awake proning began on day 3 of his admission. His oxygen requirements varied in device delivery from venturi mask, HFNC and non-rebreather mask to maintain target SpO<sub>2</sub> ≥94%. However he did not tolerate the HFNC in his delirious state. Please see Figures 2 and 3 which illustrate the significant improvement in SpO<sub>2</sub> levels and vast reduction in oxygen required over the first 15 days of proning. During the proning session, an average reduction in oxygen requirements of 19.4% was noted with an average increase in SpO<sub>2</sub> of 4.6%. The data demonstrates the profound impact proning had on this gentleman.



**Figure 3: FiO<sub>2</sub> (y-axis) levels versus days proning (x-axis). Continuous shows FiO<sub>2</sub> levels pre-proning and dotted line shows FiO<sub>2</sub> levels intra-proning.**

Awake proning was performed over 22 days with the patient tolerating the prone position between 2 and 4 hours, 1 to 2 times a day. He was monitored closely by MDT throughout his treatment session with all observations being recorded before, during and after proning. The patient was isolated in a single room with a bluetooth pulse oximeter and audio-visual monitor to observe him at all times. A health care assistant was also positioned outside the patient's door whilst he was proning to monitor his agitation levels and offer assistance if needed.

Proning was discontinued when the patient stabilised and his oxygen requirement reduced. He was subsequently transferred to a rehabilitation unit. Initially he was very short of breath and required high levels of oxygen when mobilising. A high-resolution computed tomography confirmed he had COVID-19 related pulmonary fibrosis.

The patient returned to the COVID-19 outpatient MDT clinic a month after discharge from inpatient rehabilitation care. He was mobilising independently with 2 walking sticks with a CFS of 6 (Figure 1). He completed a 6-minute walk test, mobilising 320m with no desaturation. This was 65% of his predicated distance of 495m, based on his gender, height, age and weight (Enright & Sherrill 1998). He also completed 10 repetitions in the sit to stand test within 1-minute and maintained SpO<sub>2</sub> ≥94% throughout. He continues to progress with community therapy input.

## Discussion

Awake proning is an effective treatment option for improving oxygenation in patients with hypoxemia secondary to COVID-19 (Paul et al. 2020). Awake proning provided significant improvements in oxygenation and helped reduce his oxygen requirements. Several studies (Guérin et al. 2013; Munshi et al. 2017; Sud et al. 2014) show that in patients with ARDS, prone positioning increases SpO<sub>2</sub> enabling a reduction in oxygen requirements. This case

study highlights the potential benefits of early intervention to prevent progression of disease and reduce morbidity and mortality.

Current guidelines by the ICS (See Table 1) (Bamford et al. 2020) recommend awake proning should be used only for patients who can independently get into the prone position and not for patients who are agitated or have altered mental status. In our case study, despite not meeting the ICS guidelines, it was deemed in the patient's best interest to commence a trial of awake proning as he was not for escalation to the ICU. On reflection proning showed promising effects in likely saving this gentleman's life, despite not meeting the criteria outlined in the guidelines.

Proning has shown to improve oxygenation and may prevent mechanical ventilation in certain patients (Paul et al. 2020). There is a paucity of published literature on proning in the awake patient. Scaravilli et al. (2015) observed significant improvements in oxygenation in 15 non-intubated patients with acute hypoxemic respiratory failure who underwent awake proning. Ding et al. (2020) used awake proning for 2 hours twice daily along with HFNC or non-invasive ventilation for 20 patients with moderate to severe ARDS and noted an improvement in PaO<sub>2</sub>/FiO<sub>2</sub> ratio and a decrease in the need for intubation. Within 5 minutes in the prone position, suspected COVID-19 patients with hypoxemic, illustrated an improvement in SpO<sub>2</sub> (Caputo et al. 2020).

Unlike prone positioning in sedated and ventilated patients, awake proning can be poorly tolerated and be uncomfortable especially in frail elderly patients. This often dictates the length of time in the prone position. Mechanically ventilated patients require greater than 12 hours of prone positioning to receive a mortality benefit (Munshi et al. 2017; Sud et al. 2014). The patient managed 2–4 hours daily, but often twice a day. Protocols published promote a wide range of proning time from 30 minutes to 8 hours, 2 to 3 times per day (Gordon & Weingart, 2020; Massachusetts General Hospital 2020; Nebraska Medicine 2020). In addition, proning can be intensive in terms of nursing workload, and if ineffective, could hinder the delivery of care.

The challenges encountered with awake proning this gentleman included manual handling difficulties as he required 2 to 3 members of staff to prone him due to lack of his physical strength and required constant monitoring whilst in the prone position.

The APPROVE-CARE (McNicholas 2020) study is a multi-centre randomised clinical trial across Europe and Northern America. The trial will explore whether placing patients who have hypoxemia related to COVID-19 into a prone position can improve oxygenation, reduce the work of breathing and the requirement for mechanical ventilation. If effective, this simple intervention could be widely and rapidly implemented, potentially reducing the need for ICU admission and invasive ventilation, and potentially even saving lives.

More research is required in the area of awake proning in COVID-19 patients and how this improves other outcomes such as mortality, length of stay and preventing admission to



ICU, thus providing an alternate treatment which may be cost-effective compared to current standard of care. This will likely be published in the near future.

## Conclusion

Our case study illustrates that awake proning can form a crucial role in the COVID-19 management plan. The patient did not meet the recommended criteria for awake proning set out by the ICS. Our case study also highlights that guidelines are only recommendations and need to be considered on a case-to-case basis along with clinical judgement and MDT discussion.

## Declaration of interests

The authors declared no potential conflicts of interest with respect to the work, authorship, and/or publication of this article.

## Funding

This work did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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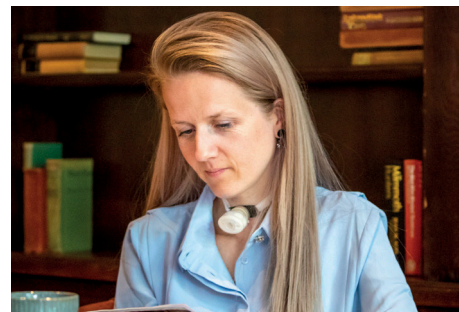
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# Evaluation of a new animal assisted intervention service for an adult intensive care unit

Ruth Johnson<sup>1</sup>

## Abstract

### Introduction

An animal assisted intervention (AAI) is an intervention between an animal and a patient during a medical, nursing or therapeutic procedure. It humanises patient care, reduces suffering and loneliness and improves mood. It is a developing service within critical care environments. The current research of AAI in critical care is limited.

### Method

The AAI was provided by a registered pets as therapy (PAT) volunteer and their dog collaborating with intensive care unit (ICU) staff. After the AAI the patient, visitor or staff member completed an electronic questionnaire using the Survey Monkey application on an iPad. The questionnaire comprised of 10 questions of mixed methods design.

The aim of this service evaluation was to ascertain if the AAI service was feasible and safe. The service evaluation would also measure the impact of the service on patients, visitors and staff. The overall objective of the service evaluation was to determine if the service should continue and to identify areas for development.

### Results

47 questionnaire responses were obtained from 2 groups of responders: (1) patients and visitors; and (2) staff. There were no concerns in relation to the dog's presentation, welfare, cleanliness or handling highlighted by responders. A 10-point Likert scale was used with free text options for comments. 83% of patients and visitors rated the level of enjoyment of the AAI as a maximum score; whilst 70% of staff rated a

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## Keywords

Animal assisted intervention, intensive care unit, adult, service evaluation.

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maximum score for level of enjoyment of the AAI for the patient. 75% of patients and visitors rated the AAI as extremely beneficial. Emergent themes were identified from the qualitative data. These were: mood; distraction; dog and handler; AAI; recommendations, impact and infection control. The first 5 themes were shared between the 2 groups of responders.

### **Discussion and conclusion**

The data collected demonstrated that providing the service was feasible and safe. Overall, there was a positive response to the service from all responders. This evaluation supports similar findings from the limited research base and highlights areas for future service development.

## **Introduction**

In modern critical care medicine, the promotion of recovery, over mere survival, for both physical and non-physical domains, is the main rehabilitation objective (Wilson et al. 2019). Research has shown that a significant number of patients who survive critical illness have post-intensive care syndrome (PICS) and require a personalised rehabilitation prescription to meet the individual physical and non-physical needs of each patient (NICE 2018; Puthuchery et al. 2021). Wilson et al. (2019) highlighted that dehumanisation of patients can negatively impact on patient engagement and interest in their own well-being during the rehabilitative phase. An animal assisted intervention (AAI) is defined as an interaction between an animal and a patient during a medical, nursing or therapeutic intervention (Hosey et al. 2018). It is an umbrella term to describe different types of animal interventions. These range from goal driven interactions to informal introductions; both provide therapeutic benefits and humanise care. AAIs contribute to a holistic approach to treatment by registered volunteers visiting with their behaviourally assessed animals. Hosey et al. (2018) identify how AAIs may help reduce suffering through humanisation, aiming to improve mood and patient engagement thus facilitating achievement of rehabilitation goals. This in turn may reduce loneliness, physiological burden and the need for medication resulting in improved cost-effectiveness. There is an established evidence base for evaluation of AAI in healthcare settings such as nursing homes, community settings and psychiatric units (Lasa et al. 2011; Lundqvist et al. 2017; Uglow 2019). However, there is little research in AAI services in intensive care unit (ICU) settings, despite positive experiences being shared widely on social media platforms (ICS 2019). Uglow (2019) studied the use of AAIs on paediatric wards at a large NHS university teaching hospital in the United

Kingdom (UK). Over 200 responses to a survey contributed to an overwhelmingly positive response resulting in the recommendation that similar services should be available across the UK. A similar AAI service had been implemented at a general ICU for adult patients at a large NHS teaching hospital in the East Midlands of the UK. The primary objective of this evaluation was to ascertain if the service was feasible and safe. Measuring the impact of the service for patients, visitors and staff would also inform future service development.

## Method

### Setting

The AAI service to a 20 bedded general ICU was implemented in September 2019. The registered charity pets as therapy (PAT) is a UK based charity which regulates and supports animal visits in various settings. A registered PAT volunteer and their dog visited the ICU on a weekly or fortnightly basis. The volunteer was also registered with the volunteer service at the NHS Trust and trained to the recommended level, as per the Intensive Care Society (ICS) guidance for AAI in a critical care setting (ICS 2020). The volunteer made contact with a senior member of nursing staff by telephone on the morning of the planned visit. Communication with the multi-professional team took place prior to the visit to identify any potential risks. Exclusions were identified as allergy, fear or an individual's indication to decline the service. AAIs occurred during visiting hours.

The volunteer determined the length of the interaction dependent on the behaviour of the dog, person(s) involved and perceived benefit for all. Most interactions were less than 20 minutes long. The interaction involved verbal communication and touching the dog during periods of rest, delivery of care or treatment. The maximum total length of time the dog visited was 120 minutes on any one day, with regular welfare breaks for the dog (Figure 1).



📌 **Figure 1: The PAT dog on a visit in ICU.**

## Subjects

All participants were asked to give verbal consent to the AAI. If verbal consent could not be gained from the patient or their next of kin the AAI did not take place. The names of patients who interacted with the dog was compiled for the date of the interaction and stored according to trust and ICS policies. The service ran on a voluntary basis with no monetary cost implications.

## Design

A questionnaire was designed by the author using the Survey Monkey application to collect opinions on the interaction between the individual concerned and the dog. The author purposefully chose similar questions to those used in a previous study by Uglow (2019) to allow for comparison. It comprised of ten questions, of mixed methods design, using 10-point Likert scales and free text responses. The questionnaire collected basic demographic information such as age, gender and for staff, their job role, using multiple-choice questions.

There were 2 questionnaire designs; 1 for patients and visitors and another 1 for staff (Appendix 1). Following an interaction, the person involved was asked if they would complete an electronic questionnaire using a convenience method of sampling. The questionnaire was pre-loaded on iPads or could be accessed by scanning a QR code with their personal electronic device. When the participant self-completed the questionnaire, implied consent was assumed.

The study was confirmed by the trust as a service evaluation that did not require ethical approval.

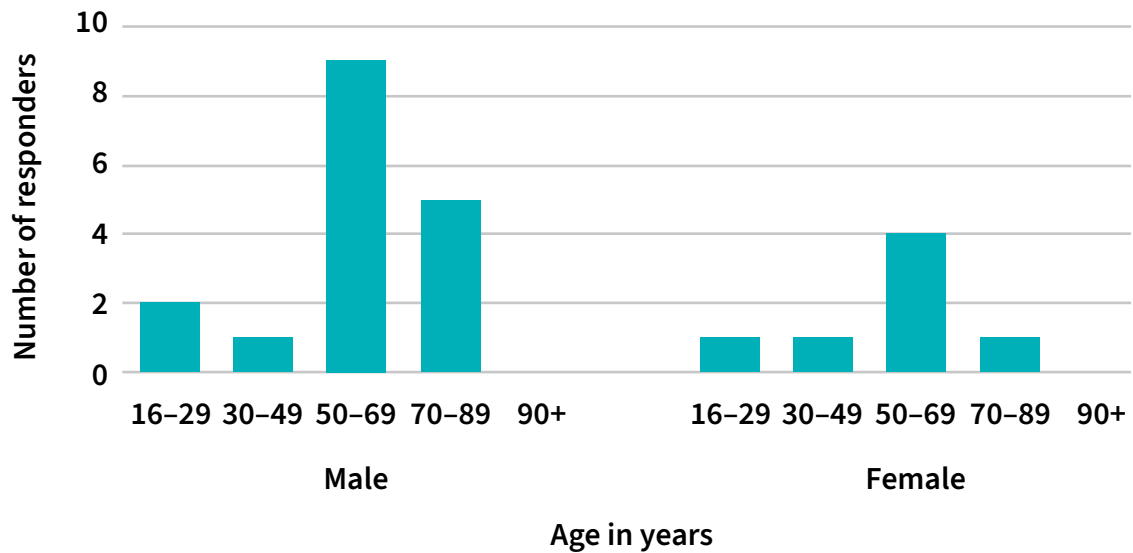
## Data analysis

The responses were collected, stored and collated by the Survey Monkey application. Quantitative data was then further analysed by the author using simple descriptive statistics, whilst qualitative data was analysed using thematic analysis (Robson 1993).

## Results

47 questionnaire responses were collected between September 2019 and March 2020. Responses comprised of 24 patient and visitor responses (70.83% male; demographics shown in Figure 2) and 23 staff member responses (91.30% nursing staff-various grades, 4.35% doctors and 4.35% physiotherapists).





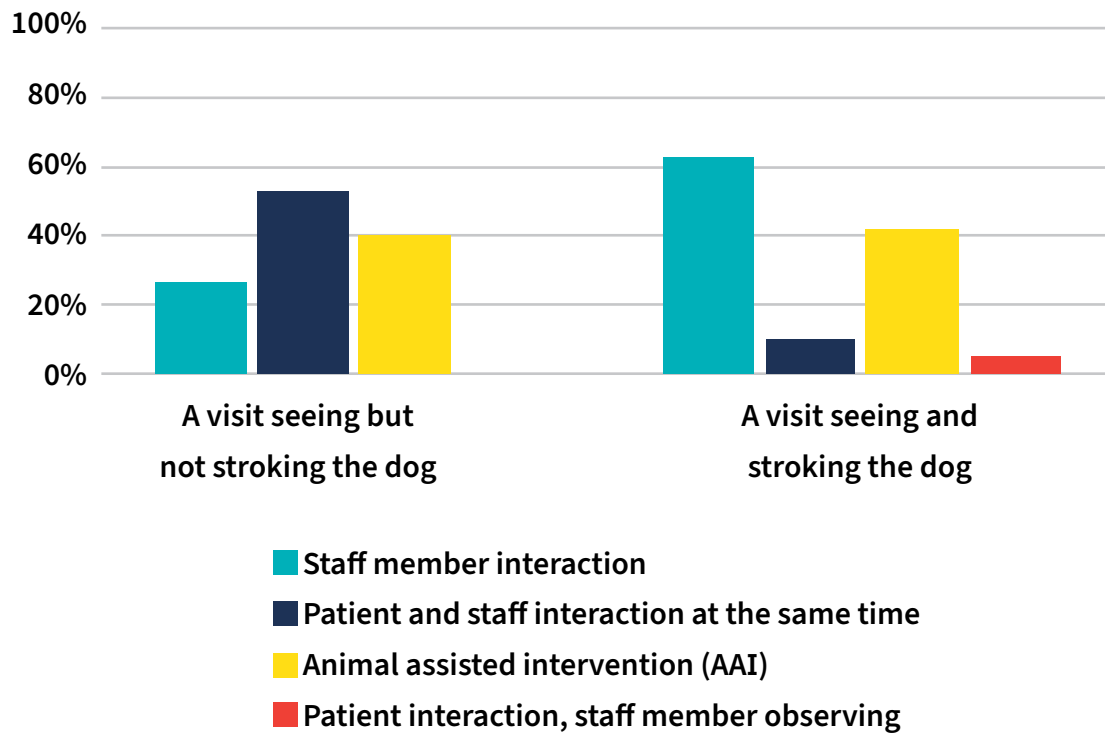
**Figure 2: To show the demographic data for patients, relatives and visitors who completed the questionnaire.**

There were no concerns from staff, patients or relatives in relation to the dog’s cleanliness, presentation, welfare or handling. There were no reports from staff that AAIs were disruptive to patient care. 100% of staff and 95.8% of patients and visitors would recommend the service to other wards and hospitals. An overwhelming majority of responses highlighted a positive perceived benefit and high level of enjoyment for patients, visitors and staff with maximum scores of 10 being given by at least 70% of responders (range 70–95%).

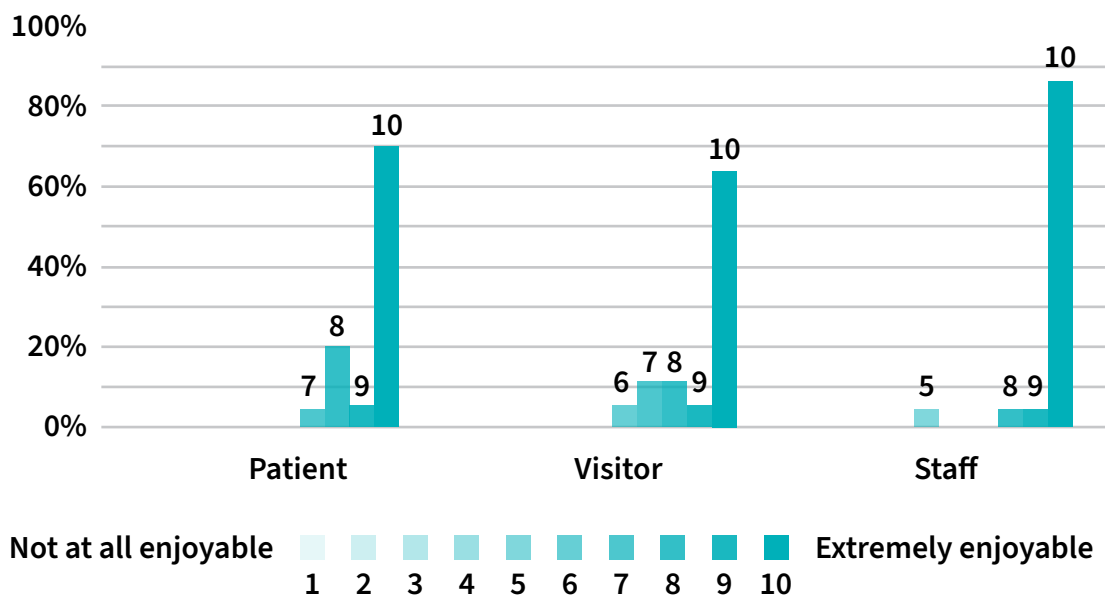
**Quantitative data: staff responses**

44% of the interactions were observed by the member of staff without interacting with the patient or dog. However, 33% of patient interactions involved the patient and the staff interacting with the dog at the same time (Figures 3 and 4).

Only 4.35% (*n* = 1) of staff identified the interactions as an AAI.



📌 **Figure 3: To show the type of interaction experienced by the staff member (n = 23).**

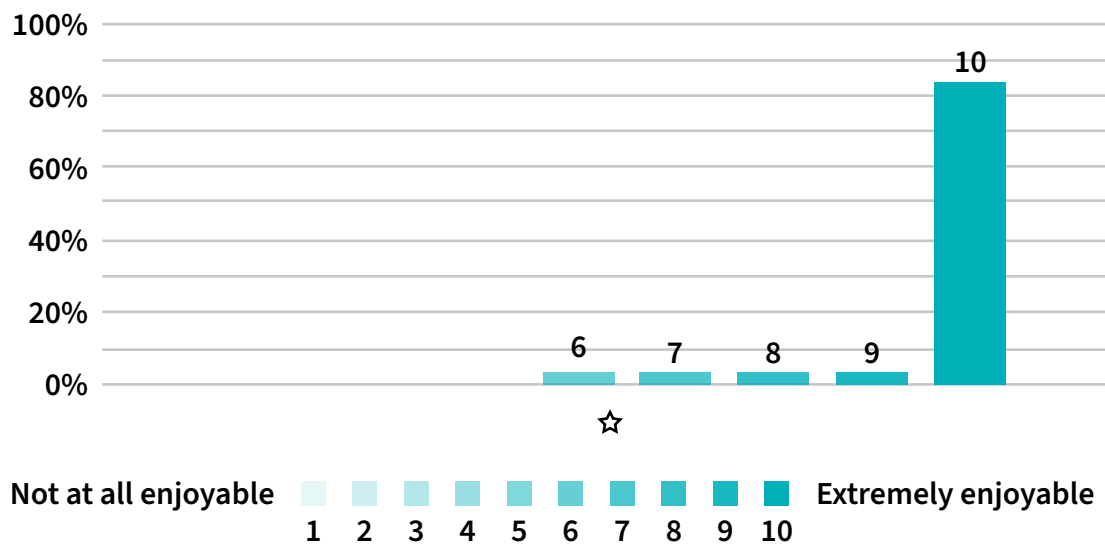


📌 **Figure 4: To show the staff members perceived level of enjoyment for patients, visitors and staff during the AAI (n = 23).**

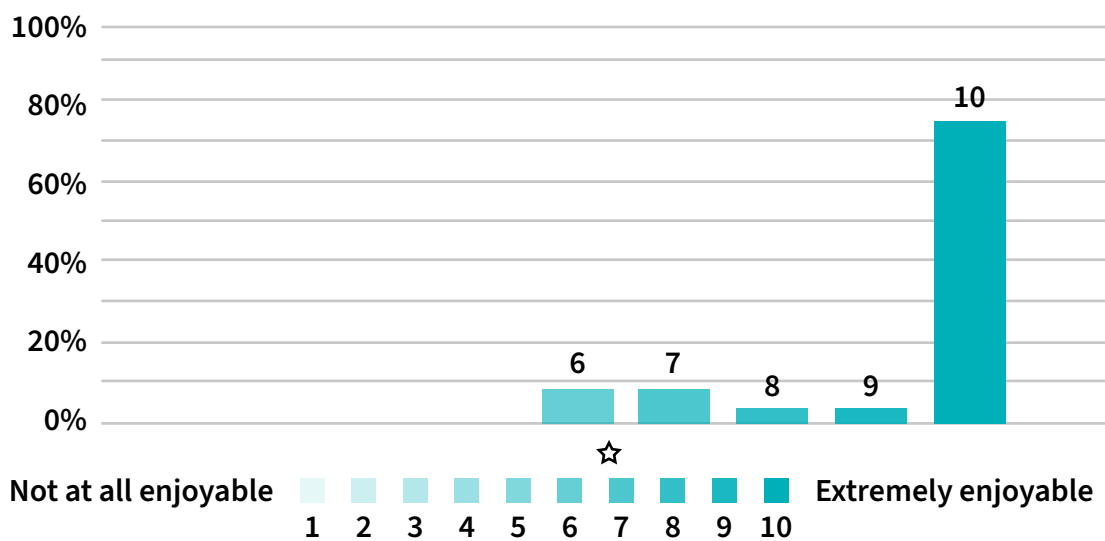
**Quantitative data: Patient/visitor responses**

The mode, median and mean length of ICU stay at the time of the AAI was 3, 4 and 7.7, respectively. A majority of the patients were resting or inactive, including sitting in a chair when the AAI took place (82.3%). Only 13% of the AAIs were during therapy (physiotherapy, occupational therapy or speech and language therapy).

83% percent of patients and visitors rated the interaction with the dog as a maximum score of 10, extremely enjoyable. 75% percent of patients and visitors rated the interaction as extremely beneficial (Figures 5 and 6).



**Figure 5: To show the patients/visitors perceived level of enjoyment during the AAI (n = 24).**



**Figure 6: To show patients/visitors perceived benefit as a result of the AAI (n = 24).**

### Qualitative data

The qualitative data was compiled from the comments made in the free text responses. Comments were independently grouped into emergent themes for the 2 groups of responders. There were 6 emergent themes for each group. The emergent themes and some quotes are detailed in Tables 1 and 2. 5 of the emergent themes were shared by both groups. These were mood, distraction, dog and handler, AAI and recommendations. The themes that were not shared between the 2 groups of responders were infection control (patients/visitor responses) and impact (staff responses).

**Table 1: To show the emergent themes and comments from the patient and visitor comments.**

<b>Theme</b>	<b>Comment</b>
*Mood	<p>‘Just made my day after operation’ (responder 12, male, age 16–29).</p> <p>‘Relaxing. Reminder of dog at home’ (responder 13, male, age 70–89).</p> <p>‘Lightened up my day and put a smile on my face’ (responder 24, male, age 50–69).</p>
*Distraction	<p>‘...I even forgot I was in pain for a moment’ (responder 23, male, age 30–49).</p> <p>‘Something different to take your mind off things’ (responder 22, male, age 50–69).</p>
*Dog and handler	<p>‘The dog was so gentle and well behaved’ (responder 10, female, age 50–69).</p>
*AAI	<p>‘Got (my partner) to walk for the first time in days’ (responder 17, male, age 16–29).</p>
Infection control	<p>‘...clean your hands after’ (responder 22, male, age 50–69).</p>
*Recommendations	<p>‘I feel it would be very beneficial for dogs to be allowed access to all the wards for patients rehabilitation’ (responder 5, male, age 50–69).</p> <p>‘Would be more beneficial to a patient who was alone with no visitors’ (responder 22, male, age 50–69).</p>

\*Shared themes for staff and patients/visitors.

Table 2: To show the emergent themes and comments from the staff comments.

Theme	Comment
*Mood	<p>‘A fantastic experience seeing an unwell patient smile for the first time whilst stroking and interacting with the dog’ (responder 10, deputy sister).</p> <p>‘Loved seeing (the dog), made my day! Thank you’ (responder 13, deputy sister).</p> <p>‘(The dog) and the patient’s interaction was emotional... the patient became slightly tearful as she remembered her own dog. This had a positive effect and uplifted the patient’s mood’ (responder 20, physiotherapist).</p>
*Distraction	<p>‘They are fantastic animals who bring a sense of normality for a lot of patients, it helps them to forget the terrible time they are having in the hospital...’ (responder 10, deputy sister).</p>
*Dog and handler	<p>‘Handler is VERY conscious of what’s going on and the importance of appropriately timed interactions’ (responder 11, staff nurse).</p> <p>‘(The dog) is a well behaved and clever dog; it was a joy to meet her’ (responder 19, health care assistant).</p>
*AAI	<p>‘The therapy dog visited ITU today, the patient walked to (the dog) as her goal and this was amazing. The interaction between the patient and (the dog) was very emotional. This was an amazing way of encouraging mobility’ (responder 20, physiotherapist).</p>
Impact	<p>‘I really hope (the dog) will visit regularly during the winter pressures as I think staff will benefit so much, helping us all stay well for our patients’ (responder 2, doctor).</p> <p>‘...The dog helped me to de-stress and helped me to deliver better, more compassionate care for our patients’ (responder 2, doctor).</p> <p>‘The dog was really good, had a very positive impact on the unit and is well loved by all the staff. She has such a positive impact on the patients too especially the long-term patients’ (responder 13, deputy sister).</p>
*Recommendations	<p>‘I would definitely recommend a therapy dog to visit any ward’ (responder 4, assistant nurse practitioner).</p> <p>‘EVERYWHERE should have this input. Nothing but positive experience and outcomes for all involved – patients, visitors and staff. Staff actively look forward to the visit. And is often used as motivation and something to look forward to for patients’ (responder 11, staff nurse).</p>

\*Shared theme identified from patient and visitor comments.

## Discussion and conclusion

The primary findings of the evaluation identified that patients, visitors and staff did not have any concerns or issues relating to a visiting dog and handler to provide AAI to patients on a general intensive care unit.

The project also highlighted that greater than 95% of all responders would recommend a similar service to other wards and hospitals. There were 5 common emergent themes identified from the qualitative data. They were AAI, distraction, mood, recommendations and dog and handler. There was an overwhelming number of positive comments made in these emergent themes. All of these findings concur with those of Uglow (2019) and highlights the potential need for developing an AAI service more widely. Provision of an AAI to patients when they move from ICU to a general ward would promote continuity of humanised care. This would potentially facilitate patient engagement and self-interest in their rehabilitation and well-being (Wilson et al. 2019).

There were no objections to the provision of the service from any ICU staff, patients or visitors. Potential risks were identified during a pre-visit telephone call on the day of the visit. One staff member highlighted a mild dog allergy and the handler ensured that there was no contact between the dog and this staff member.

The results of the questionnaire highlighted that visitors and patients reported that 79.1% of interactions with the dog were when the patient was inactive or resting. Staff reported a similar figure of 86.4%. This could be attributed to the fact that most dog visits took place during visiting hours (1–4pm), a time when patients are typically less active. It is also worth recognising that when a patient is sitting out in a chair they are perceived as being inactive, however, this may not be the case if it is part of the patient's progressive rehabilitation plan. This requires future consideration, by identifying if there are influential factors for maximising the benefit of the AAI, for example, patient position or time of day.

Following the RCN guidelines that the dog's front paws can be placed on the bed if a single use, disposable sheet is used to protect the patients bed sheets means that patients can still interact with the dog if they are not able to get out of bed. Future recommendations would involve recording the patient and dogs' position during the AAI which would enable more detailed evaluation of the impact of the interaction.

It is also recommended that responders are separated into 3 distinct subgroups (patients, visitors and staff) for comparison. This would also allow for more detailed evaluation and analysis in future studies.

Only 1 responder identified interactions as an AAI. It would be interesting to explore the knowledge and understanding of staffs' perception of an AAI. By exploring this in detail it could highlight training needs to facilitate appropriate use of the AAI and maximise the impact of both informal and targeted AAIs to achieve individual goals for the patients.

The survey responses also highlighted recommendations for service development. It was identified by 1 patient or visitor response that patients without any visitors may benefit from an interaction with the dog more than someone who had visitors. In contrast to this, however, a member of staff identified that a visit from the dog whilst the visitors were present facilitated interaction between the patient, visitors and staff. Another comment from a staff member suggested that long term ICU patients may benefit more from the dog visiting than short stay patients. The dog handler also has some anecdotal evidence and reflective thoughts on this. It seems that perceptions are personal and individual to each patient or staff member, but it also highlights the need to explore this in more detail in the future. The provision and detail of the information through displaying posters and giving explanations to patients, visitors and staff is another area that could be explored, following the comment from a member of staff who regarded this as important. There are plans to explore this with input from the ward patient advisor with a view to including information on the trusts website.

Although self-reported data or visual analogue scales are not considered as robust levels of measurement, they are frequently used in research to measure and evaluate the impact of interventions. For example, pain rating scales are routinely used in medical assessments to plan and prescribe appropriate analgesia. Another limitation of this evaluation is one of bias. The sampling method was convenience sampling. This may increase the likelihood of selection bias. Whilst responders were informed that the questionnaire was anonymous, the presence of the handler on the ward whilst the questionnaire was completed may cause observation bias, known as the Hawthorne effect. This occurs when responders are aware that they are being observed or involved in scientific study and this has a potential to influence the answers or responses given. Finally, there is a risk of confirmation bias because the researcher was also the dog handler and may therefore be looking for information or patterns in data to confirm pre-conceived ideas. These issues of bias need addressing in any future research plans.

The findings of this evaluation align with the findings of Uglow (2019) and contributes to the currently limited but developing research and evidence base of AAIs in ICU.

This evaluation identifies that a service providing AAIs to adult patients in ICU is safe and feasible. It highlights additional perceived benefits for visitors, staff and patients. In addition, a number of recommendations for service development and future research have been highlighted.

### **Key points**

- AAIs in ICU are safe and feasible.
- Contributes to the developing research base of AAIs in ICU.
- There is an overwhelming perceived benefit and enjoyment of AAI for patients, visitors and staff.

## Declarations

The evaluation received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

## Acknowledgements

Thank you to those patients, visitors and staff who have supported the service and completed questionnaires.

## Appendix

Web-links to questionnaires:

- Patients and visitors: <https://www.surveymonkey.co.uk/r/3NSM2ZV>.
- Staff: <https://www.surveymonkey.co.uk/r/P8TKV6>.

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# An exploration of patient perspectives and experiences of a 6-week outpatient rehabilitation programme following critical illness: A qualitative study

Hannah Brown<sup>1</sup>

## Abstract

With improvements in medical health care, the likelihood of surviving critical illness is increasing. However, surviving critical illness can have long-term detrimental effects on physical and functional ability, alongside psychological implications. To address these long-term effects, outpatient rehabilitation programmes following discharge from critical care have been developed. There is therefore a need to explore the perspectives and experiences of those individuals that have participated in these programmes. The findings can support in continuing to develop such programmes.

## Objective

To gain insight into patients' perspectives and experiences of attending a 6-week outpatient rehabilitation programme following critical illness and to explore patients' thoughts regarding its impact upon function and quality of life.

## Methods

Ten of the potential 15 participants who completed the critical care rehabilitation programme in 2018 met the inclusion criteria. A total of 5 participants were available and consented to attend a focus group in February 2019.

## Findings

Using thematic analysis, 3 main themes were identified: (1) barriers to exercise post critical illness; (2) benefits of the programme; (3) timings of the programme. Sub-themes were also identified within these.

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## Keywords

Critical care  
rehabilitation,  
outpatient,  
perspectives,  
experiences.

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## Conclusion

Participants had an overall positive experience of the critical care rehabilitation programme and felt that this service is beneficial and needed for all of those who survive critical illness. Further exploration as to the timing of commencement following hospital discharge and the frequency and durations of the programmes is recommended.

## Introduction

Critical care survivors commonly experience persistent disability, including the requirement of walking aids, assistance with personal care and not being able to return to work or social activities within 6 months (Ferrante et al. 2016). Physical and cognitive impairments are also evident at 9 months post-critical illness (Girard et al. 2010). Individuals can also experience varying levels of social institutionalisation due to a lack of functional ability and confidence, negatively impacting quality of life (Ferrante et al. 2016).

At present there is not an exercise-based intervention started after discharge from critical care which has been determined to have an overall effect on functional exercise capacity, or on health-related quality of life (Connolly et al. 2015). There is also variability in terms of the provision of rehabilitation programmes in either outpatient or community settings across the United Kingdom (UK) where these are not widely established and available as standardised care. For those healthcare settings which do provide outpatient exercise rehabilitation programmes for survivors of critical illness, the need to explore the lived experiences of those who have utilised such services is warranted (Aitken et al. 2015). The aim of this study therefore was to explore the lived experiences of survivors of critical illness who have attended an outpatient rehabilitation programme.

## Methods

A qualitative methodology was chosen as the ideal approach to explore patient perspectives and experiences of attending the critical care rehabilitation programme to gain an understanding of whether the programme has had an impact on participants' lifestyle, function, health and quality of life (Barbour 2014).

A focus group was utilised to allow exploration of patient perspectives and experiences in order to collect sufficient data to create themes regarding the reported effectiveness of the rehabilitation programme following critical illness (Carpenter & Suto 2008). Focus groups enable free-flowing discussions between participants in a group environment which can develop new or forgotten thoughts providing increasingly rich data, and were therefore appropriate for this study (Hicks 2009; Barbour 2014).

The focus group was held in an informal setting within a primary care national health service (NHS) Hospital meeting room. Carpenter & Suto (2008) suggests that face-to-face meetings will facilitate discussions and encourage rich data collection. Participants were recruited by criterion-purposive sampling, an effective method of selecting participants who have common characteristics which can positively impact the interaction within the focus group (Pope & Mays 2000).

### **Participants**

10 of the potential 15 participants who completed the critical care rehabilitation programme between 2018–2019 at one NHS Trust in the United Kingdom (UK) met the inclusion criteria. A total of 5 participants were available on the selected date and consented to attend. The duration for these 5 participants between hospital discharge and commencing the rehabilitation programme was between 6 and 10 weeks.

### **Inclusion criteria**

- Have had an admission to critical care for longer than 4 days.
- Completed the 6-week outpatient rehabilitation programme within the last year to ensure accurate representation of the programme.
- Over the age of 18.
- Able to provide written consent.

### **Exclusion criteria**

- Known cognitive deficit that may influence the ability to recall thoughts and feelings regarding the critical care rehabilitation programme.
- Non-English speaking, as language can cause negative barriers to the development of discussion within a focus group (Stewart & Shamdasani 2015).

All individuals who attended the programme that met the inclusion criteria were initially contacted by the researcher (HB) via post and provided with a participant invitation letter and information sheet to allow the individual to make an informed decision as to whether they wished to participate in the study. The researcher then made contact via phone call 1 week after the distribution of the information to discuss any further questions and establish whether the individual wished to take part in the research study. Individuals were made aware they could withdraw from the study at any time (Carpenter & Suto 2008). Participants made an autonomous decision to participate, improving credibility of the methodological approach (Wendler & Wertheimer 2017).

Prior to data collection, the researcher acknowledged positionality, as pre-conceptions may influence the interpretation of results (Mason-Bish 2019). Acknowledging positionality and referring to this throughout, the methodology aims to improve the trustworthiness of the results (Cypress 2017). A positionality log was also completed to consciously acknowledge and set aside preconceived notions to improve data dependability and minimise the influence of research bias (Maguire & Delahunt 2017).

The focus group was conducted by 2 members of a respiratory therapy team who were separate to the researcher, in order to reduce researcher bias, increasing data credibility (Pannucci & Wilkins 2010). One facilitated the discussion and one took field notes as a form of bracketing to strengthen confirmability (Gearing 2004).

From the available literature and the experiences of the author who had involvement in the programme, 6 questions were developed for use as the topic guide (Appendix 1). The topic guide enables a structured framework that can help guide the focus group to achieve its aims and objectives although used in a loose and open form to minimise bias during data collection (Smith & Firth 2011). These enabled a range of information about the rehabilitation programme to be gathered, using a semi-structured questioning format. Prompt sub-questions were also given to the facilitator prior to the focus group for use if required, although the facilitator was advised to be spontaneous with open questions depending upon how the discussion was developing:

- 1 How did you feel about being asked to participate in the exercise programme?
- 2 What were the pros and cons to the exercise programme?
- 3 How did it make you feel having other participants in the class who also had been critically ill?
- 4 How did the exercise programme affect your day-to-day activities?
- 5 How did the exercise programme affect your quality of life?
- 6 Is there anything else you would like to add about the exercise programme and the impact upon your lives after being critical ill?

The focus group was audio recorded using 2 dictaphones and transcribed by the researcher into textual data within 3 weeks and saved onto a password protected word document and computer in order to comply with confidentiality and information protection (Merriam & Tisdell 2015). Transcription was anonymised and participants were referred to by number in order to increase participant confidentiality and comply with the ethical principle of autonomy (Merriam & Tisdell 2015). Both dictaphone recordings were deleted after transcription.

Data was analysed based upon Braun & Clarke (2006) inductive thematic approach. This allowed an increase in trustworthiness of the analysis process for the novice researcher.

Following the focus group, a thank you letter was sent via post to all participants, including an overview of themes identified. Participants were asked to respond if they felt this was not a true reflection of discussions as a form of member checking in order to maximise the accuracy of interpretation and therefore improve credibility of results (Birt et al. 2016).

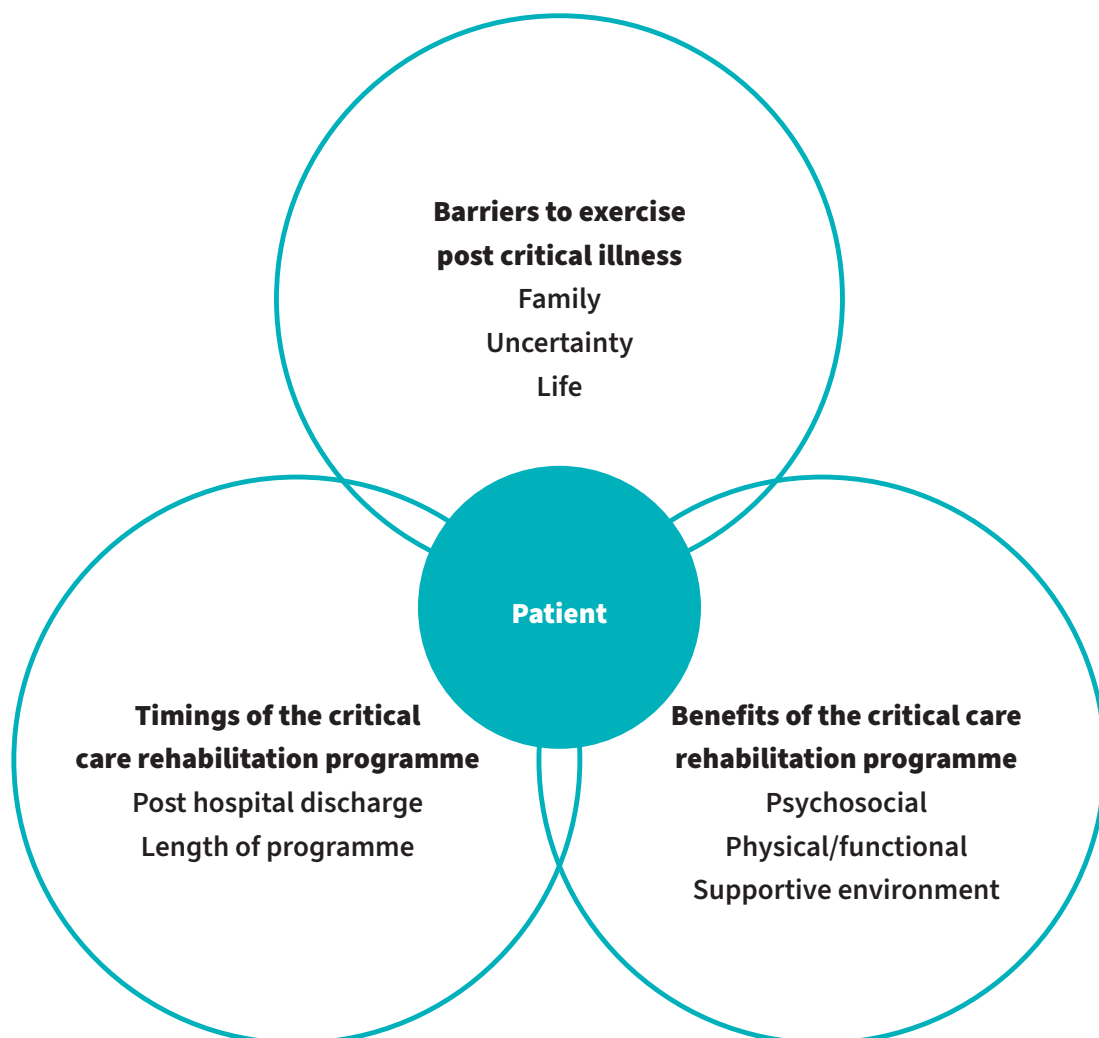
## Ethics

Approval was gained by Coventry University Research Ethics Committee, NHS Trust Research and Development, the Integrated Research Application System (IRAS) and Health Research Authority Ethics Committee in January 2019 (258215).

## Results and discussion

In summarising the results, the critical care rehabilitation programme was beneficial to all who attended. The benefits that were reported included: improved physical, functional and psychological factors, and reducing barriers created by protective family behaviours, poor education on self-progression and difficulty setting a routine to build their exercise tolerance. Participants recommended that the time between hospital discharge and starting the programme could be reduced in order to promote the above benefits as soon as possible. Finally, a 6-week programme may not be sufficient in order to optimise the benefits that participants wanted.

A thematic map was generated to refine, relate and conclude the themes found without the use of assisting software. These themes can be further divided into subthemes (Figure 1).



↑ **Figure 1: Themes and sub-themes.**

### **Barriers to exercise post-critical illness**

Participants highlighted that there are many barriers to progressing post critical illness. 1 participant spoke about how family can inhibit functional independence post critical illness.

‘My husband bless him, he’s wonderful but he wouldn’t let me do anything’ (participant 3).

‘I mean I can understand his feelings’ (participant 2).

This protective behaviour from family members, built from the stress of the critical illness may inhibit patients’ progression following discharge from hospital, becoming a barrier to physical and functional independence. Participants felt that the rehabilitation programme helped to overcome these protective behaviours surrounding family anxieties, thus suggesting the programme had a positive impact.

‘I started the rehab and I was able to tell him what they let me do and what they wanted me to do and of course it helped out and he started to let me go a bit’ (participant 3).

These findings support the idea that the upheaval associated with the traumatic event of critical illness can cause anxiety, stress and over-protective behaviours as found by Eggenberger & Nelms (2007) who completed a semi-structured interview to investigate family experiences when an adult member of the family is critically ill.

Participants also highlighted how, when left to their own devices, there is uncertainty as to the manner in which to progress, which may cause a barrier to participating in independent rehabilitation, subsequently impacting recovery and quality of life.

‘I wanted to get better and I didn’t know how to do it properly’ (participant 3).

‘You don’t quite know what to do with yourself’ (participant 3).

‘You don’t know what you are capable of doing’ (participant 2).

‘At home you don’t know what to do’ (participant 4).

Upon discharge many patients go home with no initial support or direction. The results suggest that participants felt that this could have negatively impacted their recovery. Connolly et al. (2015) reports that for some this is daunting and challenging. The implications of patients being unsure how to progress following discharge from hospital may prevent physical independence, prolong social institutionalisation and contribute to a reduction in quality of life (Fan et al. 2014). Participants’ perspectives of the benefits of the critical care rehabilitation programme included the ability to complete more physical tasks and increase exercise tolerance, suggesting the programme may positively improve strength although needs further investigation. The critical care rehabilitation programme appears to offer an opportunity to overcome potential barriers which patients face by building

strength and independence which may have additional longer term financial benefits to healthcare.

Additionally, prior to starting the critical care rehabilitation programme participants reported that they found it difficult to independently maintain a strict and consistent exercise routine that supported their recovery. Additionally, the economic influence of cost to attend community facilities was also mentioned as a barrier to participating in independent rehabilitation. Participants did not wish to spend the money to attend community facilities and identified that those who are working may not be able to commit the time and money associated with community facilities.

‘Life gets in the way’ (participant 5).

### **Benefits of the programme**

The critical care rehabilitation programme appears to have provided a focus for participants on recovery and begins to address the physical and functional benefits that occur when participating in exercise. Secondly, participants reported how exercising in the group setting with other participants who had also survived critical illness highlights that they are not alone and had psychological benefits. It has been demonstrated that patients can have difficulty returning to their previous social activities following critical illness up to nine months following hospital discharge (Girard et al. 2010); however, the importance of re-engagement in these activities is important for mental health and wellbeing.

‘It is very scary and it is reassuring to know that it is not just you that other people, it’s quite common’ (participant 4).

‘It’s good to share your experiences’ (participant 2).

‘And whilst talking about it is very hard, it is beneficial because you can talk to each other and realise it’s not just me, it’s quite common’ (participant 4).

‘I could walk further’ (participant 4).

‘My wife can see the difference no end’ (participant 1).

All participants reported an improvement in their physical and functional ability and had perceived benefits of participating in the rehabilitation programme. When asked, participants all reported that the service is needed for this very reason. The critical care rehabilitation programme appears to have provided a focus for recovery and begins to address the physical benefits that occur as a result of participating in exercise. Secondly it became apparent that participants also felt that there were other psychological benefits to participating in the critical care rehabilitation programme when being surrounded by others who have gone through similar situations, whereby the supportive environment offered by the programme became evident.



## Timings of the programme

A common topic raised during the focus group was in relation to the length of the rehabilitation programme, and duration between hospital discharge and commencement.

‘For me I was discharged in May and then it was August time erm, so I had gone through my initial recovery period, I wanted it straight away’ (participant 5).

‘It depends if you have had any operations and what you have. I think you should be able to start within a month’ (participant 2).

‘Within 6 weeks definitely’ (participant 4).

All participants reported that the 6-week rehabilitation programme was too short and they wanted to continue attending to maximise the recovery benefits. Participant perceptions of the length of the programme should support those involved in decision making in providing the service.

‘6 weeks was too short, I think it should be increased, but brilliant, absolutely brilliant’ (participant 1).

‘I would like it to be an ongoing thing as it did actually help. It was definitely worth it. I just think it should become permanent’ (participant 5).

‘Three months, yes I wouldn’t have a problem with 6 more weeks’ (participant 5).

‘I did 18 weeks as I did pulmonary rehab as well and that is probably about the minimum length of time that you want’ (participant 1).

‘But it is down to peoples’ preferences because what is wrong with you compared to what is wrong with someone else, you might not need as long as somebody else where as I needed more’ (participant 4).

2 quantitative studies conducted by McWilliams et al. (2009) and Denehy et al. (2013) examined the impact of a critical care rehabilitation programme and had differing frequency of sessions per week and lengths of programme. A lack of standardisation in the literature as to the frequency and duration of critical care rehabilitation programmes highlights an area for further research in order to maximise patient recovery as these aspects may influence the success of the critical care rehabilitation programme and patient outcomes.

The programme appeared to have positive effects in relation to the reported benefits given by participants, although it is not clear if lengthening the duration of the programme would be necessary or provide additional benefits. However, any decisions as to frequency and duration of the programmes needs to be matched with availability of resources and cost effectiveness and suggests further research into the programme duration needs to be explored.

## Limitations

There was the potential for leading question bias within the data collection, as the facilitator had background knowledge of the critical care rehabilitation programme. However, Hicks (2009) argues that having an underlying knowledge of a subject can aid the discussion, as the questioner can be intuitive, adapting to the needs of the focus group to improve flow, without influencing discussions or results. In addition, positionality was considered throughout and therefore supports in maximising confirmability of the findings.

The transcription and data analysis were only conducted by the researcher, it would have been beneficial to have the facilitator of the focus group read the transcription to confirm content and use of triangulation within the data analysis process to further maximise credibility.

## Conclusion

The findings suggest that a 6-week physiotherapy led outpatient rehabilitation programme following critical illness offers participants a supportive and motivational environment. This enables participants to fully engage in optimising their recovery and minimising the long-term impact of critical illness. The physiotherapy-led nature of this programme supports the role of the physiotherapist in having an essential role in the provision of support, by demonstrating clinical expertise in rehabilitation and individualised exercise adaptation throughout the programme.

There is limited research exploring the effectiveness of critical care outpatient rehabilitation in both quantitative and qualitative research. Participant perceptions in this study of the critical care rehabilitation programme were positive; all participants would recommend the service to others who have experienced critical illness. The timing of commencement of the programme following hospital discharge, and the frequency and duration of the programme are aspects highlighted in this study that warrant further exploration. Each participant gained benefits from participating in the programme which then translated into their normal daily activities. The benefits explored during the focus group highlight the need of the service, to not only support patients back to physical function, but to provide holistic care by reducing the psychosocial factors associated with critical illness.

## Key points

- 1 The programme was successful in supporting both the individuals, and therefore their families, in recognising what the person was physically capable of doing.
- 2 Important area of research and timely given COVID-19 and the current population of critical illness survivors.
- 3 To ensure evidenced-based practise and best patient care, further research into the effects of a critical care rehabilitation programme and on its delivery and duration would be recommended to ensure the programme provides the most effective content.

This may influence understanding of what community resources might be helpful for this population.

### **Acknowledgements**

I would like to thank the participants who took the time to attend the focus group and to all of those who have helped during the preparation and completion of the focus group as well as those who have supported me in producing this article.

## **Appendix A – Focus group questions topic guide**

*An exploration of patient perspectives and experiences of a 6-week outpatient rehabilitation programme following critical illness: A qualitative study*

### **Background**

Welcome participants to the focus group, introduction to researcher and explanation of how research is linked to Masters Degree. Explanation of microphone will be recording the group discussions and advised participants to speak freely with no right or wrong answers. Confirmation of ethics and consent forms signed.

### **Project outline and aim**

The aim of this research is to explore patient perspectives of a 6-week critical care rehabilitation programme following critical illness at one hospital NHS Trust.

### **Objectives**

- 1 To explore patient perspectives of participating in a 6-week critical care rehabilitation programme, following hospital discharge from critical illness.
- 2 To explore the positives and negatives of critical care rehabilitation programme.
- 3 To explore the impact of the rehabilitation programme on patients function and quality of life.

### **Personal experiences and perspectives**

- 1 How did you feel about being asked to participate in the critical care exercise programme?
- 2 What were the pros and cons to the exercise programme?
- 3 How did it make you feel having other participants in the class who also had been critically ill?
- 4 How did the exercise programme affect your day-to-day activities?
- 5 How did the exercise affect your quality of life?
- 6 Is there anything else you would like to add about the exercise programme and the impact upon your lives after being critical ill?

### **Question prompts if required**

- 1 Was the service needed, was the exercise programme needed.
- 2 Time, duration, size, exercises.
- 3 Any support gained from knowing others were in similar positions.

- 4 Notice any changes, did partners notice any differences, were you able to do more at the end.
- 5 Were you able to return to work, social activities, family, confidence, fitness.
- 6 Is the service beneficial.

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# A service evaluation exploring time on physiotherapy caseload following lung lobectomy surgery

Chloe Tait<sup>1</sup>

## Abstract

### Background

The number of lobectomy procedures performed in the United Kingdom (UK) continues to increase annually increasing pressure on thoracic surgical bed capacity. Physiotherapy following thoracic surgery can encourage earlier patient independence helping to reduce hospital length of stay and decrease pressure on hospital beds. The purpose of the service evaluation was to explore whether age, gender, type of surgical incision, day first mobilised and chest drain duration affected time on physiotherapy caseload following lobectomy surgery at one teaching hospital. The findings could support the identification of individuals at risk of longer times on physiotherapy caseloads and help direct physiotherapy rehabilitation provision towards these individuals.

### Methods

A retrospective service evaluation was conducted in a UK teaching hospital. Data were retrospectively collected from 1st July 2015–30th June 2016 for all patients reviewed by the cardiothoracic physiotherapy team following lobectomy surgery. Data were collected from patients' physiotherapy ward sheets, chest radiograph and an electronic patient database and included: date of surgery; day discharged from physiotherapy; age; gender; type of surgical incision; day first mobilised; day chest drains removed.

### Results

135 individuals were treated by the physiotherapy team following lobectomy surgery within the data collection period. Time on physiotherapy caseload was longer for females and for those who had longer

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## Keywords

Length of stay, thoracic surgery, service evaluation.

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chest drain durations. Time on physiotherapy caseload was reduced by having a VATS incision and was not affected by the patient's age. Day mobilised post-operatively was an independent predictor of time on physiotherapy caseload however after adjusting for other covariates it was not statistically significantly associated with time on physiotherapy caseload.

### **Conclusion**

Reviewing chest drain removal practices and providing more intensive physiotherapy input following thoracotomy are worth greater exploration to ascertain whether these interventions could further reduce time on physiotherapy caseload following lobectomy surgery.

## **Introduction**

In 2016 more than 77% of all lung resections for lung cancer were lobectomy or bilobectomy procedures (Royal College of Physicians 2017). The number of lung lobectomy or bilobectomy surgeries performed annually continues to increase in the UK (Jones et al. 2013; Royal College of Physicians 2016) from 4,498 in 2015 to 4,905 in 2016 (Royal College of Physicians 2017). This leads to increased pressure on thoracic surgical hospital beds. Following lung cancer and lobectomy surgery individuals can experience a loss of independence and functional decline (Granger et al. 2012). Physiotherapy is considered a crucial component of the management of patients following lobectomy surgery (Ahmed 2018). Physiotherapy after lobectomy can facilitate early independence, functional recovery and help to reduce hospital length of stay reducing bed pressures (Tait et al. 2021). Time on physiotherapy caseload and factors influencing this following lobectomy surgery have not been explored and measured within existing research. The aim of the service evaluation was to explore whether age, gender, type of surgical incision, day first mobilised and chest drain duration affected time on physiotherapy caseload following lobectomy surgery.

## **Method**

Lobectomy is the most common type of thoracic surgery performed at our UK teaching hospital and most of the existing research features individuals who have undergone lobectomy surgery. To allow comparison with existing literature, only individuals who underwent lobectomy were analysed in this service evaluation.

This service evaluation was registered with and approved by the Blackpool Teaching Hospitals NHS Foundation Trust's Research and Development team. Ethical approval was not required in line with the Trust policy on undertaking service evaluations.

The cardiothoracic physiotherapy team routinely assess all individuals postoperatively following lobectomy surgery. Postoperative physiotherapy assessment includes respiratory function, shoulder joint range of movement and mobility assessments. Physiotherapy interventions following lobectomy surgery typically include: chest clearance techniques including incentive spirometry and wound supported cough; shoulder exercises; mobilisation; static exercise bike and a stair assessment prior to discharge (if clinically indicated). Individuals who undergo lobectomy surgery are reviewed on day one postoperatively and continue to receive physiotherapy treatment until discharged from physiotherapy. To be discharged from physiotherapy individuals should be at a level of mobility where they are able to safely manage at home, independently clear pulmonary secretions, have a chest radiograph (CXR) approved by the multidisciplinary team, maintain their target oxygen saturations on room air (unless on home oxygen) and, if applicable, safely manage to climb stairs. Referral to physiotherapy follow-up services following hospital discharge is not routinely made.

A retrospective service evaluation was conducted. Data were collected over a 12 month period from 1st July 2015–30th June 2016 for all individuals reviewed by the cardiothoracic physiotherapy team following lobectomy surgery.

Data were collected retrospectively from individuals' physiotherapy ward sheets, CXR and an electronic patient database.

Data collected included:

- Date of surgery.
- Day discharged from physiotherapy.
- Age.
- Gender.
- Type of surgical incision.
- Day first mobilised.
- Day chest drains removed.

(Day = number of days post-operatively with day of operation = day 0). Mobilisation was defined as ambulation away from the bed space.

The distribution of the data for the number of days on physiotherapy caseload, day first mobilised postoperatively and day chest drains removed postoperatively was assessed using histograms. The data did not have normal distribution. Median and interquartile range values were used due to the skewed distribution of data.



Univariate analysis was performed for each variable (age, gender, type of incision, day first mobilised, chest drain duration) separately compared with the time on physiotherapy caseload using a single linear regression model. A multivariate analysis linear regression model was then used to analyse whether there was any association between age, gender, type of incision, day first mobilised, chest drain duration and time on physiotherapy caseload. All assumptions for linear regression were checked and where the assumptions were not met, log transformation was used.

## Results

Data were obtained for 135 individuals (78 female, 57 male) following lobectomy surgery with a median (range) age of 68 (63–75) years. For 2 patients there was no available information on incision performed, whilst 68 individuals underwent a thoracotomy incision and 65 individuals underwent a VATS incision. The first day that patients mobilised postoperatively was 3 (2–5) days. Chest drains were removed after 3 (2, 5) days. Patients were on the physiotherapy caseload for 6 (4–8) days.

The results of univariate analysis for each variable and time on physiotherapy caseload showed that age was not found to have a statistically significant impact on time on physiotherapy caseload  $SE$  0.03 ( $p = 0.105$ ). Gender was found to be statistically significant with females spending an extra 1.91 days on physiotherapy caseload in comparison to males  $SE$  0.59 ( $p = 0.002$ ).

Incision type was found to also be statistically significant with VATS incision decreasing time on physiotherapy caseload by 1.99 days  $SE$  0.56 ( $p < 0.001$ ). The day first mobilised was statistically significant for each day later first mobilised time on physiotherapy caseload was increased by 0.82 days  $SE$  0.12 ( $p < 0.001$ ). Chest drain duration was statistically significant as for each extra day chest drains remained in situ time on physiotherapy caseload by 0.355 days  $SE$  0.06 ( $p < 0.001$ ).

Table 1 shows the results of the multivariate regression model for time on physiotherapy caseload. Of the variables used gender, incision type and chest drain duration had a statistically significant impact on time on physiotherapy caseload, whereby being female and chest drain duration increased time on physiotherapy caseload and having a VATS incision decreased it. Gender (female) increased time on physiotherapy caseload by 1.07 days  $CI$  0.16, 1.98 ( $p = 0.02$ ) and for each 2.7 days the chest drain(s) remained in situ the time on physiotherapy caseload increased by 1.98 days  $CI$  1.30, 2.66 ( $p < 0.001$ ). Conversely having a VATS incision decreased time on physiotherapy caseload by 0.74 days  $CI$  -1.20, -0.32 ( $p = 0.001$ ). No other variables were significant. The  $R^2$  value was 0.51 so 51% of the variance can be explained suggesting that there were other factors affecting time on physiotherapy caseload that were not measured.

📄 **Table 1: Results of multivariate analysis regression model for time on physiotherapy caseload.**

	<b>Covariate</b>	<b>Estimate</b>	<b>Confidence interval</b>	<b>p-value</b>
1	Intercept	3.73	(0.35, 7.12)	0.031
2	Age	0.02	(-0.03, 0.06)	0.435
3	Sex (female)	1.07	(0.16, 1.98)	0.022
4	Incision (VATS*)	-0.76	(-1.20, -0.32)	0.001
5	Day first mobilised	-0.16	(-0.53, 0.22)	0.409
6	log (Drain duration)	1.98	(1.30, 2.66)	<0.001

\*VATS = video assisted thoracoscopic surgery.

## Discussion

In this service evaluation there was no significant association between age and time on physiotherapy caseload. However, the sample size in this service evaluation may have been too small to detect a significant association between age and time on physiotherapy caseload. It was anticipated that with increased age patients would have a longer time on physiotherapy caseload. Suggested reasons for the risk of longer time on physiotherapy caseload with advanced age following thoracic surgery include: increased risk of postoperative morbidity and postoperative complications due to increased incidence of comorbidities and decline in cardiopulmonary function associated with aging (Okami et al. 2009).

In this service evaluation only age, gender, type of surgical incision, day first mobilised and chest drain duration were explored. It is likely that there are other factors not explored by this service evaluation that influence time on physiotherapy caseload also. It is possible some of these factors may have influenced the finding that increased age was not significantly associated with time on physiotherapy caseload.

Female gender was significantly associated with a longer time on physiotherapy caseload. Smoking history and the presence of underlying medical conditions could account for why males tended to be more at risk of longer LOS following lobectomy surgery (Wright et al. 2008); however, these aspects were not captured in data collection and is an area that warrants research focus. In this service evaluation male and females were comparable in terms of most characteristics (including postoperative chest drain duration, age, type of surgical incision), although females tended to mobilise a day later postoperatively. In this Trust the cardiothoracic wards are usually single-sex therefore males and females tend to be cared for on different wards. It is possible that differences in ward culture, routine and staffing between these wards, rather than gender, may have influenced differences in time

on physiotherapy caseload between males and females. This may be an area for further research exploration.

Time on physiotherapy caseload was also significantly longer for individuals who underwent a thoracotomy than for individuals following a VATS incision. Possible reasons for shorter time on physiotherapy caseload following VATS include shorter duration of surgery, therefore less time under anaesthetic, smaller size of incision which potentially leads to less pain reducing analgesia requirements and allowing patients to engage earlier in post-operative breathing exercises and postoperative mobilisation (Flores et al. 2009; Jeon et al. 2013; Medbery et al. 2016; Farjah et al. 2016).

The postoperative day first mobilised was found to be an independent predictor of time on physiotherapy caseload in the univariate analysis but when adjusting for other variables in the multi-variate regression model there was no significant association between day first mobilised and time on physiotherapy caseload. This suggests that other factors were more important predictors of time on physiotherapy caseload than day first mobilised postoperatively. It was anticipated that early postoperative mobilisation may reduce time on physiotherapy caseload by improving lung expansion, reducing the risk of developing postoperative pulmonary complications (PPC) and encouraging earlier independence with mobility (Agostini et al. 2014; Yeung 2016; Tait et al. 2021).

In this service evaluation, individuals with longer chest drain(s) durations had a significantly longer time on physiotherapy caseload. The presence of chest drains can limit post-operative mobilisation and likely results in patients taking longer to reach their mobility goals (Rathinam et al. 2011; Tait et al. 2021). The presence of chest drains may also increase postoperative pain potentially increasing the risk of developing PPCs (Rathinam et al. 2011; Bjerregaard et al. 201; Mesa-Guzman et al. 2015). The main reason chest drains remain in situ following lobectomy surgery is due to an air leak visible in the drain indicating the lung has not re-expanded. Prolonged air leak therefore is a likely cause of prolonged chest drain duration that may also lengthen the requirement for physiotherapy intervention (Mesa-Guzman et al. 2015).

There were several strengths to this service evaluation. We explored an area of physiotherapy practice in our service that has not yet been extensively investigated in the research. Statistical analysis was used to ascertain the significance of patient characteristics and surgery details on time on physiotherapy caseload following lobectomy surgery. The service evaluation was limited by the retrospective collection of data from the physiotherapy ward sheets. This is reliant on accurate data being collected at the time as omissions and abnormalities are hard to check retrospectively. Only patients who received in-patient physiotherapy were included in this service evaluation therefore not all data for patients who underwent lobectomy surgery were captured.

The clinical implications of the current project are for exploration within the service as to whether there are any differences in ward routine and culture between the different cardiothoracic wards. In addition, there is a need to consider providing more intensive physiotherapy input into individuals undergoing lobectomy via thoracotomy incision to help reduce time on physiotherapy caseload. This may involve treating individuals more frequently (twice daily), using the static exercise bike and encouraging early postoperative mobilisation. It may also be beneficial to review chest drain removal procedures and review the type of drains that are being used within the Trust to ascertain whether chest drain duration could be reduced to help patients to mobilise earlier and reduce time on physiotherapy caseload.

## Conclusion

Time on physiotherapy caseload was higher for females and for patients with longer chest drain durations. Time on physiotherapy caseload was reduced by having a VATS incision. It was not affected by age.

Reviewing chest drain removal practices, encouraging earlier postoperative mobility and providing more intensive physiotherapy input to individuals following thoracotomy incision are worth exploration to ascertain whether these interventions could reduce time on physiotherapy caseload following lobectomy surgery.

## Acknowledgements

Thank you to the Cardiothoracic Physiotherapy Team for their hard work. Thank you to all the thoracic surgeons, medical staff and cardiothoracic nursing staff. Thank you to the Library services, Research and Development Department and the trust statistician at Blackpool Teaching Hospitals NHS Foundation Trust.

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# Referral of patients with chronic obstructive pulmonary disease to pulmonary rehabilitation from primary care: A local survey of GPs and practice nurses

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## Abstract

### Aim

To gain an understanding of the referral practices of local general practitioners (GPs) and practice nurses (PNs) to a local pulmonary rehabilitation (PR) programme in order to improve referral rates of patients with chronic obstructive pulmonary disease (COPD).

### Methods

The study involved a cross-sectional survey of local GP and PNs from 16 GP practices within a local health and social care trust. The survey was distributed electronically and in hard copy form to GP practices and a 1-month period was provided to complete the survey.

### Inclusion/exclusion criteria

GPs and PNs who review patients with COPD were eligible to complete the survey.

### Outcome measures

The study reports on descriptive statistics for perceived referral rates to PR, knowledge of PR referral process within the local area, service user barriers, referral barriers and strategies to improve referral. Inferential statistics were used to determine if differences existed between GPs and PNs with regards MRC questioning and PR education.

### Results

The survey was distributed to a total of 70 people, with responses received from 13 general practitioners (GPs) and 11 practice nurses. The overall response rate for the survey was 34%, with a GP response rate of 23% versus a PN response rate of 79%. 83% percent ( $n = 20$ ) of respondents estimated they referred <50%

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## Keywords

COPD, pulmonary rehabilitation, referral, survey, primary care.

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and 17% ( $n = 4$ ) did not refer any COPD patients to PR. The number of PNs who reported that they question service-users around exertional breathlessness and educate around the benefits of PR was significantly higher than participating GPs ( $p < 0.05$ ). 63% ( $n = 15$ ) of respondents felt that the principal barrier to PR referral was patient unwillingness/refusal to attend. 29% ( $n = 7$ ) of respondents felt that information leaflets/posters would improve referral rates to PR.

### **Conclusions**

In this local survey referral from primary care to PR in the COPD population was underutilised by clinicians. PNs reported that they were more likely than GPs to explore patient's exertional breathlessness and to educate patients regarding the benefits of PR. Respondents perceived that patient unwillingness to attend PR was the primary barrier however practitioner referral barriers in the form of time constraints were also cited. Respondents also cited a perceived lack of patient understanding of the benefits of PR as a factor affecting PR attendance.

## **Introduction**

Chronic obstructive pulmonary disease (COPD) is a progressive lung disease associated with breathlessness, inability to exercise, frequent infections and hospitalisation (Early et al. 2019). Pulmonary rehabilitation (PR) is a multidisciplinary programme involving exercise training, disease education and behavioural interventions shown to significantly improve symptoms of dyspnoea and exercise capacity in patients with COPD (Nici et al. 2006). Within Northern Ireland (NI), COPD is the second most common reason for emergency admission to hospital with about 30% of patients being readmitted within 3 months (NI COPD Audit 2017). PR reduces the number and duration of respiratory hospital admissions and readmissions experienced (Steiner et al. 2015). PR is also recommended within the National Institute for Health and Care Excellence (NICE) quality standards (2011) for patients with COPD exercise limitation due to breathlessness.

Despite the clear benefits, implementation of PR programmes in people with COPD is reported to be low, with only 3%–16% of eligible patients being referred, and as few as 1%–2% gaining ongoing access to such programmes (Johnston & Grimmer-Somers 2010). A recent study by Watson et al. (2020) found referral barriers included limited awareness of



clinical benefits, little knowledge of local PR providers, consultation time constraints and presumed low patient motivation. A review by Milner et al. (2018) previously had reported that the most frequently identified enablers of PR referral were PR training, mentoring or experience in PR, with other enablers such as PR awareness events, reminders and a streamlined referral process. Early et al. (2019) also found that nurses felt more prepared than GPs to make referrals and reported a better understanding of PR. In addition, nurses felt they lacked support from GPs in reinforcing PR discussions with patients.

The rationale for the study was borne from the acknowledgement by the principal investigator (LG) that previous attempts to offer PR training and information sessions, as well as the provision of awareness events to local primary care services, had resulted in limited engagement. Retrospective analysis of PR referral numbers locally had also identified a 10% reduction over the preceding 3-year period. A large proportion of this reduction was attributed to a reduction in general practitioner (GP) referral numbers.

The aim of this article was to understand why referral rates of people with COPD to PR from primary care are low and then to identify referral barriers and ascertain facilitators for improving referral rates. It was envisaged that an understanding of referral may facilitate improved referral rates and ultimately patient outcomes. The study aims to also ascertain differences between GPs and practice nurses (PNs) with regards to exertional breathlessness questioning and PR education.

## **Methods**

### **Study design**

The study involved a cross-sectional survey focusing on the referral of patients with COPD by GPs and PNs to PR, knowledge of local PR services, referral barriers and strategies to improve referral rates.

### **Survey procedure**

Recruitment took place through meeting the practice managers (PMs) of 19 prospective GP practices within a single locality of a local health and care trust and discussing the aims of the study. PMs who consented to assist with the study acted as a communication conduit between the research team and GPs/PNs. The PMs were advised to distribute the survey to all GPs within their practice and PNs involved in the management of patients with COPD. Those PMs who agreed for their practices to participate in the study distributed a participant information sheet and the survey in paper format, or directed them to an electronic version, to all those eligible for inclusion in the study. 1 month was given to complete the survey. After 2 weeks the principal investigator contacted the PMs within each practice to determine engagement and reinforce completion.

### **Survey format**

There was no questionnaire available that met the aims of this study therefore the questionnaire was developed independently and piloted in 2 GP practices. 4 participants

completed the questionnaire in the pilot period and feedback highlighted no issues with question completion and therefore the questionnaire was distributed in its initial format. To encourage participation, the survey was in the form of a multiple-choice questionnaire (Appendix 1) with 13 closed checklist type questions, designed to take less than 20 minutes to complete, given the time constraints within primary care. To help improve response rate, the survey was available in either a digital format and was provided on the platform Survey Monkey, or a paper copy distributed by the PMs. A study by Taylor & Scott (2018) which reviewed physician's preference with regards surveys recommended the use of mixed mode survey design to accommodate doctors with different mode preferences.

### **Data analysis**

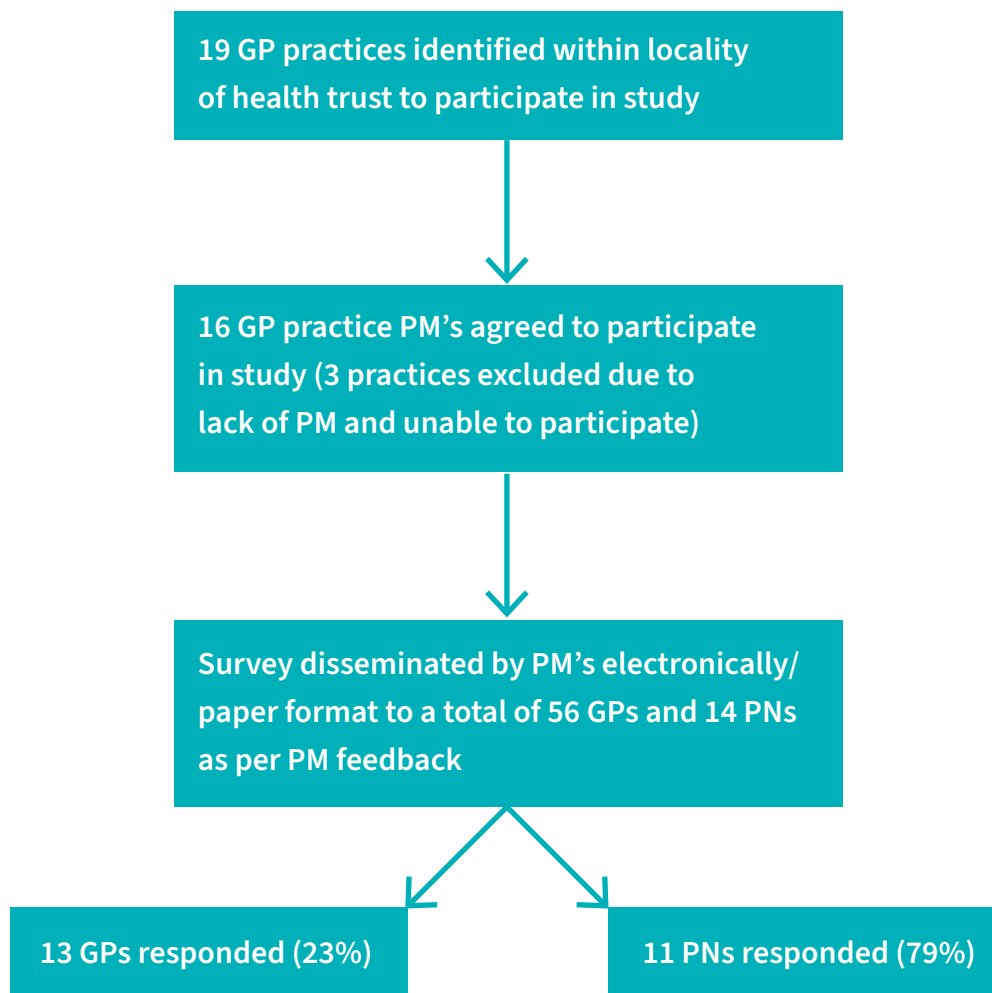
On completion of the 1-month data collection period electronic data was exported from Survey Monkey and from the paper copies to SPSS Version 25. The data was analysed using simple descriptive analysis including modal and percentage response rates. Inferential statistical analysis in the form of chi-square ( $\chi^2$ ) was performed to compare GPs and PNs responses with regards exertional breathlessness exploration/determination of Modified Research Council (MRC) score and discussion of PR benefits, with the value of  $p < 0.05$  considered to be statistically significant.

### **Ethical issues**

This research study was granted ethical approval by the Ulster University Research Governance Filter Committee in September 2019 (reference: RG3\_2019-091). Ethical implications of the research were considered and identified as informed consent, anonymity of responses, independent recruitment and safe storage of data in line with Ulster University General Data Protection Regulations 2018. The study design ensured that all responses received either electronically or in paper copy form were anonymous.

## **Results**

Figure 1 shows a flow chart depicting the recruitment process.



📌 **Figure 1: Recruitment flowchart.**

The combined completion rate for the survey was 34%.

### **Caseload**

Regarding the estimated percentage of patients reviewed by respondents that have a diagnosis of COPD, 71% ( $n = 17$ ) of respondents estimated this to be less than 25% of their total patient caseload. Other estimates included, 25% ( $n = 6$ ) of between 25–50% of their caseloads, and 4% ( $n = 1$ ) of between 50–75% of their caseloads. No respondents estimated that >75% of their caseload included patients with COPD.

### **Use of NICE quality statements and referral to PR**

In terms of the knowledge of the NICE quality standards related to PR in COPD, 88% ( $n = 21$ ) of respondents stated that they were aware of the statements.

Regarding the questioning of patient's around breathlessness on exertion and MRC score, 82% ( $n = 9$ ) of PNs and 23% ( $n = 3$ ) of GPs answered that they regularly explored this issue. A statistically significant relationship was found with regards to PNs being more likely than GPs to discuss breathlessness on exertion and MRC score,  $\chi^2 = 8.2$  ( $p < 0.05$ ). Regarding PR education, 91% ( $n = 10$ ) of PNs and 43% ( $n = 6$ ) of GPs stated that they discuss benefits with service users that meet referral criteria. The relationship was deemed to be statistically

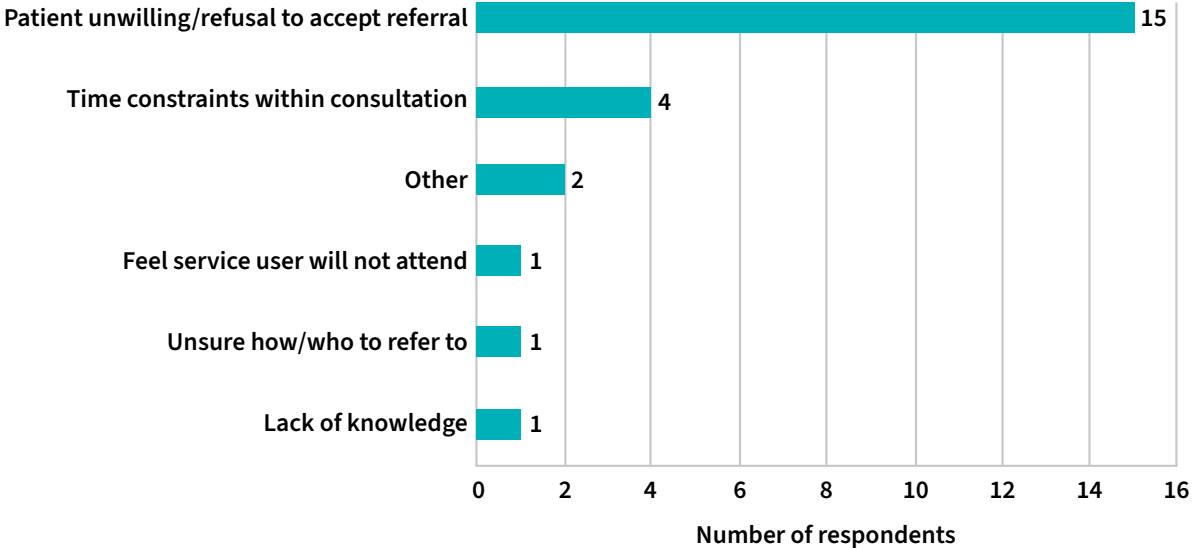
significant with  $\chi^2 = 5.37$  ( $p < 0.05$ ). Respondents estimated the percentage of patients COPD that they refer to PR. Overall, 83% ( $n = 20$ ) of respondents estimated that they referred less than 50% of their patients to PR and 17% ( $n = 4$ ) of respondents did not refer any patients to PR.

**Knowledge of PR in local area and referral process**

71% ( $n = 17$ ) of respondents were aware of the location and structure of the classes within their local area and 92% ( $n = 22$ ) were aware of the referral process.

**Barriers to referral**

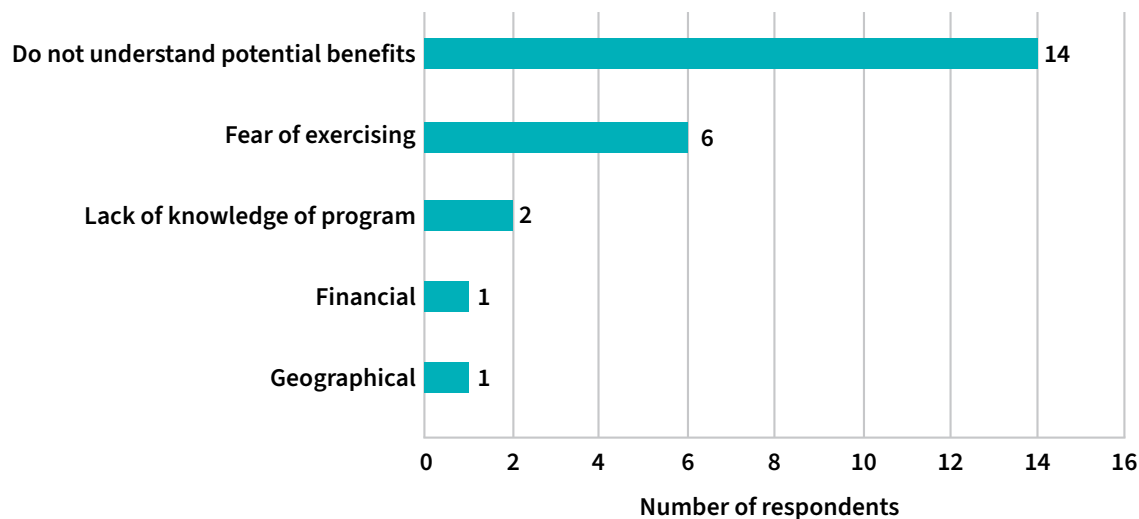
The main barrier to PR identified by the respondents (Figure 2) was perceived patient unwillingness or refusal to accept a referral to a PR programme with 63% ( $n = 15$ ) responses citing this as the main barrier.



**Figure 2: Main barrier for referral to PR program.**

**Service user barriers**

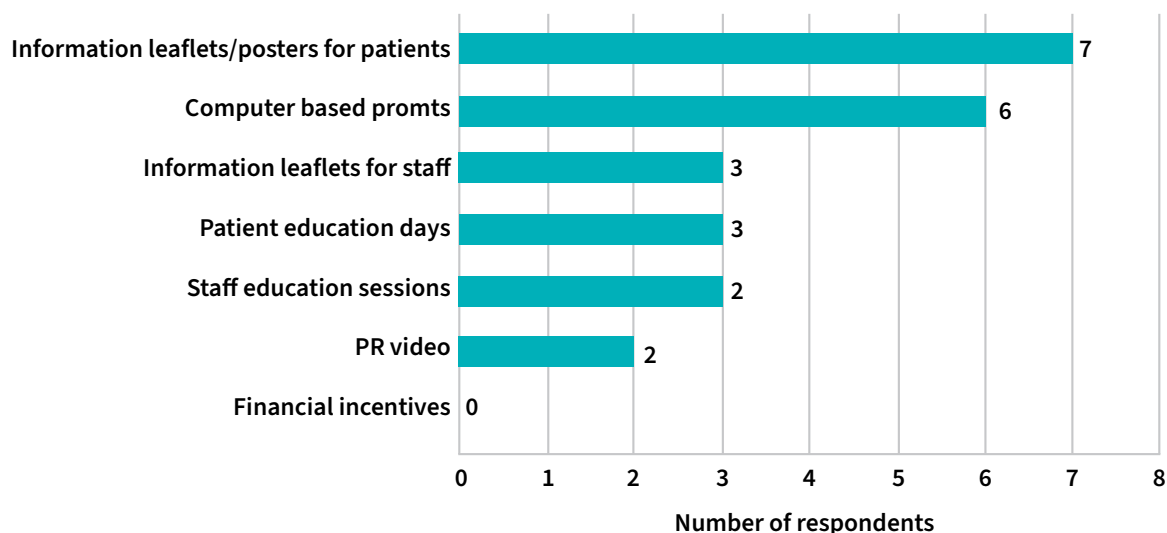
58% ( $n = 14$ ) of respondents perceived the main barrier to service users in attending a PR programme was that they did not understand the potential benefits, whilst 25% ( $n = 6$ ) felt patients had a fear of exercising (Figure 3).



⬆ **Figure 3: Main barrier for patients attending a PR program.**

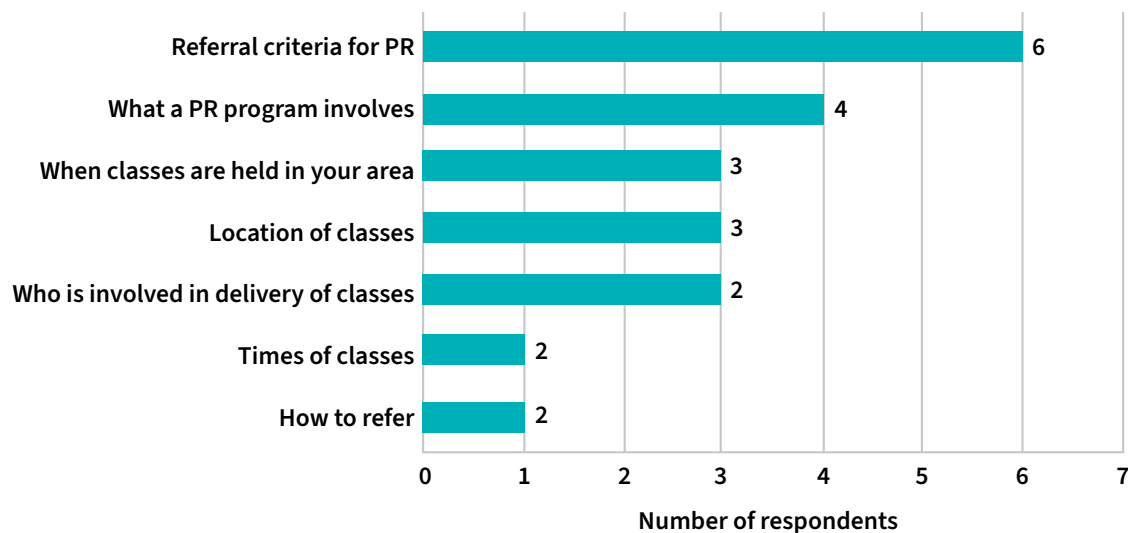
### Methods to improve referral rates

29% ( $n = 7$ ) of respondents felt that information in the form of leaflets/posters for patients would be the best intervention to improve referral rates to PR (Figure 4).



⬆ **Figure 4: Key intervention to improve patient referral rate.**

As outlined in Figure 5, 88% ( $n = 21$ ) of respondents indicated that they would like more information regarding PR, with a wide variety of responses observed in terms of specific information.



📌 **Figure 5: Beneficial information.**

## Discussion

The survey was carried out due to a pattern of reduced PR referrals to a local respiratory service from primary care in order to better understand the barriers and enablers for PR referral. The aim was to use the findings to implement methods to improve PR referral rates within the local area, since previous attempts to implement educational and information sessions had poor engagement levels.

In terms of PR referral barriers, the findings of this study demonstrate similarities to that of Watson et al. (2020). The main views of respondents on the perceived barriers of referral to PR were patient unwillingness/refusal to attend (63%) and time constraints within the consultation (17%), with clinicians reporting that another significant patient barrier to attending PR is a lack of understanding of the benefits (58%).

Patient refusal to attend PR is a common theme in the literature. Grant et al. (2012) reports that 45% of patients refuse a referral to PR following an exacerbation of COPD and a further 45% do not attend the initial assessment. Early et al. (2018) report that the influence of the referring doctor and lack of explanation of the benefits is a referral barrier. It is important to consider that clinicians may decide to make their own assumption as to whether a patient will attend PR, rather than definitively offering referral and explaining the benefits. This fact is supported by Rochester et al. (2018) who found that  $\frac{2}{5}$  of respondents reported that their health care provider had never told them about PR or the potential benefits. Clinicians should also strongly convey the benefits of PR in terms of reduced hospital admissions and improved quality of life to patients in order to improve uptake rates. Sohanpal et al. (2015) highlighted that reasons for attending included a trusted, enthusiastic doctor who explained the benefits, perceived increased severity of the condition, perceiving that PR would help increase control and independence and improve health, and perceived social benefits.

According to the survey responses PNs reported that they questioned patients around breathlessness and MRC score and the responses indicate the PNs were also more likely to promote PR than GPs, with a statistically significant difference evident. Watson et al. (2020) found that PNs had greater knowledge than GPs regarding PR and this finding is pertinent to consider in the context of referral rates within this survey. Despite this finding, it also needs to be considered that the nature of the consultations may also be different, in that PNs discuss breathlessness and MRC scores during annual review consultations versus GPs who are more likely to review patients for exacerbations of COPD.

Within the survey, 4 GPs cited time constraints within the consultation process as the main barrier to referring patients to PR. Given the fact that GP workload is estimated to have increased by 15% in the last 7 years (Fisher et al. 2017) this is particularly pertinent. There have been recommendations to extend appointment times to 15 minutes as this would allow GPs to spend more time on health promotion (Oxtoby 2010), which would be extremely cost effective for the National Health Service in the long run but given increasing appointment pressures this would be extremely difficult to implement. For the PNs carrying out annual COPD reviews, it may be that more time is available for these consultations where time to discuss self-management techniques is therefore possible.

This survey has several limitations with the small sample size used being the most evident. In addition, the GP response rate within the study was only 23%, although published response rates from medical practitioners is often below 30% (Bonevski et al. 2011). The low GP engagement within the study raises questions regarding response bias (Bjertnaes et al. 2008) as well as non-response bias. Within the survey every effort was made to reduce response bias and therefore improve reliability of responses by using well designed questions, keeping the survey short and maintaining respondent anonymity. With regards to non-response bias, the PMs were contacted 2 weeks after the survey was disseminated in order to encourage participation. Whilst an improved response rate would have been desirable in order to improve the external validity of the results, low response rates should not be cited as reasons to dismiss results as uninformative (Meterko et al. 2015).

PMs were used as a communication conduit in an attempt to reduce non-response and respondent bias but in hindsight may have introduced an element of sampling bias. PM feedback identified 14 PNs responsible for the management of patients with COPD and it is not possible to ascertain whether other PNs who reviewed patients with COPD were unavailable during the study period. Given PNs can have multiple roles within GP practices and may not review patients with COPD PMs were asked to distribute the survey to the appropriate PN, however this may have led to sampling bias. Of the 16 GP practices surveyed there were a total of 75 GPs registered as working at these sites, although the PMs distributed the survey to only 56 GPs. It is acknowledged that all GP staff working in a practice may not have been available during the 1-month survey period, however sampling bias cannot be ruled out given that 25% of GPs were not distributed a survey. In addition, the fact that a

convenience sample was used limits the ability to control for confounding bias within the survey. Confounding factors not considered were clinician experience, previous PR training that respondents had attended and experience in dealing with patients with COPD, which may have influenced answers provided within the survey, particularly around MRC and PR promotion.

Another limitation with the study is the fact that clinicians provided perceived answers to some survey questions, rather than using actual raw data. However, on discussion with PMs, practices did not have the systems in place to capture this information. This may have affected the survey validity and it is therefore imperative to bear this in mind when considering the survey outcomes. Despite this, within the study it is evident that there is a clear need to improve referral rates to PR as 59% ( $n = 14$ ) of respondents estimated referring less than 25% of patients who meet the referral criteria and 17% ( $n = 4$ ) referring no patients at all. An important factor that potentially limits referral to PR is the fact that 71% of respondents estimated that less than 25% of their caseload was comprised of patients with a diagnosis of COPD, therefore some clinicians may not they have the necessary skills to promote PR. A survey by Rochester et al. (2018) confirmed the need for greater healthcare professionals' knowledge and awareness of PR to foster patient referrals. Interestingly knowledge of local PR services in terms of location and class structure was reported at 71% within the local area but given this was self-reported this should be viewed with caution given the fact that 88% of respondents felt that they could benefit from more information regarding PR.

29% of respondents also felt that patient information leaflets/posters would assist in improving referral rates. This is a pertinent point given previous research recommends that professional societies and patient groups develop educational materials for people with chronic respiratory disease regarding PR (Rochester et al. 2018). 25% ( $n = 6$ ) of respondents felt that computer-based prompts would assist in improving referral rates. A study by Angus et al. (2012) used a computer guided consultation and found that 24% of patients with confirmed COPD were referred to PR. A systematic review by Roshanov et al. (2011) also detailed the use of electronic decision support systems in the management of chronic disease and found that just over half of the systems improved patient health. Unfortunately, only 4 studies within the review investigated systems to support the management of patients with COPD and the evidence to support its use in this context is limited. Despite this the studies did not all incorporate key factors associated with effectiveness and further research in this area is warranted.

## Conclusion

In this local survey, referral from primary care to PR in the COPD population appeared to be underutilised by clinicians. Within this survey it is apparent that referral rates remain low for a variety of reasons but primarily since clinicians perceive that patients are unwilling to accept a referral, as well as GPs citing time constraints within the consultation process.



PNs reported that they question patients about their MRC scores and educate patients regarding PR more than their GP colleagues, although the context of the consultation needs to be considered alongside this. This study supports the need for further research around PR promotion and referral from primary care, particularly amongst GPs, in order to positively promote its benefits and improve service utilisation.

### Key points

- Within this local survey, PR referral from primary care is underutilised with an ongoing need for promotion of the health benefits of PR programmes.
- A predominant barrier to PR referral identified by respondents is the patient willingness to attend, with respondents reporting that another barrier is a lack of understanding from the patient as to the benefits of PR.
- PNs reported that they question service-users around exertional breathlessness and educate around the benefits of PR was significantly higher than participating GPs ( $p < 0.05$ ).

### Declaration of conflicting interest

The author(s) can confirm that there are no conflicts of interest.

### Funding

The research received no grant from any funding agency in the public, commercial or not-for-profit sectors.

### Acknowledgments

Sincere thanks to Dr Daniel Kerr (supervisor) for his assistance and guidance throughout the completion of this study.

Thanks to the practice managers who agreed to assist and distribute this survey to staff within their practices.

Thanks to the GPs and practice nurses who took the time to complete the survey.

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## Appendix 1 (survey)

Please read the questions carefully and tick (✓) the appropriate answer. For all questions please tick only *ONE* answer.

### 1. What is your role regarding the review of patients with COPD?

GP

Practice nurse

### 2. Approximately what percentage of the patients you review in a week have a diagnosis of COPD?

0–25%

25–50%

50–75%

75–100%

### 3. Are you aware of the NICE quality statements related to pulmonary rehabilitation (PR) for patients with COPD?

Yes

No

### 4. Do you commonly question patients around exertional breathlessness and determine their MRC score?

Yes

No

### 5. Do you discuss PR and its benefits with COPD patients who have frequent exacerbations and/or complain of breathlessness?

Yes

No

### 6. What percentage of your COPD patients who meet the criteria for PR for example, with a Medical Research Council score of 3 and above, complain of exertional breathlessness and who have frequent exacerbations do you refer?

None

1–25%

25–50%

50–75%

75–100%

**7. Are you aware of the location and structure of PR programs within your local area?**

Yes

No

**8. Are you aware of how to refer to a PR program within the NHSCT?**

Yes

No

**9. Do you have access to Clinical Communications Gateway (CCG) for the referral of patients to PR?**

Yes

No

If you do not have access to CCG and refer patients to PR how do you do so?

---

**10. What do you consider the principal barrier to you referring to a PR program?**

Lack of knowledge of what the program involves

Time constraints within consultation

Unsure how or who to refer to

Don't see it as your role to refer

Feel service user will not attend program

Patient unwillingness/ refusal to accept referral

Other

Please specify reason for answering other

---

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**11. What do you consider the principal barrier for your patients attending a PR program?**

Geographical

Financial

Fear of exercising

Lack of knowledge of program

Don't understand potential benefits

Social isolation

Other

Please specify reason for answering other

---

**12. What intervention do you feel would improve your referral rates to PR?**

Computer based prompts

Information leaflets/posters for patients

Information leaflets for staff

Staff educational sessions

Pulmonary rehab video

Patient education days (respiratory team)

Financial incentives

Other

Please specify reason for answering other

---

**13. Would you like more information regarding PR?**

Yes  No

If you answered yes, what information do you feel would be most beneficial?

Referral criteria

How to refer

What a PR program involves

Who is involved in the delivery of PR

Location of classes

When classes are held in your area

Times of classes

Other

Please specify other information you would like

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Any further comments/information you wish to add?

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*Many thanks for your time and support in completing this survey.*



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# Breathing retraining to improve dyspnoea and walking distance in patients with interstitial lung diseases: A randomised controlled trial

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## Abstract

### Objective

Dyspnoea is the hallmark progressive symptom in interstitial lung disease (ILD). Breathing retraining in chronic obstructive pulmonary disease (COPD) improves dyspnoea and walking distance (Garrod et al. 2005) but there is a dearth of evidence for ILD. This study aimed to identify whether breathing retraining incorporated during pulmonary rehabilitation (PR), leads to better dyspnoea and functional scores.

### Design

27 patients with ILD were randomly distributed to a control group (CG) who underwent a 12-week hospital-based PR programme or experimental group (EG), receiving PR with breathing retraining. The *6-minute walk test* and dyspnoea scores were assessed at baseline and on completion.

### Results

Statistical improvements in walking distance were recorded in the EG median 416.25; (IQR 368–463) week 0 to 475m (IQR 437–521) week 12;  $p = 0.017$  and dyspnoea post exertion (median 3.00; IQR 1–5) week 0 to 2.50 (IQR 0.3–4) week 12;  $p = 0.033$ ). The CG obtained a less, but statistically significant improvement 360m (IQR 330–405) week 0 to 412.50m (IQR 394–450) week 12 ( $p = 0.003$ ). When comparing outcomes at week 12 between groups, superior results in dyspnoea at rest (EG 0 (IQR 0–0); CG 2 (IQR 0–2);  $p = 0.029$ ), and

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## Keywords

Breathing exercises, dyspnea, exercise tolerance, lung diseases, interstitial, pulmonary disease, chronic obstructive.

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walking distances (EG 475m (IQR 437–521); CG 412.50 (IQR 394–450;  $p = 0.015$ ) were recorded for the EG.

### **Conclusion**

Breathing retraining added to PR, resulted in improvements in dyspnoea scores and functional capacity in patients with ILD.

## **Introduction**

Interstitial lung disease (ILD) is a term used for a group of conditions in which changes to the interstitium, due to a combination of inflammation and fibrosis, are observed (Swigris et al. 2008). Dyspnoea is the hallmark progressive symptom in this group of conditions, which may be severe and disabling leading to severe physical impairment, exercise limitations and poor quality of life (Swigris et al. 2005; Kondoh et al. 2005; Martinez et al. 2005; Swigris et al. 2008) with accompanying aerobic and skeletal muscle deconditioning, leading to social isolation and impaired emotional well-being (Swigris et al. 2008).

The importance of including pulmonary rehabilitation (PR) as part of the symptom management for patients with ILD is being given more importance, especially when noting the marked improvements in dyspnoea and exercise tolerance in patients with chronic obstructive pulmonary disease (COPD) (Sciriha et al. 2005; Walter et al. 2006). Such an intervention is now recommended as part of the management of ILD (Raghu et al. 2011; Raghu et al. 2015; Sciriha et al. 2019).

Recently, breathing retraining as part of the management of COPD has been investigated, with research reporting marked improvements in dyspnoea (Garrod et al. 2005; Spahija et al. 2005; Bianchi et al. 2007; Nield et al. 2007). The reasons for such improvements relate to the reduction of dynamic airway compression and air trapping which is brought about with prolonged expiration (O'Donnell et al. 1987). In addition, it is apparent that breathing retraining using pursed lip breathing is also effective in improving walking distances in people with COPD (Garrod et al. 2005).

Despite just a few studies recommending breathing retraining in COPD patients (Garrod et al. 2005; Spahija et al. 2005; Bianchi et al. 2007; Nield et al. 2007), other studies including one by Vitacca et al. (1998) questioned the validity of this technique, stating that breathing retraining using deep diaphragmatic breathing is not recommended for persons with COPD, as it worsens dyspnoea. This conclusion was based on the reduction of the efficiency of the diaphragm caused by its asynchronous and paradoxical breathing movements. These inconsistencies have led to debates about the importance of including such techniques in the management of dyspnoea in COPD. Since the findings are inconclusive (Vitacca et al. 1998; Garrod et al. 2005; Spahija et al. 2005; Bianchi et al. 2007; Nield et al. 2007; Bhatt

et al. 2012), and noting the impact that dyspnoea has on the physical status and health related quality of life in patients with a diagnosis of ILD, the need to explore the benefits of this technique in patients with ILD is warranted (Raghu et al. 2011). Findings may lead to better management of dyspnoea as one of the main patient-reported symptoms in ILD.

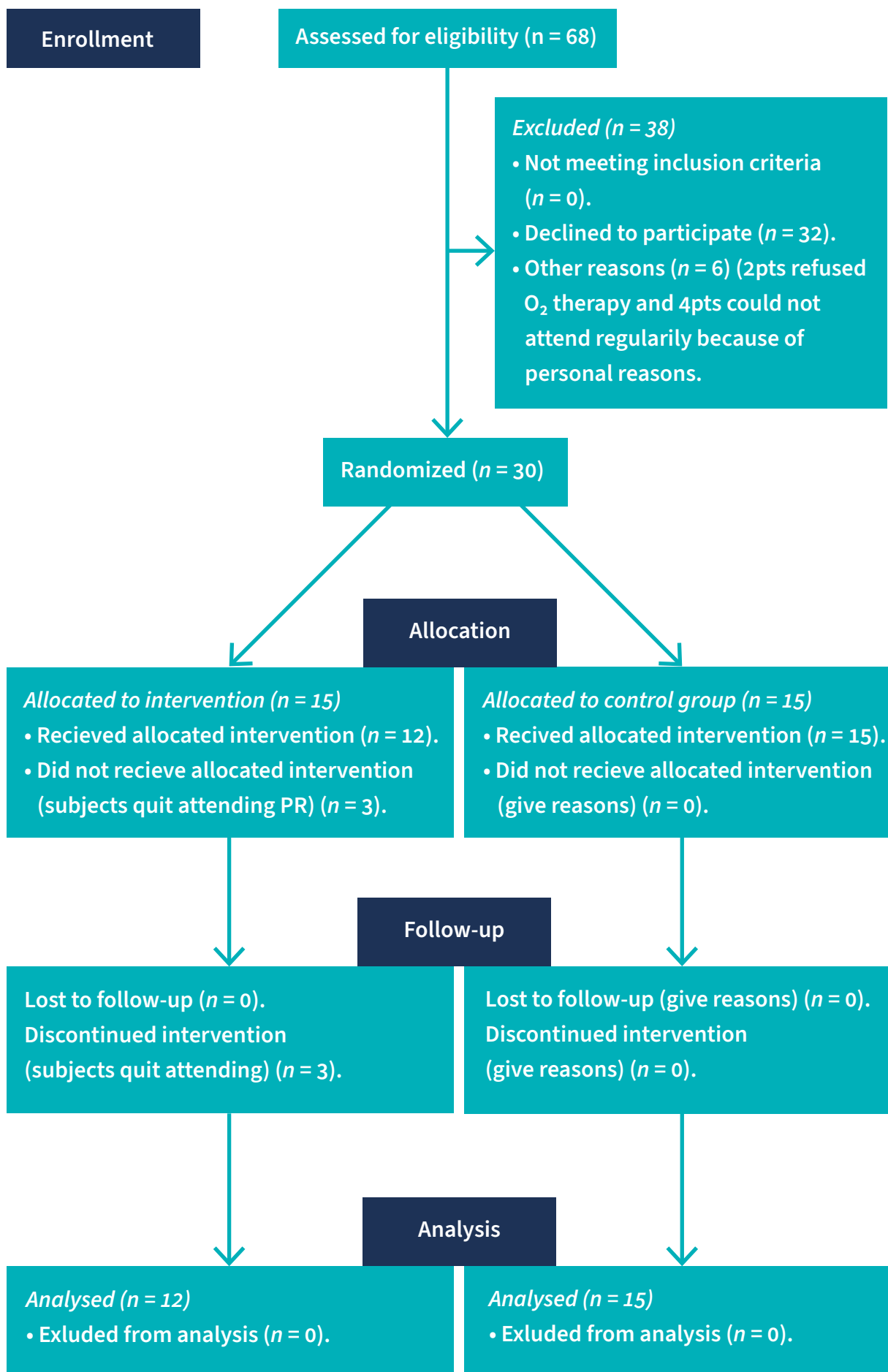
## **Method**

This paper reports a randomised controlled trial. Data obtained for both the experimental and control groups were recorded at the start of week 0 (baseline) and the end of week 12, during which PR sessions were held twice weekly.

### **Participants**

68 subjects with a confirmed diagnosis of ILD, were referred to the PR service by respiratory consultants from the medical outpatients of a local hospital serving the population needs of a small independent jurisdiction of approximately 500,000 persons, with the prevalence of patients with ILD estimated to be at 24.9 per 100,000 population. These subjects were all found to be medically stable by the respiratory physicians and had been free from exacerbations for the 3 months prior to their recruitment. Pharmacological treatment was assured to be optimal by the medical doctors. Each participant was provided with written information about the programme and were invited to participate in this study.

Following an assessment by both a medical practitioner and a physiotherapist, 27 subjects accepted to participate in this study (Figure 1).



📌 **Figure 1: Consort flow diagram.**

The inclusion criteria included age (18 years and over), oxygen saturation (>92% at rest with or without the use of supplementary oxygen), a willingness to participate in the rehabilitation classes, a stable cardiovascular system and the absence of neurological or orthopaedic problems which could interfere with rehabilitation and did not have other lung pathologies including COPD or bronchiectasis. Those subjects who required modifications to their drug therapy due to exacerbations during the trial were excluded from the study. Participants were then randomly allocated by a 3rd person – in doing so blinding the selection to the researcher. 15 participants were allocated to the control group that followed a 12-week PR programme and 12 participants were allocated to the experimental group that followed the same 12-week PR programme with the addition of breathing retraining.

## Measurements

All the subjects were assessed before being enrolled and then on completion of the PR programme. The following outcomes were measured: lung function tests, *6-minute walk test* (6MWT) and dyspnoea scores before and exactly following the 6MWT.

### *The 6-minute walk test (6MWT)*

The 6MWT was performed indoors, in accordance with the guidelines of the American Thoracic Society (ATS 2002). Each participant was instructed to walk at their perceived maximum intensity along a pre measured, 30-metre corridor, consisting of a flat hard surface, marked clearly by two cones at either end, for 6 minutes. The total distance walked was measured.

### *The dyspnoea Borg scale*

The Borg scale is a valid and reliable scale that was used to assess dyspnoea scores at rest and on exertion (Nishiyama et al. 2010). Before and after the 6MWT, each participant was asked to rate their perceived levels of breathlessness. Participants were familiarised with the scale before the start with explanations provided as to the different scoring levels so each participant could each rate their own perceived level of breathlessness and in order to ensure that each had the same explanation of how to rate their breathlessness.

## Intervention

All 27 subjects followed a multidisciplinary-led PR programme which was delivered twice weekly for 12 weeks at an outpatient department in a local general hospital. Each session lasted 2 hours, with the 1st hour consisting of exercises made up of 5 minutes warm-up, walking on a treadmill, (the speed of which was devised from the *6-minute walking test* and the time gradually increased throughout the weeks); step-climbing, arm ergometry, cycling using a stationary bike and also strength training for the upper and lower limbs using free weights. The intensity of the exercise programme was one set at 70% of their maximum heart rate measured using a pulse oximetre. Inspiratory muscle training, a routine procedure to this PR programme, was also carried out using the Respironics IMT Threshold Trainer® for 15 minutes at the end of this 1-hour session. All participants were then instructed to complete IMT at home for 30 minutes, 5 days per week, with adherence

assessed through a diary system. In addition to this, the experimental group was given an exercise programme of breathing retraining consisting of pursed-lip breathing, breathing control and diaphragmatic breathing exercises as described below.

#### *Breathing control (BC)*

Involved encouraging each patient to use his/her lower chest to breathe whilst relaxing the upper chest, head, neck and shoulders.

#### *Pursed-lip breathing (PLB)*

Involved the patient having to inhale through the nose then exhale slowly and evenly through the mouth against a resistance created by pursing the lips with an aim of controlling the respiratory rate and decreasing the levels of breathlessness.

#### *Diaphragmatic breathing (DB)*

Involved encouraging each patient to inhale slowly and deeply through the nose for a count of 2 and exhale slowly through pursed lips for a count of 4. During this breathing exercise the participant was encouraged to move out the abdominal wall with reduction of upper rib cage movement during inspiration, to keep neck muscles relaxed and to place their hands on their abdomen if one was performing an exercise which did not require the use of the hands.

Participants in this group, whilst undergoing the exercise component of PR, were constantly instructed, advised and monitored throughout the intervention to ensure that such exercises were integrated in the regime, with the breathing control and pursed lip breathing carried out during the PR programme.

Included in the PR programme, both the control and the experimental groups received educational sessions discussing several topics including aspects about their condition, pharmacological measures, coping with a chronic condition, dietary aspects and chest clearance. The experimental group received 2 additional, educational sessions on breathing retraining delivered by the physiotherapist running the PR programme. All participants were then given a home exercise programme consisting of exercises similar to those that were carried out during the session. The home exercises were monitored by means of a home diary system provided to each participant at the start of the programme.

#### **Ethical considerations**

Signed informed consent was requested from all the participants with the possibility to withdraw from the programme at any time without prejudice. Data collected was coded to ensure patient anonymity and the information collected was used only for the study purposes. No inducement was offered. Ethical approval was sought and obtained from the University of Malta Research and Ethics Committee (067/2017) and Clinical Registration (NCT03729583).

## Statistical analysis

Statistical analysis was carried out using Statistical Package for Social Science (SPSS) software version 25. Baseline characteristics and exercise data are presented as median and interquartile range (IQR). After having tested for normality using the Shapiro-Wilk test, the Wilcoxon signed rank test was used to compare changes in dyspnoea scores before and after the 6MWT, and the walking distance, at baseline and on completion of the PR programme, for both the experimental and control groups. The Mann-Whitney U test was then used to compare the differences between the experimental and control groups by demographic variables (for example, age, height, weight) and functional variables (for example, 6MWT and Borg scales).

## Results

The baseline characteristics of all the participants are presented in Table 1.

Table 1: Demographic characteristics at baseline.

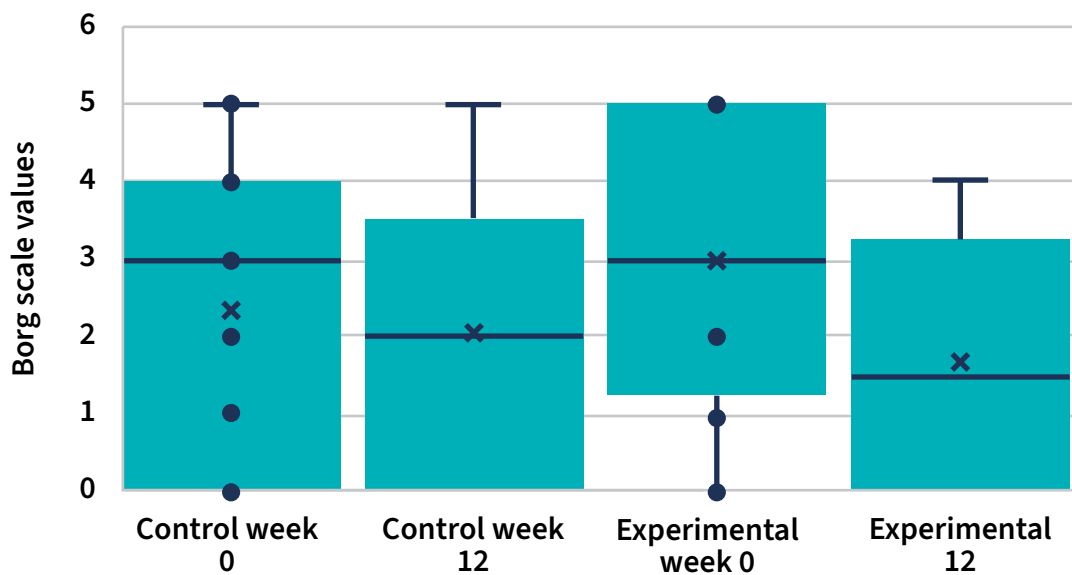
	Group (n)	Median	IQR	Mann Whitney U Value	p-value
Age (years)	Experimental (12)	71.00	66–78.5	37.500	0.015
	Control (15)	63.00	68–83		
Height (cm)	Experimental	157.50	153.3–167.88	77.500	0.742
	Control	157.00	153–163		
Weight (kg)	Experimental	72.50	64–82.8	80.500	0.860
	Control	73.00	68–83		
Borg scale at rest	Experimental	0.00	0–1.5	78.500	0.781
	Control	0.00	0–0		
Borg scale on exertion	Experimental	3.00	1.25–5	64.500	0.322
	Control	3.00	0–4		
6MWT (M)	Experimental	416.25	367.5–463.1	48.000	0.067
	Control	360.00	330–405		

6MWT: 6-minute walk test; IQR: interquartile range.

No significant differences were identified in height ( $p = 0.85$ ), weight ( $p = 0.58$ ), 6MWD ( $p = 0.064$ ), Borg scale at rest and the Borg scale on exertion ( $p = 0.70$ ;  $p = 0.30$  respectively) between the participants of the experimental and control groups. Although there was a significant difference ( $p = 0.015$ ) identified in age with the experimental group consisting of older participants than the control group, the age of the participants was not found to correlate with outcome measures in this study using the spearman correlation test.

Experimental group: correlations between age and 6MWD =  $r = 0.69$ ,  $p = 0.832$ ; Borg scale at rest  $r = -0.093$ ,  $p = 0.775$ ; Borg scale on exertion  $r = -0.282$ ,  $p = 0.374$ . Control group: correlations between age and 6MWD =  $r = -0.065$ ,  $p = 0.817$ , Borg scale at rest  $r = 0.208$ ,  $p = 0.458$ , Borg scale on exertion  $r = -0.447$ ,  $p = 0.095$ .

Comparisons were made within the experimental and control group respectively to examine whether there were any significant changes in dyspnoea scores measured before and after the 6MWD at between baseline and at the 12-week time point. Breathing retraining with PR resulted in statistically significant improvements in dyspnoea scores for the experimental group post exertion Figure 2, as measured using the Borg scale over the 12-week PR intervention (median 3.0 (IQR 1–5) at week 0 to 2.5 (IQR 0.2–3.75),  $p = 0.033$ ), but not for dyspnoea measures pre-exertion (0 (IQR 0–2) and at week 12 (0 (IQR 0–0)  $p = 1.000$ ).



**Figure 2: Figure showing changes in the dyspnoea Borg scale on exertion in the experimental and control group.**

No significant differences in dyspnoea scores were found in the control group which did not obtain any statistically significant changes in dyspnoea scores both at rest (week 0: 0 (IQR 0–0), week 12: 0 (IQR 0–2)  $p = 0.139$ ) and post exertion (week 0: 3 (IQR 0–4), week 12: 2 (IQR 1–4)  $p = 0.608$ ).

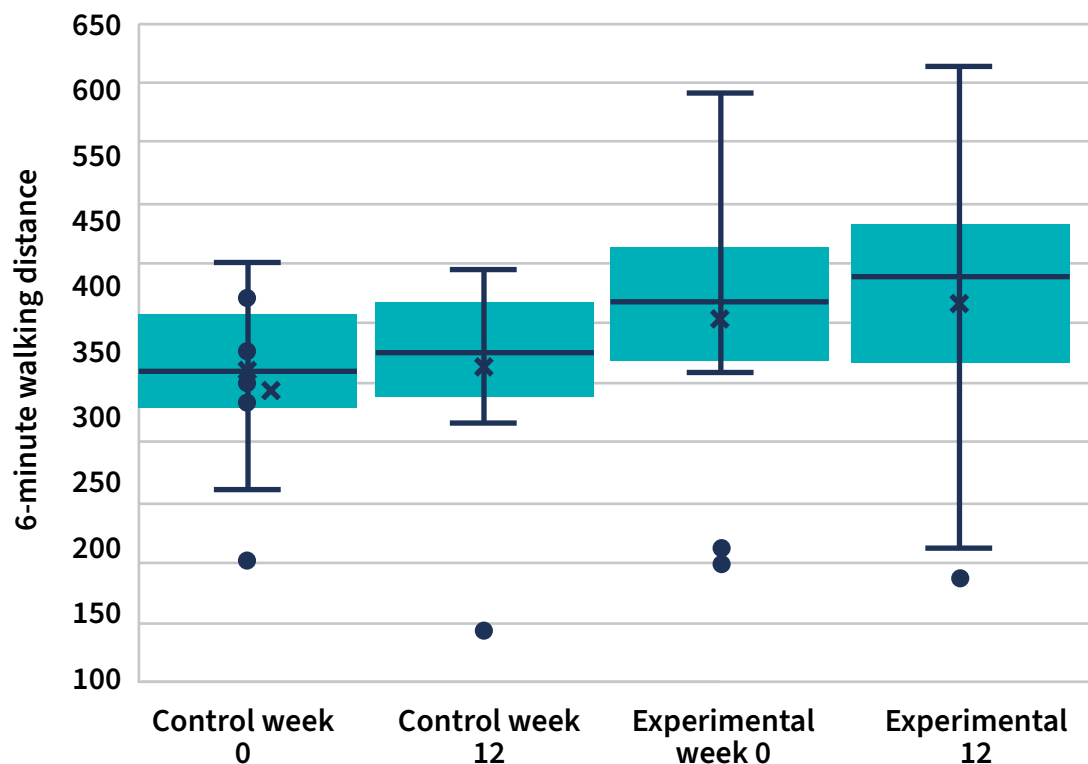
When comparing both groups at the 12th week, statistically significant improvements were noted for the experimental group in dyspnoea scores at rest ( $U = 28.000$ ;  $p = 0.029$ ). On the other hand, when comparing the dyspnoea scores following exertion, the difference in improvement was not statistically significant ( $U = 51.500$ ;  $p = 0.971$ ) as presented in Figure 2.

### 6MWT measure

Both the experimental ( $p = 0.017$ ) and control group ( $p = 0.003$ ) reported statistically significant improvements in the 6MWT between baseline and following the 12-week PR programme. The experimental group covered a median total walking distance of 475m (IQR



437–521) and the control group, a median value of 413m (IQR 394–450) (Figure 3). However, when analysing the 6MWT scores at the 12th week between the experimental and control groups, a statistically significant difference was identified ( $U = 18.500$ ;  $p = 0.015$ ).



📌 **Figure 3:** Figure showing changes in the 6-minute walk test in the experimental and control group.

## Discussion

The addition of breathing retraining to a regular 12-week PR programme have been shown to add improvements in dyspnoea scores and also in the 6MWD in a group of patients with a diagnosis of ILD. Although not all gains reached statistical significance, this study will serve for further studies in this field searching for better outcomes in the management of symptoms in ILD patients.

There is little research on the effects of breathing retraining on dyspnoea scores and walking distance in patients with interstitial lung disease; results which would have important clinical implications in the management on SOB (shortness of breath). The identification of better outcomes through additional interventions such as breathing retraining, will allow health care providers to offer support to these patients to better patient management. This is regarded as a significant step in the right direction since patients who are symptomatic will eventually develop other co-morbidities such as depression, which in turn results in a decline in health status (Swigris et al. 2008). Therefore, such interventions may have a greater positive impact on the health status associated with this condition, and would also merit further investigation.

Evidence shows that breathing retraining is beneficial in COPD patients as it improves the 6MWT (O'Donnell et al. 1987; Steier et al. 2008; Holland et al. 2010; Bhatt et al. 2012) and a reduction of dyspnoea levels (Spahija et al. 2005; Garrod et al. 2005; Bianchi et al. 2007; Nield et al. 2007). In this study, in which breathing retraining was included to the normal PR programme, at the 12th week comparisons between the groups found statistically significant differences in the pre-exertion dyspnoea scores ( $U = 28.000$ ;  $p = 0.029$ ), and in the 6MWD ( $U = 18.500$ ;  $p = 0.015$ ) for the experimental group.

The reasons for these better outcomes in dyspnoea scores at rest and following the 6MWT for the experimental group may be explained. Having incorporated breathing control in with a high intensity PR programme, might have enabled the patients to be in a better position to meet with the demands of the programme whilst learning to control their breathing pattern, something which was not applicable for the control group. In light of this, the participants in the experimental group might have focused on pacing the exercise task requested, learning to control their breathing pattern, therefore controlling the respiratory rate and in turn preventing hyperventilation. As a result, it may be hypothesised that the respiratory muscles are able to deal with the increased demand causing less lactic acid production as the programme progressed. It is known that lactic acidosis induced by exercise increases the stress on the ventilatory system due to a buildup of carbon dioxide, a finding which has been reported to occur in patients suffering from COPD (Souza et al. 2010) and would merit investigation in ILD patients, something which to the knowledge of the authors has not been look into. Dyspnoea scores at rest improved throughout the programme and this may be attributed to the slower and deeper breathing associated with breathing retraining using pursed lip breathing. This is known to prolong expiratory time which in turn, might have mediated a reduction in the resting respiratory rate (Bianchi et al. 2007), possibly resulting in a reduction of minute ventilation and ventilatory work as tidal volume remained unchanged. This in theory, would allow more time for ventilation/perfusion matching (Muller et al. 1970; Hsia et al. 1999) resulting in the reduction of dyspnoea at rest in the experimental group subjects.

Even though not all the evidence points towards the efficacy of breathing retraining in improving dyspnoea scores in all patients with a diagnosis of COPD (Vitacca et al. 1998; Fernandes et al. 2011; Bhatt et al. 2012) the findings from this study show that breathing retraining might benefit patients with a diagnosis of ILD. The difference in lung pathology between ILD and COPD may account for this difference. COPD is an obstructive condition unlike ILD which is a restrictive condition, making those who have COPD more disposed to dynamic hyperinflation. Dynamic hyperinflation increases the mechanical load on inspiratory musculature and also reduces their mechanical advantage resulting in the greater severity of dyspnoea and distortion in chest wall movement (Gibson 1996). In view of such mechanical changes, as Bianchi et al. (2012) concluded, breathing retraining using PLB is useful in patients who manage to deflate their chest wall but not in those that hyperinflate during PLB. With such a difference in the lung pathology, breathing retraining may be

regarded as favourable for ILD patients as it allows for better gaseous exchange and less workload on the inspiratory muscles (Wilkins et al. 2010).

When comparing dyspnoea scores for both groups on exertion, the difference in improvement found for the experimental group ( $p = 0.897$ ) after 12 weeks was statistically insignificant. Despite this, the median score on the Borg scale post exertion (median value of 2.50 (IQR 0.3–3.8)) was better than that of the control group (median value 2, (IQR 0.5–4)) after 12 weeks. These findings confirm that breathing retraining does lower dyspnoea scores as reported by Nield et al. (2007) and Bhatt et al. (2012) in patients with COPD possibly due to the prolonged expiration. A sustained increase in the strength of the inspiratory musculature as a result of the addition of breathing retraining, might have resulted in less force being generated with each breath, that in turn may have led to less motor output of the muscles of respiration and to a reduction in the work of breathing (Nield et al. 2007). Overall, breathing retraining did show added benefits to the already documented benefits of PR in improving exertional dyspnoea in ILD patients. These added benefits may help these patients to perform other activities with less shortness of breath and in doing so enhance their quality of life (Swigris et al. 2005).

Statistically significant improvements in the 6MWT were also noted following the 12-week PR programme in both groups, with changes in distance being more significant in the experimental group ( $U = 18.500; p = 0.015$ ). Hence breathing retraining has a role in improving functional exercise capacity in ILD patients by improving the walking distance. The reason for this may lie in the understanding that the experimental group developed a lower work rate for breathing on exertion. In doing so, a decrease in the metabolic energy requirements of respiratory muscles might have allowed the locomotory muscles to maximise their performance (Hsia 1999; Aliverti et al. 2008). This would help also in decreasing the levels of anxiety associated with SOB and hence account for the decrease in dyspnoea scores at rest in this group (Tselebis et al. 2016).

Breathing retraining performed by patients with COPD improved the 6MWT (Steier et al. 2008), mediated by an increased diaphragmatic excursion and a reduced respiratory rate resulting in decreased dyspnoea. Despite this, consideration must be taken when comparing the results to the current study involving ILD patients. The primary limitations to exercise in COPD patients may be ventilatory limitation and skeletal muscle dysfunction (Pepin et al. 2007) whilst in ILD patients this may be circulatory factors and impaired pulmonary gas exchange (Agusti et al. 1991) characterised by exercise induced hypoxaemia.

## Conclusion

In conclusion, whilst noting that the sample size of this current study was small and that there were trends of improvement, that would be best repeated using larger cohorts of patients, it found that the addition of breathing retraining to a 12-week PR programme resulted in better dyspnoea scores and greater exercise tolerance in patients with ILD. These findings signpost that breathing retraining should be considered into the management of dyspnoea in those persons who have from ILD.

### Key points

- The addition of breathing retraining to a PR programme led to additional improvements in dyspnoea scores and also functional capacity as assessed using the 6MWT in a group of patients with a diagnosis of ILD compared to the control group who only received PR.
- This study will serve as a pilot study and as a call for further research to explore further means on how to assist in the management of dyspnoea in patients with ILD.
- With guidelines for the management of ILD recommending the importance of PR together with the pharmacological management, this study continues to add on the importance of this intervention for these patients with breathing retraining being one of the possible areas to have incorporated in PR as a possible and effective strategy to help improve shortness of breath (SOB).

### Acknowledgements

The authors wish to thank all the participants who made this study possible.

### Author disclosures

All the above mentioned authors report that this study was self-funded and having no competing interests, financial benefits or conflicts of interest. Preliminary results of this research study were presented in the Malta Medical School Conference held between the 28th and 1st December 2018.

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# Helping you help yourself (HYHY) for people with mild breathlessness: A service evaluation in Wales

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## Abstract

### Background

Pulmonary rehabilitation (PR) is an evidence-based intervention which improves exercise capacity and quality of life (QoL) for patients with chronic obstructive pulmonary disease (COPD). Commonly, outpatient rehabilitation is available for patients with significant breathlessness (Medical Research Council (MRC) >3). This evaluation explored changes in exercise capacity and knowledge of condition and their relationship with the impact of COPD (CAT score) at baseline following a community exercise and education programme delivered by the British Lung Foundation (BLF) in people with mild breathlessness (MRC ≤2).

### Methods

People with mild breathlessness, MRC ≤2, were recruited from GP surgeries, the BLF website and support groups. The 6-week *Helping you help yourself (HYHY)* programme included weekly exercise, education and social engagement. Participants were assessed at baseline using the COPD Assessment Tool (CAT), 6-minute walk test (6MWT), Bristol COPD Knowledge quiz (BKQ), and questions on self-management was assessed by questionnaire. After 6 weeks 6MWT, BKQ and self-management were assessed and related to CAT at baseline. The usefulness of the programme to participants was also assessed by questionnaire.

### Results

In the 210 patients who completed assessments before and after HYHY, there was an increase in 6MWT distance, median (IQR) 60 (30–80)m and BKQ 3 (1–4) points ( $p < 0.05$ ), and most elements of self-management

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## Keywords

Mild breathlessness, pulmonary rehabilitation, community.

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improved. Almost all participants considered HYHY useful ( $p < 0.05$ ). There was no relationship between baseline CAT score and change in outcome measures ( $p > 0.05$ ).

### **Conclusion**

The results support the provision of community rehabilitation as an alternative to hospital-based interventions to support and promote self-management in people with mild breathlessness across the severity of disease burden as measured by CAT.

## **Introduction**

Pulmonary rehabilitation (PR) is an evidence-based intervention which improves exercise capacity and quality of life (QoL) for people with chronic obstructive pulmonary disease (COPD). One of the aims of PR is to promote behaviour change to enhance healthy behaviours, such as physical activity and self-management beyond the short-term programme provided. Typically, in the United Kingdom (UK) rehabilitation is recommended for patients with significant breathlessness as measured by Medical Research Council (MRC) 3–5 (Bolton et al. 2013). However, this results in limited accessibility for patients with mild symptoms. Maintaining healthy lifestyles beyond the rehabilitation setting remains a challenge. The reasons are multifactorial and include the impact of breathlessness on exercise tolerance and difficulties integrating into standard community exercise provision (Hogg et al. 2012).

It has been acknowledged that increased access to PR is needed which may be achieved by increasing community-based programmes including developing and validating novel models to deliver sustainable PR, promoting maintenance of long-term results, and identifying those who should be prioritised (Vogiatzis et al. 2016). It is suggested that positive behaviour changes and healthy choices at the early stages of COPD can help slow down the disease progression (Jolly et al. 2018). Evidence from a systematic review (including 3 studies) highlighted the benefits of PR for mild COPD ( $FEV_1 \geq 80\%$  predicted) with improved exercise capacity and QoL. However,  $FEV_1$  is a relatively poor correlate of symptoms such as breathlessness and the impact of COPD on daily life and therefore investigating the impact of people with mild breathlessness is needed (Jones et al. 2012). Community-based rehabilitation for mild breathless may provide an opportunity for early lifestyle modification, self-management and physical activity before breathlessness becomes disabling with reduced cost to healthcare services (Golmohammadi et al. 2004) and there is evidence that a twice weekly community rehabilitation programme can improve exercise tolerance and QoL (Cecins et al. 2017). In response, BLF Wales set up a low resource 6-week

community-based exercise and education programme, based on PR guidelines: *Helping you help yourself (HYHY)*. A similar programme of weekly exercise and education for 4 weeks in England showed improvements in exercise capacity and knowledge of disease and self-management (Lewis et al. 2019).

The aim of this evaluation was to gain information on the demographics of people with self-reported COPD (in the absence of spirometry) with mild breathlessness that are attending the HYHY programme in Wales and to investigate changes in exercise capacity, knowledge of COPD and self-management behaviours as a result of the programme. In addition, relationships with the impact of respiratory disease using the COPD Assessment Test (CAT) score at baseline were explored. It was hypothesised that there would be significant differences in *6-minute walk test* (6MWT) distance and knowledge of condition with HYHY, and that participants would gain benefit irrespective of CAT score. The usefulness of the programme to participants was also evaluated.

## Methods

### Study design

This was a retrospective evaluation of the BLF *Helping you help yourself (HYHY)* programme funded by the National Community Fund Wales. HYHY involves weekly exercise, education and social engagement across three health boards in South Wales. Recruitment and data collection were managed by the BLF, participants were recruited from GP surgeries and through the BLF website and *Breathe Easy* groups.

### Inclusion/exclusion criteria

People with self-reported COPD and mild breathlessness, as determined by the MRC breathlessness scale of  $\leq 2$  (where 5 is most breathless), who live or work in Wales were eligible for the study. People with MRC  $> 2$ , blood pressure  $> 190/100$  mmHg, Borg resting breathlessness  $> 5$ , and resting oxygen saturations  $SpO_2 < 85\%$  as well as those living outside Wales were excluded.

### HYHY programme

HYHY ran between March 2018 and March 2020. The programme was once a week for 6 weeks, each class was undertaken in a community setting (local community hall/leisure centre) for approximately 2 hours per week as a low resource intervention. A typical session included 30–40 minutes exercise plus a 10-minute warm up and cool down, 30 minutes of education and 30 minutes for (optional) social engagement. The exercise was led by a level 4 chronic respiratory disease trained programme coordinator and included: aerobic and strength training modified weekly by the programme coordinator and aiming for a ‘some-what hard’ rate of perceived exertion (rate of perceived exertion 13/14).

Standardised education provided by healthcare professionals (such as respiratory nurses, physiotherapists, occupational therapists and pharmacists) based on motivational interviewing techniques (Rollnick & Miller 1995). The programme builds on the learning of

BLF self-management programmes elsewhere in the UK and included the following topics: understanding COPD and self-management, managing breathlessness, being active, managing flare ups and medications, looking after yourself and further support. People attending HYHY were also provided with the BLF *Your COPD self-management plan* and *Your exercise handbook* booklets, which were referred to during the education sessions. The BLF provided information about HYHY to potential participants and obtained consent from all participants. The BLF gave permission for the use of the retrospective anonymous data and ethical approval was gained from the School of Healthcare Sciences at Cardiff University in July 2019.

### Assessments

Participants were asked to confirm MRC breathlessness for recruitment to the service, but scores were not recorded for the analysis. Assessments were collected by the exercise instructor and included age (by category), gender and body mass index (BMI) and resting blood pressure of participants were recorded as well as self-reported smoking history, number of GP appointments and hospital admissions in the past 6 months at baseline. The CAT score is a COPD specific measure of the impact of the disease and is valid and reliable in COPD. It consists of eight-topic domains, each is presented as a 6-point scale (0–5) reflecting impact of symptoms, including cough, phlegm, chest tightness, breathlessness; limitations; confidence leaving home; sleep and energy. The total score ranges 0–40, with a higher score representing greater impact of COPD (Jones et al. 2009). CAT was measured at baseline only as it has previously been shown to be response to PR (Dodd et al. 2011).

Assessments before and after HYHY included the following (Table 1):

Table 1: Assessment schedule.

	Baseline	After 6 weeks
Demographic data	X	
6-minute walk test	X	X
Bristol knowledge quiz	X	X
Self-management behaviour	X	X
COPD assessment tool score	X	

6-minute walk test (6MWT), a sub-maximal exercise test used to assess aerobic capacity and endurance, was performed on a 10m track (without a practice test) before and after 6-weeks of HYHY programme. The validity and reliability of the test has been shown previously (Singh et al. 2014). Pre and post 6MWT measures of breathlessness (Borg 0–9 a valid measure in PR (Crisafulli & Clini 2010) and oxygen saturation were taken using pulse oximetry.

Knowledge, impact of COPD and self-management behaviours were assessed by self-administered questionnaires before the start of the exercise programme (visit 1), 6 weeks (visit 2) and 6 months after the programme (visit 3 by telephone).

A sample of 12 questions (*Bristol knowledge quiz: BKQ*) from the *Bristol COPD knowledge questionnaire (BCKQ)* (excluding COPD aetiology which was of limited relevance) were completed. Each question has 3 response options *true*, *false*, and *don't know*. A correct answer scores 1 point, while an incorrect answer or *don't know* scores 0. Thus, BKQ scores ranged from 0 to 12, high scores indicating greater knowledge. The BCKQ is an instrument that assesses knowledge of COPD in 13 areas: COPD epidemiology, breathlessness, phlegm, chest infections, exercise, smoking, vaccination, bronchodilators, antibiotics, oral and inhaled steroids (White et al. 2006).

To assess self-management behaviours an unvalidated tool was used, with participants asked to rate their agreement on a 5-point Likert scale to 9 statements including: understanding of condition, where to find further information about managing their lung condition, what to do during a flare-up, smoking status, healthy eating, importance of exercise, social life, happy with social network and attending social activities ([Appendix 1](#)).

Data were analysed using SPSS version 25, normality was tested using Kolmogorov-Smirnov test and assessed visually looking at the distribution according to the histogram outputs. As data were not parametric, median and interquartile range (IQR) are presented. Independent groups (included and excluded data) was compared with the Wilcoxon test for paired analysis. Group proportions were compared using Chi square test, and the Spearman's rank correlation was used to look for relationships between variables.

## Results

### Demographic and baseline data

Data from 293 (48% male) participants who commenced HYHY between March 2018 and March 2020 were included in the present analysis. The majority were aged above 65 ( $n = 230$ ),  $n = 55$  were aged 55–64,  $n = 7$  aged 45–54 and  $n = 2$  aged 35–44 and  $n = 1$  aged 23–34 years. There were 45 smokers, 224 non-smokers and 24 declined to say.

Of the 293 who started HYHY, 54 failed to complete (28%) the programme and 29 were excluded (15%) due to incomplete data leaving 210 participants who were included in the present analysis. There was no difference in gender, BMI, blood pressure, oxygen or BKQ, smoking status, number of GP and hospital visits between included and excluded data  $p > 0.05$  (Table 2).

Table 2: Participant characteristics for included and excluded data.

	Included data <i>n</i> = 210	Excluded data <i>n</i> = 83	<i>p</i> =
Gender male <i>n</i> = [%]	103 [49%]	37 [45%]	0.490
Age 25–34 years <i>n</i> =	0	1	0.037
35–44 years <i>n</i> =	0	1	
45–54 years <i>n</i> =	4	3	
55–64 years <i>n</i> =	33	22	
65+ years <i>n</i> =	173	56	
Height (m)*	1.7 (1.6–1.7)	1.7(1.6–1.8)	0.634
Weight (kg)	78.0 (67.8–93.3)	81.0 (69.0–92.0)	0.665
BMI (kg/m <sup>2</sup> )*	28.2 (24.8–32.9)	28.1 (25.4–33.1)	0.798
Systolic BP (mmHg)	143 (132–155)	139 (128–152)	0.140
Diastolic BP (mmHg)	82 (74–88)	84 (77–92)	0.188
6-minute walk test distance (m)	340 (268–380)	320 (260–350)	0.033
Oxygen level at rest (%)	96 (95–98)	97 (95–98)	0.307
Breathlessness at rest (1–10)	0 (0–1)	1 (0–1)	0.029
Baseline CAT total (0–40)	18 (13–24)	23 (17–27)	<0.001
Baseline BKQ total (0–12)	3 (4–6)	3 (4–5)	0.696
Smoker <i>n</i> =	30 [15%]	15 [19%]	0.145
Nonsmoker <i>n</i> =	164 [84%]	60 [77%]	
Neither <i>n</i> =	2 [1%]	1 [1%]	

Data are Median (IQR) \*missing data (complete *n* = 196, non-complete *n* = 78); BP: blood pressure, BKQ: Bristol COPD knowledge quiz, CAT: COPD assessment tool.

There was a significant difference in age between completers and non-completers with a higher proportion of older people with complete data (*p* = 0.037). Breathlessness at rest (Borg) and CAT scores were higher in non-completers and 6MWT was lower than completers (*p* < 0.05). The majority of participants at baseline had no GP or hospital appointments (Table 3).

Table 3: GP and hospital appointments for included and excluded data.

Number of GP appointments	Included data	Excluded data	Number of hospital appointments	Included data	Excluded data
0	79	24	0	198	75
1	46	25	1	6	5
2	40	15	2	4	2
3	25	9	3	1	1
4	20	10	-	-	-
<i>Total</i>	209	83	<i>Total</i>	209	83
Difference included and excluded data	$p = 0.494$		$p = 0.528$		

### Self-management

There was no significant difference in any of the questions on self-management in those who completed or did not complete HYHY ( $>0.05$ ) (data not shown).

### Comparison of baseline and post HYHY data

In the 210 participants who completed assessments at baseline and after 6 weeks of HYHY, there was a significant increase in 6MWT median (IQR) 60 (30–80)m and BKQ 3 (1–4) points ( $p < 0.05$ ), and there was no difference in oxygen saturation or breathlessness before or after the 6MWT (Table 4).

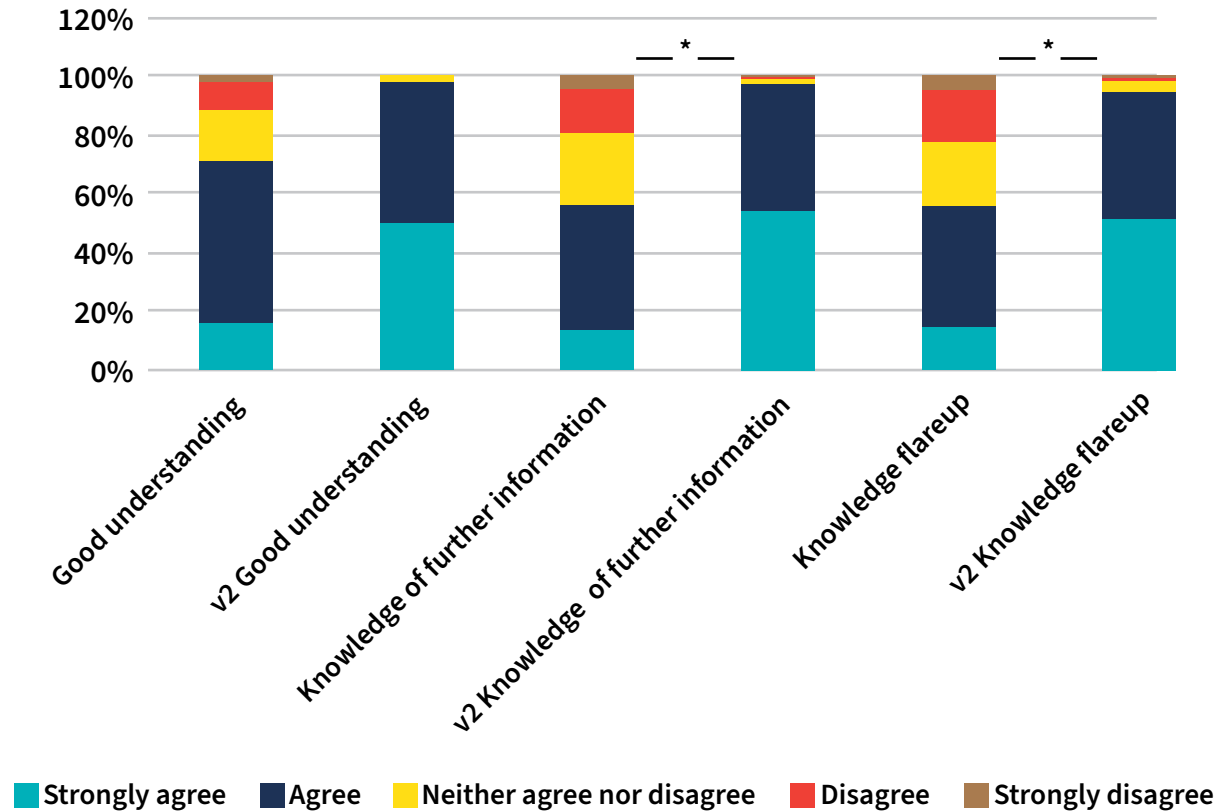
Table 4: Change in 6MWT and BKQ with HYHY.

	Baseline	6 weeks post HYHY	$p =$
Distance walked (m)	340 (268–380)	400 (320–440)	<0.001
Oxygen level at rest (%)*	96 (95–98)	96 (95–98)	0.667
Oxygen level post 6MWT (%)**	96 (94–98)	96 (93–97)	0.111
Breathlessness at rest (1–10)	0 (0–1)	0 (0–1)	0.249
Breathlessness post 6MWT (1–10)	2 (1–3)	2 (1–3)	0.310
BKQ total	4 (3–6)	7 (6–9)	<0.001

Data are median (IQR)  $n = 210$  unless  $*n = 197$ ;  $**n = 19$ ; BKQ: Bristol COPD knowledge quiz.

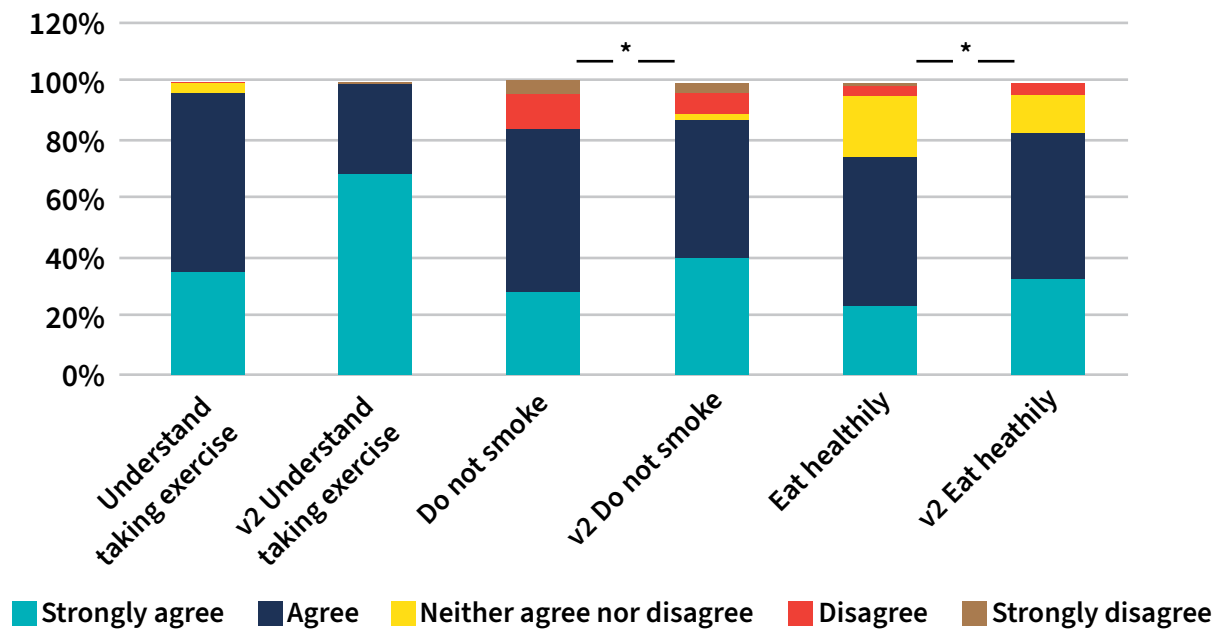
## Self-management

The questions relating to self-management showed significant changes of knowledge of finding further information, knowledge of what to do during a flare up, not smoking and healthy eating, happy with social life, having a network of friends and attending interest groups ( $p < 0.05$ ) (Figures 1–3). Overall participants showed increased knowledge relating to self-management.



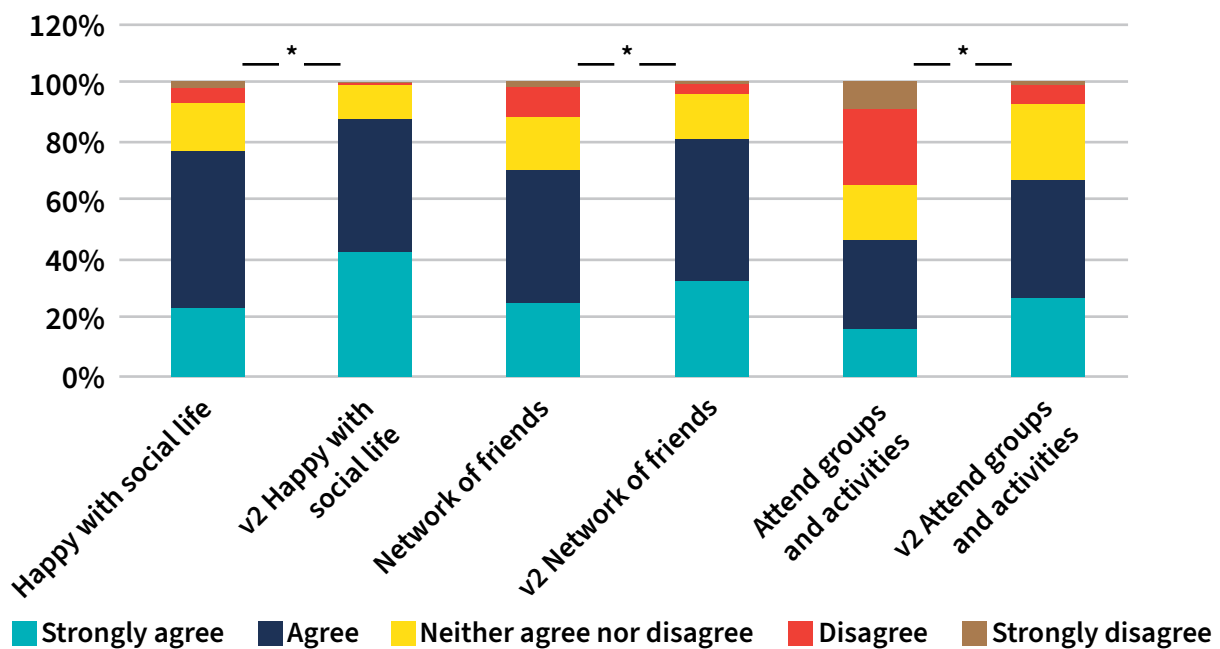
**Figure 1: Knowledge of self-management response percentage baseline and after 6-weeks (v2).**

\* significant difference  $p < 0.05$



📌 **Figure 2: Healthy behaviours response percentage and after 6 weeks (v2).**

\* significant difference  $p < 0.05$



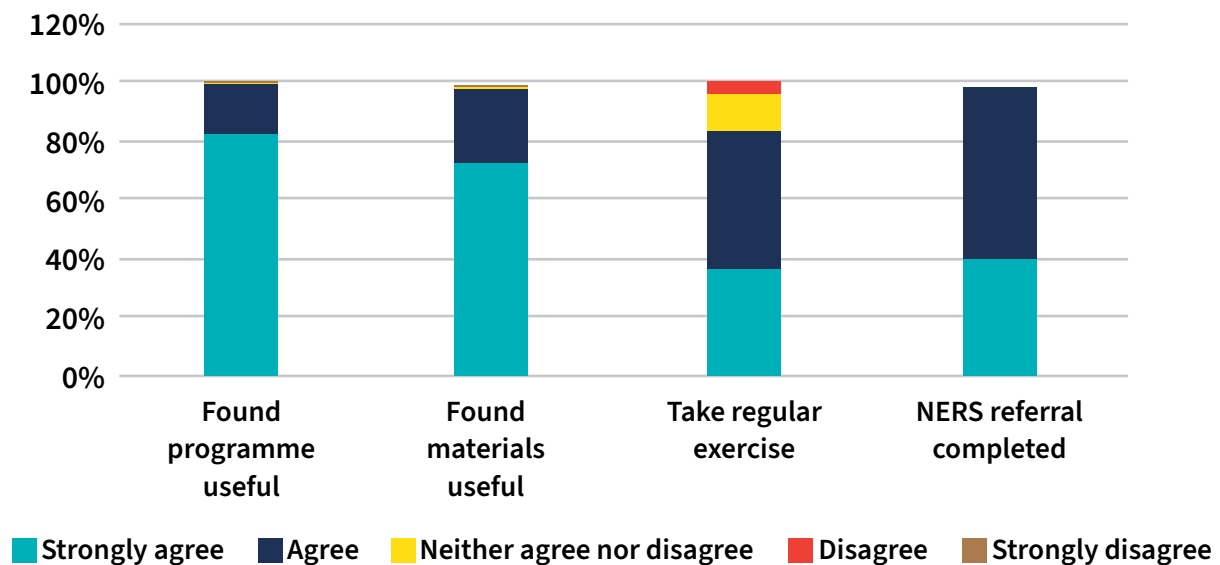
📌 **Figure 3: Social activities response percentage and after 6 weeks (v2).**

\* significant difference  $p < 0.05$

### Usefulness of the programme

After the programme, 99% of participants agreed or strongly agreed that the programme was useful, 98% of participants agreed or strongly agreed that they found the materials useful, 83% of participants agreed or strongly agreed that they took regular exercise and 41% referral to the National Exercise Referral Scheme (NERS) were made (Figure 4).





📌 **Figure 4: Usefulness of HYHY post programme.**

### Relationship between baseline CAT and changes at 6 weeks

Baseline CAT did not relate to change in 6MWT ( $r=0.02, p>0.05$ ) or change in breathlessness at rest (Borg)  $r=0.003, p>0.05$  or knowledge of condition (BKQ) ( $r=0.07, p>0.05$ ).

## Discussion

This is the first evaluation of the BLF *Helping you help yourself* community exercise and education programme for people with mild breathlessness ( $MRC \leq 2$ ) in Wales. The study showed that there was an improvement in exercise capacity, knowledge of condition and self-management behaviours after 6 weeks of HYHY and participants found the programme useful. Additionally, baseline measures of impact of COPD did not relate to changes in 6MWT, breathlessness and knowledge of condition 6 months after the programme.

### Baseline data

The demographics of the participants with complete data including gender (49% male) and age (82% over 65 years) were representative of data from the national COPD audit which included patients with COPD who were assessed for, or began, PR between 3 January and 31 March 2017 in England and Wales. The audit sample comprised 53% males and the majority of patients were aged >65 years (72%). In the present study at baseline 15% were current smokers while 22% were current smokers in the audit (Steiner et al. 2018) with 16% of patients having MRC grade 1–2 breathlessness (Steiner et al. 2017). Thus, there are some similarities in the participants of HYHY with individuals in the audit. The low percentage of patients with mild breathlessness in the audit is likely to be attributed to the delivery of pulmonary rehabilitation patients with  $MRC \geq 3$  whereas HYHY specifically targeted people with MRC 2. The less severe breathlessness in the present study may explain a higher completion rate of HYHY which was 81% compared to 62% in the audit. This may be attributed to less severe disease as the participants reported infrequent GP attendances and hospital appointments, or the community programme may have been more local and convenient

(Steiner et al. 2018). Attendance at PR has previously been shown to be independently influenced by smoking status, the degree of breathlessness, frequency of hospital admissions, length of the programme and journey time (Sabit et al. 2008). The participants had a median CAT score of 18 which suggests chronic respiratory disease as it has been shown that the mean score for healthy individuals is 7 and a CAT score of 13 aligns to a grade 1 COPD GOLD classification, even though COPD was not confirmed with spirometry (Jones et al. 2013).

### **Change with HYHY**

After 6 weeks of HYHY, 6MWT and BKQ increased; these findings are similar to those of the systematic review by Jácome & Marques (2014) that showed that exercise and QoL improved in people with mild COPD. 6-minute walk distance was increased by at least 50m in 48% ( $n = 100$ ) of participants with 92 people exceeding the higher minimum clinically important difference (MCID) for the 6MWT which varies in the literature from 25–54m (Holland & Nici 2013) this demonstrates a clinically relevant change with HYHY. However, some of this may be attributed to a learning effect, in the absence of a practice test. This suggests that the low resource exercise and education intervention was able to improve exercise capacity. It is not known if participants' level of physical activity and/or exercise changed outside of the HYHY programme and therefore whether the education element indirectly influenced exercise capacity, or the change was solely due to the exercise component of the intervention.

Our results in people with mild breathlessness can be compared to Lewis et al. (2019) in patients with COPD confirmed by spirometry which included weekly exercise for 4 weeks, led by a senior physiotherapist and rehabilitation assistant. Improvement in knowledge of condition in the present study, by 3 points (25%), was similar to the 21% improvement in the full version of BCKQ. Although, to our knowledge no MCID for the BCKQ has been published, this improvement suggests that HYHY has a positive effect on knowledge of condition, despite the lower frequency of education and exercise training compared to traditional PR (2–3 times per week). These findings may be particularly valuable in people with milder disease as it has been suggested that community rehabilitation may facilitate ease and convenience of participation, and link to a lifestyle change rather than being applied in a hospital setting (Crisafulli & Clini 2010).

A review of studies including self-management behaviours showed improved QoL, dyspnoea and reduced all-cause mortality. These studies included the self-management behaviours of self-recognition and self-treatment of exacerbations, taking medication and eating a healthy diet, coping with breathlessness, quitting smoking and taking regular exercise (Zwerink et al. 2014). The significant improvements in self-management after 6 weeks may be attributed to the HYHY education programme which largely aligned with NICE guidance (Steiner et al. 2018). The HYHY education programme included information regarding COPD as a condition, goal setting, managing breathlessness and anxiety, being active and getting

referred to the NERS, advice on eating well, managing flare ups and medications, but did not include smoking cessation, oximetry or inhaler training. Despite the lack of specific advice on smoking cessation, there was a significant improvement in the responses to the statement 'I don't smoke', which could indicate that an education programme alone may promote people to make healthy lifestyle choices. Although there was no significant change in responses to the comment 'I understand the importance of being active/taking exercise', there was a significant increase in exercise capacity as measured by 6MWT in the participants. This may therefore indicate that the change in exercise capacity was in fact due to the exercise component rather than changes to lifestyle beyond the HYHY programme. The findings from this study indicate that behaviours such as attending groups and activities and having social contacts did change significantly after attending the programme, even though knowledge of the condition remained unchanged. Further qualitative research exploring participants experiences of taking part in community rehabilitation may help in understanding the mechanisms of behaviour change as well as design of future community programmes.

The findings from this study are similar to a randomised controlled trial in people with mild breathlessness (MRC 1 or 2) (Jolly et al. 2018) that demonstrated improvements in self-management as a consequence of a telephone coaching intervention. The theoretical basis of the intervention was social cognitive theory, whereas HYHY was underpinned by a motivational interview approach. Both approaches aim to enhance self-efficacy through goal setting (Hettema et al. 2005; Beauchamp et al. 2019) which was evidenced by a significant change in physical activity and seeking support from healthcare professionals by Jolly et al. (2018) and by agreement with statements related to social participation in the current study. Comparable results were found in an evaluation of PR for people with asthma and COPD, with significant improvements found in patient activation, health-directed behaviour and self-monitoring (Janssen et al. 2019).

At baseline, the impact of disease score as measured by CAT was median 18 (moderate impact); CAT was not measured at the end of the HYHY so it is not known if there was a change post HYHY and its inclusion would be recommended for future evaluations. Lewis et al. (2019) included participants with similar baseline CAT values which did not change after a 4-week programme. However, a previous study showed a 2.9 change immediately post PR (Sabit et al. 2008). The contrast in findings may be due to the short PR intervention, 4 weeks, by Lewis et al. (2019) compared 8 weeks by Dodd et al. (2012) a minimum of 6 weeks is recommended by the British Thoracic Society (Bolton et al. 2018).

The current study demonstrated that baseline CAT was not related to changes in 6MWT, breathlessness at rest (Borg) and knowledge of condition at the end of the HYHY programme. Dodd et al. (2012) showed that change in CAT was significantly correlated with a change in 6MWT ( $r = 0.31, p = 0.01$ ). It is difficult to compare the findings as the current study used baseline CAT and Dodd et al. (2012) used change in CAT as the independent variable.

The implications from the current study are that improvements in exercise capacity are possible irrespective of the disease burden for people with mild breathlessness COPD.

The HYHY programme was well received with participants agreeing that the programme (99%) and materials (98%) were useful. This suggests that this low resource community programme may be a useful support mechanism to promote self-management in people with COPD and mild breathlessness.

### **Limitations**

We acknowledge a number of limitations to our study. As HYHY was set up as a support service, we did not recruit a control group for comparison, nor was the evaluation powered to detect change in variables. Participants had self-reported COPD (not confirmed with spirometry) which may affect the validity of the CAT score. There were some missing data, and unvalidated questionnaires included in the evaluation and more consistent completion of outcome measures would have been useful. The 6MWT was completed using a 10m track which increases the number of turns and may therefore affect distance gained. It was undertaken without a practice test which means the changes may be attributed to a learning effect and given the mild breathlessness there was potential for a ceiling effect and an alternative may have been an externally-paced test. Data were collected by the exercise instructor which may have resulted in response bias. However, this reflects the limitations of a charity-funded service evaluation. We also recognise that there may be differences in people who volunteered to participate and reasons for non-completion were not explored. The study also did not explore pre-post programme health-care resource use, lung function and long-term effects of HYHY.

### **Conclusion**

This study suggests that HYHY, a community-based rehabilitation programme, may provide benefits for people with mild breathlessness and COPD in terms of exercise capacity, knowledge of disease and self-management. The improvements in exercise capacity and knowledge of condition were independent of the impact of COPD, therefore, it is suitable for all people affected by breathlessness. Further research is needed to explore the experiences of people with mild COPD who have taken part in community rehabilitation programmes to further understand the mechanisms of behaviour change.

### **Conflict of interest**

Although set up by the BLF authors, the analysis was undertaken by Cardiff University independently of the BLF who were blinded to the study analysis.

### **Acknowledgements**

The authors would like to extend their thanks to BLF and the National Community Fund Wales for funding this evaluation.

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## Appendix 1

**Q1. How much do you agree or disagree with the following statements? Please tick (✓) 1 box for each statement**

<b>With regards to your lung condition...</b>	<b>Strongly agree</b>	<b>Agree</b>	<b>Neither agree nor disagree</b>	<b>Disagree</b>	<b>Strongly disagree</b>
I have a good understanding of my lung condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I know where to find further information about managing my lung condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I know what to do if I have a flare-up (exacerbation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I don't smoke	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
I eat healthily	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I understand the importance of being active/taking exercise	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I am happy with my social life	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I have a network of friends and social contacts whom I can go to for support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I attend groups and activities that are of interest to me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



# Patient experiences of face-to-face and remote clinics in a cystic fibrosis service – what can we learn?

Elizabeth Shepherd<sup>1</sup>, Laura Davis<sup>1</sup> and Keeley Stevens<sup>2</sup>

## Abstract

Clinic flow at the *Wessex adult cystic fibrosis service* was recognised to be sub-optimal with patients spending on average 36% of their total clinic time waiting to see the next clinician. Changes had been made to improve the clinic experience for patients and clinicians and following these changes an initial questionnaire was completed in 2019 to explore patients' views of the face-to-face clinic experience.

Results were analysed from the first questionnaire but before further changes could be implemented the COVID-19 pandemic began and almost all clinic appointments became remote appointments. A second questionnaire was completed in July 2020 to understand the patients' perceived advantages and disadvantages of face-to-face and remote clinics.

A total of 25 adults with cystic fibrosis completed the 1st questionnaire and 48 completed the 2nd questionnaire. Participants reported advantages and disadvantages to both types of clinic appointment and neither type of appointment offered the perfect solution. A majority of participants (71%) were happy to continue with remote clinic appointments in the future with some participants keen for a hybrid approach of face-to-face and remote appointments.

The feedback from both questionnaires has provided clinicians at the *Wessex adult cystic fibrosis service* with the opportunity to further improve the current clinic experience and to give patients a greater choice of clinic appointment type which also meets their clinical and personal needs.

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## Keywords

Cystic fibrosis, remote, face-to-face, clinics.

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## Introduction

Cystic fibrosis (CF) is a multi-organ disease which requires management by a specialist multi-disciplinary team located in one of 28 adult centres across the United Kingdom (UK). CF Trust guidelines recommend that adults with CF should be seen in a clinic by a CF specialist team consisting of a consultant, physiotherapist, dietitian and nurse at least 4 times per year to ensure that health is monitored and treatment is given appropriately (CF Trust 2011).

The *Wessex adult cystic fibrosis service* is based at University Hospital Southampton (UHS) with 300 adults with CF attending the service. Many of those attending the service in Southampton live more than 50 miles from the hospital, with some driving up to 3 hours one way to their hospital appointment and others flying in from the Channel Islands. Anecdotal evidence from patients at the *Wessex adult cystic fibrosis service* suggested that they found the clinic experience frustrating at times and were keen to seek alternatives to their routine three monthly face-to-face clinic appointments.

It was recognised by the *Wessex adult cystic fibrosis* team that clinic flow was sub-optimal. Analysis of clinic flow in 2018 demonstrated that on average patients spent 36% of their total clinic time waiting to be seen by the next clinician. Consequently the team implemented changes to streamline clinics and minimise wait times, including the introduction of a pre-clinic meeting which encouraged clinicians to prepare for clinic beforehand rather than on the day. Having made changes to the clinic structure it was decided to invite patients to share their views on the face-to-face clinic experience using a questionnaire, to ensure any future changes would be patient-centred and improve the clinic experience for patients as well as clinicians.

The initial questionnaire was completed in 2019 and the team began to discuss changes that could be made to improve clinics. However, in March 2020, the impact of the COVID-19 pandemic necessitated rapid changes to CF outpatient clinics; from a face-to-face to a remote (for example, telephone or video consultation) service with patients continuing to have three monthly clinic appointments. Evidence suggests that remote clinics are liked by people with CF (Wood et al. 2016) and it was hypothesised that remote clinics might address some of the challenges posed by face-to-face clinics, such as the need to travel long distances for an appointment. A 2nd questionnaire was conducted to understand the challenges and advantages of remote clinics from the patient's perspective. The aim was to use the information gained in both questionnaires to offer an improved clinic service which met patient's needs once it was possible to return to routine face-to-face clinics.

## Method

### Participant sampling and eligibility

Participants for both questionnaires were chosen from a convenience sample of adults attending a routine face-to-face clinic appointment at the *Wessex adult cystic fibrosis service*

between 1st September and 1st October 2019 ([questionnaire 1](#)) or a remote clinic appointment between 1st–31st July 2020 ([questionnaire 2](#)). Participants were eligible if they had a diagnosis of CF confirmed by sweat test and genetics, had attended at least one face-to-face clinic appointment ([questionnaire 1](#)) or remote appointment ([questionnaire 2](#)) at UHS and had capacity to consent to their participation.

### **Ethics and approvals**

The questionnaires were part of a service evaluation and therefore ethics and approvals were not required. Both questionnaires were registered at UHS as service evaluation (SEV/0288 – [questionnaire 1](#)) (SEV/0289 – [questionnaire 2](#)).

### **Procedure**

For the 1st questionnaire, eligible participants were invited by clinicians to complete the questionnaire feedback when they attended their routine clinic appointment. Those who consented were contacted within 3 weeks of their appointment by a volunteer at UHS. The volunteer recorded a written summary of the participant's answers for questions 1 to 3 and documented the participant's 3 answers for question 4 which were given in order of the participants' perceived priority. Proformas were stored in a locked, secure area and were anonymised.

For the 2nd questionnaire, eligible participants were also asked if they would like to participate in the questionnaire during their remote clinic appointment which occurred in lieu of a routine 3 monthly face-to-face appointment. Those who consented were contacted by telephone by the patient experience team who routinely undertake patient surveys at UHS. Answers were recorded anonymously on the Gather survey database (<https://gthr.co.uk>).

### **Questionnaire design**

Both questionnaires were designed by the *Wessex adult cystic fibrosis service* quality improvement team. Questionnaire 1 aimed to understand the reasons participants attended CF face-to-face clinic appointments and the participants' perspectives of the challenges and benefits of attending clinic. There were 4 questions in [questionnaire 1](#) which are shown in [Figure 1](#).

- 
- 1 From your point of view what is the main purpose of going to clinic?
  - 2 In your opinion what makes (or might make) clinic difficult for you?
  - 3 In your opinion what makes (or might make) clinic a good experience?
  - 4 Which of the following aspects of clinic are most important to you? Please choose your top 3:
    - Feeling I have been listened to.
    - The chance to discuss my treatment.
    - Being able to talk about difficult issues or problems.
    - My appointment not over-running.
    - Knowing my lung function (or CR, for example).
    - Being able to talk to specific team members, for example: physio, dietitian, social worker.
    - To feel that my health is reviewed regularly.
    - Something else (not mentioned above).
- 

**📌 Figure 1: Questions asked during the face-to-face questionnaire.**

Questionnaire 2 aimed to understand the patients' perceived benefits and challenges of remote and face-to-face clinics and whether patients would want to continue with remote clinics in the future. The questionnaire comprised 15 questions (Appendix 1).

### **Data analysis**

Written comments from questionnaires 1 and 2 were analysed using thematic analysis (Braun & Clarke 2006) to identify patterns within the data relating to participants' experiences of face-to-face or remote clinics. Thematic analysis was chosen for its ability to be used with many types of data including summaries (Braun & Clarke 2013). Qualitative data analysis was carried out by KS, LD and ES and any discrepancies in themes and coding were discussed until a consensus was reached.

In questionnaire 1, data from question 4 were numeric and were analysed for frequency of answers reported. Quantitative data from questionnaire 2 were presented descriptively as percentage (categorical data) or mean and range (numerical data).

## **Results**

### **Questionnaire 1: face-to-face clinics**

25 participants (89% of those eligible) agreed to complete questionnaire 1. Each respondent answered all 4 questions. Participant demographics are shown in Table 1.

**Table 1: Demographics of participants for questionnaire 1.**

<b>Variable</b>	<b>n = 25</b>
<b>Age (yrs)</b>	
Median (IQR)	35 (24 to 42)
Range	20 to 64
<b>Gender</b>	
Female (%)	12 (48%)
Male (%)	13 (52%)
<b>BMI</b>	
Median (IQR)	22.9 (21.1 to 24.2)
Range	18.3 to 39.1
<b>FEV<sub>1</sub> litres (% predicted)</b>	
Median	2.67 (75%)
IQR	1.85(53%) to 3.72 (85%)
Range	1.0 (21%) to 4.99 (96%)

### **Purpose for attending clinic**

Responses to question 1 showed that participants saw the main purpose of attending clinic as the opportunity to have their health reviewed by the multi-disciplinary team, particularly their CF-related diabetes and their lung function. It also gave them the chance to discuss their current treatments.

### **Factors that affected the clinic experience**

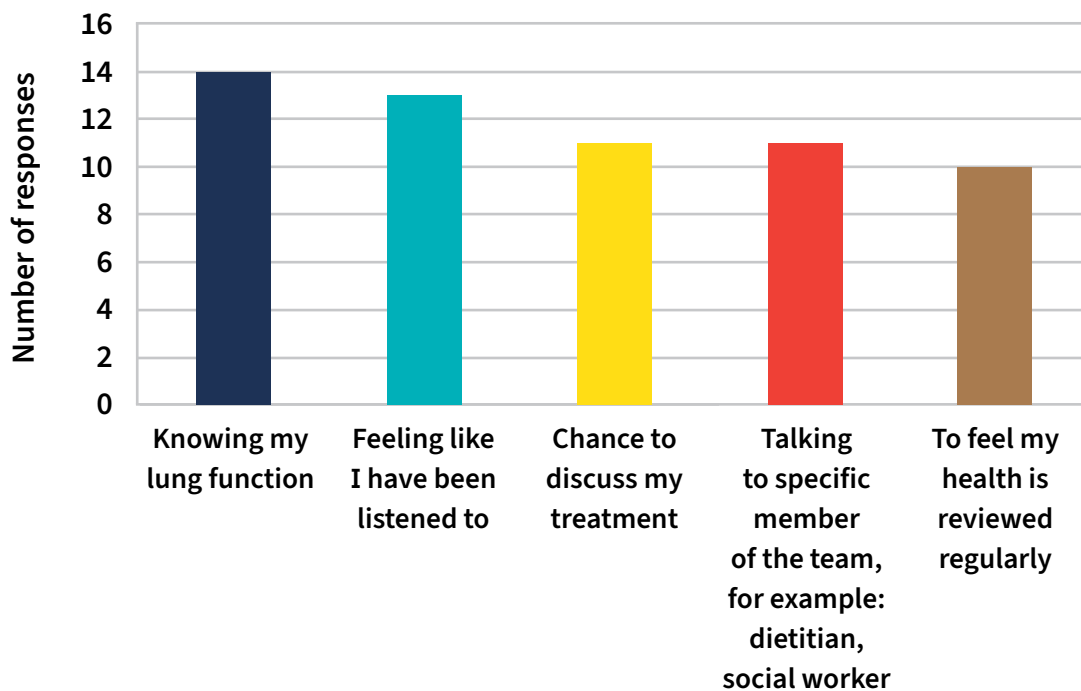
5 themes were found to influence the clinic experience in a positive or negative way. These were travel, communication, logistics of clinic, support from the CF team and service development. The impact of these themes is shown in [Table 2](#).

Table 2: Key themes affecting the participant's experience of face-to-face clinics.

Theme	Negative impact	Positive impact
Travel	<ul style="list-style-type: none"><li>• Expensive.</li><li>• Time taken to travel to appointments.</li></ul>	
Communication	<ul style="list-style-type: none"><li>• Parking difficulties.</li><li>• Frustrating when having to repeat the same information.</li></ul>	<ul style="list-style-type: none"><li>• Understanding what they were told by clinicians.</li></ul>
Logistics of clinic	<ul style="list-style-type: none"><li>• Length of time taken to receive letters after clinic could make information in the letters inaccurate.</li></ul>	
Support from CF team	<ul style="list-style-type: none"><li>• Clinic times not fitting in with other commitments, for example, work.</li></ul>	<ul style="list-style-type: none"><li>• Reassured by the advice received during clinic.</li></ul>
Service development	<ul style="list-style-type: none"><li>• Questioning the need to attend clinics every three months even if they felt well.</li></ul>	<ul style="list-style-type: none"><li>• Recent changes had improved the service, for example, having bloods taken in the clinic room rather than the phlebotomy department.</li></ul>

### Most important aspects of face-to-face clinic appointments

Finally, participants highlighted the top three aspects of clinic they considered most important (Figure 2). Only 5 aspects of clinic were reported by respondents in total, with participants citing an 'opportunity to complete pulmonary function tests' (mentioned by 14/25 participants) as the most important reason for attending clinic.



📌 **Figure 2: Frequency of the top three aspects of clinic considered most important by participants.**

### Questionnaire 2: comparison between face-to-face and remote clinics

A total of 48 participants completed the questionnaire (94% of those eligible). Participant demographics are shown in Table 3. Lung function is not included as this data was not available for most participants at this time as participants were not coming to the hospital for their clinic appointments due to the ongoing COVID-19 pandemic. Some participants did not answer every question. The questionnaire assessed the remote clinic experience in 2 areas: travel and technical. It also asked participants to compare remote and face-to-face clinics and to list the benefits and disadvantages of both types of clinic appointment.

📌 **Table 3: Demographics of participants in questionnaire 2.**

Variable	<i>n</i> = 48
<b>Age (yrs)</b>	
Median (IQR)	30.5 (22.3 to 39)
Range	19 to 74
<b>Gender</b>	
Female (%)	26 (54%)
Male (%)	22 (46%)
<b>BMI</b>	
Median (IQR)	23.1 (21.4 to 26.2)
Range	18.4 to 45.8

## Travel

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- 27.2 miles = mean average distance travelled to clinic appointment (1-way).
- Mode(s) of transport used to attend clinic:
  - Car = 44/48.
  - Other\* (including train, bus, ferry, plane) = 11/48.
- 100% of participants saved time by having a remote clinic appointment, median 2–3 hours.
- 47/48 participants saved money by having a remote clinic appointment.

\*Some participants used >1 mode of transport.

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## Technical

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- 100% participants used mobile phone or landline.
  - 13/48 participants reported technical difficulties with the appointment, for example: poor phone signal.
-

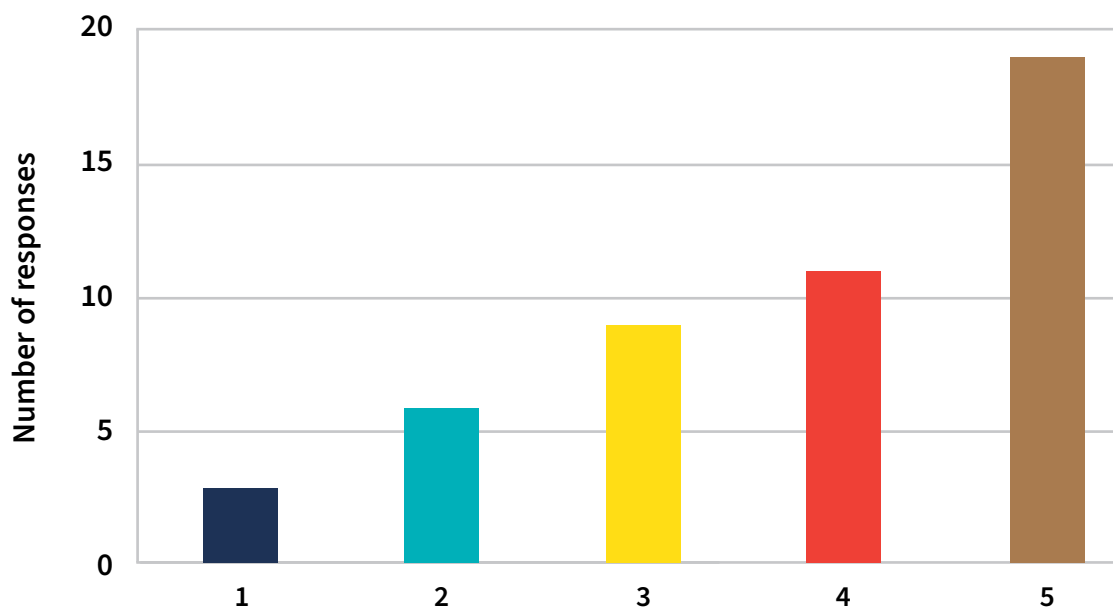


## Face-to-face compared to remote clinics

- Do you think your remote clinic appointment was as useful as a face-to-face appointment?  
Yes = 58%                      No = 27%                      Unsure = 15%
- Did the benefits of remote clinics outweigh the benefits of face-to-face clinics?  
Yes = 52%                      No = 19%                      Unsure = 29%
- Would you be happy to have remote clinic appointments after the pandemic has ended?  
Yes = 71%                      No = 19%                      Unsure = 10%

‘Remote clinics interspersed with face-to-face might work’ – *Participant 20.*

- On a scale between 1 to 5 do you think remote appointments are a better or worse use of your time overall than face-to-face appointments (1 = much worse use, 5 = much better use)



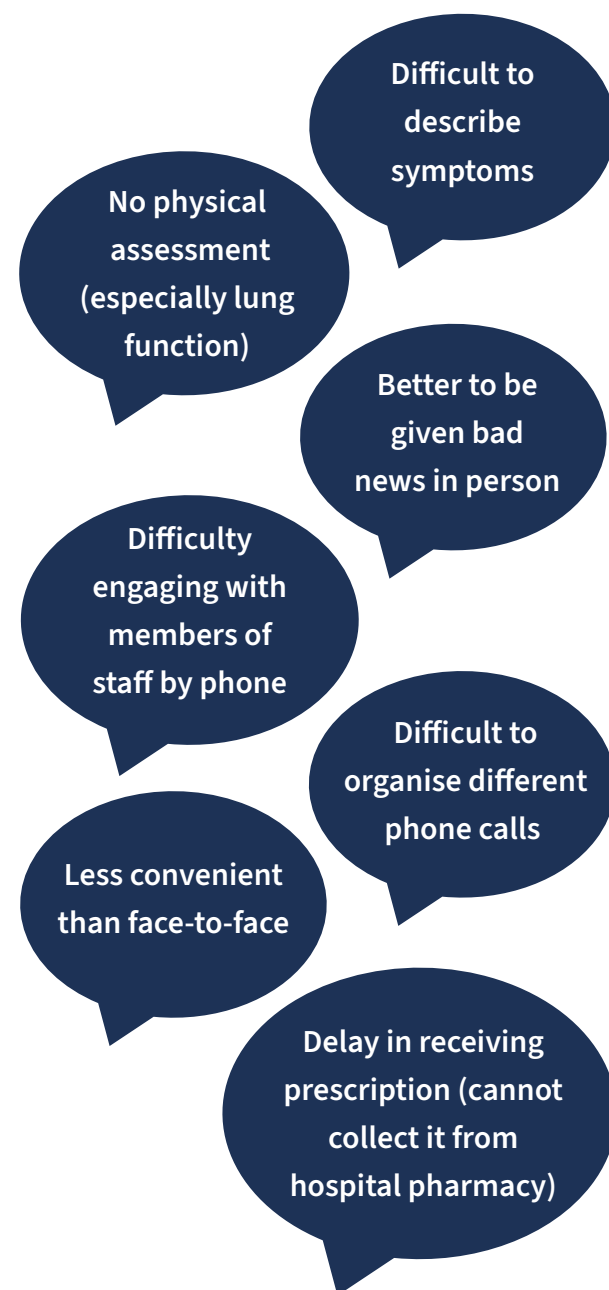
Remote appointments are a better or worse use of your time overall than face-to-face appointments (1 = much worse use, 5 = much better use)

**Figure 3: Responses for better use of time for remote appointments versus face-to-face appointments.**

## Perceived advantages of remote clinics



## Perceived disadvantages of remote clinics



**Figure 4: Participants perceived advantages and disadvantages of remote clinic appointments.**

## Discussion

Here we present work detailing attitudes of people with CF to different models of delivering outpatient adult CF care. The 2 questionnaires have highlighted the perceived advantages and disadvantages of both face-to-face and remote clinics and have shown that neither option offers an ideal clinic solution. Whilst remote clinic appointments were able to counteract some of the disadvantages of face-to-face appointments such as travel inconvenience, they also brought new disadvantages such as the difficulty of objectively assessing physical health remotely.

Participants viewed remote clinics positively overall with 71% of participants willing to continue with remote clinic appointments in the future with several participants keen to see the opportunity to alternate remote and face-to-face appointments in the future. Just over half of participants (52%) reported that the benefits of remote clinics outweighed the benefits of face-to-face clinics. They were perceived to be less expensive, were time efficient as they negated the need for participants to travel to their appointment saving an average of 2–3 hours travel time per appointment, and were easier to fit in with a person's lifestyle. There were also unforeseen benefits such as a being able to physically check medication details rather than relying on memory at a hospital clinic appointment. However, they also offered less opportunity for a full physical assessment, particularly of pulmonary function. It is recommended that pulmonary function testing should be performed at each clinic visit (Cystic Fibrosis Trust 2011) and as with other chronic lung diseases it is a key outcome measure for assessing lung health. Subsequent to this work, solutions have been implemented to address this issue and the majority of patients at the *Wessex adult cystic fibrosis service* now have a home spirometer.

These results are broadly in line with patient experiences of remote clinics at other CF centres. An analysis of 79 video consultations at the Royal Brompton hospital found that patients saved time and money when their appointment was conducted remotely. They also demonstrated that remote spirometry was both feasible and showed a high degree of accuracy (Parrott et al. 2019).

Communication was seen as key to a successful clinic review for both clinic formats. Participants reported that they valued the opportunity to talk to the multi-disciplinary team at face-to-face appointments and to feel they had been listened to. In contrast, some participants found remote clinics made it more difficult to communicate with a clinician and technical issues with phone reception also increased frustrations around communication. However, communication issues did exist in face-to-face clinics and included the need to repeat the same information at each visit, for example, a medication list. Although this may be necessary to ensure that the patient has not stopped or started a medication without the clinician's knowledge it is clearly a source of frustration for some.

The questionnaires have their limitations. The sample size for both questionnaires was small, although the completion rates were high, with less than 16% of the total adult CF population at the *Wessex adult cystic fibrosis service* interviewed for either questionnaire. However, similar themes were reported by a majority of participants for both questionnaires suggesting that the main advantages and disadvantages of both types of clinic appointment have been captured.

The 2 questionnaires have provided the CF multi-disciplinary team with valuable patient-led information to use to plan future services. CF care is rapidly changing. New life-changing medications, known as CFTR modulators, are available for over 90% of adults with CF and have been licensed for use since June 2020. CFTR modulators have been shown to reduce pulmonary exacerbations and increase lung function and may alter the need for regular face-to-face reviews as people with CF live longer, healthier lives (Heijerman et al. 2019). These questionnaires will provide the team with patient insights to allow them to deliver a service that meets their patients' changing needs.

## Conclusion

Clinicians should use the feedback from both questionnaires to improve both face-to-face and remote clinics. For example, explaining to patients why they may be asked about their medications at every appointment may alleviate frustration for some. Future changes should seek to provide a clinic service that offers some flexibility to patients, giving them the opportunity to choose their type of clinic appointment, where clinically appropriate. In addition, further evaluation of the optimal model of virtual clinic appointment is required, for example comparing video and telephone appointments. Any future model of outpatient care delivery is likely to involve a hybrid model of both face-to-face and remote clinic appointments and the use of technologies which enable objective assessments of health status in person and remotely. Finally, clinicians should work with local IT to ensure that the technology used during remote appointments works consistently for both patients and clinicians.

### Key points

- 1 The majority (71%) of people with CF would be willing to include remote clinic appointments in the standard CF care.
- 2 People with CF perceive advantages and disadvantages to face-to-face and remote clinic appointments with neither type of appointment offering the perfect solution: a flexible approach to clinic appointments, where clinically appropriate, will therefore improve the clinic experience for many.
- 3 Further evaluation is needed to assess the effectiveness of any hybrid clinic models introduced in the future.

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## Appendix 1

### Evaluation of telephone/video consultations as a replacement for person-to-person consultation in cystic fibrosis outpatient clinics

#### 1. What format was the appt?

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Phone (1)

Video (2)

---

*Patient questions:*

#### 2. What device did you use for your virtual clinic appointment?

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Phone (1)

Tablet (2)

Laptop/desktop (3)

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#### 3. Do you think this appointment was as effective as a face-to-face clinic appointment?

---

Yes

No

Unsure (3)

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Comments:

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#### 4. Were there any technical difficulties during the virtual clinic appointment?

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Yes (1)

No (2)

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If yes, please explain what these difficulties were: for example, internet connection, audio issues, video issues

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## 9. Have you found any other benefits to virtual clinic appointments?

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*Patient prompts such as:*

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I didn't have to take as much time off work/ education (1)	It was better for my health condition that we could stay at home (2)	I didn't have to arrange childcare/care for a relative (3)
Less time waiting (4)	More comfortable waiting experience at home (5)	Easier for other family members to join the consultation (6)
Reduced stress (7)	It was better for the environment (8)	Consultation was quicker than a hospital appointment (9)
Other (10)		

---

## 10. Are there any disadvantages to virtual clinic appointments?

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*Patient prompts such as:*

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It was less convenient (1)	I couldn't find somewhere private for the consultation (2)	I struggled with the technology (3)
I struggled to engage with the member of staff on the screen/phone (4)	The physio was not able to physically review my breathing +/- airway clearance or exercise technique/posture (5)	I would have preferred a person-to-person appointment (6)
It used up too much of my data allowance (7)	It was too stressful (8)	I was concerned about the privacy of using the internet to discuss confidential issues (9)
Other (10)		

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**11. Do you feel that the benefits of virtual clinic appointments outweigh the benefits of seeing the team face-to-face?**

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Yes (1)

No (2)

Unsure (3)

---

Comments:

---

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**12. Would you be happy to have virtual clinic appointments after the COVID-19 pandemic has ended?**

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Yes (1)

No (2)

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**13. Do you have any other thoughts or ideas about virtual clinic appointments?**

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**14. Is there anything we could do to improve virtual clinics in the future?**

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Designed and  
Developed in Canada

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# Association of Chartered Physiotherapists in Respiratory Care position statement: Physiotherapists use of lung ultrasound

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## Introduction

This position statement from the Association of Chartered Physiotherapists in Respiratory Care (ACPRC) recognises the evolving use of point of care (PoCUS) lung ultrasound (LUS) by physiotherapists. The number of physiotherapists within the United Kingdom (UK) that are undertaking training and gaining accreditation in this emerging area of practice is increasing. While the benefits and use of PoCUS LUS by our respiratory, emergency department and critical care medical colleagues has been established (Intensive Care Society 2019; Stanton et al. 2020) (including training, accreditation and clinical guidelines), this is not currently the case for physiotherapists. This statement identifies the scope of practice, education, competency and governance requirements for the physiotherapy use of PoCUS LUS.

## Scope of practice

At present, the physiotherapy use of PoCUS LUS is predominantly undertaken in the critical care environment, due to the established use of PoCUS by medical colleagues and the subsequent availability of equipment and mentors.

Physiotherapists can effectively use LUS to support their assessment and guide acute respiratory interventions in the critically ill patient. LUS can be used by physiotherapists to diagnose and assess: pneumothorax, consolidation (for example, pneumonia, contusion, lobar collapse), pleural effusion and interstitial syndrome (Leech et al. 2015; Le Neindre et al. 2016; Hayward & Janssen 2018). The use

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of LUS to provide a rapid diagnosis can guide efficient physiotherapy interventions and prevent under or over treatment. In addition to its use as a diagnostic tool, LUS provides an outcome measure to evaluate the effectiveness of physiotherapy treatment/interventions (Le Neindre et al. 2016). However, LUS should be used as part of a multifaceted clinical evaluation and not as the only outcome measure (Le Neindre et al. 2016). In addition to acute respiratory scenarios, physiotherapists could also use PoCUS to evaluate diaphragm function in patients weaning from mechanical ventilation (Hayward & Janssen 2018).

There are a number of emerging clinical scenarios not limited to the critical care environment where physiotherapists can utilise LUS, which include: chronic lung disease, chest wall trauma and assessment of lung compliance during ECMO (Hayward & Janssen 2018; Battle et al. 2019; Ntoumenopoulos et al. 2021). However, physiotherapists should use LUS only within their scope of practice and as such will be unable to comment on other structures and pathologies that may be within the LUS anatomical field, for example, pericardial effusion. To support this, the tissues/organs, differential sonographic diagnoses and clinical decisions which are *outside* of the scope of practice of the physiotherapist using PoCUS LUS can also be defined.

## Education and competency

Formal training and evidence of competency is necessary for physiotherapists who wish to practice PoCUS LUS. Prior to embarking on formal training, physiotherapists must identify an accredited supervisor from the appropriate awarding body. Currently accreditation can be gained through the Intensive Care Society, Society of Acute Medicine and Paediatric Intensive Care Society.

The training should be a four phased competency programme (See et al. 2016; Hayward & Kelly 2017) that follows the programme of the appropriate awarding body and consists of: theoretical introductory training and attendance on an approved course, directly supervised scans, unsupervised scans, and a triggered assessment. A logbook recording completion of scans, competency and

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### Keywords

Lung ultrasound, PoCUS, physiotherapy.

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triggered assessments should be maintained throughout the training period. Following completion of a formal education programme (including triggered assessment), physiotherapists should submit their required documentation to the relevant awarding body for accreditation.

Barriers to physiotherapy use of LUS in clinical practice include a lack of team support and resource availability (Intensive Care Society 2019). Therefore, physiotherapists should gain the support of their line manager and the multidisciplinary team within their clinical area in advance of any training.

## Governance

As of 2nd December 2020, diagnostic LUS falls directly under the Chartered Society of Physiotherapy's 4 pillars of practice via the *therapeutic and diagnostic technologies* pillar (CSP 2020). Until formal accreditation is gained by the relevant awarding body, any scans undertaken should not be stored in the clinical record and not used for clinical decision-making until they have been reviewed by a suitably trained clinician. Once accredited, physiotherapists should undertake LUS only within their scope of practice and comply with all local governance procedures for storing scans, documentation and quality assurance processes such as audit. It is the individual physiotherapist's responsibility to maintain knowledge competence in LUS through undertaking regular ultrasound examinations and relevant continual professional development (Intensive Care Society 2019). Those with sufficient experience in LUS are encouraged to apply to become a mentor to support the training of other physiotherapists.

PoCUS LUS is an expanding imaging modality within physiotherapy, however its adoption into clinical practice needs to be framed by robust governance, education and competency within a clearly defined scope of practice. A framework to support the use of ultrasound imaging by physiotherapists in the UK has been developed and is due to be published by the Chartered Society of Physiotherapy. This framework will define and align the inter-related elements of scope of practice, education and competency and governance. This ACPRC position statement reflects the current evidence and guidance related to PoCUS LUS. As such, the ACPRC recommend that if physiotherapists wish to use PoCUS LUS, they gain accredited training in LUS, use LUS within their scope of practice and in an environment that provides supervision and mentorship and comply with all local governance procedures.

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# Statement and considerations for the remote delivery of pulmonary rehabilitation services during the COVID-19 pandemic

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This document has been produced to support providers of pulmonary rehabilitation (PR) services in response to numerous requests for guidance received by the ACPRC during the COVID-19 pandemic to date.

The COVID-19 pandemic and associated national measures to reduce transmission have significantly impacted healthcare provision across the UK. Following the outbreak, many 'non-essential' services have adapted in order to provide a partially or fully remotely delivered service (telephone or video-conferencing) in order to continue to serve their local population. A survey of PR healthcare professionals was conducted in the development of this document in order to scope current practice in PR services across the UK.

The British Thoracic Society (BTS) have recently produced guidance on PR regarding remote assessment and reopening services for 'business as usual' participants (Gardiner et al. 2020a; Singh et al. 2020a). This document seeks to provide pragmatic guidance on the practical delivery of remote PR for healthcare professionals working in this field, which should be used alongside local guidance. We are unable to provide universal recommendations due to the extensive variation in factors currently affecting the delivery of PR services across the UK. The recommendations provided are for guidance only and may be updated in response to further government and national guidelines.

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This guidance document is formed of 2 parts:

- **Part 1** covers the background and rationale, methods of guidance development, adapted models of service delivery, risk assessment, workforce, and resources for remote delivery.
- **Part 2** will cover platforms for remote delivery, components of PR (assessment and re-assessment, exercise, and education) via remote delivery, and audit.

## Introduction

The COVID-19 pandemic has had an overwhelming impact on people's lives and healthcare delivery across the world. Prioritisation of NHS resource during the first UK national lockdown led to a temporary suspension of 'non-essential' services. Conventional face-to-face PR programmes were widely suspended in order to protect vulnerable groups and many staff redeployed in order to support the care of those acutely unwell. Currently, the majority of patients eligible for PR are still recommended to shield or limit their exposure by accessing online or remote consultations with healthcare professionals (Department of Health & Social Care 2020a). Though the majority of services have restarted in some form, many have once again been faced with redeployment of staff during the 2nd wave and many rehabilitation spaces or venues remain unavailable (Chartered Society of Physiotherapy (CSP) 2020a).

Technology-enabled remote delivery of non-urgent health-care services has played a significant role in the resumption of non-urgent services in the NHS. Whilst this has facilitated the delivery of components of care during the pandemic for many, it is inevitable that some will be significantly disadvantaged by the movement to digital services.

It is estimated that 7% of UK households are without internet access, and 10.7 million people in the UK have limited to no digital skills (Majeed et al. 2020). In a recent survey of PR service-users, of 170 survey respondents, 31% reported having never accessed the internet, and 29% reported no interest in accessing any component of PR digitally (Polgar et al. 2020). The spectrum of digital literacy of health care

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Remote delivery, pulmonary rehabilitation, COVID-19, ACPRC.

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professionals expected to use potentially unfamiliar digital tools and technology must also be acknowledged. The rapid shift to remote delivery has highlighted the need for identification of training need and support in this regard. Willingness and acceptance of telehealth by staff is required in the provision of an effective remote service (Smith et al. 2020).

The efficacy of PR in improving health related quality of life (HRQoL) and exercise capacity in chronic respiratory disease populations is undisputed, and the need for PR remains high priority (McCarthy et al. 2015; Dowman et al. 2014; Lee et al. 2017). The continually evolving circumstances and associated measures to reduce transmission of the novel virus have seen the rapid adaptation of PR services in the pursuit of continuing to serve our chronic lung disease population. The prevention of hospital admissions is of utmost importance not only in terms of an individual's health, but also in minimising the burden on our NHS and risk of COVID-19 transmission. COVID-19 has imposed an unprecedented challenge on accessibility to PR, further to the well-established existing issues with access, uptake and adherence (Rochester et al. 2015; Royal College of Physicians 2018). The World Health Organisation (2020) recommended the use of tele-rehabilitation where feasible during the pandemic; indeed, the role and opportunity to evaluate remotely delivered PR has been highlighted (Houchen-Wolloff & Steiner 2020; Jácome et al. 2020).

Remote physiotherapy is considered to comprise any means of service provision whereby the patient is remote from the practitioner; including email, SMS (short message service), telephone, web-based platforms or apps, and video conferencing (CSP 2020b). In the context of PR, there is an existing body of evidence for home-based rehabilitation encompassing both digital and non-digital platforms, which has recently been summarised by Singh et al. (2020a). Though several studies demonstrated similar improvements in exercise capacity and health related quality of life (HRQoL) as observed in centre-based PR (public relations), all of the studies identified involved thorough face-to-face pre- and post-PR assessment; limiting the applicability of findings due to the restrictions faced by many services at this time.

In the unprecedented and ever-evolving circumstances we find ourselves in, we must continue to prioritise the safety and well-being of our patients and staff in the provision of adapted interventions that focus on improving HRQoL (health-related quality of life) in our chronic lung disease population. This document draws on the experience of UK PR professionals, highlighting examples of innovative practice seen during the pandemic, with the aim of supporting services to deliver the best possible care under varied restrictions. It is hoped that evaluation of remotely delivered PR during this time will assist in the pursuit of improving access to PR longer-term.

## **Methods of guidance development**

An online survey *ACPRC Pulmonary Rehabilitation provision during COVID-19 and beyond!* (delivered via SurveyMonkey) was developed by members of the ACPRC committee with an

interest in PR, with the aim of scoping current practice and shaping this document. Inspired by queries received from ACPRC members during the pandemic, questions were developed with a view to scoping staff provision, extent and mode of service delivery, use of video-conferencing and associated challenges, and responsibility for post-COVID-19 rehabilitation. The survey was conducted between 20th September and 6th October 2020, and was publicised and disseminated via Twitter using the [@theACPRC](#) handle with the aim of promptly reaching as many respiratory physiotherapists working in PR services in the UK as possible.

It was requested that 1 team member completed the survey on behalf of their PR service, and consent was assumed based on completion of the survey. A summary of the responses from the 46 participants are appended ([Appendix 1](#)).

A call of interest to contribute to the development and review this document was communicated via email to the ACPRC editorial board and respiratory leaders' group late September 2020, seeking to recruit experienced respiratory physiotherapists working in PR. 12 reviewers were identified and subsequently 2 online meetings were held on 15th and 16th October 2020 to discuss the scope and contents of the document with those able to attend. Subsequently, the draft document was developed and 2 rounds of reviews were conducted over October and November 2020.

Furthermore, a rapid literature review was undertaken in order to inform practice and to identify any additional grey literature or relevant studies published following the release of the BTS guidance documents (Gardiner et al. 2020a; Singh et al. 2020a). The search terms used were: pulmonary rehabilitation, respiratory rehabilitation, tele-rehabilitation, remote delivery, and virtual.

## **Adapted models of service delivery**

It is recognised that the ability to deliver PR in the current circumstances is highly dependent on various local factors in addition to government imposed national and local guidelines. It is essential that PR services continue to adhere to the most up-to-date government guidance in order to minimise the risk posed by COVID-19 to both patients and staff (Department of Health & Social Care 2020b). The impact of the pandemic has led to the need for adapted, in some cases untested, models of service delivery and prioritisation. Further, services have already and will continue to be required to adapt to the varying levels of restrictions imposed for the foreseeable future. Although some evidence-based models of remote service delivery were developed and in use prior to the pandemic (including forms of tele-rehabilitation), these models may need to be adapted or modified according to current circumstances. An example of service adaptation in response to COVID-19 is available here (Nottinghamshire Healthcare NHS Foundation Trust 2020): <https://www.nottinghamshirehealthcare.nhs.uk/latest-news/covid19-drives-digital-innovation-in-pulmonary-rehab-3628>.

At the time of completion of the survey, 33% of participating services reported offering the exercise component of PR face-to-face within the patient's home, and 26% in a hospital or community site.

- Where feasible to do so, restarting face-to-face services is recommended due to the robust evidence of efficacy and benefits of face-to-face contact. The BTS have produced guidance regarding the safe resumption and continuation of respiratory services (BTS 2020) and the delivery of face-to-face PR during the pandemic (Singh et al. 2020a, pp. 3–6).
- Where it is feasible, the delivery of outdoor exercise testing and/or exercise training may be considered based on local policy and procedures, including risk assessment. Consideration must be given to social distancing measures, weather limitations, and individual participant risk assessment.

We recommend the following model of service prioritisation for those able to offer limited face-to-face services:

**Priority 1:** Exercise testing (assessment) with prioritisation of high-risk groups\* as required.

*As able then add:*

**Priority 2:** Exercise testing (assessment) with all groups (usual prioritisation protocol).

*As able then add:*

**Priority 3:** Exercise component with prioritisation of high-risk groups\* as required.

*As able then add:*

**Priority 4:** Exercise component with all groups (usual prioritisation protocol).

*As able then add:*

**Priority 5:** Education component (complete face-to-face PR service).

\*High-risk groups (patient groups likely to be at increased risk of adverse events).

- Complex needs/multi-morbidity (for example, cognitive/balance/sensory impairment, concomitant cardiac/neurological disease).
- At risk of exertional desaturation <90% (for example, resting SpO<sub>2</sub> ≤92% or home oxygen user, pulmonary fibrosis, post-acute exacerbation, post-thoracic surgery).

Please note that this is intended as a guide only; individual risk assessment as per usual protocols is required.

Many services are now offering various methods of remote delivery to both ensure meeting increased demand and, in some cases, services are still unable to provide any face-to-face

option. Subject to appropriate risk management procedures, remote delivery options may be used for triage, assessment, exercise and education components of PR (CSP 2020b).

Survey participants reported using supervised 'virtual' rehabilitation via video-conferencing (50%), unsupervised exercise programmes with telephone support (63%) or app/web-based platform (50%) for remote delivery. Risk mitigation covering inclusion and exclusion criteria is considered within the Governance section of this document. The remote delivery of the separate components of PR (assessment and re-assessment, exercise and education) will be covered in further detail in part 2.

It is essential to evaluate remote delivery options following implementation to inform future service delivery planning, minimising health inequalities, supporting case for technological hardware and software, identifying training needs of staff and demonstrating cost (CSP 2020b).

## **Considerations in setting up a remotely delivered service:**

- Alignment with BTS quality standards for PR (BTS 2014).
- Use of existing products and services provided by your trust where possible. Consult your local IT service in the consideration of a new product or service.
- Any new forms of delivering care should go through local governance procedures; including quality, data protection, and equality impact assessment.
- Consider the digital literacy, skills and confidence of staff, and the provision of support to ensure competence to safely and effectively utilise digital tools.
- Workspace and equipment required to safely and effectively deliver the service.
- Risk versus benefit of providing service, with consideration of feasibility and sustainability.
- Information and guidance for staff (including standard operating procedure).
- Communicating changes to service with internal and external stakeholders.

## **Governance**

### **Risk assessment/mitigation**

It is essential to regularly review the UK government website to ensure that service delivery continues to adhere to the latest guidance and associated measures to reduce transmission of COVID-19 (Department of Health & Social Care 2020b): [www.gov.uk/coronavirus](http://www.gov.uk/coronavirus).

### *Face-to-face services*

If any components of service delivery are being provided face-to-face, a COVID-19 screening protocol is essential to reduce risk of transmission. The protocol should reflect the latest guidance for households with a possible or confirmed COVID-19 infection (Public Health England 2020) and local guidance, to include:

- Contacting the patient one or 2 days before the planned face-to-face session to screen for patient and/or household member symptoms of COVID-19.
- Acute symptom screening on arrival.

- Advice to be given if the patient or household member has symptoms of COVID-19.
- Advice to be given to the patient regarding the safe resumption of face-to-face contact. The BTS have produced guidance regarding the restarting conventional PR and associated risk mitigation procedures (Singh et al. 2020a).

### *Remotely delivered services*

If any components of service delivery are being provided remotely, comprehensive risk assessment must be conducted in line with local policy and procedures. Standard operating procedure (SOP) for any pre-existing remotely delivered components should be reviewed and updated (an appendix could be used to document this). Many PR services are offering both digital and non-digital modes of remotely delivered care. Identification and mitigation of potential hazards associated with each type and model of remote service delivery offered must be considered.

The BTS has produced a checklist of safety precautions for remotely supervised interventions (Singh et al. 2020a). Important considerations in mitigating risk associated with the delivery of remotely supervised PR include:

- Individual patient risk assessment; [Table 1](#) details recommended inclusion and exclusion criteria.
- Obtain informed consent (verbal or written) to remotely supervised PR ensuring the patient has a clear understanding of the intervention and associated risks and benefits. An example consent form for remotely supervised PR is appended ([Appendix 2](#)).
- Ensure the patient has a clear understanding and awareness of potential adverse events. Ensure to include procedure for medical emergency during remotely supervised contact within your SOPs. This should include appropriate review during and after the session to ensure the patient's well-being in the case of observed adverse events or sudden unexpected video disconnection.
- Ensure to provide the patient with clear information and instructions regarding the use of the video-conferencing/other digital platform. An example patient information document (Microsoft Teams) is appended ([Appendix 3](#)).
  - Where possible, providing the patient with an opportunity to do a 'test run' prior to commencing their programme is advisable. Ensure to familiarise the patient with the 'speaker view' function of the video-conferencing tool to facilitate optimal visualisation of the instructing clinician.
  - In accordance with local privacy and data protection policy, ensure to advise patients against recording their group session as doing so in the absence of explicit consent from all members of the group would be considered a breach of confidentiality (NHSX 2020a).
- Consider the use of a patient self-assessment checklist to prompt review of symptoms, preparation of equipment and environment, and access to support, prior to starting a session. An example checklist of this is appended ([Appendix 4](#)).

- Where remote monitoring is being used, patients should be provided with equipment that has been appropriately maintained and checked, as well as quarantined/cleaned in line with local infection control policy. Patients should be provided with the relevant guidance and instructions, and technique checked prior to commencing their programme to ensure safe and effective use.
- Risk assessment of available workspace and equipment to be used for the delivery of remotely supervised interventions is essential.
  - Consideration must be given to the screen size of the device to be used by the clinician (for example, laptop, desktop) in assessing staff to patient ratio requirement for group interventions. Dependent on individual patient risk assessment, a ratio of 1:4 may be appropriate when using a laptop, whereas 2:8 may be optimal in using a large TV screen, enabling one member of staff to focus on monitoring.
  - The use of headsets may be beneficial in optimising audio quality.
  - Consideration must be given to the background environment seen and heard by patients in order to ensure privacy, avoid unwanted distractions, and optimise instructive interaction with patients. Avoid windows/mirrors being in view, and take appropriate action to minimise any significant background noise. The volume of any music used in exercise sessions must be assessed to ensure the instructing clinician can be heard clearly by all; with consideration for any participants with any hearing impairment.
  - Training needs of staff expected to use video-conferencing (and/or other digital platforms) must be assessed and appropriate support provided.
  - Consideration of individual risk assessment is essential in grouping patients for exercise interventions based on monitoring requirements.
- In instances where the ability to meet service demand is significantly impacted due to imposed restrictions resulting in breach of maximum waiting times (BTS 2014), this must be logged on the local trust's risk register in line with local policy and procedure.
- A health inequalities impact assessment is recommended in order to support the identification of approaches to reduce discrimination and improve access.

**Table 1: Recommended inclusion and exclusion criteria for remotely supervised exercise testing and exercise component of PR.**

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**Inclusion**

- Access to device capable of supporting the video-conferencing platform and reliable internet connection.
- Adequate digital literacy and competence to use video-conferencing and email, or reliable support of digitally competent family member/carer.
- Able to safely follow instructions in English or be supported by family/carer or remote interpreting service.
- Safe environment within home to perform exercise test/exercise programme.
- Able to mobilise and use any home exercise equipment safely and independently.
- Consents to participate in remote exercise testing/virtual PR programme.
- Able to provide informed consent and report adverse events.

**Exclusion**

- Significant unstable cardiac or other disease that would make exercise unsafe or prevent programme participation.
  - Cognitive impairment with inability to follow instructions safely.
  - Significant sight or hearing impairment (individual risk assessment where indicated).
  - Impaired balance with risk of falls without supervision.
  - Identified as high risk of exertional desaturation  $<90\%$  (for example, resting  $SpO_2 \leq 92\%$  or home oxygen user, pulmonary fibrosis, post-acute exacerbation) and unable to remotely monitor pulse oximetry.
- 

Please note that this is intended as a guide only; individual risk assessment as per usual protocols is required.

**Workforce**

Many PR services faced re-deployment of staff into the acute hospital and rapid discharge sectors to support the first wave of COVID-19. This came with increasing demand on hospital services and the drive to discharge as many suitable patients as possible back into the community setting to avoid the NHS being overly burdened. Though required at the time, the recommended temporary suspension of face-to-face PR services caused significant impact for the staff involved. Many staff were re-deployed to areas and specialities outside of their usual remit and/or working unusual shift patterns in highly stressful environments. Although staff have pulled together to support the wider NHS team in acute service delivery, the significant impact on morale and staff well-being must be recognised. Trusts have been pro-active in supporting staff with increased access to well-being resources and counselling support (NHS Leadership Academy 2020): <https://people.nhs.uk>. Teams need to consider easy access to well-being support of all staff who have worked through the pandemic, regardless of the role they have provided.

This impact must continue to be considered as the UK endures a second wave of COVID-19, which is coinciding with flu season and winter pressures. Services have also to contend with the significant impact this disruption to services has caused on waiting lists and waiting times for PR. Some may face further redeployment in the future; services need to plan for this and how they can reduce this impact in the future. The utilisation of the existing workforce in a different way can go a long way in supporting the reduction of the backlog.

Many services are receiving referrals for post-COVID-19 patients; 57% of survey respondents reported being responsible for the delivery of a post-COVID rehabilitation service. Dependent on the provision of additional resource, the potential impact on existing capacity and demand issues must be considered. Guidance on the delivery of post COVID-19 rehabilitation using an adapted PR approach has been produced by the BTS (Singh et al. 2020b).

PR teams also need to consider the sustainability of services and how different tiered lockdown restrictions may impact on service delivery. Social distancing measures have reduced throughput of patients in face-to-face programmes. In some instances, remotely delivered services may play a role in managing service demand and reducing waiting times. As tier restrictions increase, some services may face loss of indoor venues; for example, in the Liverpool City region, all gyms and leisure centres were closed including those used for local PR services during tier 3 restrictions (prior to the second national lockdown). The provision of remotely delivered PR, home visits, and group outdoor activities (as weather permits) needs to be considered (and regularly reviewed) at a local level based on what can feasibly be offered by the service within the area they serve, as and when restrictions are updated.

Services offering any remotely delivered components of PR must ensure staff are suitably digitally literate and competent in using digital platforms used by the trust. Appropriate training and support needs to be provided (NHSX 2020b): [www.nhsx.nhs.uk/covid-19-response/technology-nhs/web-based-platform-which-offers-video-calls-services/](http://www.nhsx.nhs.uk/covid-19-response/technology-nhs/web-based-platform-which-offers-video-calls-services/).

Upskilling existing support staff within services is a practical approach in supporting the continued service delivery. This serves to strengthen the workforce and ensure services can continue to support increasing numbers of patients. Developing skills and expanding capabilities within the existing workforce will create more flexibility, boost morale and support career progression (NHS England 2020a): <https://www.england.nhs.uk/ourpeople/online-version/new-ways-of-working-and-delivering-care/making-the-most-of-the-skills-in-our-teams/>. An example of band 4 competencies and duties for the delivery of virtual PR is appended (Appendix 5). Supporting staff to develop motivational interviewing skills can ensure teams are supporting the Making Every Contact Count (MECC) agenda and supporting increased uptake of PR (Health Education England 2020a). Staff training and support resources are detailed within the 'Resources for remote delivery' section of this document.

Utilising staff who may be shielding for remote assessments and interventions has been implemented by a number of services; this has increased capacity and ensured continuation



of service delivery. A number of teams have opened this opportunity to shielding staff who may not routinely work within the PR service, but following appropriate training and up-skilling, this has enabled staff to be utilised in direct patient care and enabled service to continue to run.

There is a large and potential under-utilised resource from the student physiotherapy body. Placements have been cancelled in some areas and changed significantly in others (CSP COVID-19 survey 2020). Students can be utilised (again with training and development of an educator) to support the delivery of remote interventions. They are a highly trained and dedicated future workforce that could be mobilised to support the PR delivery. 'What makes a great placement' in the context of the COVID-19 response including virtual health-care delivery and placement models has been considered by the CSP (CSP 2020c): [www.csp.org.uk/frontline/article/student-placements](http://www.csp.org.uk/frontline/article/student-placements).

## Resources for remote delivery

The pandemic has seen a rapid shift to remote consultation in primary and secondary care with the aim of reducing unnecessary face-to-face attendances; serving to accelerate work associated with the widespread implementation of technology-enabled care (NHSX, 2020b). Using local trusts' pre-existing digital facilities has several benefits including: staff familiarity, reduce training costs, use of existing authentication processes and data management protocols (NCSC, 2020). Healthcare professionals must adhere to their local trust's clinical and information governance guidance in the use of remote delivery platforms. This section provides an overview of the available resources for the remote delivery of PR. Part two of this guidance document will cover further detail and evaluation of platforms for remote delivery.

### Video conferencing platforms

- **Microsoft Teams** (replacing Skype for Business): [www.microsoft.com/en-gb/microsoft-365/microsoft-teams/group-chat-software](http://www.microsoft.com/en-gb/microsoft-365/microsoft-teams/group-chat-software).
  - Allows you to host audio, video, and web conferences with anyone inside or outside your organisation.
  - Servers based in EU rather than US which helps with GDPR compliance.
  - Requires purchase of Office 365: Business Essentials (£3.80/user/month), Business Premium (£9.40/user/month).
- **Attend Anywhere**: [www.attendanywhere.org.uk](http://www.attendanywhere.org.uk).
  - Your Trust must register via NHS Improvement to get access.
- **Zoom**: <https://zoom.us>.
  - Basic free plan: unlimited 1:1 meetings, limited to 40 minutes on group meetings, up to 100 participants.
  - Paid plans are available including Zoom for healthcare: <https://zoom.us/healthcare>.

- **Webex:** [www.webex.com](http://www.webex.com).
  - Basic free plan: unlimited meetings with up to 100 participants, unlimited time per meeting.
  - Paid plans are available including Webex for telehealth: [www.webex.com/industries/healthcare.html](http://www.webex.com/industries/healthcare.html).
- **OneConsultation:** <https://modalitysystems.com/software/oneconsultation-healthcare/>.
  - Fully managed and customisable virtual consultation service using Microsoft 365 technology.
  - One-month free trial available.
- **accuRx:** [www accurx.com](http://www accurx.com).
  - Free services include: individual text messaging, video consultation, digital documents, medical surveys.
  - Paid plan (accuRx plus) includes: patient triage, batch messaging and appointment reminders, wider range of surveys.

(Gardiner et al. 2020a; NHSX 2020b).

### Web-based platforms

- **myCOPD:** [www.nhs.uk/apps-library/mycopd/](http://www.nhs.uk/apps-library/mycopd/).
  - Online COPD self-management app platform comprising education programmes, inhaler technique videos, weather/pollution alerts, and home rehabilitation classes (6-week graduated programme).
  - Commissioned in some areas (free access for patients with COPD). Able to purchase myCOPD license via App Store/Google play for one-off payment of £39.99.
  - Related evidence: Bourne et al. 2017.
- **SPACE for COPD:** [www.spaceforcopd.co.uk](http://www.spaceforcopd.co.uk).
  - Self-management Programme of Activity, Coping and Education for COPD: manual and online self-management programme.
  - Contains a range of educational topics including: information about medication, breathing control, exercise and nutritional advice. Individuals are encouraged to set goals and progress through a prescribed exercise programme and achieve weekly targets.
  - Additional features include a glossary, frequently asked questions, a moderated discussion forum, an 'Ask the expert' facility which provides email access to a multi-professional team of experts, and a news blog (University Hospitals of Leicester NHS Trust 2020).
  - Contact via website to register for paid access to manual and/or online programme.
  - Related evidence: Chaplin et al. 2017; Horton et al. 2018; Bourne et al. 2020.

- The Innovation Agency (2020) present digital options seeking to improve the patient's experience of PR. Examples include remote-monitoring (for example, CliniTouch Vie) and exercise prescription apps (for example, Rehab Guru); further information can be found on their website (Innovation Agency 2020): [www.innovationagency.nhs.uk/innovation-insight-pulmonary-rehabilitation](http://www.innovationagency.nhs.uk/innovation-insight-pulmonary-rehabilitation).

### Education resources

- ACPRC:
  - Patient information leaflets (ACPRC 2011): [www.acprc.org.uk/publications/patient-information-leaflets/](http://www.acprc.org.uk/publications/patient-information-leaflets/).
- Asthma UK: [www.asthma.org.uk/advice/inhaler-videos](http://www.asthma.org.uk/advice/inhaler-videos).
- British Lung Foundation (BLF): [www.blf.org.uk/support-for-you](http://www.blf.org.uk/support-for-you).
  - Stay Active and Stay Well (BLF 2017): [www.blf.org.uk/support-for-you/keep-active/exercise-video](http://www.blf.org.uk/support-for-you/keep-active/exercise-video).
  - Coronavirus and COVID-19 (BLF 2020): [www.blf.org.uk/support-for-you/coronavirus](http://www.blf.org.uk/support-for-you/coronavirus).
- British Thoracic Society:
  - PR resource pack (Gardiner et al. 2020b): [www.brit-thoracic.org.uk/about-us/covid-19-information-for-the-respiratory-community/](http://www.brit-thoracic.org.uk/about-us/covid-19-information-for-the-respiratory-community/).
- European Lung Foundation (ELF): [www.europeanlung.org/en/lung-disease-and-information/lung-diseases/](http://www.europeanlung.org/en/lung-disease-and-information/lung-diseases/).
- Living well with COPD: [www.livingwellwithcopd.com](http://www.livingwellwithcopd.com).
- Lung Foundation Australia: <https://pulmonaryrehab.com.au/importance-of-education/education-topics/>.
- myope: [www.nhs.uk/apps-library/mycopd/](http://www.nhs.uk/apps-library/mycopd/).
- SPACE for COPD: [www.spaceforcopd.co.uk/](http://www.spaceforcopd.co.uk/).

### Staff training and support resources

#### Managing health and well-being:

- <https://people.nhs.uk> (NHS Leadership Academy 2020).
- [www.england.nhs.uk/ournhspeople/online-version/lfaop/support-during-covid/](http://www.england.nhs.uk/ournhspeople/online-version/lfaop/support-during-covid/) (NHS England, 2020b).
- [www.acprc.org.uk/resources/covid-19-information/self-care-for-staff/](http://www.acprc.org.uk/resources/covid-19-information/self-care-for-staff/) (ACPRC 2020).

#### Supporting redeployment and upskilling:

- [www.england.nhs.uk/ournhspeople/online-version/new-ways-of-working-and-delivering-care/making-the-most-of-the-skills-in-our-teams/](http://www.england.nhs.uk/ournhspeople/online-version/new-ways-of-working-and-delivering-care/making-the-most-of-the-skills-in-our-teams/) (NHS England 2020a).
- [www.e-lfh.org.uk/programmes/covid-19-recovery-and-rehabilitation/](http://www.e-lfh.org.uk/programmes/covid-19-recovery-and-rehabilitation/) (Health Education England 2020b).
- [www.nhsx.nhs.uk/covid-19-response/technology-nhs/web-based-platform-which-offers-video-calls-services/](http://www.nhsx.nhs.uk/covid-19-response/technology-nhs/web-based-platform-which-offers-video-calls-services/) (NHSX 2020b).
- [www.vc.scot.nhs.uk](http://www.vc.scot.nhs.uk) (NHS Scotland 2020).

- [www.makingeverycontactcount.co.uk](http://www.makingeverycontactcount.co.uk) (Health Education England 2020a).
- Free training is available: [www.eventbrite.co.uk/e/register-your-interest-introduction-to-motivational-interviewing-202021-tickets-56111935309](http://www.eventbrite.co.uk/e/register-your-interest-introduction-to-motivational-interviewing-202021-tickets-56111935309).

### Other resources

Coronavirus guidance for clinicians and NHS managers:

- [www.england.nhs.uk/coronavirus/?priority-taxonomy=774cee22-d896-44c1-a611-e3109c-ce8eae](http://www.england.nhs.uk/coronavirus/?priority-taxonomy=774cee22-d896-44c1-a611-e3109c-ce8eae) (NHS England and NHS Improvement 2020).

PR SOP examples:

- [www.respiratoryfutures.org.uk/resources/regional-and-local-resources/pulmonary-rehabilitation-standard-operating-procedures-sops/](http://www.respiratoryfutures.org.uk/resources/regional-and-local-resources/pulmonary-rehabilitation-standard-operating-procedures-sops/).

Managing questionnaires online:

- LimeSurvey: [www.limesurvey.org/en/](http://www.limesurvey.org/en/).
  - Free online survey software (paid plans available).
- Microsoft Forms: [www.microsoft.com/en-gb/microsoft-365/online-surveys-polls-quizzes](http://www.microsoft.com/en-gb/microsoft-365/online-surveys-polls-quizzes).
  - Requires purchase of Office 365.
  - Can be used for surveys, polls, and quizzes.
- REDCap: [www.project-redcap.org](http://www.project-redcap.org).
  - Secure web application for building and managing online surveys and databases. Some PR services are using this to distribute their assessment questionnaires to patients.

Student placement guidance:

- [www.csp.org.uk/professional-clinical/practice-based-learning](http://www.csp.org.uk/professional-clinical/practice-based-learning) (CSP 2020c).

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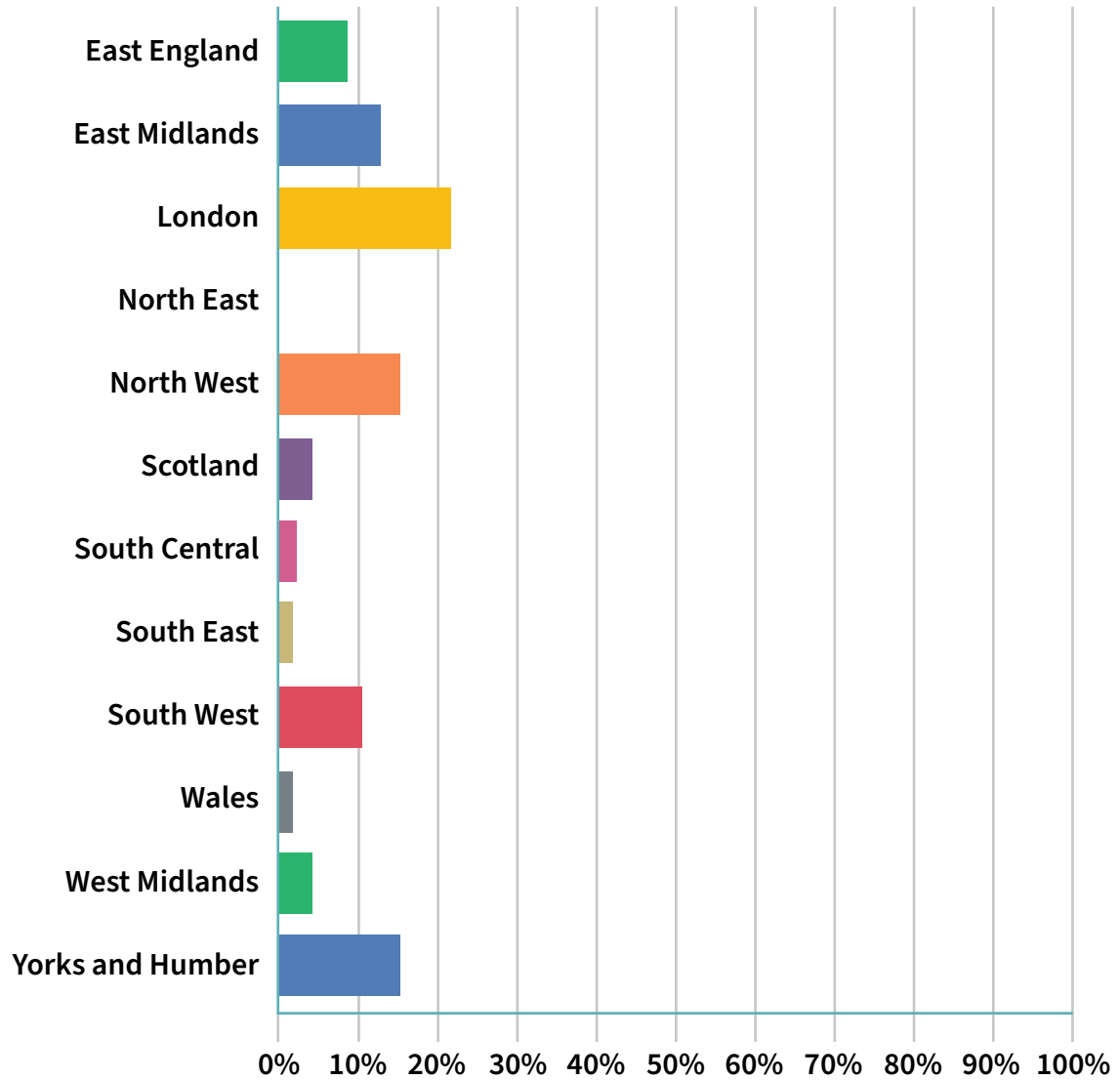
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# Appendices

## Appendix 1: Summary of survey responses (ACPRC pulmonary rehabilitation provision during COVID-19 and beyond!)

### Question 1

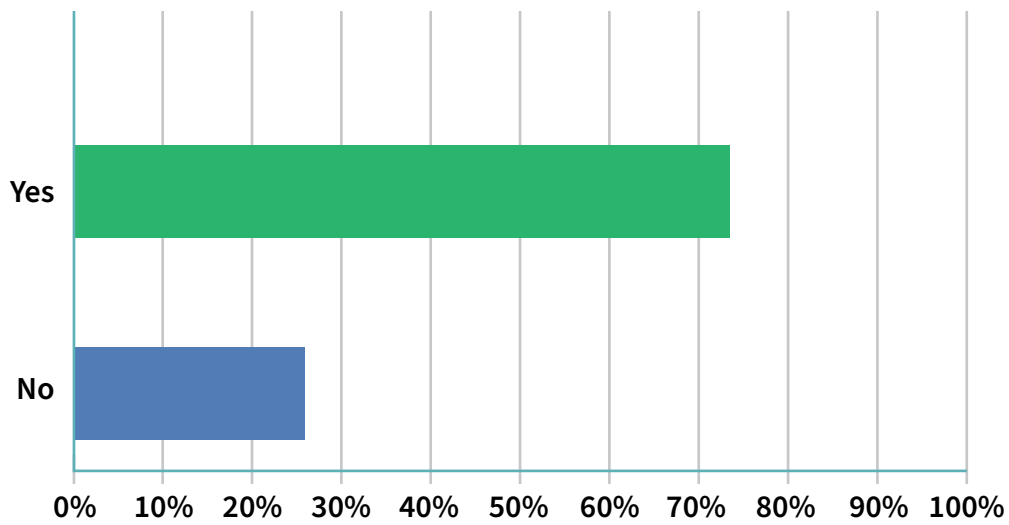
Which region do you work in?



Answered: 46. Skipped: 0.

**Question 2**

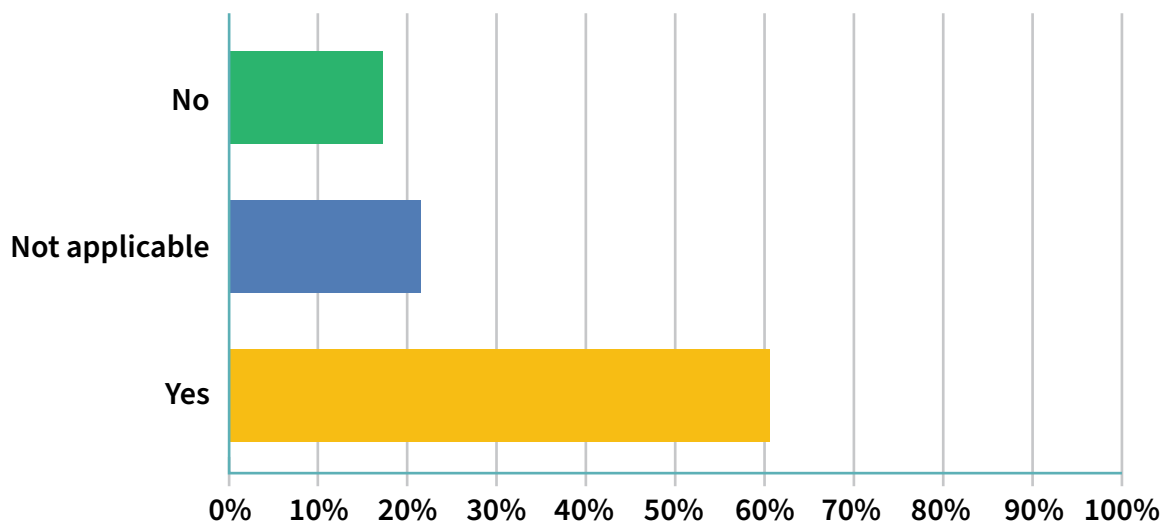
Have you or any members of your pulmonary rehabilitation team been redeployed at any points since the outbreak of COVID-19?



Answered: 46. Skipped: 0.

**Question 3**

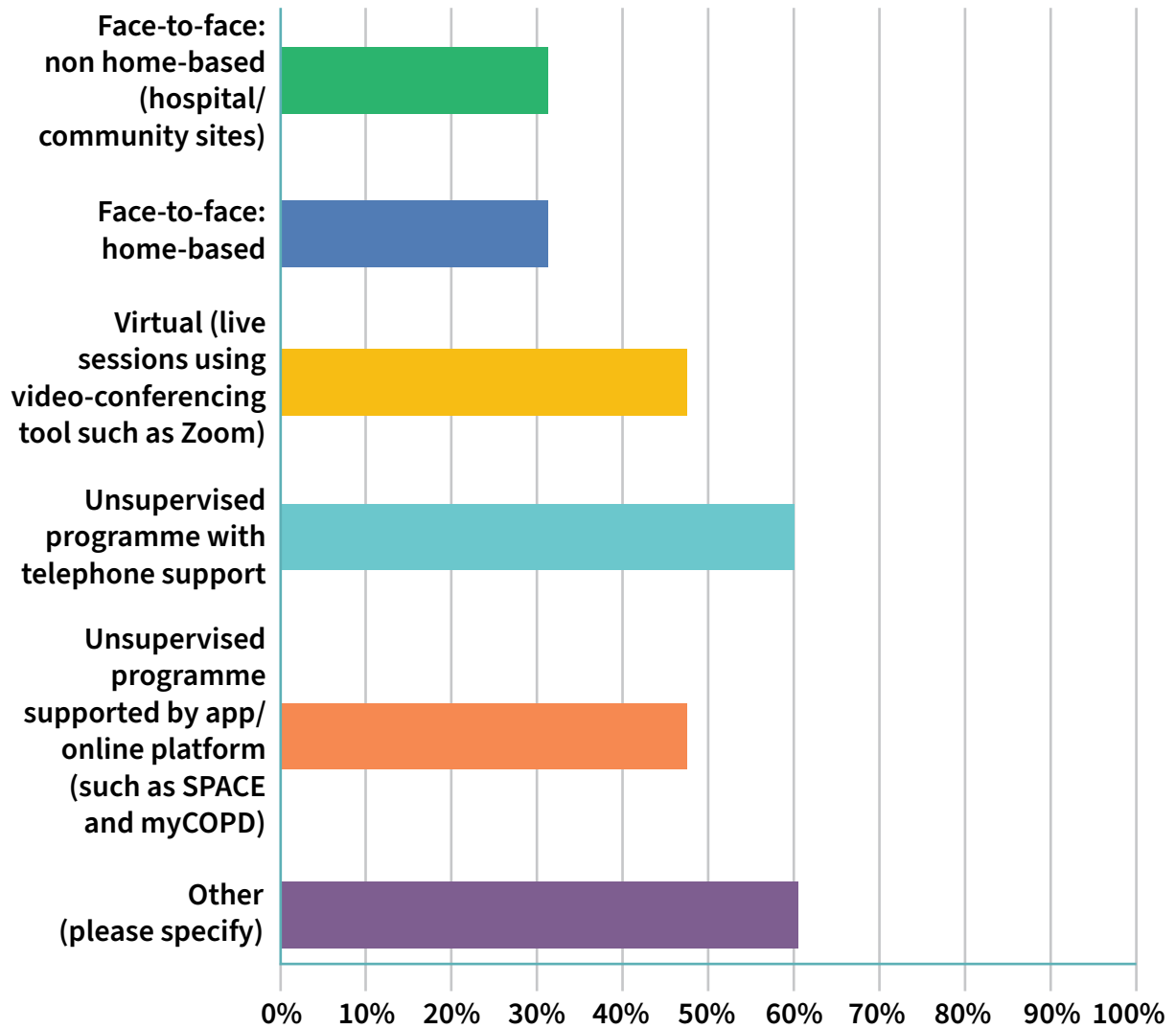
If you answered yes to Question 2, has your staffing provision now returned to pre-COVID-19/‘usual’ levels?



Answered: 46. Skipped: 0.

Question 4

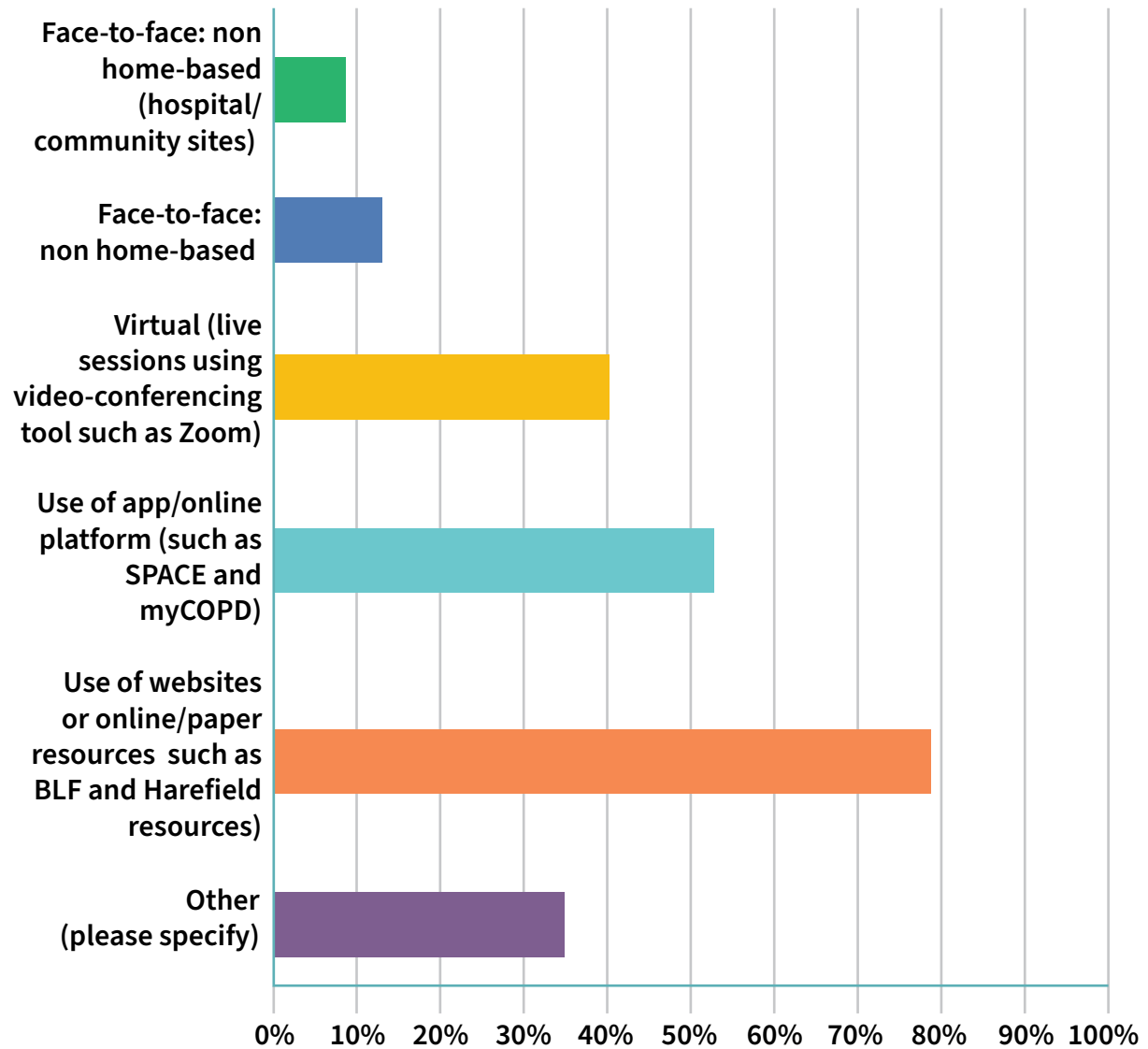
What form(s) of PR delivery is your service currently offering for exercise?



Answered: 46. Skipped: 0.

Question 5

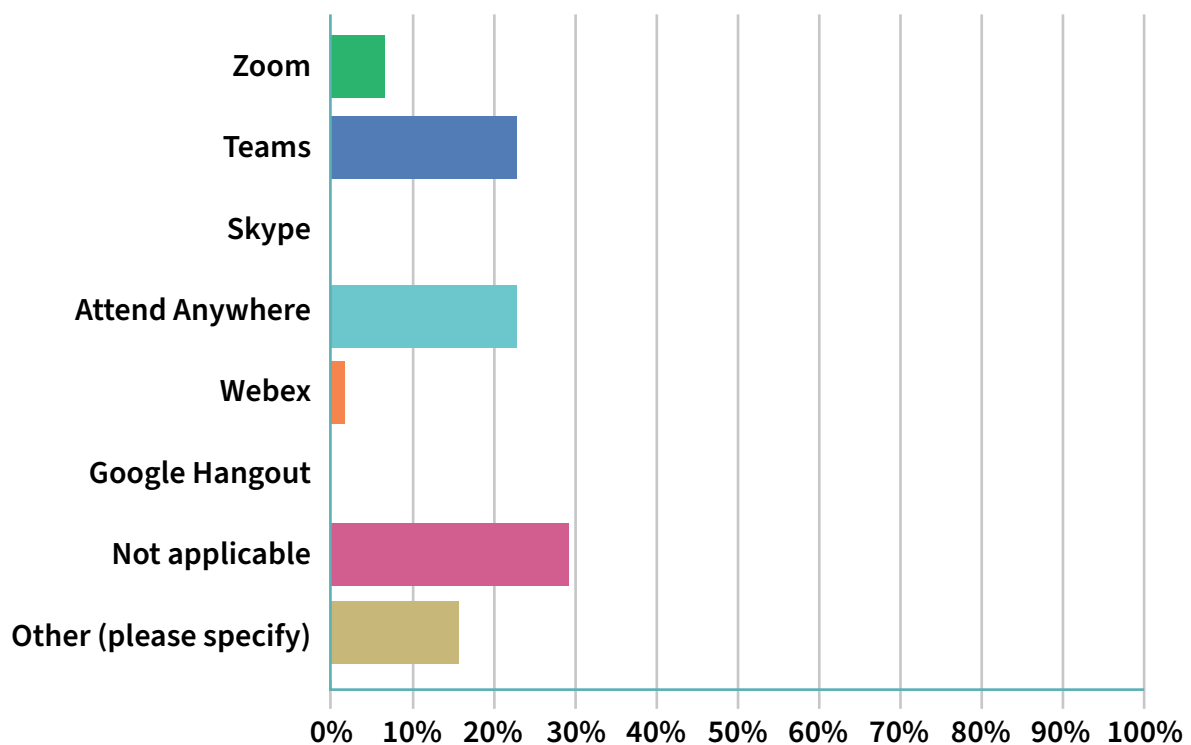
What form(s) of PR delivery is your service currently offering for education?



Answered: 46. Skipped: 0.

### Question 6

If you're providing a 'virtual' rehab service, which video-conferencing platform are you using?



Answered: 44. Skipped: 2.

### Question 7

If you're providing a 'virtual' rehab service, what challenges have you experienced in delivering this? (for example, upskilling staff, limited resources, poor uptake, and so on). (Please move on to Question 8 if you're not currently providing a 'virtual' service.)

- 14/33 poor uptake by patients.
- 13/33 limited access to devices/internet (patient).
- 9/33 technical issues.
- 8/33 need for upskilling staff and/or appropriate space.

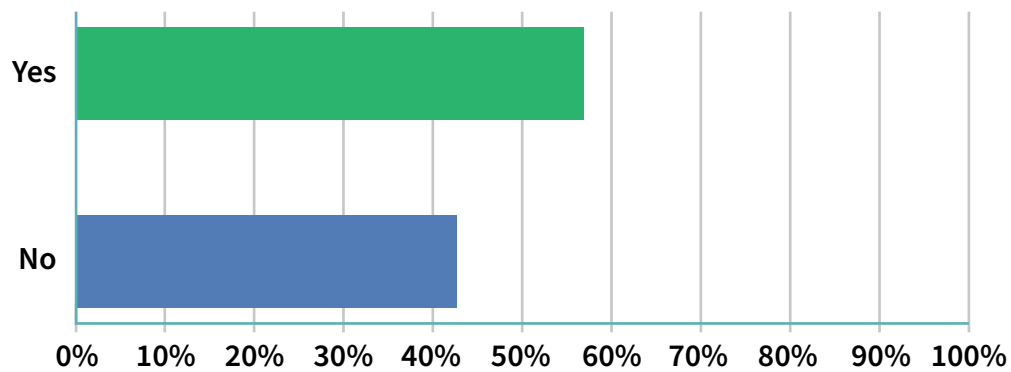
### Question 8

If you answered Yes to Question 8, has your service been provided with any form of additional resources to support this? (for example, staffing, equipment). (If you answered No to Question 8, please move on to Question 10).

- 18/29 reported 'no'.
- 11/29 reported provision of some form of additional resource including: pulse oximeters, iPads to loan, headsets, 4G sim cards for laptops, camera equipment, physical screens for use in face-to-face exercise sessions, additional exercise equipment, additional laptops, large smart touch screen.

### Question 9

Is your service currently responsible for the provision of any form of post-COVID rehabilitation? (not associated with 'business as usual' participants).



### Question 10

Are there any changes to your service (that have occurred as a result of COVID-19) that you think will either remain in place or continue to evolve long-term?

- 28/45 virtually delivered components of PR service.
- 10/45 remote (telephone or video-conference) subjective/'pre' assessment.
- 4/45 increased use of web-based platforms.

## Appendix 2: Example consent form for remotely supervised PR



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**Pulmonary Rehabilitation**

**Harefield Hospital**

Hill End Road

Harefield

UB9 6JH

T: +44 (0)1895 828851

F: +44 (0)1895 828889

Email: [rbh-tr.harfieldpr@nhs.net](mailto:rbh-tr.harfieldpr@nhs.net)

I \_\_\_\_\_ agree and consent to the following:

- I am voluntarily participating in an initial Pulmonary Rehabilitation assessment via video call.
- I understand that this is a new initiative and the background and benefits of the programme have been explained to me.
- I have access to a technological device with real-time video camera function and internet connection, and can operate this independently or with the help of a household member.
- I am willing to have a designated area at home openly displayed to a member of the pulmonary rehabilitation team during videoconferencing sessions.
- I understand that when participating in any exercise/objective tests there is a risk of injury.
- I will ensure that an able-bodied person will be present in the house throughout the entire assessment.
- I will ensure that I have access to a home telephone or mobile during the video call for contact in case of an emergency or loss of videoconferencing contact.
- I am taking part at my own risk and assume all risk of injury to myself.
- The Royal Brompton and Harefield NHS Foundation Trust and physiotherapists on this programme accept no liability.

**Name (Print)**

\_\_\_\_\_  
**Signature**

\_\_\_\_\_  
**Date**

\_\_\_\_\_



[www.rbht.nhs.uk](http://www.rbht.nhs.uk)



@RBandH





# Appendix 3: Example patient information document on use of video-conferencing platform

## Pulmonary rehabilitation – virtual classes

Welcome to the pulmonary rehabilitation virtual classes!

We are holding our virtual classes using the video conferencing platform called Microsoft Teams. There are a few steps we will ask you to follow to join our virtual classes and to make sure that you can exercise safely at home.

Please read this document in full.

Look out for the  icon to show you that you need to do something. We have also highlighted some terminology using this icon .

### Step 1 Consent to join the virtual classes

After your pulmonary rehabilitation assessment, which is carried out over the telephone or in your home, we need to formally have your consent to join our virtual classes and take part in the exercises. This is done by emailing the pulmonary rehabilitation team, and it also allows us to double-check that we have the correct email address for you.

 Please email us at [wsh-tr.pulmonaryrehabilitation@nhs.net](mailto:wsh-tr.pulmonaryrehabilitation@nhs.net)

### Step 2 How to join our virtual classes

We are holding these classes using Microsoft Teams which is a secure and safe video conferencing application. You will be joining a group of patients with similar breathing conditions and will be able to see them taking part in the exercises and they will be able to see you.

We will be sending you an invitation to join our classes by email. The email will come from the pulmonary rehabilitation team and will use the email address from step 1 so you will know it is from us. The email will contain a link that allows you to join the virtual classes and the link will remain the same for the duration of the programme. The link looks like this:

#### [Join Microsoft Teams Meeting](#)

 Please find this email before the class starts.

You do not need to download any special software to do join in, although there is an app for Microsoft Teams available should you wish to download and use this. There are instructions here for both options. Microsoft Teams will call our class a 'meeting' – this is fine!

You will need to use a mobile phone, tablet or computer, with a webcam and microphone – quite often these are included within modern computers and tablets.

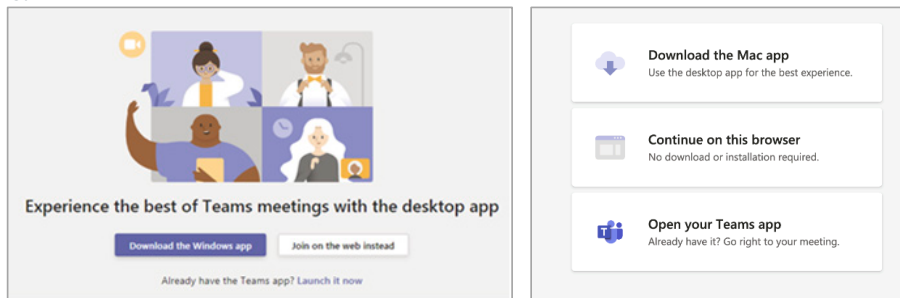
Putting you first

### Using a web browser – no need to download any software

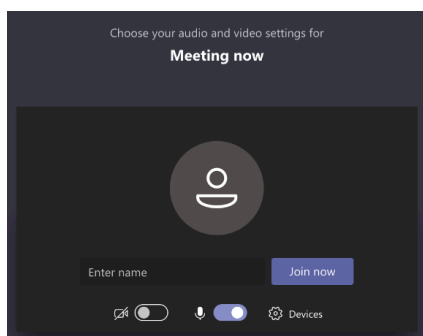
1. Open your email programme and find the email from the pulmonary rehabilitation team which includes the link.
2. Left mouse click on the link to the Teams meeting, which will look similar to this:

#### [Join Microsoft Teams Meeting](#)

3. Your web browser should open at the following screen (this depends on what type of computer you are using):



4. Click on 'Join on the web instead' or 'Continue on this browser'  
You may be prompted to allow access to your camera and microphone. Please choose 'allow' so we are able to see and hear you!
5. Enter your full name and click 'Join now'



6. You may be asked to wait until someone lets you into the class.
7. When you have joined, a toolbar will display showing your camera and microphone being switched on or off, make sure they are switched on to start with – it is shown here as off.



Putting you first

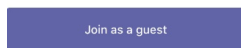
### Using the Teams app

1. Download and install the Teams app from your app store (e.g. Apple App Store or Google Play Store) on your device.
2. Open your email app on your mobile phone or tablet.
3. Open the email from the pulmonary rehabilitation team and press on the link which may look like this:



#### Join Microsoft Teams Meeting

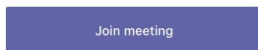
4. The Teams app should open.
5. You should select the option to 'Join as a guest'.



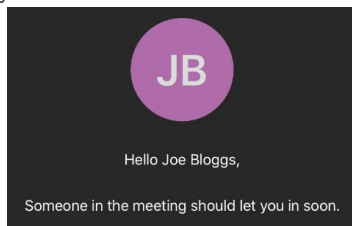
6. Enter your full name then click on 'Join meeting'

Type your name, then select  
Join meeting.

Joe Bloggs



7. You may be asked to wait until someone lets you into the meeting.



8. You will need to enable your camera and microphone so press on these icons to turn them on if needed – they are shown as crossed through if not enabled.



### Glossary

- 💡 **Web browser** – used for looking up information on the internet. Examples are Google Chrome, Internet Explorer, Safari, Microsoft Edge.
- 💡 **Mobile device** – this includes smartphones and tablets, such as iPhones, iPads, Android phones and tablets.

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### Step 3 About the virtual classes

Our pulmonary rehabilitation classes are held on **\*\*DAY\*\*** at **\*\*\*time\*\*** for xxx weeks.

The classes will last two hours at most so please be available for this whole period of time. It is important to join as many classes as you can in order to gain the most benefit.

The virtual classes will be available to join **15 minutes early** so you can test out joining using Microsoft Teams. We do need to be able to **see and hear you** to make sure you are okay during the exercises. We may ask you to mute (turn off your microphone) during the exercises as it could get quite noisy, but the therapist will show you how to do this.

### Step 4 Do you need any special equipment?

The quick answer is no! The exercises are designed so you can complete them at home, but it is helpful to have some items at hand to use during the class.

**Please have these items ready to use before the class starts**

- Theraband – you can find this in your starter pack
- Drink of water
- Blue inhaler
- GTN spray, if prescribed
- Oxygen, if prescribed
- A chair close by in case you need to sit down
- BORG breathlessness scale– you can find this in your starter pack
- Record of exercise sheet and a pencil or pen

Putting you *first*

## Step 5 Before you start the class

Please consider the following before each class starts:



Do you feel well today? If not, do not exercise and contact the team via the CCC.



Have you had breakfast or lunch? A light meal a couple of hours prior to class is ideal.



Do you have enough space? Have you removed rugs?



Is there a chair you can hold the back of for balance or a kitchen worktop?



Please shut pets away so they are not a trip hazard!



Have you had all your prescribed medications, including inhalers?



Have a glass/bottle of water and maybe a towel close by as you may sweat slightly.



Have you got good fitting shoes and appropriate clothing on?



Place a telephone nearby or make sure you are wearing your pendant alarm



Make sure that a family member, friend or carer is aware of the times that you are exercising

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## Step 6 During the exercise part of the class

Please consider remember the following whilst you are exercising – we will remind you as well!



Make sure you have your blue inhaler, GTN spray and oxygen (if prescribed) nearby



If you start to feel unwell, stop the exercise and sit down. Alert the staff.



Have the sound muted during the exercise. If you want to ask any questions, remember to unmute so we can hear you.



If you feel you are above a BORG 3 or 4 before the time is up, please take time to rest and recover before continuing.

Most of all have fun and enjoy some gentle exercise!

## Step 7 Keep the pulmonary rehabilitation team up to date

Please contact the pulmonary rehabilitation therapists prior to the class to discuss:

- Any changes to medications
- If you have felt unwell
- New joint or worsening joint pains
- If any new tests have been arranged for you by your GP

We would like to remind you that this is a group class, albeit a virtual one. Please avoid discussing personal matters during the virtual group as we can contact you separately about these if needed. This helps protect your confidentiality.

### Contact information

The best way to contact the pulmonary rehabilitation team is by calling the Suffolk Community Healthcare CCC on [0300 123 2425](tel:03001232425)

The email address for the pulmonary rehabilitation team is not monitored, and is only used to receive consent emails from step 1, and to send out the links to the virtual meetings. It should not be used to contact the pulmonary rehabilitation team otherwise.

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## Appendix 4: Example of remotely supervised PR patient self-assessment checklist



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### Virtual Pulmonary Rehabilitation Self-Assessment Checklist

You must complete this checklist before each video pulmonary rehab class.

#### Equipment to have ready:

- |  |           |          |           |
|--|-----------|----------|-----------|
| 1. I have my reliever inhaler to hand                  | Yes _____ | No _____ | N/A _____ |
| 2. I have my GTN spray/tablets to hand                 | Yes _____ | No _____ | N/A _____ |
| 3. I have a glass of drinking water ready              | Yes _____ | No _____ |           |
| 4. There is a sturdy chair against a wall              | Yes _____ | No _____ |           |
| 5. My telephone/tablet/computer is charged and working | Yes _____ | No _____ |           |

#### Environment:

- |   |           |          |
|---|-----------|----------|
| 1. The room is a comfortable temperature                  | Yes _____ | No _____ |
| 2. There is adequate lighting                             | Yes _____ | No _____ |
| 3. Trip hazards e.g. rugs, pets, children have been moved | Yes _____ | No _____ |

#### Other:

- |  |           |          |
|--|-----------|----------|
| 1. My able-bodied household member is within earshot         | Yes _____ | No _____ |
| 2. I have informed the team of any changes to my health      | Yes _____ | No _____ |
| 3. I have informed the team of any changes to my medications | Yes _____ | No _____ |
| 4. I have had a recent light meal or snack                   | Yes _____ | No _____ |
| 5. I am wearing appropriate clothing and flat shoes/trainers | Yes _____ | No _____ |

#### Symptoms:

It is your responsibility to monitor your symptoms and only exercise if you feel well enough.

You must check your symptoms before **each** class. You must not join in the class if you have a temperature, feel ill or become suddenly unwell.

If you have increased breathlessness, worsening symptoms or new/worsening joint pain prior to exercising you should not join the class for that session but return when the symptoms have settled.

You must stop exercising immediately if you experience any of the following:

- |               |                           |
|---------------|---------------------------|
| 1. Chest Pain | 4. Extreme Breathlessness |
| 2. Dizziness  | 5. Excessive Wheezing     |
| 3. Nausea     | 6. Coughing up blood      |

If there is any other reason you feel you should not exercise today, you must let the team know. Please call us on 01895 828851 or email [rbh-tr.harefieldpr@nhs.net](mailto:rbh-tr.harefieldpr@nhs.net) if you wish to speak to someone before the class.

Now please enjoy your class!

[www.rbht.nhs.uk](http://www.rbht.nhs.uk)



 @RBandH

## Appendix 5: Example of band 4 competencies and duties

### Virtual Pulmonary Rehab group

#### Competency 1:

The Band 4 is able to complete daily class management tasks relating to the organisation of Pulmonary Rehabilitation groups

#### Competency 2:

The Band 4 is able to contribute to the running of the Pulmonary Rehabilitation programme and assessment requirements

#### *Admin tasks:*

1. Monitor SystmOne work lists for tasks to be completed in VPR, awaiting venues and myCOPD, such tasks include sending Harefield & BLF packs, sending letters, sending Zoom class links or gathering objective outcomes
2. Send patient emails with attachments and/or links
3. Send secure emails to non-NHS accounts
4. Copy and paste emails to patient record on SystmOne
5. Send Zoom class links to patients
6. Set up a new Zoom class as requested
7. Know how to access Zoom, enter patients, enable video and microphone and end session
8. Session must be open 15mins prior to class starting to allow patients to access class
9. Assist patients to access Zoom class if having difficulties (How to use Zoom guide on VPR g-drive)
10. Keep class registers, SystmOne list and database up to date



*Preparation:*

11. Set up equipment in room for class including laptop, headset, Ethernet cable, connect to TV screen if available, position room and laptop to ensure full view of staff
12. Prepare, maintain and clean the equipment
13. Report any problems with equipment

*Delivering the group:*

14. Complete the patient register, record any planned UTA/DNA, education, and handover tab on Excel
15. Lead the warm up focussing on upper limb, lower limb movements and stretches. Focus on breathing control and positions of ease
16. Demonstrate the exercises using NAMSET principles and ensure patients know what times they're on
17. Correct the patient's form to ensure muscles are recruited properly
18. Can change exercises/adaptations for patients

*Evidence of exercise adaptation and repertoire*

19. Assist delivering the group e.g., music, timing, patient encouragement
20. Monitor patients and write down oxygen saturations/altered exercises as required so this can be transferred in SOAP notes
21. Write follow-up SOAP notes whilst the therapist is delivering education or within 24 hours

*Telephone Objective Assessment*

1. Complete consent and record sharing page – ensure understanding of electronic health care records, liaison with other MDT members, next of kin, permissions for communication
2. Complete Accessible Information tab regarding communication needs
3. Hospital Anxiety and Depression Scale (HAD) Highlight to the qualified therapist if any scores trigger further follow up (>10 for Anxiety/Depression)

scores). Transfer results onto front page. If triggering for a follow-up letter or discussion, this should be highlighted to the Physiotherapist in situ

4. COPD Assessment Tool (CAT) if COPD/Bronchiectasis patient on SystmOne
5. Kings brief interstitial lung disease (KBILD) complete on system 1 if ILD patient
6. Sit-to-stand in 1min (STS1M) send guide to patient or instruct on phone and complete on call
7. If complex – discuss with qualified staff
8. Select appropriate class and Email patient welcome email with class details and links

*Telephone Re-assessment*

1. Complete telephone reassessments
2. Reassessment to include questionnaires repeated from those on initial assessment, repeat STS1M and review goals and patient feedback from.
3. Can write re-assessment entries in SOAP notes and must be completed within 24 hours
4. Discuss long-term exercise options and maintenance participation
5. Complete and send referral form to maintenance class as appropriate or other referrals as required
6. Write basic reassessment discharge letter which must be sent within 1 week of reassessment
7. Seek support from qualified staff member if abnormal results or complex issues raised.

Discharges include database, education, register, maintenance referral, end referral

## Physiotherapy following blunt chest trauma

**Clare Wade<sup>1,2</sup>, Ceri Battle<sup>3</sup>, Zoe Barrett-Brown<sup>4</sup>,  
Rebekah Haylett<sup>5</sup>, Rob Leatt<sup>2</sup> and Una Jones<sup>6</sup>**

Blunt chest injury is a prevalent traumatic injury which remains associated with high levels of mortality and morbidity. Acute post-injury complications include pain, pneumonia, haemothorax, pulmonary contusion and in severe cases, respiratory failure. Longer term physical, psychological and socio-economic sequelae have also been identified (Baker et al. 2018.). Studies over the past 10 years have investigated the development and implementation of multi-disciplinary bundles and clinical pathways to reduce complications and improve outcomes for patient suffering blunt chest trauma (Unsworth et al. 2015; Curtis et al. 2016; Chrvsou et al. 2017; Kourouche et al. 2018; Kelley et al. 2019). It is particularly noted in this body of literature that respiratory physiotherapy, more traditionally referred to as ‘pulmonary hygiene’ or ‘pulmonary toileting’, is an integral part of optimum supportive care for patients after chest wall injury. However, there remains very little high quality empirical evidence to determine the efficacy of specific physiotherapy interventions with this patient population.

Given that many respiratory complications following chest wall trauma stem from lung contusion, and are exacerbated by pain, it is understandable that interventions often employed by physiotherapists to aid in increased functional lung volume, optimal ventilation-perfusion (V/Q) matching and secretion mobilisation are most commonly used (van Aswegen et al. 2020). From a clinical perspective, it could be determined that the physiological effects of these interventions (predominantly positioning, mobilisation, and thoracic expansion exercises) would translate to positive outcomes in the patient with lung contusion following chest trauma. However, we need to consider whether we can continue to rely on clinical practice expertise alone,

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### **Keywords**

Blunt chest wall trauma, respiratory, physiotherapy

without investigating the efficacy of physiotherapeutic and multi-modal interventions in this particular population.

This is clearly a ‘hot’ topic; since ACPRC members identified this as a priority area for guidance development and scoping work began, a state-of-the-art review has been published (van Aswegen 2020) and work is in progress to develop international consensus on physiotherapy best practice. Some key physiotherapy researchers are leading the field in this area of practice and research. Ceri Battle is a key figure driving physiotherapy and multidisciplinary research in the area of blunt chest trauma management and is working closely with international experts to develop guidance for best practice. Helena van Aswegen’s state-of-the-art review on physiotherapy management of trunk trauma, provides the most recent comprehensive overview of current practice and evidence. In the absence of high-quality experimental trials, or expert consensus to determine best practice, we would currently refer ACPRC members to this review.

The ACPRC recognise the need to provide guidance for members on recommendations for best practice, optimum delivery of intervention and use of adjuncts, but we also recognise the need to consider the contextual and organisational factors within which every physiotherapist works. It is likely that each local organisation and department has policies and guidelines for the management of patients following blunt chest trauma. It would be surprising if these did not incorporate physiotherapy assessment and treatment as a core component, and we encourage physiotherapists working in these clinical areas to contribute to development of local practice guidance where possible.

Like for many other areas of respiratory physiotherapy, we recognise the need for further research to develop best practice recommendations for physiotherapy management of patients with blunt chest trauma. Research to determine best practice should consider the recommendations made by Rodrigues and colleagues in their recent narrative review of developments and future directions in respiratory physiotherapy (Rodrigues et al. 2020). In addition to need

intervention,  
clinical commentary.

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for high quality, sufficiently powered experimental studies, we also recognise the value of developments in practice. We encourage all ACPRC members who work with patients suffering blunt chest trauma to share their best practice case studies, feasibility studies and quality improvement projects, and to participate in future research in order to continue to grow this evidence base.

*This work has been completed by the ACPRC editorial board.*

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ISSN 2059-0199 (Online)