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Introduction

Welcome to the first publication of 2019 for the Association of Chartered Physiotherapists in Respiratory Care (ACPRC) Journal.

It is with great pride as editors that we are able to bring this journal to you. The quality of the articles is testament to the hard work of the authors. In addition we would also like to thank all of the reviewers for the journal for their time in providing comment and support for authors in developing their articles.

This edition of the journal includes a mix of original articles across specialties, including two qualitative studies by authors McCallion et al. and Hubbard.; a preliminary study by Ajiboye et al. and a service evaluation focusing on establishing a dedicated physiotherapy service for patients undergoing corrective chest wall surgery by Johnstone et al. Banks et al. present the use of change models to increase exercise in adult CF, Hayward & Hayward present a case report on the use of lung ultrasound during an on-call physiotherapy assessment and Wells et al. have reported the results of a national survey looking at physiotherapy service provision in children with difficult asthma. We are also very fortunate to be able to include the joint CSP ACPRC briefing looking at the NHS long term plan and respiratory care.

In April it is our biennial ACPRC conference entitled 'Innovate, Influence and Inspire' which is to be held on 26th and 27th April 2019 in Birmingham, we do hope to see you all there. As we stated in the last journal publication, it is our intention to provide a journal supplement in 2019 of the posters presented at the conference, and we are always keen for authors to develop their poster presentations into an articles for submission to the journal. Please do get in touch if you would like to discuss ideas further.

We really hope that you enjoy reading this issue of the ACPRC journal and hope that it inspires you to write up your work. To increase the flexibility for authors, we are now accepting submissions to the journal at any time throughout the year. Please remember that we provide members with support through the Research Officer and there are also writing guidelines for authors which are all available on the website www.acprc.org.uk.

With our very best wishes,

Laura Moth (MSc. MCSP) and Amy Bendall (MSc. MCSP).

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A passport for patients with non-cystic fibrosis bronchiectasis: A qualitative investigation of patients' and carers' beliefs and expectations

Paul McCallion¹, Katy Hester², Anthony De Soyza²

Abstract

Objective

A draft information resource called the bronchiectasis patient passport was developed by a multi-disciplinary team including expert physicians from several BronchUK centres (www.bronch.ac.uk), nurses, physiotherapists and patients.

We aimed to assess patient and carer views on challenges in bronchiectasis care and define their views on a draft patient passport and how this might help future patients.

Research Design

Qualitative research methodology. Eleven participants were recruited for two focus groups between March and April 2018. The analysed group consisted of ten patients and one carer: male (5), female (6), age (42–76), length of bronchiectasis diagnosis (3–55 years approximately). Patients who attended the specialist bronchiectasis clinic within Newcastle Upon Tyne Hospitals NHS Foundation Trust were used in this study. Convenience sampling was used. Focus groups were conducted, digitally recorded and transcribed verbatim. The data were analysed using theoretical thematic analysis.

Results

Three themes were identified: (1) Interactions with Health Care Professionals, (2) Self-Management and (3) Beliefs about the Passport.

Discussion

Patients expressed the importance of being under a specialist clinic; having a single point of contact, continuity of care and access to multi-disciplinary team services.

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Keywords

Bronchiectasis, education, self-management, patient views.

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Patient reports confirmed an awareness of principles of self-management and appeared to have good knowledge of their disease. Their suggestions for improvement were therefore based on experience. Suggestions for alterations to the passport were discussed and implemented. These included changing of medical terminology: 'Flare ups' as opposed to 'exacerbations', and removing points they felt were not relevant to management of their bronchiectasis: 'My Bronchiectasis diagnosis was confirmed with an x-ray test called a CT scan (also called CAT scan/computed tomography)'.

Patients believed the passport would be useful for newly diagnosed patients but potentially less for experienced patients.

Conclusion

This study showed patients and carers felt the bronchiectasis patient passport was a useful information resource particularly for newly diagnosed patients.

Introduction

Bronchiectasis, also referred to as non-cystic fibrosis bronchiectasis, is characterised by irreversible airway dilatation with key clinical features including cough, chronic sputum production, haemoptysis, dyspnoea and chronic rhinosinusitis (Pasteur et al. 2010).

Data across multiple healthcare systems suggest the prevalence is increasing (Quint et al. 2016; Seitz et al. 2007). Recent data from a UK primary care database study has suggested rates much higher than previously estimated with over 300,000 affected patients in the UK (Quint et al. 2016).

The increasing prevalence in bronchiectasis requires a greater awareness and optimum management of the disease across primary and secondary care (Quint et al. 2016). Previous research has demonstrated that patients with bronchiectasis feel more confident about their condition and their treatment regimens after receiving information in a specialist clinic (Hester et al. 2016).

The British Lung Foundation (BLF) facilitated the production of a small handheld leaflet for patients with chronic obstructive pulmonary disease (COPD) called a *Patient Passport*. The aim of this patient passport was to facilitate provision of concise and credible information in a user friendly format for patients with COPD. The patient passport is a checklist of information detailing what patients should expect from their respiratory services after diagnosis of their COPD. It aims to ensure patients know about different treatment approaches and management strategies. This approach therefore raises the potential to empower patients in accessing best quality guideline compliant care.

This study aimed to establish patients' and carers' beliefs and expectations about a similar patient passport that has been drafted for patients with bronchiectasis. The draft passport was developed by a multi-disciplinary team including expert physicians, physiotherapists and patient/carers. This study aims to seek wider views from patient and carers on the usefulness of the bronchiectasis patient passport and discuss the information included in it.

Methods

Study Design

This was a qualitative study which comprised of two focus groups. Bell (2005) discusses that focus groups work best when they include participants who have similar characteristics, for example, they may all have the same type of illness. Focus groups are undoubtedly valuable when in-depth information is needed about how people think about an issue and why they hold those views (Laws et al. 2003). There are no universal guiding principles to weigh up the pros and cons of focus groups versus alternate methods e.g. one-to-one interviews for qualitative research. Limiting factors including time frames, investigator experience and resources may be reasons to favour focus groups (Crabtree 1993). Due to time constraints focus groups were chosen as the most appropriate method of data collection for this study.

A structured list of questions or topic guide was used for the first focus group developed by the research team (Appendix 1). A topic guide was used to ensure all discussion points were covered during the focus groups. The topic guide for the second focus group was created after analysis of the first focus group discussion demonstrating the iterative process of the study.

The study setting was a tertiary hospital in the North East of England. In practice, the discussions lasted up to one hour and the subject was thoroughly explored.

Participants

Eight to ten participants are deemed an adequate figure for a sufficient data yield in focus groups (Barbour 2007). Ten patients and one carer participated between the two focus groups. Five participants recruited were unable to attend after recruitment into the study. Focus groups lasted just over one hour.

Patients who attended the specialist bronchiectasis clinic within Newcastle Upon Tyne Hospitals NHS Foundation Trust were used in this study. Eligible patients and/or their carers' were invited to participate in one of the focus groups.

Inclusion Criteria

- Have received a clinical and radiological diagnosis of Bronchiectasis.
- Be English Speaking.
- Be aged 18 years old.
- Have the capacity to provide written informed consent.

Exclusion Criteria

- Cognitive impairment.
- Non-English Speaking.
- Age <18 years.

Sampling

Convenience sampling was used for this study due to time constraints, resources available to the researcher and the small scale of the study. An effort was made to include maximum variation e.g. recently diagnosed and patients with chronic bronchiectasis.

Analysis

All focus groups were digitally recorded and transcribed verbatim for analysis. The data were analysed using theoretical thematic analysis as described by Braun and Clarke (2006). Theoretical thematic analysis involves the development of a coding template which summarises themes derived from data that are considered important. Template coding is generally hierarchical with broad themes containing narrower sub-themes derived from data extracts. All coding must be able to be linked to the elicited themes (King 2004).

Ethics

Wales Research Ethics Committee 6 Proportionate Review Sub-Committee who has responsibility for reviewing medical research studies has raised no objections to this study. Approval was gained on 16th March 2018.

Newcastle Upon Tyne Hospitals Foundation Trusts Local Research and Development approval was gained on 22nd March 2018.

Results

On initial analysis of the data there were multiple sub-themes (Appendix 2). Further analysis revealed three main emergent themes:

1. Beliefs about Bronchiectasis Patient Passport.
2. Interactions with Health Care Professionals.
3. Self-Management.

1. Beliefs about the Bronchiectasis Patient Passport

Participants highlighted that the information within the passport prompted questions regarding aspects of their care for their bronchiectasis:

'It gives information to the sufferers so that they can answer the question- So that they can ask the questions. A well-informed patient is to their own benefit.'

[PT_5 FG1_690]

Others agreed with this and added that the passport also prompted engagement with other services to help self-management of their condition, as this patient explained:

'Yeah, and signposting as well to other things like pulmonary rehab, you know, exercise, nutrition. Things like that...you can direct them to something or work out a plan.'

[PT_10 FG1_1426]

This patient explains that knowing about available services is not enough; it is how to access these services that is important. Having healthcare professionals direct you the appropriate services is key.

This led to discussion on a specific point in the passport about an additional information resource, 'having a written plan with their doctor or nurse' about how to manage their bronchiectasis:

'I certainly have never had a written plan with my doctor or nurse, erm, giving me bullet points or guidance on how to manage my bronchiectasis.'

[PT_9 FG1_231]

This patient and others were keen to have a written plan or a daily reminder on how to manage their day to day symptoms. Participants' established that although a written plan was desirable, it would not need to be a specific addition to the passport.

Patients' were asked if a version of this passport were published, would they use it. The majority of participants cited that they would, but had suggestions for some modifications including the terminology used:

'I think maybe if it's the very first thing that they're going to be given, maybe things like pulmonary rehabilitation would need to be explained. Exasperation [Exacerbation] would need to be explained. Erm, you know, you've got to think that it's somebody who knows nothing.'

[PT_9 FG1_694]

This statement suggested newly diagnosed patients' may be unfamiliar with medical jargon, and offering an explanation of these terminologies or writing them in Layman's terms, would benefit this patient group.

There were particular bullet points of information deemed irrelevant to improve patients understanding or self-management of their condition including knowing their bronchiectasis was diagnosed by High resolution CT (HRCT) scan or nutritional advice. Participants also stated that some aspects i.e. pulmonary rehabilitation, would only be relevant to certain patients:

'But apart from that, nobody's ever asked me about pulmonary rehabilitation...So, it may say, 'As appropriate,' rather than, 'If you've got bronchiectasis and you're getting this list, you should be doing this,' which is the way it reads now.'

[PT_13_FG2_949]

This patient expressed their view that particular points in the passport may make some patients believe they need certain treatments when, at that time, it may not be necessary for them and make no impact in optimising the care for their bronchiectasis.

The group discussions concluded with opinions on the format of the passport. Some patients felt that a mobile application version would be useful, similar to other web based information on bronchiectasis. Others felt that a non-digital version was better, but did appreciate the increasing use of technology in healthcare, as stated by this patient:

'Are we the older generation who are unwilling, inflexible?...Yes, there's an inevitable walk of technology whether we like it or not.'

[PT_13_FG2_857]

2. Interactions with Health Care Professionals

Participants discussed that their GP's knowledge of how to treat their bronchiectasis was often limited, as this patient described:

'I don't think GPs, or certainly mine, understands a damn thing about it... Personally, I think I'd be teaching him. I mean that quite seriously.'

[PT_12 FG1_262]

This sentiment was echoed by many other participants, yet others had a different experience:

'My experience is good. I've had no problems with getting any medication or getting appointments when I have a flare-up. I usually get in that day.'

[PT_18_FG2_111]

Participants stated they wanted more involvement from their GP's. Improving education and information provision were discussed as methods to achieve this:

'I think the GPs need educating, or we as patients need educating as to what to make our GPs do. Instead of lumbering it all on SPECIALIST NURSE.'

[PT_12 FG1_431]

Participants felt that improved communication between primary and secondary care teams would help with this.

3. Self-Management

An important component of self-management of bronchiectasis includes a patient's ability to recognise their flare-ups. It was clear that some patients knew how to recognise a flare-up.

'I know when I get a flare-up and I take my antibiotics. I'm, I'm taking them now, because I know I've got a flare-up.'

[PT_5 FG1_1095]

This was not consistent with all participants, however:

'Because it's not always clear that you're going to have a flare-up. Erm, and sometimes I, I'm in a quandary as to whether to start the 14-day antibiotic ...You know, it's not cut and dried.'

[PT_9 FG1_148]

This led participants to debate the definition of a flare-up. Many felt the term was ambiguous, subject to individual interpretation:

'I think basically we should all try and find out what is, what is the flare-up, and define your own. And then write down what, what it feels like when it starts.'

[PT_12 FG1_1231]

Others felt that having bronchiectasis for longer enabled them to understand and recognise flare-ups as described by this patient:

'I'm well on to understanding and coping with flare-ups. Erm, whereas initially, I certainly wasn't.'

[PT_9 FG1_248]

This steered the discussion toward the difference in self-management skills between newly diagnosed patients and 'expert' patients. Participants discussed that they felt all patients' needed more information on how to manage their bronchiectasis, especially those newly diagnosed:

'I would expect a little bit more explanation about just the- What it is and the effects, and the progression, possible progression, would help...it wasn't until I sat with SPECIALIST NURSE and made that specific point that he told me... And then I began to understand what I was doing and why.'

[PT_12 FG1_772]

This patient felt that if people received their diagnosis of bronchiectasis in a specialist clinic, there would be more information available in that setting to optimise their care as soon as possible after diagnosis.

Discussion

Many themes were discussed during the groups including patients' beliefs about the passport and its content, self-management strategies and the interactions patients have with their health care professionals.

The content within the patient passport was thoroughly discussed. The original draft version of the passport (Appendix 3) was updated throughout the study based on guidance from patients and carers in the focus groups. Certain points were seen as non-significant in the management of bronchiectasis. One specific point was receiving advice about nutrition. Patients felt this was not a significant aspect of their care for their bronchiectasis. There is no mention of nutrition in the BTS bronchiectasis quality standards (Hill 2012) despite the fact having a low body mass index (BMI) correlates with a worse mortality rate (Chalmers et al. 2014). This was removed from the passport as it was not a point that users thought would be useful to include.

Another point in the passport, '*knowing your bronchiectasis was diagnosed by computerised tomogram (CT) scan*', was deemed irrelevant for patients. High resolution CT scan is the gold standard diagnostic test to confirm bronchiectasis (Chalmers and Sethi 2017), however patients did not feel this was relevant to their understanding or self-management of their condition.

The last point in the passport some patients believed needed to be changed was, '*all patients should discuss pulmonary rehabilitation*'. People with bronchiectasis should be offered pulmonary rehabilitation if they have breathlessness affecting their activities of daily living (Hill 2012). Participants felt this does not need to be routinely discussed unless it is relevant for that individual and that the language used in the passport should reflect this.

The passport should be available in multi-format. The participants in the groups appreciated the increasing use of technology within healthcare and suggested digital, including web-based and mobile phone application, as well as paper-based formats should be available.

Participants' interactions with the health care professionals varied. The main challenges with primary care included: difficulty getting appointments; obtaining appropriate medications; GP's lack of knowledge of bronchiectasis and the lack of continuity of care. This contrasted with their views on attending a specialist clinic. Patients commented that having continuity of care was of paramount importance to them. This has been shown to improve concordance with treatments and patient-professional relationships (Kuijpers et al. 2016)

Most of the patients demonstrated good knowledge of their disease and self-management strategies. Despite this, one of the points in the passport initiated a discussion: *how to recognise a flare-up of bronchiectasis?* Regular tracking of flare-ups and their indicative symptoms, allow the patient to learn more about managing their disease (Chalmers and Sethi 2017). Patients mentioned the ability to recognise a flare-up of their bronchiectasis may improve their use of ‘emergency pack’ of antibiotics. It is recommended in guidelines and literature that patients with bronchiectasis should be taught this in both primary and secondary care (Polverino Eva et al. 2017). This passport could be used as a reminder to do so.

All participants felt the patient passport was useful, however many struggled to determine exactly how they felt it should be used. Some felt it would be useful for newly diagnosed patients rather than experienced patients as they would know less about their condition initially. McBride (1994) suggests education heightens awareness, builds knowledge and confidence to motivate individuals to assume responsibility for their health condition in a positive and confident manner. Using this passport could help educate and promote self-management in this patient population.

Limitations

This was a single centre study. Due to time constraints, convenience sampling was used. This limits the transferability of findings and could have resulted in some selection bias, leaving out participants who had limitations to allow their attendance to the focus group e.g. significant distance to travel or work commitments.

Trustworthiness

A researcher’s background and position will affect what the angle of investigation, the methods judged most adequate for the study’s purpose, the findings considered most appropriate, and the framing and communication of conclusions (Malterud 2001). The researcher acknowledges that he is a respiratory physiotherapist with a specialist interest in bronchiectasis and therefore that may have influenced the interpretation of the data. To maximise the constructs of trustworthiness in the study, all transcripts were checked by the lead researcher (PM) and themes and sub-themes were presented to the researcher’s supervisors and participants to gain consensus.

Conclusion

This is a novel study that explored patients’ and carers’ beliefs and expectations surrounding a checklist called the bronchiectasis patient passport. This study provided guidance and recommendations from patients and carers for alterations to the bronchiectasis patient passport (Appendix 4). This study showed that despite patients’ and carers’ beliefs that the passport is a useful checklist or document, its specific role remains unclear. Future research should include implementing the passport within the clinical setting and using outcome measures to assess its usefulness in patient knowledge and self-management of their bronchiectasis.

Key Points

- The patient passport has the potential to be a useful checklist to improve patients self-management of their bronchiectasis.
- Patients felt the passport would be useful for newly diagnosed patients but potentially less for experienced patients.
- Patients believe improved communication between primary and secondary care teams would improve the management of their bronchiectasis.

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Appendices

Appendices 1

Bronchiectasis Patient Passport: Topic Guide for Focus Group 1

Note: The topic guide is developmental. The questions will need to be tailored to the answers of each group. The topic guide given here is therefore a general topic guide for the focus groups.

Plan of focus group

1. Introduction.
 - Anonymity, ground rules.
2. Introduce passport.
3. Discuss passport.
4. Close group.

Introduction

- Introduce people leading focus group.
- Explain purpose of the study and this focus group.
 - We want to understand your thoughts about the usefulness on an information leaflet or checklist we are calling the bronchiectasis patient passport. The focus group discussion will take no more than one hour.
- Explain focus group recorded but details will be confidential.
 - We're tape recording the session because we don't want to miss any of your comments. People often say very helpful things in these discussions and we can't write fast enough to get them all down. We will be on a first name basis today, and we won't use any names in our reports. You may be assured of complete confidentiality. The recordings will be kept safely in a locked facility until they are transcribed word for word, then they will be destroyed. The transcribed notes of the focus group will contain no information that would allow individual participants to be linked to specific statements.
- Explain participation.
 - Won't affect the care you receive whether you take part or decide not to.
 - What you tell us will not be discussed with your health professionals or anyone else outside of the research team without your permission.
 - If there are any questions or discussions that you do not wish to answer or participate in, you do not have to do so.

- Explain ground rules.
 - Ideally, we want one person to speak at a time. We know there may be a temptation to jump in when someone is talking but please try and wait until they have finished.
 - There are no right or wrong answers – not a test of your knowledge.
 - You do not have to speak in any particular order.
 - When you do have something to say, please do so.
 - If we move to a different point and you wish to go back to speak about a previous point, please do so.
 - You don't need to agree with what others say, but please listen respectfully as others share their views.
- Any questions or comments?

Introduce Passport

- Introduce passport and give them a few minutes to read it.

Discussion

- What are your initial reactions to the bronchiectasis passport?
 - What information, if any, do you feel should be added?
 - What information, if any, do you feel is missing?
 - How do you feel about the language used in the passport?
 - Is there anything you do not understand or want described in a different way?
 - Which parts are relevant to you? Which parts are not relevant?
- When do you feel this passport should be given to patients diagnosed with bronchiectasis?
 - Just after diagnosis? Once had time to take news in? Specialist clinic?
 - Who should give it to you?
 - GP, nurse, physio or just when in specialist clinic? Why that person?
- Do you feel the information in this document would help you take better care of your bronchiectasis?
 - Would you use this patient passport?
 - If so how? If not, why not?
 - When would you use it?
 - How would it help?
 - Would you want to show it to others? Partner, Family or Friends?
 - Which parts are relevant to you? Which parts are not relevant? (repeated if not covered initially).
- What are your views on the format of/how the passport is presented?
 - Do you think a booklet or a wallet/purse size would be useful?
 - Would it be useful in a phone APP?
 - Would the format influence your decision to use this resource? Why/Why not.
- Of all the things we've discussed today, what would you say are the most important issues you would like to tell us about the bronchiectasis patient passport?

Close group

- Thank them for participating.
- Remind them about anonymity.

- Outline that, if any questions or concerns whom they can contact – that details are also on information sheet.

Appendix 2: Summary of Sub-Themes.

Main Themes	Interactions with Health Care Professionals	Self-Management	Beliefs about Patient Passport
Sub-Themes	Challenges with primary care	Patient/expert knowledge of condition	Patient/expert knowledge of condition
	Benefits of Specialist Clinic	Clarity of flare ups	Clarity of flare ups
	Disease and Treatment burden	Benefits of Specialist Clinic	Comments on passport
	Physiotherapy & Exercise	Need for more information	Newly diagnosed and Experienced Patients
	Newly diagnosed and Experienced Patients	Written action plan	Research
	Continuity of Care	Physiotherapy & exercise	Need for more information
		Anxiety	Usefulness of passport
		Disease and Treatment Burden	
		Newly diagnosed and Experienced Patients	
		Research	

Bronchiectasis Patient Passport

1. My Bronchiectasis diagnosis was confirmed with a xray test called a CT scan (also called CAT scan/computerised tomogram)
2. I understand my bronchiectasis. My doctor or nurse has explained where to find information, advice and emotional support (if I need it).
3. I get support to manage my care, and have agreed a written plan with my doctor or nurse about how I will manage my bronchiectasis.
4. I contact my GP, nurse or pharmacist to get a free flu vaccination each year. I have also had the one-off pneumonia jab.
5. Whilst many patients with bronchiectasis have never smoked, If I smoke, I am offered support and treatment to stop every time I meet my doctor or nurse about my bronchiectasis.
6. I know the importance of doing chest clearance physiotherapy to help me cough effectively to clear my phlegm. I know to ask for help from a physiotherapist if I am unsure of the techniques or feel they aren't working.
7. I have discussed pulmonary rehabilitation, a series of classes to help with breathlessness symptoms

Bronchiectasis Patient Passport

8. I have received advice about ongoing exercise and nutrition. I know to seek help if I am more breathless than people of my age doing normal activities.
9. I know what all my medicines and inhalers are for and when to take them. I can ask my doctor, nurse or pharmacist if I'm not sure.
10. My health care professional reviews how I use my treatments at least once a year and undertakes a sputum test even if I am stable.
11. I can spot the signs of an exacerbation that can be the start of a chest infection.
12. If I have a flare-up, I know who to contact at any time and where to submit a sputum specimen.
13. I have discussed if I should have medicines at home for use in as an emergency pack with my doctor. I am prescribed 14 days of antibiotics according to national guidelines.
14. I see my nurse or doctor at least once a year to review my health, my care and my treatment, and have time to discuss all the points mentioned previously.
15. If I have more than 3 flare-ups in a year I ask my doctor or nurse if there are things I should be doing differently or if I need to try new treatments.

Bronchiectasis Patient Passport

1. I understand my bronchiectasis. My doctor or nurse has explained where to find information, advice and emotional support if needed.
2. I have a written plan with my doctor or nurse about how to manage my bronchiectasis. My GP is aware of this.
3. I contact my doctor, nurse or pharmacist to get a free flu vaccination each year. I have also had the one-off pneumonia vaccination.
4. I understand the importance of maintaining a healthy diet and exercise. If I smoke, I am offered support and treatment to stop by my doctor or nurse.
5. I know the importance of doing chest clearance physiotherapy daily to effectively clear any phlegm. I know to ask for help from a respiratory physiotherapist if I need it.

Bronchiectasis Patient Passport

6. I know to seek help if I am concerned about my breathlessness. If I do suffer from breathlessness, I have discussed pulmonary rehabilitation with my doctor, nurse or physiotherapist.
7. I understand the medicine I am taking for my bronchiectasis. I know when and how to take them.
8. I can recognise flare-ups (exacerbations) of my bronchiectasis. I know to take 14 days of antibiotics when I have a flare-up.
9. I submit a sputum sample at least once a year, even if I am well, to check for new infections and to help choose the right antibiotic if I have a flare-up.
10. If I have 3 or more flare-ups per year, I have discussed with my doctor or nurse about ways to improve this.

Efficacy of thoracic mobility exercise on cardiopulmonary parameters and quality of life of individuals with asthma (a preliminary study)

Ajiboye OA¹, Ajepe TO² and Oyefeso TA²

Abstract

Objective

Asthma is a chronic respiratory disease which reduces patients' daily activities and impairs their health related quality of life. Little is known on the effect of Thoracic Mobility Exercises (TME) on cardiopulmonary function and quality of life. This study was aimed at investigating the efficacy of TME on selected cardiopulmonary parameters and the quality of life of individuals with asthma.

Methodology

Thirty three (33) subjects diagnosed with mild to moderate asthma were recruited from the Respiratory Unit of a tertiary hospital in Lagos, Nigeria. The study included patients with mild to moderate asthma (GINA Guideline) without respiratory tract infection in the preceding 6 weeks, and had no spinal deformity. They were randomly assigned to 3 groups (A, B and C). Group A underwent thoracic mobility exercises (TME), deep breathing exercises and counselling sessions; Group B underwent a combination of thoracic mobility exercises and aerobic exercise with deep breathing exercise and counselling sessions while Group C underwent deep breathing exercises and counselling sessions only. Interventions in each group lasted for 30 to 45 minutes, twice weekly for 6 weeks. Asthma Quality of Life (AQoL), Asthma Control, selected pulmonary parameters (Peak Expiratory Flow Rate (PEFR), Forced Expiratory Volume in 1 second (FEV₁), Forced Vital Capacity (FVC), Thoracic Expansion at Axilla (TE_A) and Thoracic Expansion at Xyphoid process (TE_x)) and selected cardiovascular parameters (Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP)) were assessed.

Results: Group A recorded a statistically significant improvement in the SBP (p=0.016), TE_A, (p=0.007), QoL (p=0.030), ACT (p=0.020) and perceived exertion (p=0.030). Participants in group B recorded a significant improvement in TE_x (p=0.023) and the perceived exertion (p=0.024) while in Group C (Control group) improvement was only noted in perceived exertion (p=0.017). On comparison across groups, there was no statistical significant difference in FEV₁, PEFR, FVC, TE_A, TE_x, SBP, DBP, asthma control and quality of life.

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Keywords

Asthma, thoracic mobility exercise, cardiopulmonary parameters, quality of Life.

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Conclusion

Thoracic mobility exercise are effective in improving systolic blood pressure and thoracic expansion, perceived exertion, asthma control and quality of life of patients with asthma. Similarly, aerobic exercise as well as deep breathing exercise and counselling sessions improved perceived exertion. However, comparison across the three groups showed no significant difference.

Introduction

Asthma is one of the most common chronic diseases worldwide with an estimated 300 million affected individuals (Global Initiative for Asthma (GINA) 2015). Despite the effects of pharmacological interventions for the control of asthma, symptoms still persist which reduce individuals' daily activities, impair their health-related quality of life (HRQoL), school or work performance and social lives and consequently increase reported anxiety and depression; all of which are seen to be related to a decrease in asthma control (Martinez and Vercelli 2013; Levy et al. 2014).

In addition, structural and inflammatory changes occur in the airway which predisposes the individual with asthma to a reduction in chest wall movement with shortened muscle length and weakness of respiratory muscles (Leelarungrayub 2012). This reduces thoracic mobility in all the three planes and increases the effort of breathing, involving more of the accessory muscles of respiration (Boruah et al. 2014). Furthermore, the relationship between asthma and cardiovascular disease (CVD) has been established in previous studies (Dogra et al. 2007; Appleton et al. 2009; Chung et al. 2014). According to a recent meta-analysis, Wang et al. (2017) reported that patients with asthma had up to 32% increased risk of coronary heart disease (CHD) occurrence when compared with individuals without asthma. Chronic inflammatory reaction which is common to both conditions might be the linking factor.

Although studies have been carried out on the efficacy of various pulmonary rehabilitation techniques, such as breathing exercises and aerobic exercises, which were found effective in improving the respiratory function of individuals with asthma (Leelarungrayub 2012; Basso et al. 2013; Thomas and Bruton 2014), there is a paucity of data on the efficacy of Thoracic Mobility Exercises (TME) among individuals with asthma. Thoracic mobility exercises are pulmonary rehabilitation techniques which involve specific movements designed to increase the expansion of the thorax which leads to improvement in the lung function and reduction in resting blood pressure. This has been supported by literature among patients with chronic obstructive pulmonary disease (COPD) and stroke (Bang and Jang 2016; Mulay et al. 2017); however, this is still understudied among patients with asthma. This study therefore aimed to evaluate the efficacy of TME on cardiopulmonary and cardiovascular parameters and quality of life of individuals with asthma.

Methodology

Thirty three (33) subjects classified with mild to moderate asthma using GINA guideline (2015), were screened for inclusion in the study while 30 were eligible for the study. The ages ranged between 18–30 years. They were subjects with no spinal deformity and who have not smoked for at least one full year (non-smokers). Individuals with other lung diseases and sores or wounds around the chest wall were excluded. Informed written consent was taken from the subjects

prior to participation. The study was single blinded, with the participants being unaware of the treatment they received.

Ethical Approval

Ethical approval was sought and obtained from the Health Research Ethics Committee of Lagos University Teaching Hospital. Ethics Protocol Reference Number: ADM/DCST/HREC/APP/736.

Procedure of randomization

The subjects were recruited from the Respiratory Unit of Lagos University Teaching Hospital (LUTH). They were randomly assigned to 3 groups (A, B and C) of 10 subjects per group using fish bowl randomization technique (Aweto et al. 2015).

Intervention:

Group A

Subjects in this group received TME in addition to breathing exercises and counselling sessions twice a week for 6 weeks.

For the TME, each session lasted for 30 minutes. The intervention was performed in a supine position using a stretch pole that was placed longitudinally down the length of the spine (Shigeki et al. 2011). It included a total of eleven exercises consisting of three preliminary motions and eight main exercises as recommended by Shigeki et al. (2011) and Leelarungrayub (2012).

Preliminary Motions:

- *Maintenance of shoulder abduction and adduction:* Subjects were positioned supine on a stretch pole and were instructed to take both lower-limbs away from the body with their elbow extended within a comfortable range of movement and to then relax for about 60 seconds. The knees were in a flexed position. Each of these exercises were repeated 2–3 times.
- *Maintenance of internal and external rotation of the hip joint:* Subjects were positioned supine position on a stretch pole and were instructed to take both lower-limbs away from midline with the knees slightly flexed within a comfortable range of movement and to then relax for about 60 seconds. Upper-limbs were placed beside the body in a neutral position.
- *Unilateral shoulder abduction and contralateral hip external rotation:* Subjects were positioned supine on a stretch pole and were instructed to take one upper-limb away from the body with elbow extended and the opposite lower-limb away from the midline with knee in slight flexion and relaxing for about 60 seconds. Upper-limbs The same procedure was followed by the opposite upper and lower limbs. The uninvolved upper-limb were placed beside the body and the uninvolved leg was kept in knee flexed position.

Main Exercises:

- *Floor polishing:* Subjects were positioned supine on a stretch pole on the floor were asked to round their hands to draw circles on the floor. The knees were maintained in a flexed position (Figure 1).



Figure 1: A subject on a stretch pole placed vertically, about to perform floor polishing.

- *Scapular adduction (retraction) and abduction (protraction):* Subjects were positioned supine on a stretch pole with their knees in a flexed position and were instructed to repeatedly extend both arms with hands reaching the ceiling with scapular abduction and then relaxing the scapulae while maintaining the arm in extension.
- *Shoulder abduction and adduction:* Subjects in supine on a stretch pole with their knees flexed were instructed to repeatedly abduct and adduct both shoulders with both forearms sliding on the floor.
- *Internal and external rotation of hips:* Subjects in supine on a stretch pole were instructed to repeat hip external and internal rotation with both hips in extension and knees in slight flexion.
- *Slight knee extension:* Subjects in supine on a stretch pole were asked to repeat hip abduction in extension and external rotation with knees in slight flexion.
- *Swaying:* Subjects in supine on a stretch pole were instructed to repeat sliding of the trunk in a lateral direction on the stretch pole.
- *Abdominal breathing:* Subjects in a supine position on a stretch pole were instructed to puff out the abdomen during inspiration and drawing it in during expiration.
- *Lateral chest wall mobilisation:* Subjects were positioned in side-lying on the stretch pole (perpendicular to their trunk), and were instructed to flex the upper limb in the air to 180° and remain in that position for 15 seconds, then continuous flexion and extension was completed for 45 seconds (Leelarungrayub 2012). The exercises were performed for 28-30 minutes where each main exercise was repeated 2–3 times per session. For the deep breathing exercise: Subjects were instructed to sit erect while performing this exercise concentrating on breathing. Subjects were asked to take slow and maximal inspiration lasting for five seconds, followed by maximal expiration at a rate of 6 breaths per minute during each repetition. This was done in 2 sets, with 6 repetitions in each (Sunitha and Ravi 2013). This was completed for a total of 12–15minutes.



Figure 2: A participant performing lateral chest wall mobilization on a stretch pole.

The counselling session involved lifestyle, behavioural and dietary modifications and was carried out for 15 minutes.

Group B

Subjects in this group received a combination of TME and aerobic exercise (AE) in addition to breathing exercise and the counselling session. The interventions were carried out twice a week for 6 weeks. TME as detailed for Group A was completed for 15 minutes, and aerobic exercise (AE) using the bicycle ergometer for another 15 minutes. Each subject was allowed to sit comfortably on the seat of the ergometer (JK Exercise bicycle ergometer, JK1305, Japan) and was instructed to ride the bicycle at self-selected velocity; the initial resistance was set at 25 watts. The resistance was increased every two minutes by 10 watts as recommended by Pollock and Wilmore (Pollock and Wilmore 1990; Awopeju et al. 2012). The methods used for the breathing exercises and counselling session were as stated above for Group A.

Group C

Subjects in this group served as the Control group. They only received breathing exercises and counselling session and are stated above for Group A.

Outcome Measures

The following outcome measures were evaluated by the researcher at the pre-intervention stage/baseline and reevaluated at the 6th week post intervention:

1. *Selected Respiratory Parameters:* [Forced Vital Capacity (FVC), Forced Expiratory Volume in the first second (FEV₁) and Peak Expiratory Flow Rate (PEFR) were assessed using a portable handheld Spirometer (CONTEC Spirometer SP10W, USA), and following the ATS/ERS guidelines (Miller et al. 2005). Thoracic Expansion at the Axilla (TEA_{axilla}) and Thoracic Expansion at the Xyphoid Process (TE_{xyphoid}) were measured using a flexible tape measure, 1.5m long and calibrated in centimeters (Sunky, China).
2. *Selected Cardiovascular Parameters:* [Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP)] using a Mercury Sphygmomanometer and a Stethoscope
3. *Asthma Control Test (ACT)* using Asthma Control Test Questionnaire (ACTQ). Its documented intraclass correlation coefficient is (ICC) = 0.90 (Juniper et al. 2001).
4. *Asthma Quality of Life (AQoL)* using Mini Asthma Quality of Life Questionnaire (AQLQ). Its documented intraclass correlation coefficient (ICC) = 0.95 (Juniper et al. 1998).
5. *Perceived Rate of Exertion* was assessed using Modified Borg Scale of Perceived Exertion.

Data Analysis

A paired-t test was used to compare the pre- and post-data of the quantitative variables (selected respiratory and cardiovascular parameters) in each group while Wilcoxon signed ranks test was used to compare the pre- and post-data of the qualitative variables (ACT, AQoL and Perceived Exertion) in each group. Analysis of variance (ANOVA) was used to compare the mean difference of the parameters across the 3 groups (A, B and C) while Kruskal Wallis test was used for the qualitative data across the 3 groups. Shapiro-wilk's test was not significant ($p > 0.05$) which shows that the data were normally distributed.

Results

Twenty eight subjects completed this study. They were aged 18 to 29 years, with a mean age of 21.4 ± 2.1 years. The mean height of subjects in group A was 1.65m, in group B was 1.58m and in group C was 1.73m. One subject was underweight ($<18.5 \text{ kg/m}^2$), thirteen subjects were within the normal BMI range ($18.5\text{-}24.9 \text{ kg/m}^2$), and six (6) subjects were overweight ($> 25 \text{ kg/m}^2$).

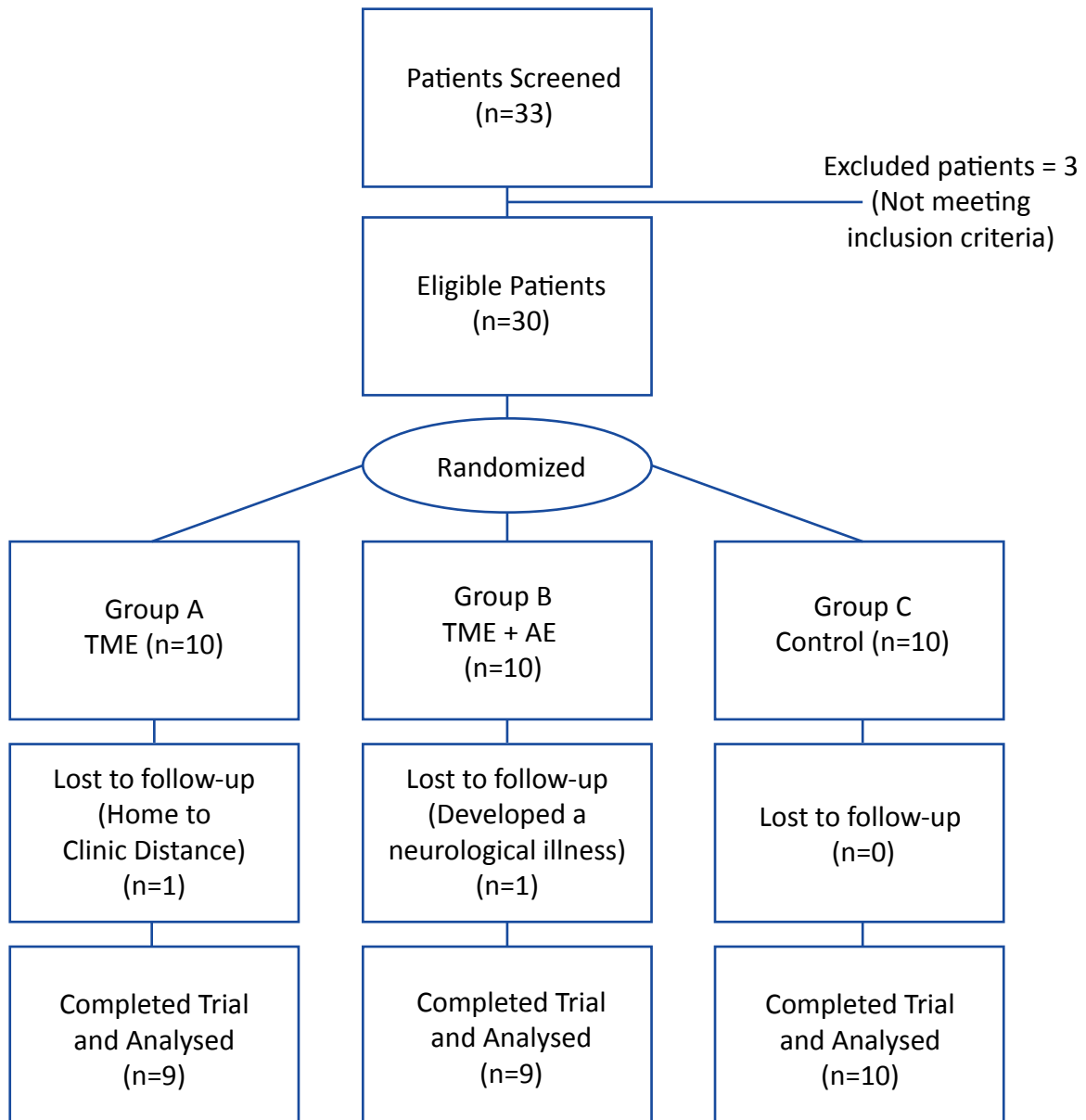


Figure 3: Flow of Patients through the Study.

Key

TME = Thoracic Mobility Exercise.

AE = Aerobic Exercise.

Tables 1 and 2 shows the comparison between the selected respiratory and cardiovascular parameters assessed as well as ACT, AQoL and perceived exertion at the pre-intervention/baseline and the post intervention stages.

Table 1: Comparison of the cardiopulmonary function parameters at baseline and at 6 weeks post-intervention.

Variables	Groups	Baseline Mean \pm SD	6 weeks post Rx Mean \pm SD	Mean Change ΔX	t-value	p-value
FEV ₁ (L)	Group A	1.93 \pm 0.64	2.16 \pm 0.27	0.24	-1.28	0.257
	Group B	2.14 \pm 0.47	2.18 \pm 0.41	0.05	-0.26	0.809
	Group C	2.45 \pm 0.54	2.43 \pm 0.54	-0.02	0.33	0.750
FVC(L)	Group A	2.67 \pm 0.81	2.61 \pm 0.51	-0.05	0.30	0.778
	Group B	2.78 \pm 0.53	2.73 \pm 0.43	-0.05	0.28	0.789
	Group C	3.29 \pm 0.74	3.22 \pm 0.74	-0.07	0.71	0.500
PEFR(L/s)	Group A	3.55 \pm 1.82	5.08 \pm 1.10	1.52	-2.50	0.055
	Group B	4.42 \pm 1.57	5.79 \pm 0.72	1.36	-2.40	0.062
	Group C	5.30 \pm 2.04	5.58 \pm 1.79	0.28	-0.64	0.550
TE _{axilla} (cm)	Group A	3.12 \pm 1.41	4.37 \pm 1.12	1.25	-4.43	0.007*
	Group B	2.42 \pm 0.99	3.38 \pm 0.83	0.96	-2.55	0.052
	Group C	3.39 \pm 1.30	3.56 \pm 1.01	0.17	-0.48	0.640
TE _{xyphoid} (cm)	Group A	3.88 \pm 0.52	5.18 \pm 1.09	1.30	-2.43	0.060
	Group B	3.05 \pm 1.31	4.62 \pm 0.91	1.57	-3.23	0.023*
	Group C	4.38 \pm 2.26	4.52 \pm 1.95	0.14	-0.77	0.470
SBP(mmHg)	Group A	119.14 \pm 8.69	110.86 \pm 8.82	-8.29	3.31	0.016*
	Group B	105.67 \pm 8.02	107.83 \pm 6.24	2.17	-0.72	0.503
	Group C	118.86 \pm 14.14	116.43 \pm 10.64	-2.43	0.60	0.570
DBP(mmHg)	Group A	71.33 \pm 11.34	70.83 \pm 10.51	-0.50	0.27	0.797
	Group B	60.83 \pm 5.53	63.67 \pm 6.41	2.83	-0.87	0.425
	Group C	64.00 \pm 6.71	67.29 \pm 4.07	3.29	-1.30	0.240

*Level of Significance at p<0.05.

Key

FVC = Forced Vital Capacity expiratory

Volume in 1st second Expansion at Xyphoid
Process Pressure.

PEFR = Peak Expiratory Flow Rate.

FEV₁ = Forced.

TE_{Axilla} = Thoracic Expansion at Axilla.

TE_{xyphoid} = Thoracic.

SD = Standard deviation.

SBP = Systolic Blood Pressure.

DBP = Diastolic Blood.

t-value = Paired t-test.

mmHg = Millimeters of Mercury.

Table 2: Evaluation of the quality of life, asthma control test and perceived BORG exertion of the subjects.

Variables	Groups	Baseline Mean \pm SD	6 weeks post Rx Mean \pm SD	Mean Change Δ X	w-value	p-value
ACT	Group A	16.62 \pm 4.37	20.16 \pm 3.25	3.50 \pm 2.42	-2.023	0.043
	Group B	18.87 \pm 5.19	21.00 \pm 2.00	3.50 \pm 4.27	-1.753	0.080
	Group C	18.55 \pm 2.55	17.71 \pm 3.40	-0.14 \pm 2.47	-0.137	0.891
AQoL	Group A	4.31 \pm 1.27	5.45 \pm 1.08	1.14 \pm 0.79	-2.207	0.027
	Group B	4.22 \pm 1.11	5.22 \pm 1.04	1.07 \pm 1.63	-1.355	0.176
	Group C	4.88 \pm 1.05	4.86 \pm 0.96	0.10 \pm 0.75	-0.085	0.933
Perceived Exertion	Group A	5.75 \pm 1.48	3.00 \pm 1.09	2.33 \pm 1.03	-2.226	0.026
	Group B	6.12 \pm 1.55	3.00 \pm 0.00	3.83 \pm 0.98	-2.264	0.024
	Group C	5.77 \pm 1.48	3.00 \pm 1.00	2.57 \pm 1.71	-2.379	0.017

Level of Significance at $p < 0.05$.

Key

AQoL = Asthma Quality of Life.

ACT = Asthma Control Test.

w-value = Wilcoxon signed ranks test.

Subjects in Group A who received TME with deep breathing exercise and counseling sessions showed significant reduction in the systolic blood pressure (SBP) ($p=0.016$) with a significant improvement in TE_{axilla} ($p=0.007$), AQoL ($p=0.030$), ACT ($p=0.020$) and perceived rate of exertion ($p=0.030$).

Subjects in Group B who received TME and AE with deep breathing exercise and counseling sessions showed significant increase in $TE_{xyphoid}$ ($p= 0.023$) and perceived rate of exertion ($p=0.024$).

Subjects in Group C who received breathing exercise and counseling sessions showed significant improvement only in the perceived rate of exertion ($p=0.017$).

Comparison of the mean changes in the selected respiratory and cardiovascular parameters showed no significant difference ($p > 0.05$) among the three groups. Similarly, the changes in the ACT, AQoL and Perceived exertion showed no significant difference ($p > 0.05$) among the three groups.

Table 3: Mean changes of the cardiopulmonary variables amongst all 3 groups (A, B and C).

Variables	GROUP A $\Delta\bar{X}$	GROUP B $\Delta\bar{X}$	GROUP C $\Delta\bar{X}$	F-value	p-value
Cardiovascular Parameters					
SBP(mmHg)	-8.29	2.17	-2.43	2.49	0.113
DBP(mmHg)	-0.50	2.83	3.29	0.62	0.552
PR(beats/min)	-1.83	-1.83	-0.71	0.03	0.976
RPP(beats/min/mmHg)	-717.33	-52.33	-295.71	0.48	0.625
Pulmonary Parameters					
FEV ₁ (L)	0.24	0.05	-0.02	0.84	0.449
FVC(L)	-0.05	-0.05	-0.07	0.01	0.995
PEFR(L/m)	1.52	1.36	0.28	1.68	0.218
TE _A (cm)	1.25	0.96	0.17	2.67	0.100
TE _x (cm)	1.30	1.57	0.14	3.55	0.053

Level of Significance at p<0.05.

Key

$\Delta\bar{X}$ = Mean Change.

SBP = Systolic Blood Pressure.

RPP = Rate Product Pressure.

FEV₁ = Forced expiratory Volume in 1 second.

PEFR = Peak Expiratory Flow.

TE_x = Thoracic Expansion at Xyphoid process

DBP = Diastolic Blood Pressure.

PR = Pulse Rate.

FVC = Forced Vital Capacity.

TE_A = Thoracic Expansion at Axilla.

F = Analysis of Variance (ANOVA).

Table 4: Mean Changes of the Quality of Life, Asthma Control Test and Perceived Exertion Amongst all 3 Groups (A, B and C).

Variables	GROUP A $\Delta\bar{X}$	GROUP B $\Delta\bar{X}$	GROUP C $\Delta\bar{X}$	K-value	p-value
AQoL	-1.14	-1.07	-0.10	1.752	0.417
ACT	-3.50	-3.50	0.14	3.447	0.178
Perceived exertion	2.33	3.83	2.57	0.135	0.935

Key

$\Delta\bar{X}$ = Mean Change.

AQoL = Asthma Quality of Life.

ACT = Asthma Control Test.

K-value = Kruskal-wallis test.

Discussion

The results showed that there was significant reduction in the resting systolic blood pressure at the end of the 6 weeks management, and an improvement in TE_{axilla}, AQoL, ACT and perceived rate of exertion of subjects in Group A (TME group). These suggest that TME, which involves a

series of upper limb exercises in addition to breathing exercise and counseling, had a significant effect in reducing resting blood pressure. This is consistent with a previous study (Westhoff et al. 2008) where exercises involving the upper limb reduced the resting SBP and pulse rate.

The significant increase noted in the TE_{axilla} , AQL, ACT and perceived rate of exertion suggests that TME in addition to deep breathing exercise and counselling sessions are beneficial on stretching of the intercostal muscles, scapulothoracic muscles (trapezius muscle, levator scapulae muscles, pectoralis major and minor muscles, pectoral fascia) and expansion of the chest wall during the respiratory phases which may result in reduction in the work of breathing and promote better ventilation. The resultant ease experienced at respiration as a consequence may be responsible for better asthma control, more endurance during activities and ultimately a better quality of life. This however did not translate into statistically significant improvements in lung volumes (FVC, FEV₁ and PEFr), although there was slight improvement in the mean measurements seen in FEV₁ and PEFr. This may be due to the low sample size. This finding is similar to the studies of Jung and Moon (2015) and Boruah et al. (2014).

The findings from subjects in Group B imply that the combination of TME, AE and deep breathing exercises with counselling sessions may not have any additive effect on the cardiovascular system. This is contrary to previous studies where aerobic exercise was found to have a significant effect on the cardiovascular system (Fanelli et al. 2007; Awopeju et al. 2012). This difference may be accounted for by the low sample size in this study, as this is still a preliminary study as well as the reduced period of exposure to TME and aerobic exercise in this group. The statistically significant result observed in $TE_{xyphoid}$ may be as a result of the effect of thoracic mobility exercise. Furthermore, the significant improvement (although it did not reach statistical significance) also observed in the perceived rate of exertion may be related to breathing exercise in addition to aerobic exercise in this group. Previous studies have confirmed the efficacy of breathing exercise and aerobic exercise on cardiovascular endurance of patients with asthma (Wright et al. 2002; Holloway and Ram 2013; Evaristo et al. 2014). The finding that there was no significant difference in all parameters assessed except in perceived exertion in subjects in Group C (Control Group) is due to the fact that only deep breathing exercises in addition to counseling sessions were administered. The deep breathing exercise may have led to an increase in oxygen consumption, which in turn improves the cardiopulmonary function and perceived exertion.

Despite the fact that subjects in group A showed a significant improvement in many of the mean measurements for each of the variables compared to the other two groups, overall it was not statistically significant from the other groups. This finding therefore should not be generalized because of the small sample evaluated in this study, being a preliminary study.

Conclusion

Thoracic mobility exercises proved effective in improving cardiopulmonary parameters (systolic blood pressure and thoracic expansion), perceived exertion, asthma control and quality of life of patients with asthma. Also, the combination of TME, AE and deep breathing exercises with counselling sessions was effective at improving the thoracic expansion at the level of the xyphoid process. Thoracic mobility exercises are therefore recommended in the management of individuals with mild to moderate asthma and for better outcome, the period of exposure to TME should not be less than 30 minutes (Boruah et al. 2014). Further studies with an adequately powered sample size following completion of a power calculation should be conducted in order to affirm the efficacy of TME in individuals with mild to moderate asthma.

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Conflict of Interest

All authors have significantly contributed to the manuscript and agreed with the content. They declare that they have no conflicts of interest.

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Establishing a dedicated physiotherapy service for patients undergoing corrective chest wall surgery

Ashley Johnstone¹, Carl Davis¹, James Andrews¹, Barry Johnstone¹ and Kathryn Sharp¹

Abstract

Purpose

To describe the development of a dedicated chest wall physiotherapy service as part of the Scottish National Chest Wall Service for patients undergoing chest wall corrective surgery at the Royal Hospital for Children, Glasgow (RHCG).

Method

Eight patients undergoing corrective surgery at RHCG received pre-operative and post-operative physiotherapy intervention with measurement of inspiratory capacity used to track their recovery.

Results

The risk of post-operative pulmonary complications after chest wall surgery was recognised with the mean percentage predicted inspiratory capacity 27% on day 1 following surgery and 39% on discharge home. It was identified that despite early intervention from Physiotherapy many other factors impact on the recovery process with no improvement in length of stay on previous years.

Discussion

The fall in inspiratory capacity demonstrates the increased risk of developing post-operative pulmonary complications following corrective surgery for anterior chest wall deformity. The importance of a multi-disciplinary team approach with pre-operative education and early post-operative physiotherapy intervention in conjunction with effective pain management and ongoing physiotherapy review is recognised with the development of a pectus surgery recovery pathway and the provision of ongoing follow up and personalised rehabilitation.

Key Points

Patients are at risk of post-operative pulmonary complications (PPC) following chest wall corrective surgery.

Physiotherapy has a role in the prevention of post-operative pulmonary complications following chest wall surgery developing pre-operative education in addition to post-operative rehabilitation.

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Keywords

Pectus, surgery, physiotherapy, recovery.

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Introduction

Anterior chest wall deformities represent a spectrum of anomalies; the most common is where rib overgrowth causes either depression of the anterior chest wall (Pectus Excavatum) or protrusion (Pectus Carinatum) (Obermeyer and Goretsky 2012). Early attempts at surgical intervention for the correction of the chest wall deformity date back to 1911 with techniques evolving over time. Ravitch first described the complete resection of the ribs and sternum, a technique which has been since been modified (Jaroszewski et al. 2010). As clinical experience advanced, it became apparent that such extensive and radical surgery was not always necessary. This led to the emergence of the minimally invasive repair of pectus excavatum (MIRPE) described by Nuss et al. (1998) in which curved metal bars are implanted through the chest wall to exert continuous pressure on the posterior surface of the sternum achieving immediate correction of the deformity (Jaroszewski et al. 2010). This became an attractive alternative to previous surgical procedures and has become the standard technique for the correction of pectus excavatum (Nazr et al. 2010). Following surgical correction, restrictions to movement and activity are advised for 6 months to prevent bar displacement (Obermeyer and Goretsky 2012).

Post-operative Pulmonary Complication (PPC) is used to describe any complication that affects the respiratory system after surgery (Miskovic and Lumb 2017). A European joint taskforce published guidelines for peri-operative clinical outcomes (EPCO) and define PPCs as: respiratory infection, respiratory failure, pleural effusion, atelectasis, pneumothorax, bronchospasm and aspiration (Jammer et al. 2015). The incidence of PPCs ranged from <1%–23% in major surgery with adverse effects on patients with an increased in mortality in both the short and long term, increased morbidity and increased health care costs due to increased length of stay required to treat adverse outcomes (Miskovic and Lumb 2017).

It is difficult to predict when PPC may occur, however a number of studies have shown that pre-operative aerobic capacity correlates with PPC in patients undergoing lung surgery, suggesting pre-operative physical functioning can predict post-operative functioning (Loewen et al. 2007). Valkenet et al. (2011) reported the findings of a systematic review of the literature examining the effects of preoperative exercise in patients awaiting surgery and concluded that pre-operative exercise can be effective in reducing PPC and reducing length of stay.

The value of pre-operative management is becoming recognised to further enhance recovery following surgery. Boden et al. (2018) investigated 441 adults aged 18 years or older, undergoing elective major open upper abdominal surgery, and randomly assigned them to either receive an information booklet or a thirty minute preoperative physiotherapy session which included breathing exercises and education regarding early mobility. They demonstrated that a thirty minute preoperative physiotherapy session significantly reduced the incidence of PPCs from 27% of patients in the control group to 12% of patients in the physiotherapy group. In addition, they suggested that the timing of initiation of breathing exercises and technique could be improved if the patients were trained and educated prior to surgery rather than waiting until the first physiotherapy session which is often not until the day following surgery.

Literature examining the rehabilitation and recovery of patients following surgical intervention for anterior chest wall deformities is limited. Bal-Bochenska (2016) presented a single case report describing the post-operative recovery of an individual following MIRPE. Two months after the surgery, the individual reported feeling fatigued on minimal exertion and a perceived

reduced strength. Pulmonary function tests showed a forced vital capacity 48% of predicted with an inspiratory capacity of 2300ml/min, which was 1300ml/min below the predicted value. There was an imbalance in the trunk muscles with overuse of chest muscles and inefficient use of abdominals. This was further supported by Linhares et al. (2017) who evaluated forty patients, twenty in each group, comparing the functional exercise capacity and lung function among patients undergoing an early rehabilitation programme to those receiving conventional care after MIRPE. It was demonstrated that the implementation of early rehabilitation following the MIRPE presented better postoperative functional exercise capacity by hospital discharge day compared with a group receiving conventional physiotherapy (Linhares et al. 2017).

Following the appointment of a designated Chest Wall Physiotherapist as part of the Scottish National Chest Wall Service based at the Royal Hospital for Children Glasgow, the objective was to standardise postoperative physiotherapy practice and optimise patient recovery for patients undergoing corrective chest wall surgery.

Method

A small pilot study was undertaken with 8 patients listed for chest wall surgery over the months of June to August 2017 to evaluate the benefit of structured surgical pathway. As this was part of service redesign ethics clearance was not required.

Pre-operative Intervention

Each patient was seen preoperatively by a respiratory physiotherapist on the day of surgery for education regarding the recovery process and explanation of the risk of PPC and how these could be prevented. Predicted values for Incentive Capacity (IC) were established using Global Lung Initiative (<http://www.ers-education.org/guidelines/global-lung-function-initiative.aspx>). A COACH 2 (Smiths-Medical) Incentive Spirometer (IS) was issued and the technique practiced prior to surgery. A measurement of pre-operative IC was recorded. Advice was given to commence hourly incentive spirometry once the patient was awake and able following surgery. Bed transfers were practised pre-operatively to encourage patients to mobilise out of bed on day one following surgery and guidance was provided on the physical restrictions and precautions to be followed after chest wall surgery.

Post-operative Intervention

Following surgery, the patients were seen from day one for respiratory assessment and support to complete hourly IS. Mobility was encouraged, aiming to get all patients up sitting at their bedside on day one post procedure, and mobilising around their room by day two. Posture awareness and shoulder range of movement exercises were also commenced on day one. All patients were reviewed by the paediatric pain team on a daily basis to ensure adequate pain management.

Discharge Home

On discharge, each patient was given an individualised home exercise programme and encouraged to continue with three times daily IS until they achieved their predicted (IC). In addition the patients were all advised to progress their activity levels with daily walking.

Patients were followed up at one week by phone call and three weeks post discharge from hospital by outpatient review. Further follow up was arranged on an individual basis to monitor

IC and any evidence of PPC; to progress activity levels within their restrictions and to provide postural advice with range of movement and strengthening exercises as required.

Results

8 patients were listed for the NUSS procedure for correction of Pectus Excavatum over the summer of 2017 (Table 1).

Table 1: Patient recovery outcomes following chest wall surgery.

Patient Number	Gender	Age (years)	Pectus Excavatum	Surgical procedure	Post-op day commenced Incentive spirometry	Post-op day up to sit	Post-op day of mobilisation	Length of stay (days)
1	Male	14	x	Nuss	0	1	3	6
2	Male	16	x	Nuss	0	1	2	7
3	Male	12	x	Nuss	0	1	3	9
4	Male	15	x	Nuss	0	1	2	6
5	Male	15	x	Nuss	0	1	4	6
6	Male	17	x	Nuss	0	1	2	6
7	Male	15	x	Nuss	0	1	4	6
8	Female	13	x	Nuss	0	2	3	6

As demonstrated in Table 1, seven patients were able to sit out of bed on day one post-surgery with patient 8 unable to achieve this due to the level of discomfort they were experiencing and side effects of pain medication. Although 6 patients achieved mobility by day 3 post-surgery, 2 patients did not mobilise until day 4. This coincides with epidural and catheter removal and the weekend. The mean length of stay was six days which was unchanged from previous years.

Table 2: The inspiratory capacity (IC) of patients listed for chest wall surgery.

Patient Number	Predicted IC (ml)	IC Pre-Op (ml)	IC Post-Op (ml)	IC Discharge (ml)	IC 3 Weeks Post-Op (ml)	IC 3 Months Post-Op (ml)
1	2200	2500 (113%)	500 (23%)	1000 (45%)	2500 (114%)	2700 (123%)
2	3450	3750 (108%)	2000 (58%)	2000 (58%)	3750 (109%)	3500 (101%)
3	1880	1500 (80%)	500 (27%)	750 (40%)	1000 (53%)	2250 (120%)
4	2770	1500 (54%)	500 (18%)	1250 (45%)	2000 (72%)	4000 (144%)
5	3330	2290 (69%)	1000 (30%)	1000 (30%)	2000 (60%)	4000 (120%)
6	3200	2730 (85%)	500 (16%)	1000 (31%)	1500 (47%)	3250 (102%)
7	3040	2000 (66%)	750 (25%)	1000 (33%)	2000 (66%)	3250 (107%)
8	3210	2000 (62%)	500 (16%)	1000 (31%)	2500 (78%)	2800 (87%)
Mean	2885	2284 (80%)	781 (27%)	1125 (39%)	2156 (75%)	3219 (112%)

Figures in brackets indicate percentage of the predicted normal.

The mean IC preoperatively is 80% of the predicted normal (Table 2) and on day one post-surgery the mean IC fell to 27% of predicted normal. The mean IC increased to 39% of predicted normal by the discharge day (Table 2). Three weeks following surgery the mean predicted IC improved to 75% of predicted normal and by three months following surgery IC had increased above the initial pre-operative value and is above the predicted normal at 112% (Table 2 and Figure 1).

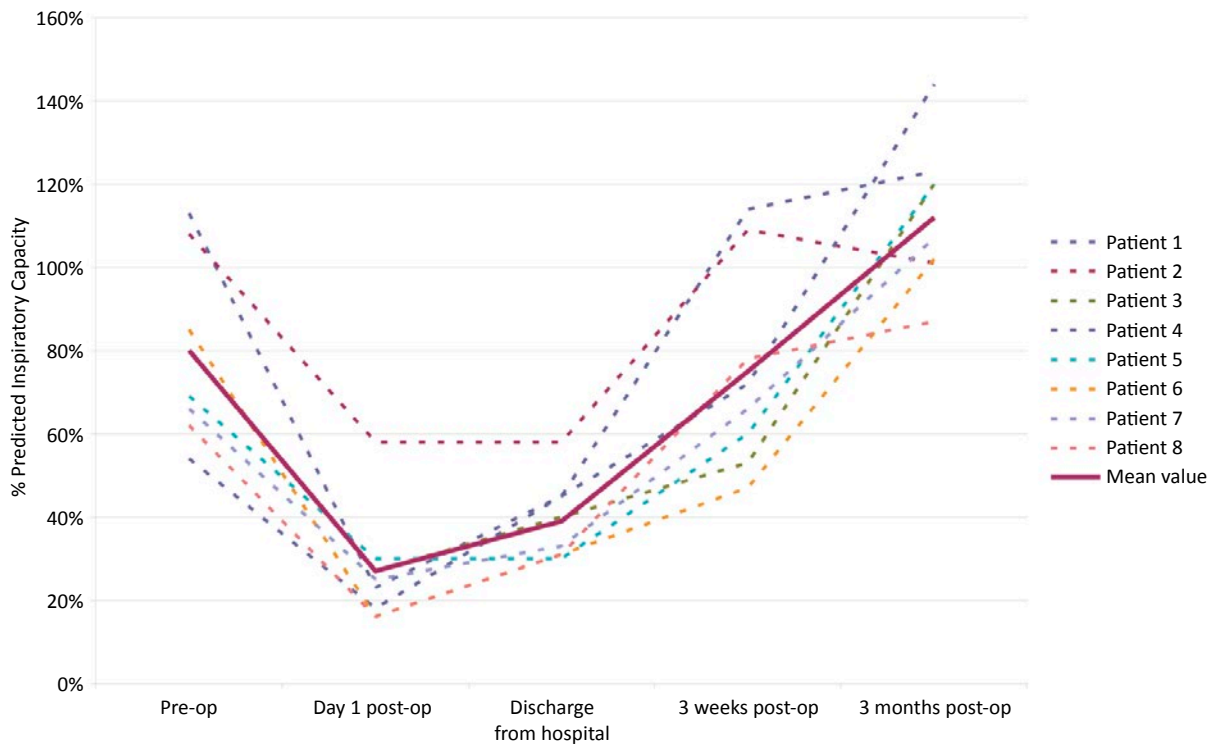


Figure 1: The Percentage Predicted Inspiratory Capacity.

Discussion

Following thoracic surgery, it is recognised that postoperative physiotherapy regimes with, or without IS are the most effective mechanism to avoid PPC and enhance patient recovery (Agostini et al. 2008). In this study, all patients were encouraged to begin IS as soon as possible after surgery to prevent PPC. This is important as timing of the intervention is critical because the majority of PPC will occur during the first 24 hours following surgery (Boden et al. 2018). The risk of PPC and the importance of timely initiation of breathing exercises in patients undergoing MIRPE is demonstrated by the drop in IC immediately postoperatively to 27% of predicted normal demonstrating a dysfunction in breathing mechanics.

Despite early intervention, on discharge home, the mean IC was 39% of predicted normal suggesting there is still a risk of PPC after these patients are safe to discharge home. This is unsurprising due to the physical restrictions advised at discharge which include no lifting, twisting, forward or side bending from the chest and no physical exercise for the first three months and only light exercise between three and six months. In addition, patients still have substantial discomfort and ongoing analgesia requirements.

We also found that despite early postoperative intervention the length of stay remained unchanged on previous years. This was felt clinically significant as the length of stay is associated with the development of PPC (Boden et al. 2018). It was observed that the level of pain the patients were experiencing in addition to nausea and vomiting, constipation, wound infection and low mood, were all significant in the recovery process following MIRPE and would need to be considered by the multidisciplinary team to optimise recovery.

As a result of our findings and positive patient feedback from a more structured and informed rehabilitation process, a Recovery Advice Leaflet and Pectus Surgery Recovery Pathway were

devised in conjunction with the multidisciplinary team to guide patients through their rehabilitation on a daily basis. Following the work of Boden et al. (2018) who established the value of a pre-operative education, an education class is to be implemented for future patients. Potential service development could include implementing an enhanced recovery model to reduce the average length of stay from six days in recognition that length of hospital admission is associated with increased incidence of PPC (Boden et al. 2018). Further work by the multidisciplinary team exploring all aspects of the patient journey will be undertaken to develop this model of care.

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Using change models to improve the provision of exercise for the inpatients on the adult cystic fibrosis unit

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Abstract

Exercise is viewed as an important component to Cystic Fibrosis (CF) inpatient care and recent CF guidelines state that inpatients with CF should have the opportunity to exercise on a daily basis, (CF Trust, 2017). A local training course on models for change (Tools for Change Projects, 2016) helped to identify issues with exercise provision for inpatients on our specialist adult CF unit. An exercise session was observed and the views of a patient and the treating therapist were gained, as well as the views of the other physiotherapists on the unit.

Once issues were identified, an aim was agreed with key stakeholders that 80% of eligible inpatients should receive an individualised exercise program. All patients who were deemed safe to exercise were asked to take part. A patient information leaflet on the benefits of exercise and how to exercise safely and effectively was developed, as well as a computerised exercise database containing exercises appropriate for adult CF inpatients. An individually tailored exercise program was developed for each patient from the exercises in the database, and patients were then encouraged to exercise independently for the duration of their admission.

Data were collected for six weeks before and after the changes. Before the project 11 out of 18 patients (61%) were offered exercise and only 5 (28%) patients agreed to exercise. After the project all 19 patients (100%) were offered exercise and 16 (84%) undertook exercise. This demonstrates that a hospital run training course on models for change can help identify issues enabling the instigation of changes necessary to improve the provision of exercise, within the current resources of the unit.

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Keywords

Models for change, service improvement, exercise, Cystic Fibrosis.

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Introduction

Background

Exercise and physical activity should be integral to the overall physiotherapy management of patients with CF, irrespective of age and disease severity (Smyth et al, 2014). Exercise has been shown to have beneficial effects in longer term studies. Moorcroft et al. in 2004 looked at the effects of 12 months unsupervised exercise. Fifty-one patients were randomized into either a control group or an exercise group, who completed three 30 minute sessions of upper and

lower body strength exercises a week. In the exercise groups they found significant reductions in resting heart rate, a measure of fitness levels, a significant increase in leg strength and forced vital capacity. As well as benefits to fitness levels, lung function and strength, studies have shown beneficial effects of combined strength and aerobic training exercise over a more prolonged period (>12 weeks) in adults with CF on glycaemic control (Beaudoin et al. 2017) and improvements in health-related quality of life (Hebestreit et al. 2010).

Studies on the benefits of exercise for CF patients admitted to hospital with a pulmonary exacerbation are sparse and of low methodological quality. One study has been undertaken in a paediatric population and demonstrated that exercise can improve clinical and quality of life measures which were maintained after hospital discharge, (Selvadurai et al. 2002). The patients were randomised into aerobic training, resistance training or a control group. Those in the aerobic training group completed five 30 minute sessions of aerobic activities a week. Children randomised to the resistance training group exercised both upper and lower limbs against a graded resistance machine. Subjects in the control group received standard chest physiotherapy. The children who received aerobic training had significantly better peak aerobic capacity measured by VO_2 max during treadmill exercise, activity levels, and quality of life. Children who received resistance training had better weight gain (total mass, as well as fat-free mass), lung function, and leg strength than children who received aerobic training. However, the sample size was small, the patients and researchers were not blinded as to the intervention arm that they were in and the results are from a paediatric population. Despite these limitations it is still reasonable to assume that adults are likely to have a similar response to aerobic and strength training.

Attending a study day on exercise in CF (ACPCF Study Day, Jan 2016) highlighted a need for improvement in the provision of inpatient exercise in our specialist adult CF unit. Frimley Park Hospital has a population of 146 CF patients with five inpatient beds and four clinics a week. Two full time clinical specialist physiotherapists are employed for the unit and cover is provided by band 5 physiotherapists. Whilst receiving inpatient treatment for an infective exacerbation, the physiotherapists review all inpatients twice daily for airway clearance sessions because it is known to be an extremely important component to CF care (Prasad et al. 2013). The CF Standards of Care (CF Trust 2017) recommend that patients receive a minimum of twice daily treatment, or more regularly if required. The type of treatment is not specified but should be decided by an assessment of the patient's needs.

Individuals with CF admitted for inpatient care should have opportunities to exercise on a daily basis (CF Trust 2017) and the 2015 peer review of our service recommended 'provision of supervised exercise sessions for all inpatients in addition to airway clearance needs'. At Frimley, however, exercise sessions were offered on an ad hoc basis, for example if a patient could be independent with one their airway clearance sessions. This meant that patients were not receiving essential care that has been shown to improve lung function, health related quality of life and fitness levels (Radtke et al. 2017).

Therefore, an audit into current levels of exercise provision and uptake, the reasons for low frequency of inpatient exercise sessions, and ways of improving exercise provision was undertaken.

Aim

To use methods learnt on the 'Tools for Change Projects' course to assess and improve current levels of provision and uptake of exercise for inpatients on the CF unit.

Objectives

- To investigate the reasons for poor provision of exercise.
- To ensure that all appropriate patients are offered an exercise program during their inpatient admission.
- For 80% of inpatients admitted with CF, who are medically fit to exercise, to have a personalised exercise plan that they could carry out independently during their hospital admission.

Methods

A 3-day training course on making change happen in the NHS called 'Tools for Change Projects' was attended and helped identify different stages to making successful and long lasting changes to practice (Tools for change 2016). The initial stage involved ensuring that the 'project was worthwhile one' to pursue by reviewing national and local policies and guidelines. For this project this included the latest peer review of our CF service (2015), Frimley Health's development priorities and the national guidelines on exercise in CF (CF Trust 2017).

The second stage of the 'Tools for Change Projects' methodology stressed that before making changes it is important to understand current practice. To do this a 'Gemba walk' was used (Figure 1). This tool is part of the five principles of 'Lean' thinking (Westwood et al. 2007) and entails watching the whole patient journey from the patient's perspective and asking questions in a respectful way. The observational methods of a Gemba walk identify the root cause of problems and therefore offer a much more practical and real-time way of solving issues, (Castle and Harvey 2009). In this instance an exercise session led by a band 5 physiotherapist was observed and both the patient and the physiotherapist were questioned afterwards. The patient's questions included:

- 'How did you find the exercise session?'
- 'Is there anything that could have made the exercise session better?'
- 'What was the aim of the exercises?'
- 'Do you know what to expect from the rest of the admission?'

The physiotherapist was asked how confident they felt prescribing exercise and how they judged what intensity the patient should be exercising. Also, general feedback from the patient and physiotherapist was gained. This allowed issues with current provision to be identified.



Figure 1: The Gemba walk entails watching the whole patient journey from their perspective while asking questions in a respectful way. The Gemba walk helps to identify the root cause of problems.

A stakeholder analysis (Figure 2) was undertaken to ensure that all the key people were involved in delivering the change. Also, conflict and delays were avoided by not inadvertently failing to consult key people (ACT Academy 2018). All the people that would be involved or affected by the project were identified, then their power over the project and their impact on it was determined (NHS Vanguard Program 2012–13). Once the stakeholders were identified a meeting was arranged. This included the medical lead physiotherapist, specialist CF nurses, and the medical physiotherapists who were involved in the care of the CF patients. During the meeting the reasons for the project and the importance of exercise were highlighted. Then their views, concerns and ideas were determined and project aims were decided upon. Ideally, patients would receive daily supervised exercise whilst they are inpatients. However, this was not feasible with the CF unit’s staffing. The solution that was agreed upon was to teach all eligible patients individualised exercises and provide them with a personalised written program. The patient would then be able to follow the exercise program independently for the duration of their admission. Discussion with the ‘Tools for Change Projects’ course participants and leader helped to ensure that the agreed objectives were ‘SMART’ i.e. Specific, Measurable, Achievable, Realistic and Timed.



Figure 2: Stakeholder Analysis involved identifying all the people that would be involved or be affected by the project, then determining their power over the project and their impact on it.

The improvements were implemented by creating a computer database of exercises that are appropriate for inpatients with CF. It contained a mixture of cardiovascular and strengthening exercises for upper limb, lower limb and core. This allowed therapists who were not as confident in exercise prescription to be able to prescribe appropriate exercises more easily. If a patient desaturated during exercise it was felt that it would be more appropriate to supervise the patient for the duration of their training sessions so that adjustments could be made.

A new patient information leaflet for our unit was also developed called: Exercise in Cystic Fibrosis. This had information on the benefits of exercise, type of exercise, how to exercise safely, their target heart rate and also space for personalised exercise programs to be added by the physiotherapist. Training was given to relevant staff on the use of this new leaflet, the database and how to work out a target heart rate. This was to ensure that the patient was working at 50–70% of their maximum heart rate. Staff were encouraged to utilise the leaflet with every patient.


Benefits of Exercise

- Improves fitness.
- Maintains or improves lung function.
- Increases muscle strength.
- Improves bone mineral density.


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**How to
exercise safely**



- You should not exercise within one hour of eating.
- Wear loose fitting clothes and trainers.
- Have a drink to hand to ensure that you do not become dehydrated.
- Have any relieve inhalers to hand in case you need to use them.
- Always warm up before your exercise session and cool down and stretch afterwards.
- If you are diabetic please check your blood sugars before starting exercise – they should be above 5mmol and have a carbohydrate based snack to hand.
- If your BMI is low (less than 18) please speak to your dietician before starting a new exercise program.

Figure 3: Excerpt from the patient information leaflet used to encourage independent exercise for inpatients with CF.

Data were collected for weeks prior to the launch between October and November 2016 and for six weeks after, between December 2016 and January 2017 on adult patients who were admitted with an infective exacerbation of CF. Patients were excluded if they were admitted for less than four days or had cardiovascular instability, large volume haemoptysis (over 250mls in 24 hours

within the last two weeks), pneumothorax, acute fractures or musculoskeletal problems affecting their ability to exercise. Data collection was done prospectively by the Physiotherapists as part of the daily statistics already being collected for the ward.

Results

Subjects

Twenty-one patients were admitted during the data collection period before the changes had been implemented with three excluded due to short admissions. Twenty patients were admitted in the period after the changes had been made with two of these excluded for short admissions.

Exercise Provision and Uptake

Since the changes were made all patients were being offered an exercise program (n=19/19) compared with only 61% (n= 11/18) prior to the project. Uptake of exercise increased from 28% (n=5/18) to 84% (n=16/19). The three patients (16%) who did not take part were all offered an exercise session but all declined to exercise.

Reasons for poor provision of exercise

Issues that were identified by physiotherapists included a lack of knowledge of appropriate strengthening exercises to prescribe a patient with CF and low confidence in leading exercise sessions. Also, lack of resources and space were mentioned as issues for the lack of adequate provision of aerobic exercise. Time required to carry out exercise sessions regularly throughout a patient's admission so that meaningful gains were achieved was also an issue that was highlighted repeatedly by physiotherapists who worked on the ward. Discussion with the patient revealed that there was a lack of clarity on which exercises they should and could continue independently, how many repetitions and how frequently.

Written Exercise Program Provision

Prior to the project launch no patients received a written exercise plan during their hospital admission (n=0/18). After the improvement project of the 16 patients who agreed to exercise, the physiotherapist felt that two of these were not safe to exercise independently, either due to desaturation during exercise and a need to be closely monitored, or due to poor technique when exercising putting them at increased risk of injury. Therefore 86% of those who agreed to exercise and were appropriate to receive a written program did (n=12/14).

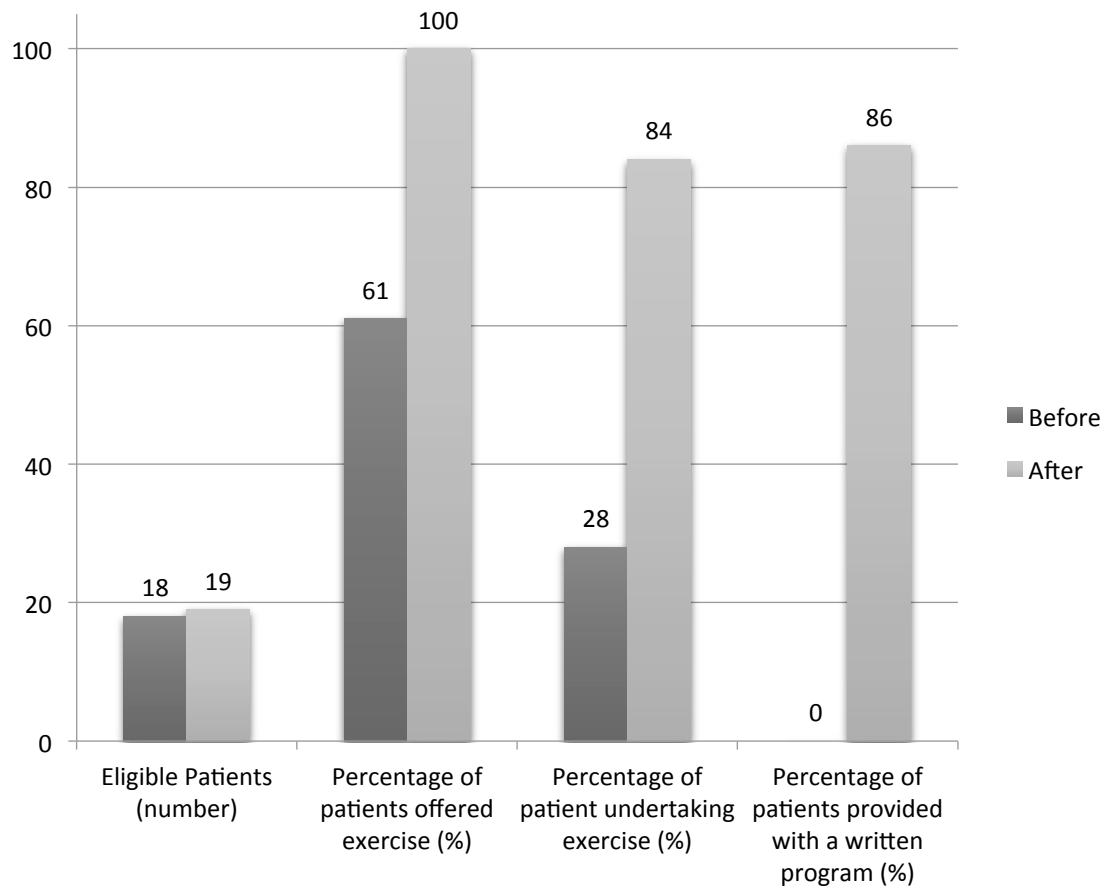


Figure 4: Graph showing the percentage of patients being offered and undertaking exercise before and after the improvement project.

Discussion

The provision and uptake of exercise for inpatients on the CF unit has improved greatly since the improvement project started (28% carrying out exercise before vs. 84% after). The course guided the process of identifying issues, setting appropriate objectives, gaining information and support from colleagues, deciding on a feasible way of making changes to achieve the project objectives and analysing the effect of the changes.

The main changes made were education of staff, the introduction of a patient information leaflet on exercise and a computerised exercise database with training on how to use it. The CF unit at Frimley is small, with a limited number of staff which made education and change easier than it may be in a larger unit with a greater number of staff. The changes enabled patients to exercise independently for the duration their hospital admission, with support from the physiotherapists and other members of the multi-disciplinary team.

Limitations

Due to time constraints it was not possible to observe more than one exercise session during the Gemba walk. Therefore, the opinions of that patient may not reflect those of other patients on the unit. Also, the observed treating physiotherapist, being a band 5 with limited training on exercise in CF, may have been unrepresentative of other CF physiotherapists. To reduce the bias of opinion on the reason for the poor provision of exercise all relevant staff members were questioned as part of the stakeholder analysis. Therefore, it is only the patient's view point that may not be a true reflection. The opinions of staff and patients were not formally assessed

following the project so observations of whether the changes implemented addressed the issues cannot be formally commented on. However, the physiotherapists had started to regularly provide exercise programs which would indicate an increase in knowledge and confidence in this area. It would have been useful to gain feedback from patients on the exercise leaflet and their experience of inpatient exercise.

One of the aims of the course was to ensure that the change project was undertaken as a collaboration of all the relevant individuals to allow all staff to own the changes to help the changes to become long lasting. Therefore, it is hoped that the positive changes seen were maintained. This, however, was not assessed as part of this project meaning that the long term effects of this service improvement cannot be commented on.

It was beyond the scope of the project to analyse how many independent sessions were undertaken by patients and whether the exercises were continued after discharge, although this would have been interesting to know. Also, objective measures on the effect of exercise for inpatients with CF were not assessed. Therefore the effect of the additional exercise sessions that were being offered is unknown.

Funding for an Exercise Practitioner role has been secured to continue to help improve the provision and uptake of exercise on the CF unit even more. This will also allow improvements in the outpatient provision of exercise to be assessed and improved. Therefore, a re-audit of the service will be undertaken after a year.

Conclusion

Utilising a hospital run course on making change happen and using material from the 'Tools for Change Projects' course allowed issues to be investigated and a solution to be devised that was feasible within the current resources. It also helped to improve the knowledge of the physiotherapists and confidence in prescribing exercise, reflected by the increase in provision and uptake of exercise in the six week study period.

Key Points

- Exercise is an important component of care for adults with CF admitted to hospital with an infective exacerbation and can be offered even when staffing levels are suboptimal.
- A 'Tools for Change Projects' course helped to identify issues and help make meaningful changes to practice.
- The introduction of a patient information leaflet and creating and training staff on a computerised database of CF appropriate exercises has improved the provision of exercise on the CF unit.

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Lung ultrasound can aid differential diagnosis of a ‘whiteout’ during an on-call physiotherapy assessment: A case report

Lisa Hayward¹ and Simon Hayward²

Abstract

Introduction

A hemithorax opacification on chest radiograph (CXR) is commonly termed a ‘Whiteout’. A ‘whiteout’ is often interpreted as whole lung collapse and assumes sputum plugging of either main bronchi. A referral to physiotherapy is usually made however this may occur outside of ‘normal’ working hours, requiring the need for ‘on-call’ physiotherapy. There are other causes of a ‘whiteout’ that would not respond to physiotherapy resulting in the ineffective use of physiotherapy time and resources. Lung ultrasound (LUS) is more accurate in differentiating between parenchymal and pleural pathologies when compared to CXR and auscultation. A recent scoping review highlights that LUS may be a useful bedside imaging technique for physiotherapists to use when completing respiratory assessments.

Case Presentation

We present an 89-year-old patient who was admitted to the surgical high care unit due to post-operative pulmonary complications. A CXR revealed a ‘whiteout’ triggering a referral to the on-call physiotherapist. A LUS scan was performed by the physiotherapist, this revealed a large right sided pleural effusion of unknown cause with underlying lung atelectasis. The patient underwent a therapeutic aspiration to the right lung with immediate good effect and a rapid decrease in his oxygen requirements. The patient’s course of treatment was altered significantly; the patient was stepped down to a different ward and Physiotherapy treatment was not performed as it was not indicated.

Discussion

A ‘whiteout’ can be caused by a significant pleural effusion even when sputum retention is suspected. LUS allowed for a faster and more accurate assessment of the patient’s lungs to help with differential diagnosis and guide any potential physiotherapy treatment. Lung ultrasound is not currently a skill commonly practised by physiotherapists and its use is only beginning to emerge. The author who has gained competency in this skill has found it to be of significant value when conducting respiratory assessments particularly when faced with emergency on-call situations and undifferentiated pathologies.

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Keywords

Diagnosis, lung ultrasound, physiotherapy, case study, whiteout, opaque hemithorax.

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Conclusions

LUS when performed during an on-call physiotherapy assessment offered a differential diagnosis in the case of a lung 'white out' resulting in more effective clinical decisions, appropriate interventions and potentially a better outcome for the patient.

Key points

This case report illustrates how:

- Lung ultrasound can be useful to identify the causes of a 'whiteout'.
- Lung ultrasound can be performed by Physiotherapists during an on-call assessment.
- Lung ultrasound can potentially enhance decision making and patient health outcomes.

Introduction

A 'whiteout', on chest radiograph (CXR) often results in a referral for chest physiotherapy. This referral assumes that sputum plugging of either main bronchi has resulted in a whole lung collapse. Chest physiotherapy treatments would then consist of sputum removal followed by lung re-expansion. The referral to physiotherapy may occur outside of 'normal' physiotherapy hospital working hours, resulting in the patient being seen by the 'on-call' physiotherapist, who would usually attend based on the above clinical information. However, there are other causes of a 'whiteout' that would not respond to physiotherapy interventions. These include: pneumonectomy (Drury et al. 2010), descending thoracic aortic dissection (Alzand and Al-haidari, 2010), pleural thickening (Lee et al. 2005) and most commonly a large pleural effusion (Bharty et al. 2013). Differentiating between these pathologies using CXR alone depends on the experience of the reviewing clinician. Even then it may not be accurate enough resulting in the patient receiving unnecessary and ineffective treatment.

Lung ultrasound (LUS) has been shown to differentiate between parenchymal and pleural pathologies such as consolidation, atelectasis and pleural effusion with good accuracy (Lichtenstein et al. 2004). The varied use of LUS by physiotherapists was recently reported in a scoping review by one of the authors (Hayward and Janssen, 2018). It highlights that LUS may be a useful bedside imaging technique for physiotherapists to use. This is further supported by two respiratory physiotherapist specific reviews by Leech et al (2014) and Le Niendre et al (2016). It seems logical that LUS would also be useful when assessing a patient with a 'whiteout' during a physiotherapy on-call situation. To the authors knowledge this is the first case study reporting on the use of lung ultrasound by an on-call physiotherapist.

Case Presentation

The on-call physiotherapist was called in at 12am and asked to assess a patient with a 'whiteout' of his right hemithorax. The medical trainee doctor assumed that post op atelectasis due to sputum plugging was clinically the likely cause.

The 89-year-old male was admitted to the surgical high care unit following an elective inguinal hernia repair. Post operatively he was requiring high concentrations of oxygen. Relevant medical history noted hypertension and a known hiatus hernia. He was an ex-smoker with a 40–50 pack year history with no reported diagnosis of COPD or other respiratory co-morbidities. He did

however report a dry cough and increased shortness of breath during the three weeks prior to surgery.

The medical trainee doctor was consulted over the phone by the surgical doctor and the treatment plan was to give intravenous antibiotics, salbutamol nebulisers, saline nebulisers and to request urgent chest physiotherapy.

On assessment by the on-call physiotherapist, the patient was fully alert and conversant with a raised respiratory rate of 26 breaths per minute and his oxygen saturations were 96% on 100% oxygen via a non-re-breathe mask. His blood pressure was low compared to normal at 98/56 but otherwise stable. He was afebrile and had no raised inflammatory markers. On chest auscultation the patient had decreased breath sounds in the right lung base and middle lobe with no added crackles or wheeze. The patient had a strong dry cough and no complaints of pain.

The clinical findings were not suggestive of sputum plugging. The physiotherapist wanted to rule out a pleural effusion as a cause for the whiteout prior to attempting any physiotherapy techniques and as LUS is found to have 94% specificity when used to rule out effusion (Winkler et al, 2018) the physiotherapist decided to perform a scan. The physiotherapist had gained accreditation following assessment of competency in the use of LUS after 9 months of scanning with mentor support. The scan took approximately 10 minutes to perform and revealed a large right sided pleural effusion with underlying lung collapse. Normal lung appearances were seen throughout the left lung.

The medical trainee doctor was contacted to re-review the patient and to discuss the LUS scan images with the physiotherapist. In doing so the course of treatment was immediately changed. The patient underwent a therapeutic aspiration to the right lung with a plan to insert a chest drain later that day; 1.5 litres of blood stained pleural fluid was aspirated with immediate good effect to the patient's condition. The patient's oxygen requirements dropped to 35% via humidified facemask and the patient was later stepped down to a respiratory ward. The saline and salbutamol nebulisers were stopped, and the physiotherapist recommended that the patient be reviewed by the ward physiotherapist later that day following drain insertion to consider the use of physiotherapy techniques to help resolve any residual atelectasis.

The ward sister on shift commented positively, highlighting the value added by the physiotherapist in performing bedside LUS *'that we have potentially prevented 24 hours of unnecessary intravenous antibiotics and nebulisers as well as the need for a surgical high care bed'*.

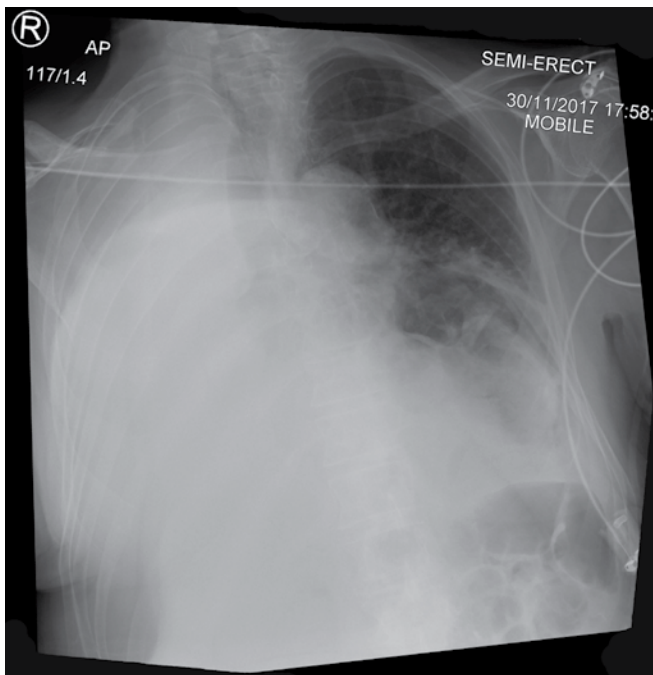


Figure 1: Chest radiograph showing right sided 'whiteout'.

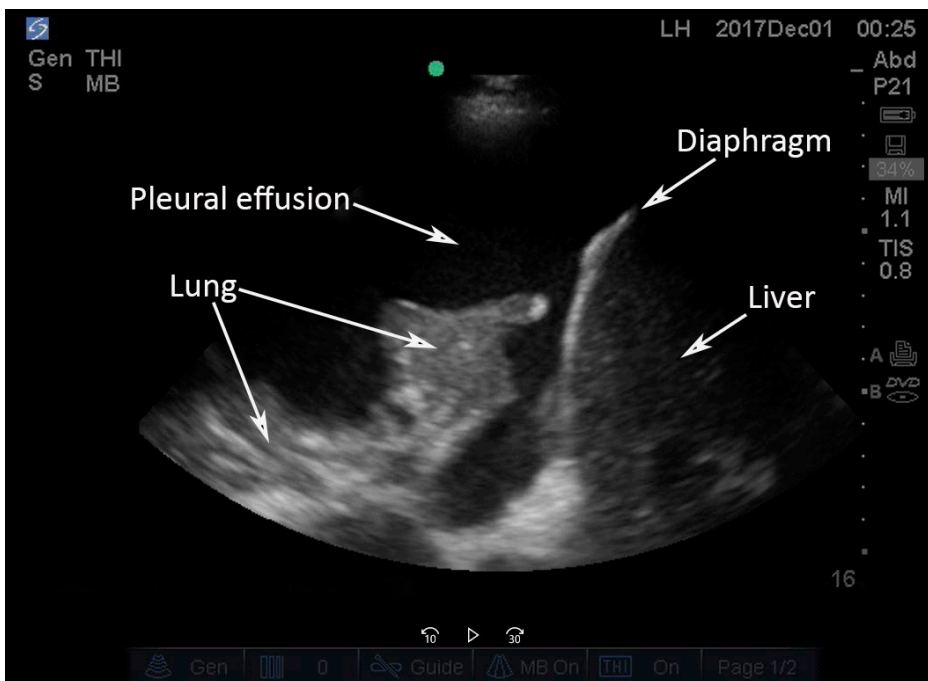


Figure 2: Lung ultrasound of right posterior-lateral thorax showing a large pleural effusion.

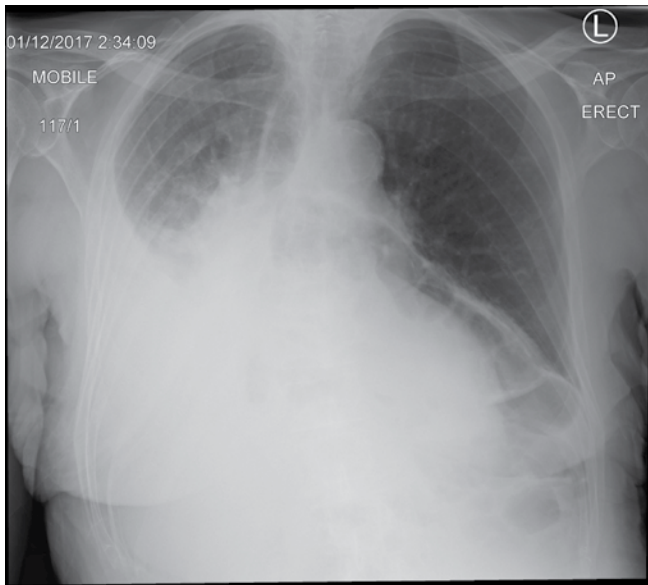


Figure 3: Chest radiograph showing residual pleural effusion and hiatus hernia following therapeutic aspiration.

Discussion

A 'whiteout' can be caused by a significant pleural effusion even when sputum retention is suspected (Leech et al. 2015; Hayward and Rudd 2017). This case similarly demonstrates the high accuracy of LUS when used to aid differential diagnosis of respiratory pathologies and its effectiveness in guiding physiotherapy interventions, specifically in an emergency on-call situation.

LUS allows physiotherapists to image the patient's lungs quickly, accurately and in real time. For this patient, significant value was added and as a result the patient received the appropriate treatment for his condition and avoided any unnecessary medical or physiotherapy interventions which would have been of little benefit or potentially caused harm.

Timely intervention for this patient resulted in immediate improvement and prevented possible further deterioration, which, may have resulted in the need for a critical care bed. Following treatment, the patient became more stable, this reduced the workload and demand on the nursing staff, meaning the patient could be stepped down from an acute surgical bed. This positively impacted both the patient and the workforce and has implications for both clinical and cost effectiveness.

Lung ultrasound is not currently a skill commonly practised by physiotherapists and its use is only beginning to emerge. This raises the question as to what might the outcome have been for the patient had he not received an ultrasound scan? Would the physiotherapy treatment plan have differed? It is possible that the same conclusions could have been drawn without the use of LUS but through use of other tools such as chest percussion or auscultation? So while this case demonstrates the high sensitivity of LUS perhaps future studies are needed to compare LUS with other assessment tools to look at sensitivity and specificity when used specifically by physiotherapists in their respiratory assessments.

Following this case report it is reasonable to suggest that there is a future potential use for LUS among physiotherapists however the teaching of LUS to all on-call physiotherapists may not be practical within many organisations due to limitations such as time, resources, governance

issues and maintaining competence. It might be more reasonable to suggest that experienced, static respiratory physiotherapists consider learning this skill within an environment that they might regularly use LUS (for example: critical care/respiratory wards/chest clinics) and have access to a LUS qualified mentor. If such physiotherapists within hospital Trusts are able to gain accreditation and eventually mentor status themselves then this may increase opportunities for less experienced rotational staff to undergo training. Staff should consider use of available CPD hours to allow dedicated time to training. More research is perhaps needed on the feasibility of training physiotherapists and the timescale required to gain competence.

It is important to consider the wider applications of LUS by physiotherapists in the acute setting, for example Hayward and Hayward (2018) demonstrated the sequential use of LUS to track changes in the lungs in response to medical and physiotherapy interventions. The cost benefit to having staff upskilled in the use of LUS is currently unknown and can only be speculated and so future studies around use of LUS and its effect on patient outcomes needs to be explored.

Conclusions

Lung ultrasound when performed during an on-call physiotherapy assessment can offer a differential diagnosis in the case of a lung 'white out'. Gaining accurate information about the patient's underlying pathology resulted in more timely and effective decisions regarding the most appropriate interventions required. In doing so the patient had potentially much better health outcomes and any further unnecessary interventions or delays in treatment were avoided.

Acknowledgements

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Funding

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Ethics

A consent form for this case report was obtained from Research and Development at the Blackpool Teaching Hospitals Foundation Trust, completed by the author and signed by the patient.

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Exploring the experiences of patients undergoing critical care rehabilitation. A service evaluation

Lorna Hubbard¹ and Molly Hashmi Greenwood²

Abstract

Introduction

Though existing qualitative studies have investigated patients' perceptions of critical illness and its impact, few studies have focused on patients experiences of the rehabilitative process during their critical care admission. Following service developments in the critical care unit it was considered important to evaluate the patients experience of rehabilitation during critical care admission.

Aim

The project aimed to explore the experiences of patients undergoing rehabilitation in the Critical Care Unit of a district general hospital.

Method

Participants were selected using purposive sampling and invited to take part in a semi-structured interview approximately 2 weeks after discharge from critical care. Interviews were recorded for transcription and data were analysed using Thematic Analysis.

Results

Four participants took part in 1 interview each; 3 male and 1 female (aged between 42 and 77). Interviews lasted between 8 and 32 minutes.

Key themes and sub themes were identified relating to the experiences of critical illness and rehabilitation during Critical Care admission. These were:

Understanding the patient perspective of critical illness and recovery

- The variety of inter-related problems.
- Recognising recovery from critical illness as a gradual process.

Understanding the experience of rehabilitation during critical care

- Therapy as a positive intervention.
- Enabling participation in rehabilitation.
- Relationship with therapy staff.

Conclusion

Participants considered rehabilitation in Critical Care beneficial as it provided distraction from boredom and a focus on purposeful activity. The relationship that therapists

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Critical care, early rehabilitation, patient experience.

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developed with patients in Critical Care can have a considerable impact on the way in which they engage in rehabilitation and influence other symptoms such as low mood. Exploring different ways of working to organise rehabilitation activities in collaboration with patients may improve patient experience.

Introduction

Existing qualitative research exploring patients' experiences during Critical Care (CC) admission provides useful insights into patients' perceptions of critical illness by exploring some of the key problems they encounter such as weakness, dependence and lack of control (Agård et al. 2012, Karlsson et al. 2012 and Engstrom et al. 2013). However, the patients' experience of rehabilitation during CC admission has not been fully evaluated. Sottile et al (2015) used a questionnaire to evaluate patients' and relatives' perceptions of physiotherapy during intensive care. Physiotherapy was considered necessary and beneficial by patients and their relatives; despite finding it difficult patients enjoyed physiotherapy and satisfaction levels were high. The authors suggested future research using a qualitative approach to explore the reasons behind these findings.

Research evaluating patients' experiences of rehabilitation after critical care has also shown high levels of satisfaction (Walker et al. 2015, Ramsay et al. 2016). Physiotherapy was considered one of the most important aspects of ward-based rehabilitation with greater satisfaction reported among participants who had more frequent physiotherapy provided by rehabilitation assistants in addition to the ward team (Ramsay et al. 2016). Walker et al. (2015) found that CC patients who attended an outpatient rehabilitation class after hospital discharge reported increased strength, fitness and function as well as a range of psychological benefits.

This project was carried out to evaluate the impact of recent service developments in the Critical Care Unit (CCU) and to inform future development work. Following audits assessing compliance with clinical guidelines including 'Rehabilitation after Critical Illness' [CG83] (NICE 2009) and the Guidelines for Provision Intensive Care Services (GPICS) (FICM/ICS 2016) changes had been made to the multi-disciplinary team (MDT) ward round, patient assessment and goal setting. Although this work improved compliance with guidelines, the patients experience of rehabilitation in CC had not been evaluated previously.

Aim

The primary aim was to explore the experiences of patients undergoing rehabilitation while in the CCU of a district general hospital.

Setting

The evaluation took place in the 7 bedded mixed CCU of a district general hospital. The CCU receives approximately 650 patients per year and provides level 2 and 3 care as defined by the Intensive Care Society (2009). Rehabilitation is predominantly provided by physiotherapists with 0.75 of a whole time equivalent dedicated to the CCU during weekdays. Two generic therapy assistants (GTAs) work with the physiotherapists when required and carry out some planned therapy interventions. An on-call service is available for treatment of respiratory problems overnight and during the weekend.

Method

Design

Semi-structured interviews were used to explore the patient experience of rehabilitation in the CCU and was completed as part of an MSc dissertation project.

Recruitment/Participants

Purposive sampling was used to ensure participants had adequate experience of CC rehabilitation and were representative of the typical population in this CCU. Inclusion and exclusion criteria are shown in table 1. Potential participants were identified by the physiotherapy team and provided with verbal and written information about the project soon after transferring to a general ward. The investigator returned 1–2 days later to gain consent and arrange an interview.

Table 1: Inclusion and Exclusion Criteria.

Inclusion	Exclusion
<ul style="list-style-type: none">• Critical care stay (level 2 or 3) of 4 days or more.• Awake and responsive for >3 therapy sessions which included a rehabilitation component carried out by a member of the therapy team.• Age >18.	<ul style="list-style-type: none">• Unable to recall >3 rehabilitation sessions.• Unable to communicate sufficiently in English.• Repatriated from another unit with recollection of undergoing rehabilitation activities in another hospital.

Data Collection

Interviews were scheduled between 7 and 15 days after discharge from CC to gain timely insights into participant's experiences during their CC stay. Participants were offered a choice of venue (within the hospital or their own home) and a mutually convenient time was agreed. All interviews were conducted by the investigator and structured using a topic guide. The key points included in the topic guide are shown in Figure 1. Interviews were recorded electronically then transcribed by the investigator.

Figure 1: Key points included in the interview topic guide.

Introduction

- Background to ICU admission.
- Perceptions of recovery process.

The meaning of rehabilitation

- Understanding of the term 'rehabilitation' in critical care.
- Clarification of rehabilitation from the investigator where necessary.

Perceptions of rehabilitation

- Activities considered to be components of rehabilitation.
- Feelings about participating in rehabilitation.
- Aspects of rehabilitation considered most beneficial.
- Physical and psychological recovery.

Facilitation of rehabilitation

- Factors aiding participation in rehabilitation.
-

Barriers to rehabilitation

- Factors limiting participation in rehabilitation.
 - Factors that could have improved participation.
-

Organisation and planning

- Goal setting.
 - Amount of rehabilitation.
 - Timing.
-

Closing the Interview

- Opportunity to discuss any aspects of rehabilitation not already covered.
-

Data Analysis

Interview transcripts were analysed using thematic analysis (Braun and Clarke 2006). Two transcripts were reviewed by a clinical colleague who had not been involved in the participants care to check coding.

Ethical Considerations

Having reviewed the project proposal Sheffield Hallam University and the hospital's research department defined the project as a service evaluation, negating the need for ethical approval. Measures to maintain confidentiality and anonymity were agreed with the hospital's information governance department. All participants were given written information, consented to participate and could withdraw at any time.

Results

Recruitment took place between November 2016 and March 2017. Four participants took part in one interview each, this included a pilot interview. Interviews lasted between 8 minutes and 34 minutes.

Participant Characteristics

Participants characteristics are shown in table 2. All participants were mechanically ventilated and received level 3 care (ICS 2009). All participants reported that they were independent in activities of daily living prior to critical illness. Interviews took place between 7 and 15 days after CC discharge.

Table 2: Participant Characteristics.

Pseudonym	Gender	Age	Diagnosis	Length of critical care stay	Interview Location
Andrew	M	65	OOHCA and pneumonia	22 days	Home
Lukas	M	59	Urinary Sepsis	8 days	Home
Janine	F	42	Pneumonia	11 days	Hospital
David	M	77	AAA repair	6 days	Hospital

Key

OOHCA = Out of Hospital Cardiac Arrest.

AAA repair = Surgical repair of Abdominal Aortic Aneurysm.

Themes

Though this project aimed to explore the experiences of patients undergoing rehabilitation while in CC, participants also spoke in detail about the impact of critical illness on their wellbeing and recovery. Subsequently, understanding the experience of critical illness was considered fundamental to understanding the experience of rehabilitation during CC.

A total of 2 themes with 5 sub-themes were identified. These are shown in Table 3.

Table 3: Themes.

Key theme	Sub themes
Understanding the patients' perspective of critical illness and recovery	The variety of inter-related problems Recovery from critical illness is a gradual process
Understanding the experience of rehabilitation during critical care	Therapy as a positive intervention Enabling participation in rehabilitation Relationship with therapy staff

Understanding the patient's perspective of critical illness and recovery

The variety of inter-related problems

Participants identified numerous problems which they experienced during CC (Figure 2). The prevalence, severity and impact varied; some problems were short-lived whereas others were persistent and several had complex connections, such as the link between boredom and low mood which subsequently affected motivation to engage in rehabilitation. Understanding the range and impact of problems experienced by participants helped to provide awareness of their rehabilitation needs.

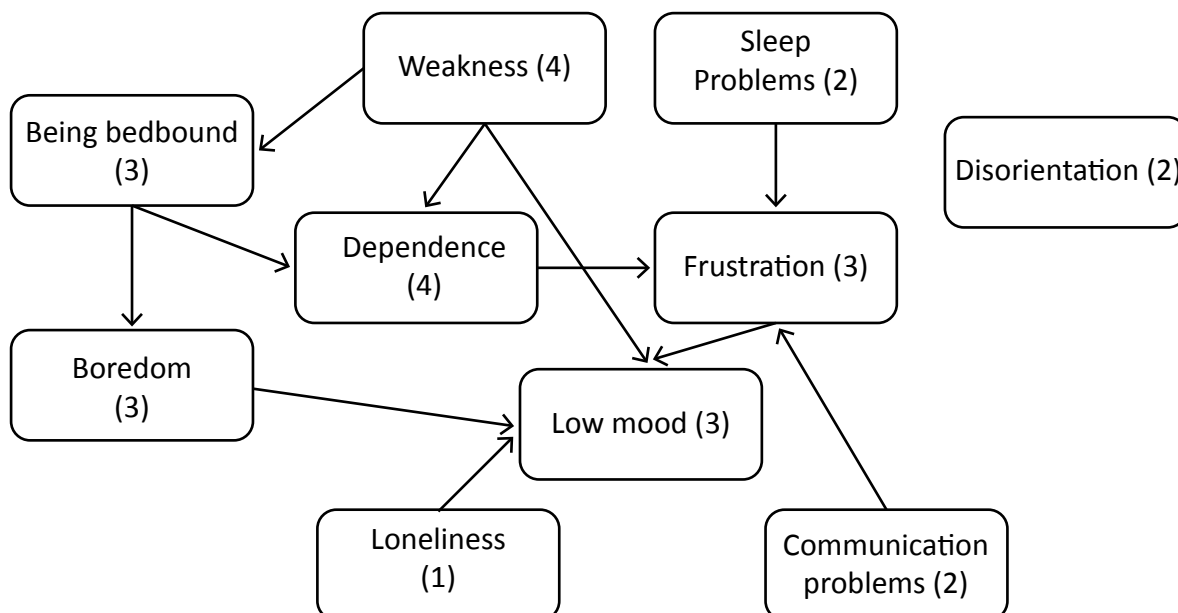


Figure 1: Symptoms reported by participants.

Recovery from critical illness is a gradual process

Having never experienced critical illness previously participants had not known what to expect. They all drew upon the notion that recovery was a slow and gradual process, this was frustrating and disappointing at times, and acceptance of the recovery process varied between participants.

'it's been small steps rather than leaps' Janine.

Understanding the experience of rehabilitation during critical care

Rehabilitation as a positive intervention

Physiotherapy was associated with improving strength, stamina and function. Guidance with activity and exercise progression was valued. There was little focus on specific activities though novel interventions such as the MOTomed cycle ergometer provided interest. Therapy was particularly valued for providing a distraction and reducing boredom.

'The physio, they come round, ... try to sit you up and try walk, to show, do this and do that, do a simple exercise, where you would have thought ... "why you have to show me that?"; you know because after you've been through the critical stage ... they have to show you some basic steps' Lukas

'It also keeps your mind occupied as well, erm which obviously, you know, gets you away from those low moods.' Janine

Enabling participation in rehabilitation

Attachments such as catheters and tracheostomies were perceived as a temporary barrier to participation. Mood and outlook on recovery had a considerable influence on participation in rehabilitation. Intensity and length of sessions was deemed appropriate but organisation and timing of activities was not always convenient.

'And when I'm on that bed, oh I just shut me eyes and go somewhere else, which is sad, but I don't know what I can do about it. I really don't, and I feel that that is holding me up to some degree' David

'You try to fight but at that particular point it was very, very low, but then when you think of your family, you know, you cannot just give up like that.' Lukas

'they [nurses] just seem to nicely finish with you, you're comfortable in bed (sighs) and you'd [physiotherapists] arrive.' Andrew

The relationship with therapy staff

Participants appreciated being treated as a person rather than a patient. Engaging in the social aspects of therapy and humour were considered to have a positive influence on their mood. The sense of team-working was important to achieve common goals and participants felt valued for their own involvement in rehabilitation sessions. Physiotherapists were trusted to judge their physical capabilities and limitations.

'We're interacting, and besides doing the physio we're interacting as human beings, bit of fun, a laugh, you know.' David

'Like I've got you, physio coming to see me once a day so it's good to know I've got that support behind me. And you're working with me, so yeah.' Janine

Discussion

This service evaluation explored patient's experiences of rehabilitation during CC admission and found that rehabilitation was viewed as a positive intervention due to the perceived psychological benefits as well as physical gains.

With no prior experience of critical illness, participants had few expectations of rehabilitation but recognised its positive effects on physical and psychological progress. They enjoyed taking part and were grateful for the care they received. Acknowledgement of the benefits of therapy during and after CC has been reported by Deacon (2012) and Sottile et al. (2015). Having used quantitative methods Sottile et al. (2015) could not explain the reasons for high satisfaction levels reported but hypothesised that the individual attention patients received may contribute. This argument is pertinent to this evaluation as the content of rehabilitation appeared not to be significant. Participants considered specific rehabilitation interventions as simplistic and linked them directly to a physical goal such as increasing mobility. More emphasis was placed on other factors, such as the diversion physiotherapy provided from boredom and the indirect psychological support received through the rapport built with therapists.

The role of physiotherapy in providing meaningful activity to reduce boredom was highly valued, it not only passed time but was perceived to be useful. This finding was also observed after hospital discharge by Walker et al. (2015) who found that CC patients attributed boredom to ongoing physical limitations but the social aspects of a rehabilitation programme and support from staff reduced boredom and provided purpose.

For most participants, the relationship they developed with the therapists had a considerable impact on the way in which they engaged in and experienced rehabilitation. Chatting and making jokes made participants feel at ease and valued as a person rather than a patient. The explanations and verbal encouragement therapists provided also reassured them about the

recovery process and helped them develop the determination and positive outlook regarded necessary to progress physically. Studies exploring the experiences of patients in CC have also found encouragement, humour and individual attention to be among some of the characteristics which create a positive environment that makes patients feel safe, empowered and motivated to focus on recovery (Wåhlin et al. 2006). Similar qualities have been noted to enhance therapeutic relationships in other rehabilitation settings. Palmadottir (2006) reported that the informality of the relationship and frequent, prolonged contact with patients had with occupational therapists in a range of settings contributed to a positive therapeutic relationship.

Mood and attitude towards recovery were considered important factors affecting the ability to engage rehabilitation, low mood was considered a significant barrier and remaining positive was important. The effect of low mood was discussed in varying degrees, some participants insinuated that more frequent interaction would have been beneficial whereas others described significant low mood. However, there was a consensus that engaging in purposeful activity had psychological benefits. Ramsay et al. (2016) found higher levels of satisfaction amongst CC patients who had received additional support from therapy assistants during ward-based care after critical illness. Participants without this dedicated support experienced more anxiety regarding the course of recovery and long-term implications of critical illness.

The way in which rehabilitation activities was organised also affected involvement in rehabilitation. The findings were varied highlighting the importance of considering patients' preferences when making daily plans and setting goals. Some participants felt they were not involved in the daily plans, activities often occurred one after another in the morning then they had nothing to do later. Spreading daily activities such as personal care and rehabilitation more evenly throughout the day to avoid boredom and fatigue would have been preferable. Some of the daily planning occurs during the MDT ward round and work has been done to develop this process. However, these results suggest further improvements could be made to foster a more patient centred approach.

Exploring participants' perceptions of the optimal amount of rehabilitation was a point of interest due to national standards and guidelines (NICE 2009, FICM/ICS 2016). Within the studied CCU, it is estimated that patients receive physiotherapy for between 10 and 45 minutes each day. Although this does not consistently meet the recommended standard of 45 minutes (FICM/ICS, 2016), participants generally thought the amount of rehabilitation they received was appropriate in relation to their capabilities and reported feeling tired after therapy. They did not want longer physiotherapy sessions but having shorter, more regular sessions was suggested as a way of receiving more therapy and being encouraged with exercises.

Increasing rehabilitation provision without extra funding requires consideration of alternative ways of working. Projects exploring different methods of increasing rehabilitation provision including developing the role of therapy assistants in CC have been published. A single centre service evaluation demonstrated a reduction in level 3 bed days and average length of CC stay which also proved to be cost-effective (Douglas 2016). However, a larger study concentrating on increased ward-based therapy with provided by GTAs reported increased delivery of rehabilitation activities and satisfaction amongst patients but no improvement in physical function or length of hospital stay after CC (Walsh et al. 2015). The role of GTAs is being developed within the therapy team to enable GTAs to provide additional rehabilitation such as exercise programmes

and supervising use of the MOTomed cycle ergometer. It is hoped that the role of the Occupational Therapist may also be expanded to provide more rehabilitation in CC.

Limitations

The main limitation of this project was the failure to reach data saturation ie. the point at which no new themes are identified, and findings are confirmed (Guest et al. 2006). Lack of data saturation limits the ability to draw clear conclusions from the data and is considered multi-factorial. The small sample size caused by various challenges to recruitment such as the temporary closure of an ICU bed due to nursing staff shortages which reduced the capacity of the CCU during the recruitment period. Additionally, the nature of critical illness may impact on a person's ability or wish to recount their experiences.

The investigators close connection with the service being evaluated provided in-depth knowledge of the service but also created potential for bias. As a novice interviewer a significant learning curve was experienced whilst conducting interviews. Reflexivity was important to develop interview technique throughout the project and consider potential biases.

Conclusions

Despite a small sample this evaluation offers useful insights into the range and impact of symptoms experienced by patients in CC. Rehabilitation in CC was not only considered important for physical improvement but also for its positive impact on psychological problems such as on boredom and low mood. The importance of the therapeutic relationship may sometimes be underestimated but can have a significant influence on participation.

Exploring different ways of working, including increasing collaboration between the patient and the MDT when organising rehabilitation and developing the role of generic therapy assistants in CC may enable increased provision of rehabilitation and improve the patient experience.

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Physiotherapy in children with difficult asthma: An exploratory cross-sectional survey of UK services

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Prof Andrew Bush^{2,3}, Prof Sejal Saglani^{2,3}

Abstract

Background

Physiotherapy services for paediatric difficult asthma (DA) are still in their infancy compared to adult DA services. Children with DA have high levels of morbidity, poor quality-of-life and require large amounts of health care resources to manage their condition. National guidelines recommend a specialist multidisciplinary assessment and evidence shows that physiotherapy input into paediatric asthma services is beneficial. Physiotherapy involvement is however extrapolated from adult services as there are no validated screening tools, assessment methods, or physiotherapy specific outcome measures for children with asthma.

Objectives

To benchmark physiotherapy service structures and describe the outcome measures and treatments used by physiotherapists in UK paediatric difficult asthma teams.

Design

Cross-sectional survey using multiple choice responses or open comments. Completed either electronically or as a semi structured telephone interview.

Setting

Geographical sampling of 22 UK hospitals with established specialist paediatric respiratory services.

Participants

Lead paediatric respiratory physiotherapists from 18 hospitals (response rate 82%).

Analysis

Descriptive and inferential statistics.

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Keywords

Child*; Asthma; Physiotherapy, Physical therapy modalities, breathing pattern, Exercise induced laryngeal obstruction; Health care surveys

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Results

Three services (3/18, 17%) had a designated physiotherapist for children with asthma. Service size and structures varied, with best access to a specialist physiotherapist being via out-patient services (10/18, 56%). The majority (15/18, 83%) of physiotherapy services were not funded from asthma teams. There was no consensus on screening patients, assessment protocols or outcome measures.

Conclusions

Physiotherapy provision for paediatric asthma is currently under-funded and provided on an ad-hoc basis. There is a clear need to create and validate screening tools and outcome measures, and identify effective treatment modalities for children with DA.

Contribution of paper

1. We identified that there is limited access to specialist physiotherapists for children with difficult asthma.
2. We identified that there is no agreed diagnostic or management algorithms to identify children with asthma who would benefit from physiotherapy interventions.
3. We identified the need for physiotherapists to be funded and integrated into specialist asthma multi-disciplinary teams to develop specialist skills, a defined role and referral pathways.

Introduction

Asthma affects an estimated 1.1 million children in the United Kingdom (UK) making it the most common long-term condition effecting children (Asthma UK, 2018) with a small proportion (approximately 5%) classed as having severe or difficult asthma (DA) (Barnes and Woolcock, 1998). DA generally refers to those patients who have been diagnosed with asthma but, despite increasing doses of regular asthma therapy, asthma or asthma-like symptoms are still present and poorly controlled; increasing the likelihood of life-threatening asthma attacks (Harrison, 2003). Children with DA often use high doses of medication including regular oral corticosteroids to manage their symptoms and require frequent unplanned visits to the GP, accident and emergency departments and inpatient stays. Because of this, children with DA have a high level of morbidity and anxiety with lower health-related quality-of-life and require a large amount of NHS resources to help manage their condition (Fleming et al., 2015).

To meet the needs of children with DA, national guidelines support the use of specialist paediatric difficult asthma multidisciplinary teams (MDT) (BTS/SIGN, 2016 and NICE, 2013). Their functions are to help confirm an asthma diagnosis, exclude alternative causes of persistent symptoms, manage co-morbidities, confirm adherence to treatment and ensure treatment is appropriate. The physiotherapist's role within the specialist DA team is to help identify symptoms caused by breathing pattern dysfunction, poor fitness, exercise induced laryngeal obstruction (EILO) and manage co-morbidities such as retained secretions (BTS/SIGN, 2016 and NICE, 2013).

Physiotherapy interventions may involve breathing pattern retraining, physical exercise training, manual therapies, relaxation techniques, self-management and overcoming barriers to

adherence (BTS/SIGN, 2016). Although there is little research on the impact of physiotherapy interventions in children with DA, we do have evidence of clinic-based physiotherapy intervention for dysfunctional breathing having significant improvements in children's symptom scores and quality of life in the short and medium term (Barker, Elphick and Everard, 2016). Community based physiotherapy interventions for children with asthma significantly reduced emergency department visits, hospital admissions and improved adherence to treatments (Lilley and Turner, 2016). Three randomised controlled trials which assessed breathing exercises for children with asthma (Chiang et al., 2009, Cowie et al., 2008 and Slader, 2006) showed clinically significant changes after physiotherapy interventions in reducing asthma symptoms, reduced inhaled corticosteroid use and anxiety levels respectively.

In 2016 NHS Commissioning for QUality and INnovation (CQUIN) for problematic severe asthma was offered to all specialist paediatric centres in England and included physiotherapy provision (NHS England, 2016). The CQUIN provided funding streams if adopted by a hospital and set out a 12-week time frame for the MDT assessment, including respiratory paediatricians, clinical nurse specialists, a physiotherapist and psychologist, for a new patient referral.

Despite national guideline and research recommendations and commissioning streams, anecdotally few paediatric asthma teams have designated physiotherapists. Paediatric asthma physiotherapy services remain in their infancy compared to the more structured adult services. This apparent disparity provided the motivation for this project.

Objective

This study aimed to (a) investigate how UK paediatric asthma physiotherapy services are structured; (b) to determine whether the current guideline recommendations about access to specialist physiotherapy care for children with DA are being met; (c) to explore physiotherapists' use of outcome measures and treatment modalities in this patient group.

Method

Design

A new survey was created as no appropriate validated tool could be identified which addressed the specific aims of this study. A review of previous similar studies was conducted alongside a comprehensive search of databases Medline, CINAHL, Embase, Cochrane library, NICE evidence and clinical guidelines (conducted in June 2016) from which a set of questions was created in alignment with the study aims. A copy of the survey is available in Appendix 1. There were 12 questions which took 15 to 30 minutes to complete.

Setting and Participants

Geographical sampling was used to identify twenty-two large referral hospitals spread across the UK with commissioned specialist paediatric respiratory services. Each hospital was contacted and the lead paediatric respiratory physiotherapist identified. Initial telephone contact was made to explain the purpose of the study and each site was invited to take part. Participation was voluntary, consent to participate was taken during this initial telephone call. Each participant was given the option to complete the survey via e-mail or as a semi-structured telephone interview. The semi-structured interview framework was based on the survey questions but gave freedom to tailor enquiries to responses given by the interviewee.

When no reply to initial contact was obtained a first reminder email was sent after six weeks with a second reminder sent six weeks later if needed. In cases where no response within six months of the initial call, the participant was excluded from the study.

Data analysis

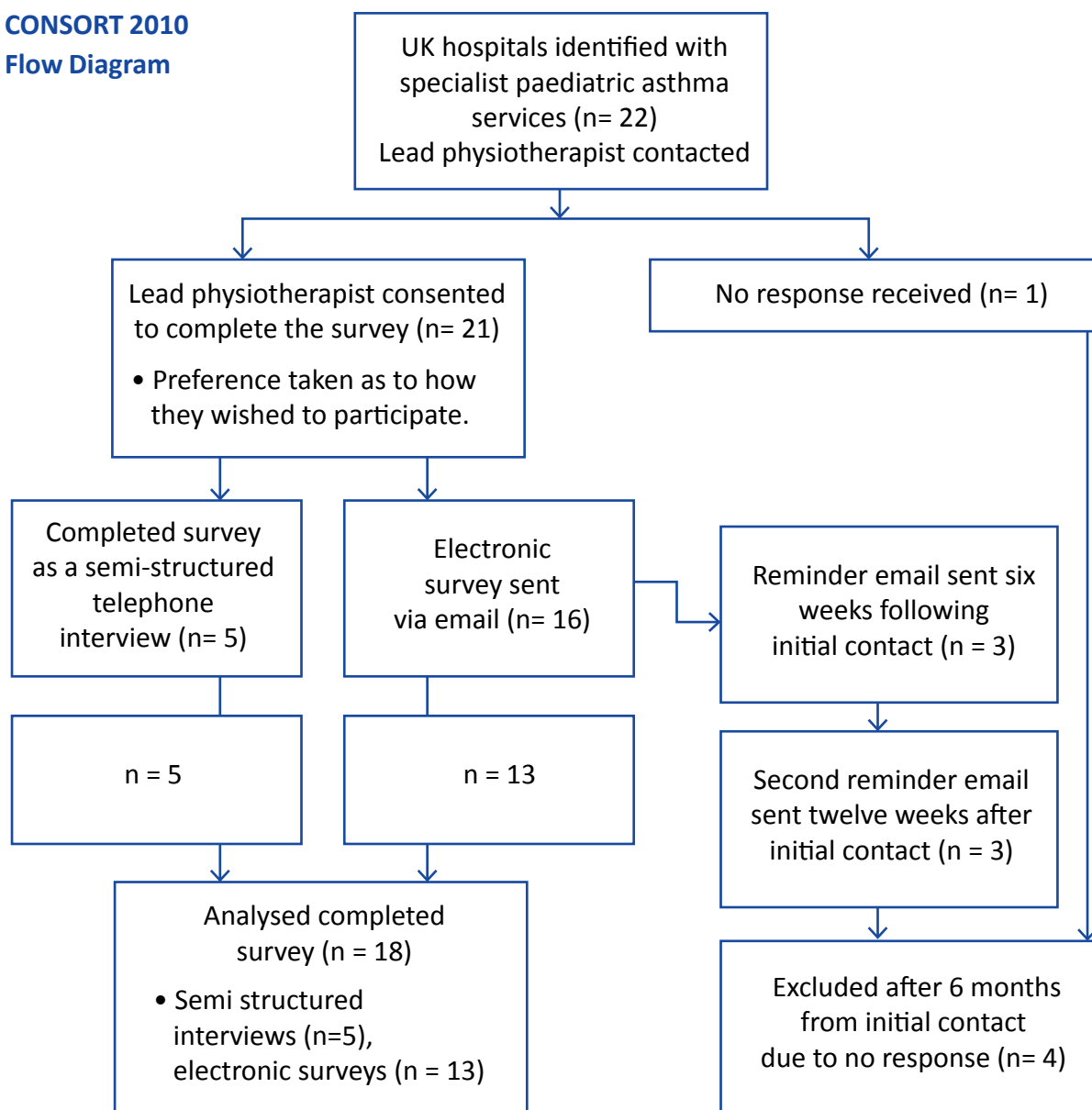
Data were coded and entered anonymously into Microsoft Excel™ spreadsheet. Data was non-parametric and summarized using descriptive statistics reported as percentages or median (range). Themes were also developed from email open text responses and semi-structured interviews.

Results

Demographic data

Only one of the twenty-two hospitals did not respond to the initial invitation. Twenty-one lead paediatric respiratory physiotherapists consented to participate in the study and the questionnaires were sent out for completion between July 2016 and Dec 2016. Three sites were excluded due to non-response after the six-month time limit. Eighteen physiotherapists replied with thirteen completing the questionnaire via email and five via semi-structured interview.

CONSORT 2010 Flow Diagram



Physiotherapy service structure

Table 1: Participating physiotherapy service descriptions.

Services	Designated DA physiotherapist	Weekly physiotherapy hours for DA service (hrs per week)	DA physiotherapy referral rate (number per year)	Method of referral for physiotherapy (Paediatric respiratory consultant: PRCons, Asthma clinical nurse specialist: A-CNS, Physiotherapist: PT, General practitioner: GP)	Physiotherapy service provision	Inpatient physiotherapy service	Outpatient physiotherapy service	Clinic physiotherapy service
BM1	No	3.5	70	PRCons, A-CNS or PT	No set hours. Service provision is dependent on referrals and case load	Blanket review	Regular outpatient slots	No clinic cover
BM2	No	0	0	N/A	No physiotherapy cover for DA at present	No formal cover	No formal cover	No clinic cover
BM3	Yes	4	Unsure	PRCons	Primarily outpatient-based services led by one physiotherapist for the paediatric asthma services	Assessed if referred	Regular outpatient slots	No clinic cover
BM4	No	0	72	PRCons	No set time for DA patients, time taken from general respiratory or cystic fibrosis service	Blanket review	Regular outpatient slots	No clinic cover
BM5	Yes	7.5	Unsure	PRCons or A-CNS	New post funding - structure of provision still to be decided. Primarily outpatient based currently. One lead physiotherapist providing the service	Blanket review	Regular outpatient slots	Yes – regular clinic attendance
BM6	No	0	Unsure	PRCons or GP	No set hours, service provision is dependent on referrals	Assessed if referred	Adhoc outpatient appointments	No clinic cover
BM7	No	0	Unsure	PRCons or A-CNS	No set hours, service provision is dependent on referrals	No formal cover	Adhoc outpatient appointments	No clinic cover
BM8	No	0	30	PRCons, A-CNS or GP	No set hours, service provision is dependent on referrals	Assessed if referred	Regular outpatient slots	Adhoc clinic attendance
BM9	No	0	Unsure	PRCons or A-CNS	Physiotherapy service provision comes from complex respiratory patient funding	Assessed if referred	Regular outpatient slots	No clinic cover

Table 1 (continued): Participating physiotherapy service descriptions.

Services	Designated DA physiotherapist	Weekly physiotherapy hours for DA service (hrs per week)	DA physiotherapy referral rate (number per year)	Method of referral for physiotherapy (Paediatric respiratory consultant: PRCons, Asthma clinical nurse specialist: A-CNS, Physiotherapist: PT, General practitioner: GP)	Physiotherapy service provision	Inpatient physiotherapy service	Outpatient physiotherapy service	Clinic physiotherapy service
BM10	No	0	Unsure	PRCons	No set hours, service provision is dependent on referrals	Assessed if referred	Adhoc outpatient appointments	No clinic cover
BM11	No	0	Unsure	PRCons or A-CNS	No set hours, service provision is dependent on referrals	Assessed if referred	Adhoc outpatient appointments	Adhoc clinic attendance
BM12	Yes	37.5	Unsure	PRCons or A-CNS	1 full post to provide physiotherapy to the whole of the asthma service	Assessed if referred	Regular outpatient slots	Adhoc clinic attendance
BM13	No	4	Unsure	PRCons	Local agreement to provide 4 hours a week, Assessed if referred this usually comes from the bronchiectasis service	Assessed if referred	Adhoc outpatient appointments	No clinic cover
BM14	No	0	12	PRCons	No set hours, service provision is dependent on referrals	Assessed if referred	Regular outpatient slots	No clinic cover
BM15	No	0	2	PRCons	No set hours, service provision is dependent on referrals. It is covered by non-funded services	Assessed if referred	Regular outpatient slots	No clinic cover
BM16	No	0	14	PRCons or A-CNS	No set hours, service covered by cystic fibrosis team	Assessed if referred	Regular outpatient slots	Adhoc clinic attendance
BM17	No	0	20	PRCons or A-CNS	Awaiting to see if funding application to develop service provision has been successful. Currently no set hours	Assessed if referred	Adhoc outpatient appointments	No clinic cover
BM18	No	0	36	PRCons	Minimal hours weekly	Assessed if referred	Adhoc outpatient appointments	No clinic cover

Physiotherapists were employed as part of specialist asthma teams in only three centres (17%). The majority of centres (13/18, 72%) provided *ad-hoc* cover to specialist asthma teams with no dedicated specialist physiotherapist, with funding from general respiratory teams or taking physiotherapy time from other funded services such as bronchiectasis or cystic fibrosis.

One third of responders did not know their service size or referral rates. Seven centres (39%) could give details of annual referral rates, with a median 20 referrals per year (range 2–72). Seventeen physiotherapy services (94%) relied on receiving referrals from paediatric respiratory consultants and clinical nurse specialists. No service had a physiotherapy referral proforma for the specialist asthma MDT to use.

Access to physiotherapy services was primarily through general physiotherapy outpatient clinics. Ten physiotherapy services (56%) had general respiratory outpatient appointments which could be available for children with DA, although not specifically dedicated for them. At the time of this service review, only one hospital had a physiotherapist regularly present in the paediatric DA clinic. Thirteen inpatient physiotherapy services (72%) could only treat a child with difficult asthma if the referral met strict criteria, typically if patients had issues of retained secretions.

Themes identified from free text in the survey and semi-structured interviews showed most respondents (78%) were unable to differentiate service provision specifically for children with DA or identify which children had a diagnosis of DA, they also reported a lack of integration within the specialist DA services. Respondents felt this led to less understanding of one another’s roles and skills.

Assessments and Outcome Measures

Twelve respondents (67%) included information on their assessment, no set protocol was identified, with the content of each assessment determined on an individual basis depending on the presentation of the child. Only 8 (44%) respondents gave details about what they included in their assessment of a child with DA (fig 1.).

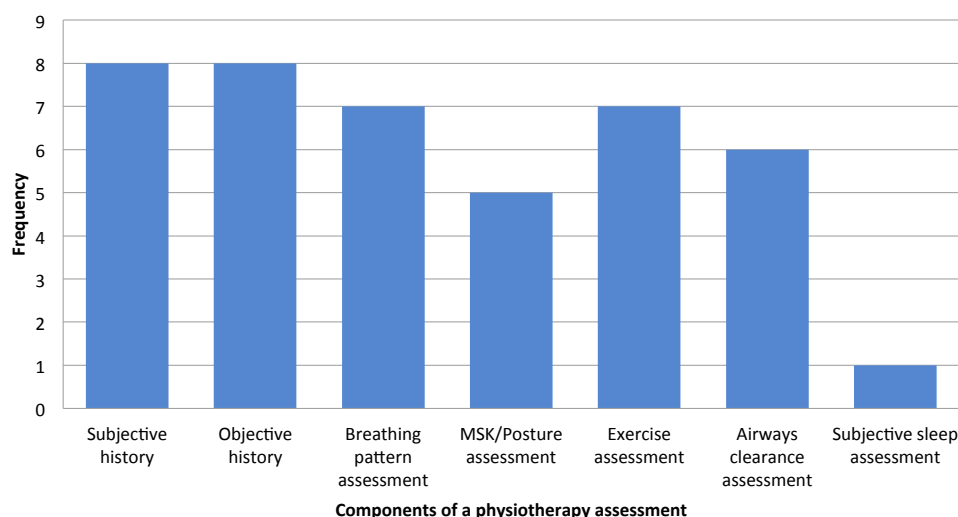


Figure 1: Elements of a paediatric physiotherapy difficult asthma assessment across the UK (numbers based on 8/18 respondents).

All eight physiotherapists completed a full subjective and objective history for each patient assessment; the majority then completing assessments for breathing pattern dysfunction, exercise and airway clearance. To do this a range of outcome measures were used (fig 2.).

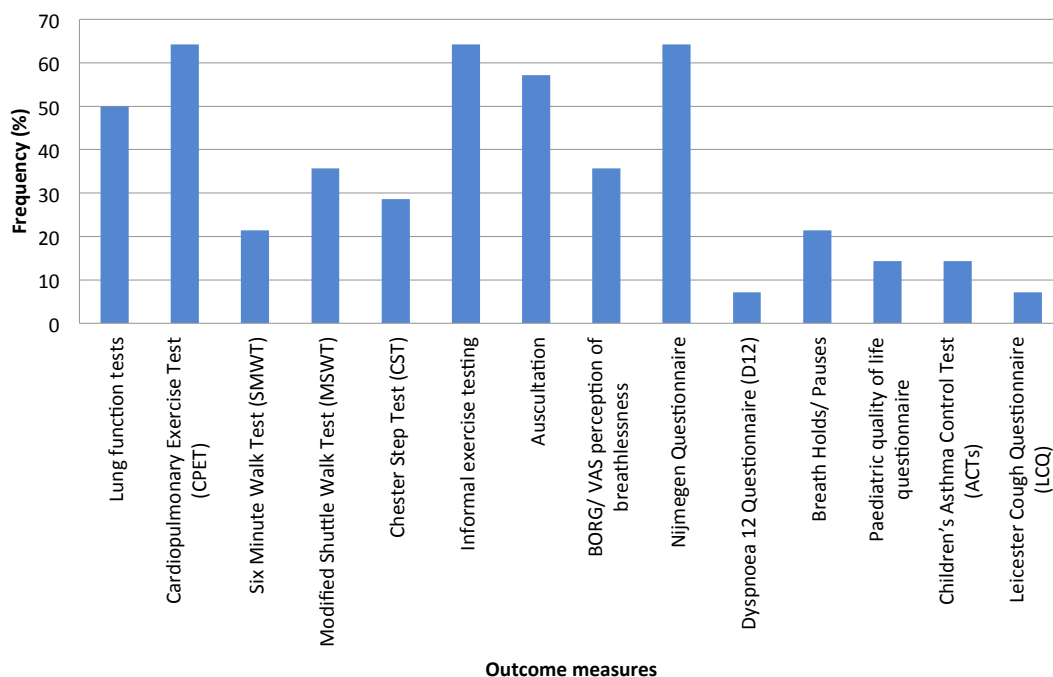


Figure 2: Outcome measures used by physiotherapists across the UK to assess children with asthma (percentage based on 14/18 respondents).

Themes which emerged from interviews highlighted a lack of consensus as to which outcome measures were thought to be clinically relevant. Physiotherapists felt they lacked specialist skills in assessing and treating children with DA particularly in relation to breathing pattern dysfunction and exercise. There was a sense of physiotherapists not having time or opportunities to undertake training to develop these skills as they were not integrated into the specialist asthma services.

In relation to outcome measures, physiotherapists often considered a child's age or maturity when deciding whether they could use an adult outcome measure effectively e.g. the Nijmegen Questionnaire (van Dixhoorn and Folgering, 2015). Physiotherapist used non-physiotherapy specific measures such as school attendance, quality of life, hospital admissions or the ACT score to assess the impact of physiotherapy interventions.

Treatment modalities

There was considerable variation in treatment approaches used across the UK. The five most common treatments provided included airway clearance techniques, breathing pattern retraining, exercise interventions, giving advice and education on asthma symptom management and exercises for relaxation and anxiety management (Fig 3.).

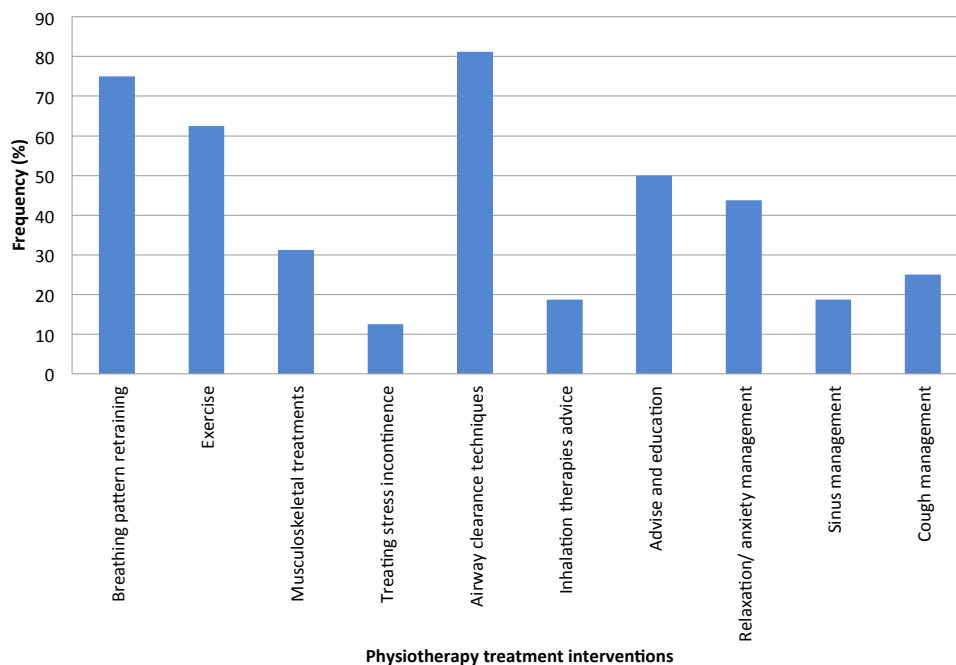


Figure 3: Treatment interventions offered by physiotherapists across the UK for children with asthma (percentages based on 16/18 respondents).

The strongest theme which emerged from the free text and semi-structured interviews was that treatments were individualised depending on patient presentation. However, because of narrow referral criteria, this was often limited to airway clearance techniques.

Discussion

Service structure

This exploratory cross-sectional survey shows that despite current clinical guidelines (BTS/SIGN, 2016) and NICE recommendations (2013) for specialist multidisciplinary team assessment of children with DA to include a physiotherapist, in clinical practice this is not the case in most UK centres. Paediatric physiotherapy services for DA are largely *ad-hoc* and reactive with no standardized approach to assessment, treatment or measures of response to therapy. Physiotherapists commonly reported this was because of a lack of investment of money and time for specialist physiotherapists within DA teams and a lack of training to develop specific clinical skills.

Access to outpatient services was better resourced than inpatient services, although participants reported that DA patients ‘competed’ with other respiratory patients for the general respiratory appointments. The telephone interviews revealed themes of under referral to physiotherapy services, this was attributed to a lack of understanding from the DA MDT of both the scope of physiotherapy interventions and how to identify children who may benefit from physiotherapy input. However, participants reported a lack of capacity to develop physiotherapy services to allow them to see more referrals due to stretched resources.

Assessments and outcome measures

The lack of physiotherapy condition specific validated outcome measures to demonstrate the effects of physiotherapy input for children with asthma was highlighted as an issue. The Nijmegen

questionnaire has been validated in adults with asthma to help identify breathing pattern dysfunction (van Dixhoorn and Folgering, 2015). The questionnaire has not yet been validated in children, but it has been appraised in a paediatric study reviewing the effect of physiotherapy involvement in the treatment of breathing pattern dysfunction (Barker, Elphick and Everard, 2016). This showed that improvements in Nijmegen questionnaire scores mirrored improvements in quality-of-life reported by children and parents after physiotherapy input. This questionnaire thus requires validation and possible adaptation for use in children with asthma. Physiotherapists need to focus on both the development of new condition specific outcome measures to assess the effectiveness of their interventions and on using standard outcomes which fit with the overarching aim of asthma management, such as the ACT score, number of symptom free days, school attendance, quality of life, oral corticosteroid usage, fitness and anxiety levels.

Treatments

The wide range of physiotherapy interventions being offered across the country demonstrates the potential skills a physiotherapist can offer the DA specialist team. Currently there is Grade A evidence in the non-pharmacological management of asthma to include breathing exercises taught by physiotherapists for both adults and children in the BTS/SIGN guidelines (2016). The symptoms of breathing pattern dysfunction can both masquerade as asthma and can occur in association with genuine asthma (Barker, Elphick and Everard, 2016), and be difficult to distinguish, potentially leading to over- or under-treatment.

The evidence for taught breathing exercises is primarily from research in adults with asthma with only three studies having focused on children (O'Connor et al., 2012). The first of these assessed inspiratory muscle training in children with mild or moderate asthma and showed improvement in the mechanical efficiency of the respiratory muscles and increased peak expiratory flow rate (Lima et al., 2008). Inspiratory muscle training however was not identified as a treatment offered by physiotherapists at any hospital in this exploratory survey. The other two studies focused on children with severe or difficult to control asthma, assessing the impact of an MDT day program (Bratton et al., 2001) or an inpatient rehabilitation program (Weinstein et al., 1996), both including elements of exercise, breathing control and relaxation. Both found emergency hospital visits and oral corticosteroid usage were reduced and quality of life improved for both child and caregiver after the intervention. However, physiotherapists were not specified as being involved in either of these programs. This may be due to international differences in roles, as respiratory physiotherapists do not function in the same way in North America as they do in the UK and Europe.

A Cochrane review has concluded that physical training may improve quality of life and should be included in the treatment of children with asthma (Bruurs, van der Giessen and Moed, 2013 and Carson et al., 2013). Exercise was highlighted in the current survey as one of the top five treatments offered by physiotherapists, although the interview themes identified a lack of physiotherapist confidence in exercising children with DA. This highlights the need for investment in specialist physiotherapist skills to enable staff to be more confident in safely exercising this patient group.

Limitations

This is the first national review of physiotherapy services for paediatric DA, with a good response rate of 82%. However, there were gaps in data collection, for example the lack of details given on

physiotherapy assessments. To engage as many centers as possible, participants could choose to complete the questionnaire electronically or via informal telephone interviews, potentially introducing a degree of investigator bias. It was felt that allowing a choice of options would increase response rate, but in future a more standardised approach would be preferable. There was also difficulty in separating general asthma services from DA services with physiotherapy referrals rarely differentiating between the two. It is difficult, therefore, to apply the study findings to children with different disease severity. The questionnaire used to survey physiotherapy services was created for this project but has not been validated as a service review tool.

Conclusion

There is limited access to specialist physiotherapists for children with asthma or DA, with no agreed diagnostic or management algorithms. These issues need to be addressed to enable services and patient care to move forward. Firstly, a tool to identify patients who would benefit from physiotherapy interventions would aid appropriate referrals from the specialist multi-disciplinary team. Secondly, physiotherapy time should be included in the DA multi-disciplinary team funding as laid out in the CQUIN to allow the development of specialist roles. This would lead to better integration of physiotherapists into DA teams and allow specialist skills to be developed in the physiotherapy team particularly for the management of breathing pattern dysfunctions, EILO and exercising patients with DA. Thirdly, there is a clear need to better define the role of physiotherapy in DA services. To do this, services need to develop clear referral criteria and pathways, manage and document referrals more effectively and use agreed proformas for assessments and outcome measures. Finally, evidence-based assessment methods need to be developed to identify children with asthma who would benefit from physiotherapy interventions.

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Ethical approval

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Conflict of Interest

There are no conflict of interests to be declared.

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The NHS Long Term Plan and **Respiratory Care**

The NHS Long Term Plan commits to reshaping the NHS over the next decade, with a strong focus on rehabilitation. Physiotherapy has a strong role to play in this.

This briefing highlights the commitments in the Long Term Plan for respiratory health.

The CSP and Association for Chartered Physiotherapists in Respiratory Care (ACPRC) are engaging with NHS England to influence the national direction being taken to put the Plan into practice, and working as members of the Taskforce for Lung Health to support the implementation of the respiratory clinical priority workstream in the Plan.

But the important decisions about what services are funded, and how these will be designed will be made locally, by commissioners and providers organised in Sustainability and Transformation Partnerships (STPs).

During 2019 STPs are required to produce five-year plans setting out how they will do this. To achieve the potential improvements in respiratory health, physiotherapy needs a voice in this.

Long Term Plan commitments on respiratory care

The Long Term Plan promises a radical expansion of pulmonary rehabilitation (PR) services over 10 years through increasing rates of referral of patients eligible

for pulmonary rehabilitation, widening eligibility. It also highlights respiratory health within work over the next five years to ramp up support for people to self-manage their own health over the next five years.

The Long Term Plan further states it will test and learn from services which deliver joint cardiac and pulmonary rehabilitation models.

“Pulmonary rehabilitation offers a structured exercise and education programme designed for those with lung disease or breathlessness. 90% of patients who complete the programme experience improved exercise capacity or increased quality of life. However, it is currently only offered to 13% of eligible COPD patients, with a focus on those with more severe COPD. By expanding pulmonary rehabilitation services over 10 years, 500,000 exacerbations can be prevented and 80,000 admissions avoided.

To increase access to pulmonary rehabilitation, a population-management approach will be used in primary care to find eligible patients from existing COPD registers who have not previously been referred to rehabilitation.

New models of providing rehabilitation to those with less severe COPD, including digital tools, will be offered to provide support to a wider group of patients with rehabilitation and self-management support. We will increase the number of patients with COPD who are referred to pulmonary rehabilitation where this is appropriate through the use of the COPD discharge bundle.”

NHS England Long Term Plan para 3.85

Long Term Plan vision for community rehabilitation

The Long Term Plan promises development of integrated community and primary healthcare services nationwide, with multidisciplinary teams operating out of community hubs.

To deliver for people with respiratory care needs, these need to be properly resourced and set up as part of integrated respiratory pathways, with active involvement of respiratory physiotherapists in their design.

Key messages from the CSP and ACPRC on local implementation

- **Pulmonary rehabilitation** should be accessible to all that would benefit from a programme, including those with less severe symptoms
- **Local rehabilitation** systems needs to be considered as a whole – adopting a symptoms and needs based approach to service and pathway design
- **Pulmonary rehabilitation teams** needs to be embedded as part of this overall rehab system
- **Their role includes** assessment of need and directing patients to the most appropriate rehab support for them from community rehab teams, exercise professionals or voluntary sector groups

- **Pulmonary rehabilitation** is similar to other rehabilitation – such as cardiac – and should be brought more together in service design and delivery
- **Ongoing rehabilitation** in the community needs to be continuous from when people leave hospital, with no gaps
- **Community rehab teams** need to have open access to dedicated pulmonary rehab teams to ensure hand over-systems are working, for specialist advice, training and if necessary for referrals back in when complex rehabilitation needs emerge later on.

There are many examples of excellent services and models of rehabilitation pathways that demonstrate all of these features. Members working with such services have a key role to play in communicating the success of these.

Demonstrating population need

To achieve the expansion of rehabilitation services needed, physiotherapy clinicians must be able to show what the need is in their area.

All rehabilitation needs of the population should be part of the local review of needs to inform STP plans. This includes needs shown in the national COPD audit (as well as audits for stroke, cardiac rehab and hip fracture).

Assessment of population need should take greater consideration of the fact that much of the population has more than one condition contributing to their rehab needs, and that many of the symptoms rehabilitation is seeking to address are common across a number of conditions.

Demonstrating impact of rehabilitation for people living with COPD

Physiotherapy clinicians also need to demonstrate the impact of their service on people with respiratory care needs, and what the impact would be if they were able to develop and expand.

Priority areas to demonstrate impact will include:

- **Exacerbation** rates
- **Participation** rates
- **Levels** of independence and disability
- **Ability** to manage common co-morbidities – such as depression
- **Time** spent in hospital and readmissions
- **Health** inequality in the population.

Developing the rehabilitation workforce

All STP areas have a Local Workforce Action Board, and they will be developing workforce plans for delivery of the Long Term Plan in your area.

To develop rehabilitation services for people with respiratory care needs, there also needs to be an expansion and development of the rehabilitation workforce. Central to this are physiotherapists and support workers.

Year on year there are growing number of physiotherapy graduates in England. This growth needs to be translated into posts through gradual expansion of the rehabilitation workforce.

Supporting the continuation of growth in physiotherapy education to supply the NHS and expanding posts needs should form part of local workforce plans.

As important is investing in the existing workforce. This includes respiratory physiotherapists in many Clinical Specialist roles where their expertise makes them as effective as nurses who traditionally hold these roles.

It also includes developing advanced practice physiotherapy skills to deploy in community settings, to deal with complexity of multiple conditions.

Another priority is the investment in support workers to take on higher levels of responsibility – for example through training in exercise prescribing and coaching skills.

This growth and development of the physiotherapy workforce to deliver the promised increase in access to pulmonary rehabilitation must be reflected in local workforce plans and staffing decisions by employers.

A more detailed briefing on the physiotherapy workforce requirements to deliver the Long Term Plan will be available at a later date.

What can you do?

- **Get to know** who is leading STP work in your local area, and how Implementation Plans are being developed in the STP
- **Find out** how your employer is feeding into Local Workforce Action Board plans and how to influence this
- **Find out** if AHP clinical leads are part of these planning processes and make contact with them to see how you can work together
- **Where AHP clinicians** are not part of the discussion, **push** for them to be

- **Download** and use the CSP's [**Pulmonary Rehabilitation Impact Model on Exacerbations**](#) (PRIME) tool to demonstrate the potential impact of physiotherapy-led rehabilitation on exacerbations of COPD and healthcare costs
- **Share ideas** with other CSP members through your networks, including [**iCSP**](#)
- **Share case** studies of service design through the CSP's [**Innovations Database**](#).
- **Read the evidence briefing** [**Physiotherapy Works for COPD**](#).

If you want more information about taking forward the Long Term Plan contact the CSP's Campaigns and Regional Engagement Team [**cre@csp.org.uk**](mailto:cre@csp.org.uk) or see the [**CSP's Long Term Plan**](#) member briefing

You can also speak with the [**ACPRC**](#), and keep an eye on their newsletter and social media for the latest updates.

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The countdown to his next COPD exacerbation has already begun.

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