



Journal of the  
Association of Chartered  
Physiotherapists in  
Respiratory Care

Volume 43 | 2011



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# Introduction

We are pleased to present the 2011 Journal of the Association of Chartered Physiotherapists in Respiratory Care (ACPRC). On behalf of the publications team we would like to thank all those who have contributed to the journal. We work in an environment where challenges upon us are greater than ever before and the pressure to respond to change becomes increasingly demanding. It therefore remains essential that workplace activity is shared, allowing the initiatives of others to influence and change practice.

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Printing  
Drayton Press

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Association of Chartered  
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Respiratory Care

Given current pressure in today's workplace we are delighted with the response for submission to the ACPRC journal. This year we have received a varied representation within respiratory physiotherapy, highlighting the diversity that exists within our practice.

The ACPRC conference was again held in Nottingham in April. It was excellent to see so many delegates in attendance. All of the abstracts that were accepted for conference are included in this edition of the journal.

It is more essential than ever that we work to promote our professional activity and we wish to encourage the sharing of such work within this arena. Clearly promoting such work with help strengthen and develop future professional growth.

We hope you enjoy this issue of the ACPRC journal and remind you that authors guidelines with detailed instructions are available on the ACPRC website [www.acprc.org.uk](http://www.acprc.org.uk). The deadline for submission to the next journal is 31st January 2012.

Kind regards

Catherine Baker BSc (Hons) MCSP  
Leigh Mansfield MSc MCSP



# A clinician's smoking habits and attitudes towards smokers - could this influence a smoking cessation service?

## Views of physiotherapy students.

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### **Summary**

***Through clinicians offering smoking cessation advice there is the potential to provide health benefits for the patient and decrease expenditure for the NHS. Physiotherapy students were surveyed to evaluate whether their smoking habits and /or views of smoking could influence such provision. Suggestions are made related to the results.***

### **Introduction**

Smoking is attributed for up to one third of all cancers (Robinson & Lader, 2007) and accounts for 80 to 85% of all cases of Chronic Obstructive Pulmonary Disease which results in 30,000 deaths and over 90,000 hospital admissions per year (World Health Organisation, 2009). It is a primary risk factor for coronary artery disease, stroke and peripheral vascular disease (Ward & Klesges, 2001) and due to the effects on tissue perfusion can lead to bone fracture and impaired soft tissue healing (Porter & Hanley, 2001). Overall smoking alone costs the National Health Service (NHS) between £1.4- £1.7 billion a year (Department of Health, 2004). Encouraging

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**Health Professional & Smoking  
Non-Smoking Role Models  
Smoking Cessation**

smoking cessation is therefore one of the most beneficial and cost effective things that health professionals can do to improve health and prolong their patient's lives (Edwards, 2008). However researchers McEwan & West (2001) reported that healthcare providers have not been proactive in providing smoking cessation services despite the knowledge that even brief smoking cessation advice has an effect on sustained quitting (Rice & Stead, 2008). Jenkins & Ahijevyh (2003) suggest this failure may be influenced by the fact that some health professionals smoke.

In 1999, Nagle et al discovered that nurses who smoked thought their behaviour would be helpful for the role of smoking cessation educator. However, more recently a number of researchers disagree having found that the individual smoking behaviour of health professionals reduces their efficacy in tobacco control practice (Gorin, 2001, Sejr & Osler 2002, Jenkins & Ahijevych, 2003, Hall et al 2005).



Boccoli et al, (1997); Rowe & Macleod Clark, (1999) and Jenkins & Aijevych (2003) all highlighted that nursing students believed cigarette smoking is harmful to health. However, this knowledge does not always equate with the ability to stop. In some cases, despite gaining first-hand knowledge of the health consequences, consumption has actually been shown to increase with each year of nurse training (Broccoli et al, 1997). In a study carried out by Cockroft in 1990, 43% of the student nurses were smokers, with similar numbers being reported in the Nursing Times as late as 2010. Students who smoke may encounter problems in quitting as Robinson & Lader (2007) report smoking prevalence to be highest amongst those aged twenty to twenty four than any other age group. They may not perceive the health risks as relevant to young adults (Murphy-Hoefer et al, 2004) and could be influenced by peers who smoke (McKenna et al, 2003).

Rowe & Macleod Clark (1999) found the smoking behaviour of the health professional potentially impairs their role in altering patterns of smoking in the general public. Studies investigating attitudes among nursing and medical students towards smoking and cessation treatment are well documented (Jenkins & Ahijevyh, 2003). However there appears to be far less literature related to physiotherapy students and furthermore, little evidence available to indicate the degree to which smoking cessation form parts of the curriculum and the range of physiotherapy staff who incorporate smoking cessation into their management of patients (Rea et al , 2004).

To address some gaps in the literature this study aimed to explore:

- Physiotherapy students individual smoking behaviour and attitude towards smoking.
- If perceptions may potentially impact on smoking cessation practice and outcomes.

## Method

This study used a mixed method questionnaire design to increase validity and reduce the threat of bias from the adoption of purposive sampling (Robson, 1994). Qualitative data provided perceptions and influences of individual smoking attitudes. Quantitatively, the study considered relationships between variables Physiotherapy students aged 18-30+ from the University of Birmingham, England responded and participated in this research. This study was open to smokers, ex smokers and non-smokers.

Ethical approval was gained and principles of anonymity and confidentiality maintained. Consent was assumed on completion and return of questionnaires.

The questionnaire; piloted on 10 non-participating respondents before distribution; was generated from a review of the literature. Smoking habits of current smokers were assessed using the World Health Organisations (1998) definition of a person who has smoked at least 100 cigarettes in their life.

### Analysis:

Quantitative responses were transferred into the statistical software package SPSS (17) for analysis. Non-parametric statistics including cross-tabulation were used to compare variables including smoking status and confidence in providing cessation advice. Chi square analysis was used to compare statistical relationship between variables. Qualitative data relating to student's perceptions and attitudes were manually transcribed and imported into NVIVO (9) for content analysis.



## Results

Questionnaires were returned by 45 students and their demographical profile is illustrated in Table 1.

Attributes	No. (N=45)
<b>Gender</b>	
Males	14
Females	31
<b>Age</b>	
18-21	11
22-24	25
25-30	8
Over 30	1
<b>Smoking Status</b>	
Current Smoker	2
Ex Smoker	1
Non-Smoker	42

**Table 1 Demographical profile of students**

One student had started smoking after enrolling on the physiotherapy degree course. The students' attitudes relating to tobacco use are shown in Table 2. Fourteen students had close family members who smoke including one of the smokers and the ex-smoker. Only 4 students (3 male and 1 female) believed it appropriate for health-care professionals to smoke and these same students considered that the physiotherapist does not need to act as

a non-smoking role model. Other than three of this group the remaining 42 students were very aware of the health consequences of smoking.

Topic	Perceptions
Why some students smoked	Enjoy it when drinking Stress Naïve Peer influence Image
How smoking habits changed/ are changing during training	To increase fitness level Not appropriate for health care workers Smoking less as most peers do not smoke
Reasons for students quitting	More aware of health risks Realised how disgusting it is.
How clinicians who smoke should feel	Hypocritical Guilty Realise they were giving the wrong message Is individual choice
How clinicians should act in relation to smoking	Be role models Have a responsibility not to smoke
When family members smoked	They are dirty and smelly Disgusted Annoyed/angry/disappointed They should know health consequences Understanding

**Table 2. Attitudes towards smokers and smoking**

Belief	Response			
	Male N (14)	Females N (31)	Male N (14)	Females N (31)
	Yes		No	
Do you believe it is part of physiotherapist's responsibility to help people to stop smoking?	13	29	1	2
Would you feel confident in giving smoking cessation advice to patients?	11	17	3	13
Are you aware of strategies and methods to help patients to stop smoking?	10	22	4	8
Do you believe it is appropriate to discuss smoking with only those smokers who will respond to advice?	3	4	11	27
Do you think that to discuss smoking with all smokers is an inappropriate use of time?	3	4	11	27

**Table 3 Beliefs and knowledge responding to smoking cessation**



Table 3 contains questions that students were asked with regard to providing smoking cessation advice. An overwhelming majority of students (n=42) believed it part of a physiotherapist's responsibility to help patients stop smoking. Cross-tabulation showed that 1 of current smokers, the ex smoker and 26 non-smokers felt confident in providing cessation advice as they were aware of cessation strategies and felt able to discuss the consequences of smoking with patients. Conversely, one of current smokers and 15 non-smokers stated that they would not be confident until they improved their personal knowledge of the subject. Pearson's Chi square value (.733), with an associated significance level of (p= .693) showed no significant relationship between individual smoking status and confidence in providing smoking cessation advice to patients.

Thirty nine students, including the current smokers, believed that all patients who smoke should be given advice on smoking cessation even though some may be reluctant to stop. Benefits of cessation advice in terms of cost to the NHS and hospital admissions, as well as relevance to professional role were the main reasons cited by these students. The remaining 6 students felt that to discuss smoking with all patients was a waste of time or should depended mainly on the condition being treated. There was no significant difference between the views of males or females.

## Discussion

Current statistics show that 23% of the population in the UK are smokers (National Statistics Office, 2011). There is therefore a substantial difference of smoking prevalence between the physiotherapy students and the general population and furthermore statistically far less than reported in nursing. For the physiotherapy students, this is encouraging considering the sample feel mainly within the age range when smoking is most prevalent (Robinson & Lader, 2007). The low number of

smokers may be due to, as Kamwendo (2000) found, physiotherapy attracting those who are interested in physical fitness and healthy lifestyles.

One student had taken up smoking after starting university, suggesting stress to be the reason. Evaluating the cause of such stress is outside the premise of this study. The other two (1 current and 1 ex smoker) commenced smoking before entering into training and as found in nursing literature (Carmichael & Cockcroft, 1990, Charlton et al, 1997, Nagle et al, 1999, Clark et al, 2004) started with the encouragement of peers. This suggests that in order to address reasons of why health-care students smoke, there needs to be an examination of factors that lie outside the context of professional training. Peer influence may be a powerful and significant factor in encouraging others to smoke however, this study also showed its supportive and inspirational features as current smokers were smoking less since commencing physiotherapy training as a consequence of people around them not smoking and because of the nature of their course. This reiterates findings of Seguire & Chalmers (2000) that peer support is a key factor in cessation among adolescents and young adults.

The majority of students, despite their smoking status, believed that the physiotherapist should act as a non smoking role model and there was no significant difference between gender or between age ranges. With such a low number of smokers in the sample it is difficult to compare the findings with Reeve et al, (1996), Hughes & Rissel, (1999), Gorin, (2001), and Chalmers et al, (2002) who questioned higher percentages of nurses who smoke and found that health professionals who smoke are less likely to believe it is their responsibility to set an example by not smoking. Unlike Murphy-Hoefer et al, (2004) reporting that nurses who smoke undervalue the health consequences,



the physiotherapy students, regardless of their smoking status and attitudes towards smoking, believed that the risks associated with smoking applied even if someone smoked one cigarette a day.

Earlier research in nursing (Nagle et al, 1999, Gorin, 2001, Hall et al, 2005) has reported that nursing students and qualified nurses believe that helping patients to stop smoking should be part of their role. The majority of the physiotherapy students were of the same opinion. A small minority held negative beliefs and attitudes mainly equated to some lack of confidence in providing appropriate advice or considered it a waste of time.

Rowe & Macleod Clark (1999) found that smokers reported guilt and shame about their personal smoking and consequently may have difficulty discussing smoking concerns with clients. Furthermore Gorin (2001), Jenkins & Ahijevych (2003), Sejr & Osler (2002) and Hall et al (2005) concluded that smoking status may affect efficacy in providing cessation advice. With so few physiotherapists likely to be smokers they may be an ideal health - professional to take the lead in smoking cessation practices.

However, there emerged a strong distaste for smoking amongst the physiotherapy students and some lack of empathy for those who may be dealing with an addiction. Many students when asked about their feelings, for example with regard to family members smoking, stated that they were angry and disgusted because their relations were aware of the risks associated with smoking but still smoked. This raises questions about how they may interact with patients who smoke. It is therefore suggested that physiotherapy education needs to give greater consideration to the psychological impact of smoking within curriculum. For the patient this in turn may lead to greater success and eventual patho-physiological changes.

## Conclusion

This study only looked at a small sample of physiotherapy students. However, it is speculated that they are fairly representative of cohorts throughout the country in relation to numbers of smokers. Consequently there should be a high percentage entering the workforce who could act as non-smoking role models.

Due to the wide range of patho-physiological damage that smoking can cause it may be relevant for smoking cessation to be considered more widely in curriculum. This in turn could eventually lead to students introducing smoking cessation into more than their respiratory placements.

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# Evaluation of a pilot 7-day cardiorespiratory physiotherapy service.

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### Summary

***A 7 day cardiorespiratory physiotherapy service was piloted for 6 months at Doncaster Royal Infirmary (DRI). A service evaluation provided positive results in a range of areas. The service has now been established for over 2 years and is continuing to expand.***

### Introduction

NHS services including physiotherapy provide patient care 24 hours a day, 7 days a week (CSP, 2008). The Chartered Society of Physiotherapy (CSP) supports the view that improvement to equity of patient access to physiotherapy at the weekends is required. This is in line with pressures in the NHS and a drive to increase productivity.

A controversial article by Templeton and Palazzo (2007) has led to physiotherapists being asked to justify their role and effectiveness within critical care and at times across the cardiorespiratory speciality. Discrepancies and a lack of data on the efficacy of physiotherapy

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**7 Day Service**

**Critical Care Rehabilitation**

**On Call Costs**

**Staff Evaluation**

in clinical trials support the need to identify guidelines for physiotherapy assessments (Gosselink et al 2008).

It is recommended that the physiotherapist should be an integral part of any respiratory team, providing effective and practical management for the benefit of the respiratory patient and that physiotherapy should be offered to patients with a variety of medical respiratory conditions (Bott et al, 2009).

A number of problems were identified as evidence based targets for physiotherapy in critically ill patients, the treatment of which may improve outcomes, reduce the risks associated with critical care and minimise costs (Gosselink et al, 2008). These problems were cited by Gosselink et al, 2008 in the Recommendations of the European Respiratory Society (ERS) and European Society of Intensive Care Medicine (ESICM) Task Force on Physiotherapy for Critically Ill Patients where the sequelae of long term bed rest and immobility is also considered. The subsequent publication of NICE CG83: Rehabilitation After Critical Illness

(2009) supports the involvement of specialist physiotherapists from admission to critical care to beyond hospital discharge.

Considering this, the Cardiorespiratory Physiotherapy Team at DRI felt that a quality cardiorespiratory physiotherapy service forms an integral part of the patient's journey. A pilot 7 day cardiorespiratory physiotherapy service ran from December 2008 to May 2009.

It was anticipated the service would have an impact in a range of areas and would affect both patients and staff. The aims of the service evaluation were to focus on:

Patient centred/clinical outcomes – time taken to achieve rehabilitation milestones in the Department of Critical Care (DCC).

Physiotherapy staff feedback – Work Positive is a workforce evaluation tool that considers the impact of different work stress factors on staff.

Multidisciplinary Team (MDT) feedback.

Financial outcome – on call cost comparison.

## Method

### Critical Care Rehabilitation Milestones

The authors used prospective and retrospective analysis of patients' physiotherapy documentation. The sample was a sample of convenience, patients that met the inclusion criteria who were on DCC in April 2008 (prior to the 7 day pilot) and in April 2009 (during the 7 day pilot) were included. The patients in April 2008 were identified from the unit audit clerk's database; the authors identified the patients in 2009 on a daily basis on DCC. The inclusion criteria were: intubated  $\geq 48$  hours, secure airway (artificial/own), cardiovascularly stable (+/- inotropes) and GCS  $\geq 11/15$  ( $E_4M_7V_6$ ). The sample size in 2008 was 14 and 9 in 2009. Ethical approval was not sought as the study formed part of a service evaluation.

The authors compiled a list of rehabilitation

milestones based on previous work in this area (McWilliams, 2008 and Morris, 2008) and that were appropriate to the local population. The day a patient met the inclusion criteria was classed as 'day 0' and the number of days from this day that it took for the patient to reach each rehabilitation milestone was recorded on the data collection sheet.

The authors collected 2008 data retrospectively from physiotherapy documentation; the Lead Physiotherapist collected 2009 data on DCC each day. None of the data collectors were blind to the service evaluation. Once the patient had reached their potential in terms of the milestones, the data was analysed using descriptive statistics by the Trust's Clinical Audit Department.

### Physiotherapy Staff

A workforce evaluation tool (HSE Management Standards Indicator Survey Tool) already in use in the Trust was utilised to obtain physiotherapy staff feedback. The cardiorespiratory physiotherapists work within a larger Acute Services Physiotherapy Team. The sample group was all members of the Acute Services Physiotherapy Team who completed and returned the questionnaire. This gave a sample size of 11 in 2008 and 14 in 2009.

The physiotherapy department has a Lead responsible for the annual workforce evaluation. In both years, the questionnaires were circulated via email by the Lead to all staff within the physiotherapy department. Individuals returned replies confidentially to the Lead and the results were analysed using an Excel-based analysis tool (HSE Management Standards Analysis Tool). The results were analysed in speciality teams and as a whole department.

The Physiotherapy Work Positive Lead and Clinical Audit Department were blind to the service evaluation. The authors for this work compared the Acute Services Physiotherapy Team's 2008 and 2009 results.



Ethical approval was not sought as confidentiality was maintained and workforce evaluation is completed annually within the Trust.

### **MDT feedback**

The authors, with support from the Trust's Clinical Audit Department, devised two qualitative questionnaires to gain feedback from the MDT. Ethical approval was not sought as confidentiality was maintained. The wards the authors identified to be most affected by the 7 day working pilot formed a sample of convenience. Inclusion criteria was any member of the MDT on the identified wards who chose to fill out a questionnaire.

Two different questionnaires were designed to gain feedback on different aspects of the 7 day pilot; the authors felt some clinical areas may notice more continuity from physiotherapists (e.g. DCC) and some clinical areas may notice a lack of continuity from physiotherapists (e.g. acute medical wards).

The sample size was 9 in DCC and 17 on the acute medical wards.

The questionnaires and a collection envelope were left on the relevant wards for a week and the authors informed senior ward staff of the project. The authors were not blind to the project; the MDT had a varied exposure or experience with the 7 day physiotherapy service.

Questionnaires were collected and the qualitative data analysed by the Trust's Clinical Audit Department.

### **On Call**

The Trust's Clinical Therapy Financial Accountant carried out a financial model comparison of on call activity in 2006 and in 2009. The total on call costs, overnight costs and weekend costs were analysed using descriptive statistics.

## **Results**

### **Critical Care Rehabilitation Milestones**

Graph 1 shows the length of stay on critical care prior to participating in rehabilitation (i.e. 'day 0'), the length of stay on critical care following 'day 0' and the overall hospital length of stay following 'day 0'. The hospital length of stay following participation in rehabilitation was shorter in 2009.

Graph 2 shows the number of days it took to reach the rehabilitation milestones from day 0. Of the milestones that were achieved, nine were achieved more quickly in 2009. The number of days it took to achieve five of the milestones halved in 2009.

### **Physiotherapy Staff**

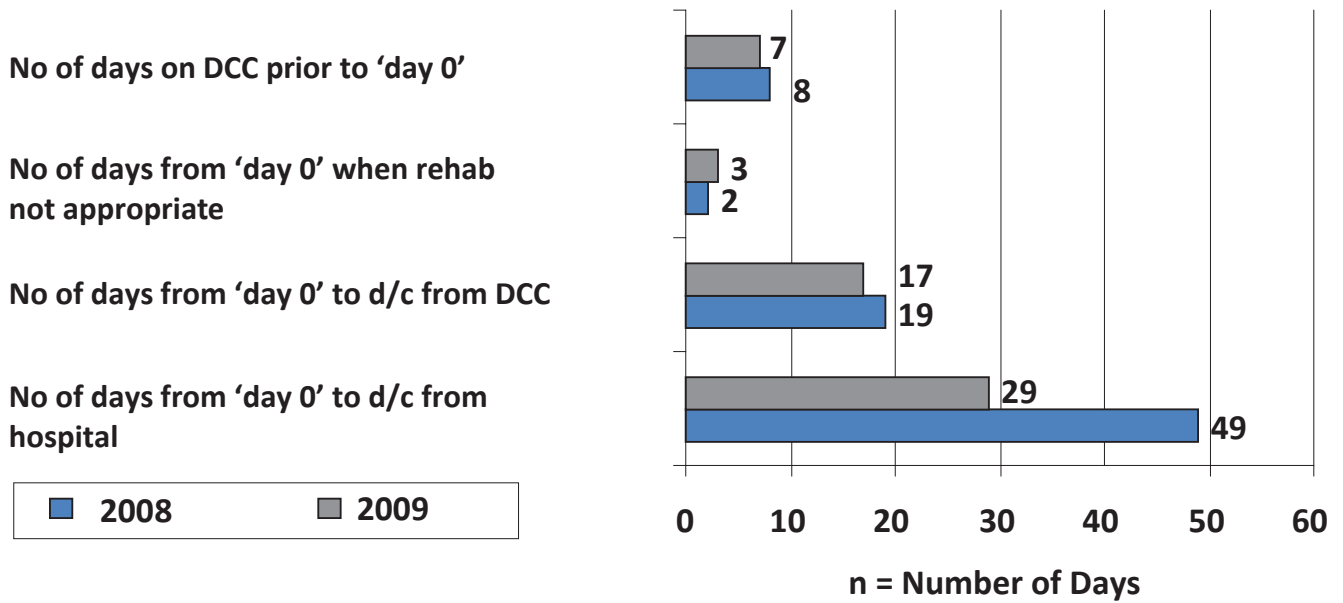
The Work Positive questionnaire considers seven categories of work stress factors that affect staff. The 2009 results demonstrated "doing very well" in five categories, suggesting that staff are not negatively affected by stress in these areas. This is an improvement from the 2008 results where there were no categories of "doing very well".

### **MDT feedback**

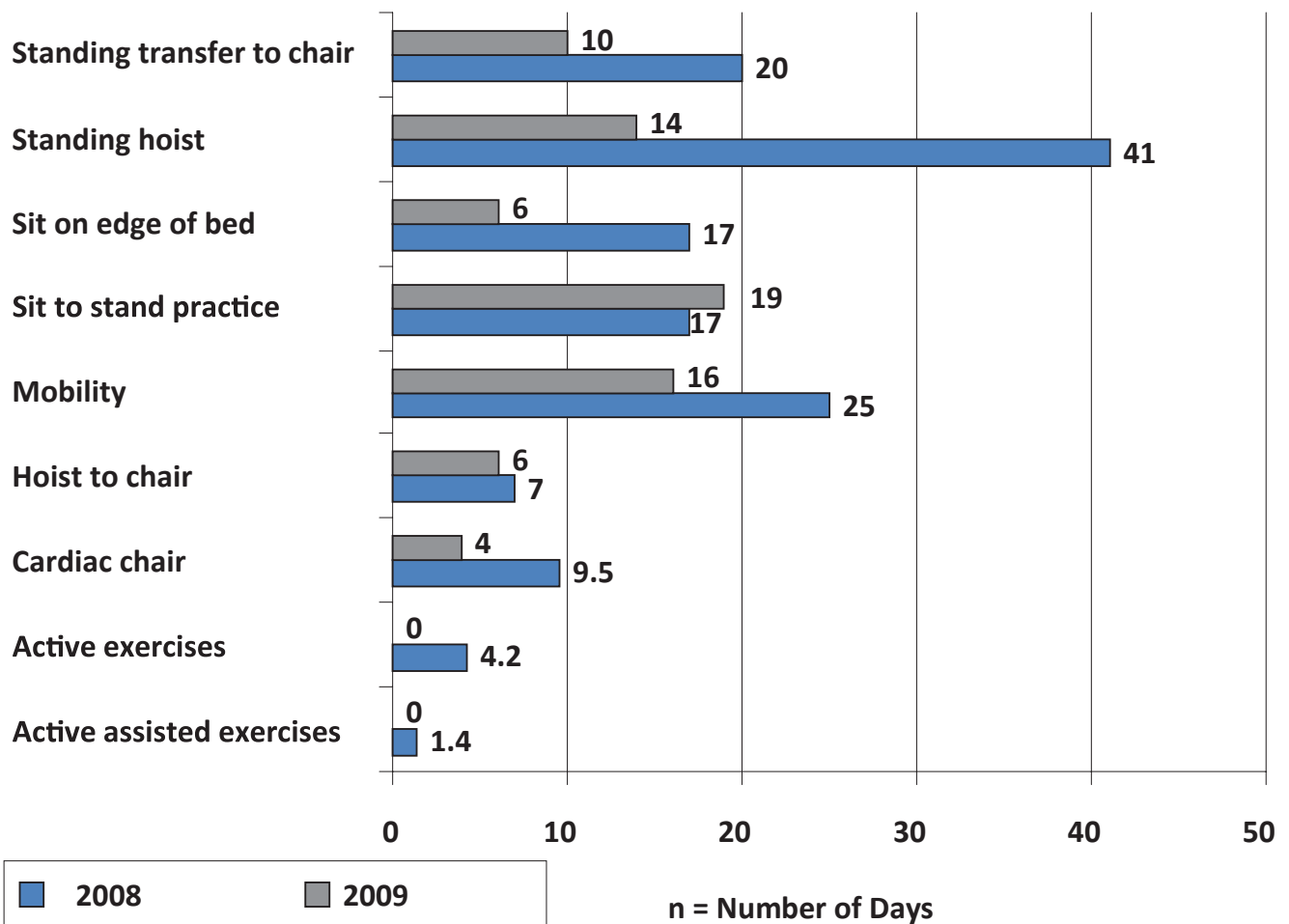
On the critical care unit 89% of respondents felt that the changes to the physiotherapy service had made a difference: 87% felt it had an impact on patient care, 86% felt it had made a difference to MDT working.

On the medical wards, 53% of staff noticed a difference in the way the physiotherapy service was delivered. 100% felt this service was beneficial to patients, 100% beneficial for MDT working. No staff noticed a difference in the service provision from Monday to Friday.





Graph 1: Length of stay in critical care and hospital

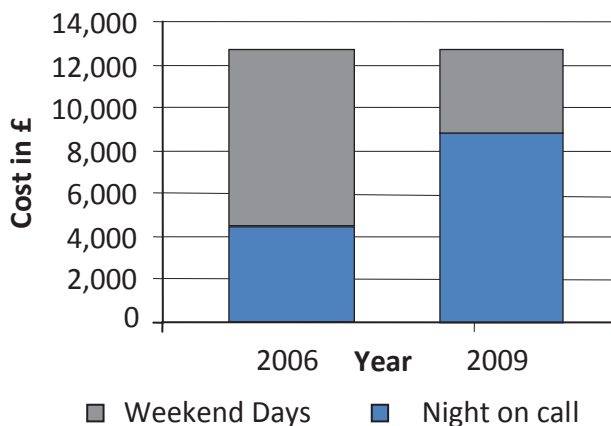


Graph 2 : Time taken to achieve rehabilitation milestones

## On Call

Graph 3 shows the overall cost of physiotherapy on call services in 2006 compared to the cost of 7 day working and on call Physiotherapy in 2009.

Although the overall costs were similar the distribution of the cost was different, the cost of weekend work halved, however, the cost of night time on call doubled in 2009.



Graph 3 : Physiotherapy 7 Day Service On-Call Cost Comparison

## Discussion

The results of the service evaluation are all positive, however, there are some limitations to the work.

The sample groups in each area of the evaluation were small and obtained from a sample of convenience. This was partly due to the time constraints a six month pilot period enforces. In order to complete a multifactorial service evaluation to demonstrate change in a number of areas each project was managed with a strict, yet realistic timescale.

The authors were the lead investigators in this work and were not blind to the evaluation aims. This may be a cause of bias, however, all the results were analysed by an independent member of the Clinical Audit Department who had no involvement in the service changes.

Another source of bias and potential error is the retrospective data collection, this relied on accurate documentation of events and correct

interpretation by the authors.

The reliability and validity of the outcome measures used in this work is unknown. There is a lack of standardised validated outcome measures available for use in this population. Expert opinion was utilised where available and pragmatic and devised outcome measures were chosen. Work by the ACPRC Critical Care Champion (McWilliams, 2008) was extrapolated to the local population at DRI and 'day 0' created by the authors as previous studies into rehabilitation outcomes in critical care have been limited by sedation and cardiovascular instability (Morris, 2008 and McWilliams, 2008).

The sample groups in the rehabilitation work were not matched when considering disease severity. The results from day of admission to 'day 0' gives some indication of how matched the populations may have been.

Other specific clinical outcomes were not investigated as it is acknowledged that patients have multiple problems that change rapidly in the course of illness and in response to medical management (Gosselink et al 2008). Anecdotally during the pilot the authors felt the management of the more complex acute and domiciliary non-invasive ventilation (NIV) patients improved, however, during the constraints of the service evaluation could not relate this change directly to the change in the physiotherapy service.

The results from the one clinical outcome evaluated are encouraging. It is known that early mobilisation facilitates weaning from ventilation (Gosselink et al, 2008) and a strengthening exercise programme improves functional outcome in long term mechanically ventilated patients (Chiang et al, 2006). The reduction in time to achieve rehabilitation milestones should be investigated further in relation to the aforementioned evidence.

Patient reported outcome measures and user involvement forms an important part of a



service evaluation. The clinical areas this pilot was expected to have an impact upon were the acutely unwell or deteriorating ward patient (DRI has a physiotherapy led NIV service) and critical care. The authors felt that patients' capacity may be compromised at times during the pilot and this raised questions over the reliability and relevance of this data if collected.

It should be acknowledged that while the pilot was carried out in 2009 some of the comparable data was up to three years old. As part of an evolving NHS there have been other service developments that may have had an impact upon the results. It is positive that during larger Trust and Organisational changes the addition of a 7 day working service has not demonstrated any negative effects.

The 2010 QIPP paper encourages clinicians to support innovation in clinical practice, improve effectiveness and enhance the patient experience. This service evaluation supports and implements these concepts within a physiotherapy service. Further work on the financial cost comparison in areas other than the on call service would provide evidence of improving efficiency and providing value for money.

## Conclusion

A range of evaluation tools have been utilised to assess the impact of the 7 day working pilot. Overall, the results were positive in all of the areas evaluated.

The implementation of a 7 day service had a significant impact on the delivery of acute physiotherapy services. Throughout the pilot, pending formal evaluation, it was necessary to adjust structure and service delivery in response to changes in demand and resources across the Trust.

Due to the positive outcome of this evaluation and support from the Trust for the continued provision of 7 day physiotherapy services, the team and the 7 day service has expanded.

This expansion will provide the opportunity for further service evaluation and to further explore the effectiveness of physiotherapy within this speciality area.

## Key Points

**A 7 day cardiorespiratory physiotherapy service can lead to improvements in clinical outcomes and multidisciplinary working.**

**Physiotherapy staff are not negatively affected by stress when working as part of a 7 day service.**

**There may be the opportunity to reduce financial costs of on call and weekend working when implementing a 7 day service.**

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# A service evaluation of physiotherapy practice within one scottish intensive care unit.

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### Summary

***Literature and guidelines are available to suggest that there should be more 'rehabilitation' delivered within Intensive Care Units. Postal questionnaires and service evaluations have reported that this is already happening. This service evaluation examined how much 'rehabilitation' was taking place within one Scottish Intensive Care Unit (ICU), and found that the frequency of 'rehabilitation' was low.***

### Introduction

Some emerging literature and expert opinion suggests that there should be an increased focus on 'rehabilitation' within Intensive Care Units (NICE 2009; McWilliams & Pantelides 2008; Needham 2008; Stiller et al 2004). Results of postal questionnaires suggest that this is being reflected in clinical practice (Skinner et al 2008; Lewis 2003; Norrenberg & Vincent 2000). However, limited work has been undertaken to explore the actual 'rehabilitation' received by

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### Keywords:

**Physiotherapy  
Intensive care  
Critical Illness  
Rehabilitation**

patients while in intensive care.

In a survey of physiotherapy profiles across European adult ICUs, Norrenberg and Vincent (2000) illustrated how physiotherapy roles vary across different ICUs and countries. A postal questionnaire was used and the response rate was poor with only 22% (102/460) returned. Although this means that a true profile cannot be given, the only technique that was consistently reported to be part of physiotherapy in all of the 102 ICUs across 14 different countries was 'mobilisation', although this term was not defined. A paper by Lewis in 2003 explored the 'rehabilitation practices' of physiotherapists working within adult ICUs in the UK. This postal questionnaire demonstrated a greater response rate of 81% (29/36). All respondents perceived that they delivered some form of 'rehabilitation'. Practices included musculoskeletal assessment and exercise regime (29/29, 100%), hoist to chair (26/29, 90%), tilt table (25/29, 86%), standing frame (17/29, 59%), and 'other' (20/29, 41%) which included ambulatory ventilation, assessment of joint range of motion, casting and splinting, and speaking valve.



A similar survey was performed by Skinner et al (2008) to investigate 'exercise prescription' within Australian adult ICUs. One hundred and eleven of the 167 returned the questionnaire. Of these 104 reported routinely 'prescribing exercises'. Active and active assisted exercises, sit-to-stand and marching on the spot were all prescribed in 103/111(97%) of the units. Sitting on the edge of the bed was prescribed by 100/111 (94%), walking away from the bed-side by 97/111 (92%), bed transfers by 71/111 (67%) and tilt table by 67/111 (63%) of respondents. While these questionnaires give an overview of clinical practice, they fail to provide detail on how often these practices take place.

In 2009, Thomas et al, undertook an audit of the incidence of physiotherapy within a general ICU in the UK. Eighty-two patients received 669 episodes of physiotherapy intervention with the most commonly occurring interventions being body positioning (76%), suction (56%) and limb care (36%), which were classed as 'standard care activities'. 'Active rehabilitation', which included active assisted and active muscle strengthening, sitting on edge of bed, active transfers and walking, occurred during 55% of the physiotherapy episodes. Interestingly, only 9% of the 'active rehabilitation' episodes involved walking. While this audit provides a good overview of the actual interventions delivered it is unclear how frequently individual patients received specific interventions.

These papers suggest that many ICUs offer some form of 'rehabilitation'. However it is not clear how often 'rehabilitation' is actually taking place. Furthermore, there is a lack of consistently used terminology, ranging from 'prescribed exercises' to 'active rehabilitation' (Thomas et al 2009; Skinner et al 2008; McKay, Ellis & Johnston 2005; Lewis 2003; Norrenberg & Vincent 2000).

The aim of our service evaluation was to review the physiotherapy interventions that were being administered in our ICU, and in particular to review the type and frequency of

'rehabilitation' being carried out.

## Method

A convenience sample of 20 consecutive patients was selected. Patients that were admitted to the ICU (18 bedded unit) during a 9 week period between May and July 2007 and met the criteria of intubation for greater than 48 hours and ICU stay of 4 days or more were included. The inclusion criteria aimed to encompass patients at risk of developing significant disability often associated with a prolonged stay in ICU (Bailey et al 2007). No specific criteria existed in the unit to identify the start of active rehabilitation and it was based on clinical judgement alone. All daily physiotherapy interventions were recorded. For the purpose of this evaluation interventions were divided into two categories 'respiratory interventions' and 'mobility interventions', as listed in tables 3 and 4. However it is recognised that in practice these techniques are not always exclusive of each another. 'Mobility interventions' can be undertaken to improve respiratory measures such as ventilation, chest clearance and respiratory muscle strength (Tarling 2007; Chiang et al 2006; Nava 1998). In this study any interventions including a mobility element were classified as a 'mobility intervention'.

Patient and unit demographics were collected to define the population. The frequency of individual respiratory and mobility interventions delivered each week was calculated. The overall frequency of mobility versus respiratory interventions was calculated per week, with a sub-analysis of the frequency of interventions on a weekday versus the weekend. Depending on the distribution of the data the descriptive statistics will be presented using either a mean and standard deviation or a median and inter-quartile ranges.



## Results

Twenty patients with an average age of 57 (41.75, 63.75) were included in the service evaluation. All 20 patients were included in week one of the service evaluation results. As patients were discharged from the intensive care unit the number of patients in each week reduces due to the smaller number of patients experiencing a longer stay. Table 1 summarises the demographic details of the patients indicating a larger proportion of males (75%), and on average an APACHE II score of 21.5, 16 days of ventilation and an ICU stay of 18.5 days. Table 2 contains details about the general population passing through the unit during the 2007-2008 financial year. In comparison to the overall unit values 95% of the study population had been admitted to ICU as a Level 3 patient, had a higher APACHE II score, considerably more days of ventilation, a longer ICU stay, a greater proportion received renal replacement therapy and spent a larger proportion of their

stay receiving ventilation. This would indicate that the study population was sicker than the average patient in the unit.

Tables 3 and 4 summarise the daily frequency of the different respiratory and mobility physiotherapy interventions delivered to the 20 patients during their stay in intensive care. A respiratory assessment was undertaken on average once a day with all patients, and the most frequent respiratory intervention undertaken on a daily basis was suctioning followed by manual hyperinflation (MHI). Other less frequently utilised respiratory interventions included the active cycle of breathing technique (ACBT), modified ACBT, intermittent positive pressure breathing (IPPB), supported cough and weaning from ventilation. Interestingly, the most frequent mobility interventions delivered were passive range of movement and active exercises although the frequency of these per day never exceeded more than 0.2 and 0.3 respectively.

<b>Gender</b>	75% male / 25% female
<b>Age in years (Median, IQR)</b>	57 (41.75, 63.75)
<b>APACHE II</b>	21.5 (18.75, 23.25)
<b>ICU Length of stay in days (Median, IQR)</b>	18.5 (8, 30)
<b>Surgical/Medical</b>	40% surgical; 60% medical
<b>Days of ventilation (Median, IQR)</b>	16 (7.25, 37.7)
<b>% of patient days on mechanical ventilation</b>	86%
<b>% of patients requiring renal replacement therapy</b>	55%
<b>Elective/Emergency</b>	15% elective; 85% emergency

Table 1. Patient demographic details

<b>Level 3 : Level 2 beds</b>	12 : 6
<b>Age in years (Mean)</b>	54.5
<b>APACHE II (Mean)</b>	18.8
<b>ICU Length of stay in days</b>	Mean 5.1; Median 2.1
<b>Surgical/Medical</b>	54% surgical; 46% medical
<b>Patients requiring mechanical ventilation</b>	73%
<b>% of all patient days on mechanical ventilation</b>	65.3%
<b>% of patients requiring renal replacement therapy</b>	16.7%

Table 2. Unit details (18 bedded unit)



Week	1	2	3	4	5	6	7	8
Number of patients	20	14	11	8	3	2	1	1
	Daily frequency of interventions (Median)							
Respiratory Assessment	1	1.3	1.2	1.1	1.1	1.1	1.86	1.83
ACBT*	0	0	0	0	*	0	*	0.17
Modified ACBT*	0	0	0.3	0.3	1	0.1	0.29	*
IPPB	*	0	0	0	*	0.2	*	1.67
Positioning	0.1	0.1	0	0	0.1	*	0.14	0.17
Suction	0.8	1.1	0.7	0.7	0.7	0.5	1	0.33
Supported Cough	*	*	0	0	*	*	*	*
Weaning from Ventilation	*	0	0.1	0.3	0	*	*	*
Manual Hyperinflation	0.4	0.5	0.1	0	0.1	0.4	0.29	*

**Table 3. Average daily frequency of respiratory interventions delivered**

\* Not Used

Week	1	2	3	4	5	6	7	8
Number of patients	20	14	11	8	3	2	1	1
	Daily frequency of interventions (Median)							
Passive ROM	0.2	0.2	0	0.2	0.1	0.1	0.14	*
Active exercises	0	0.1	0.2	0.3	0.3	0.3	*	0.5
Bed edge sit	*	0	0	0	*	0.1	*	*
Encore to transfer with footplate	*	0	*	0	*	0.2	*	*
Walking/stepping with encore	*	*	0	0	*	*	*	*
Walking/stepping with no encore	*	*	0	*	8	*	*	*
TF to chair – no encore	*	*	0	*	*	*	*	*

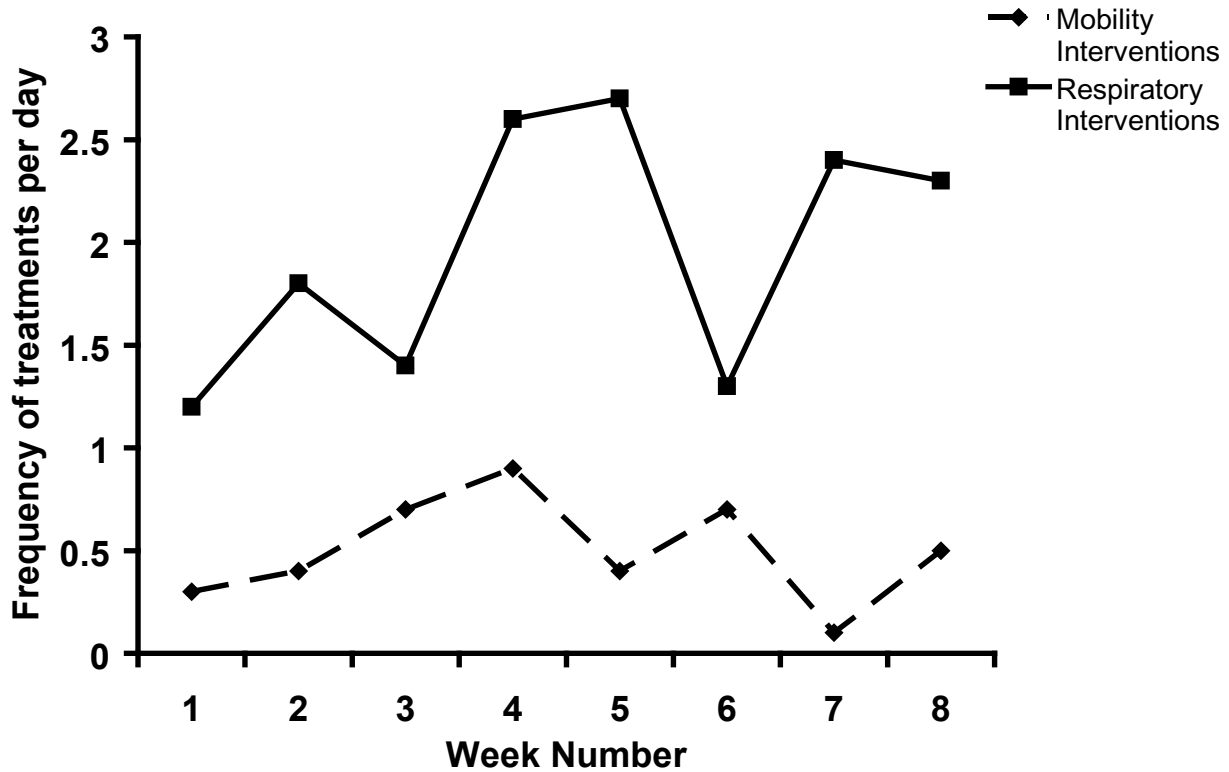
**Table 4. Average daily frequency of mobility interventions delivered**

\* Not Used

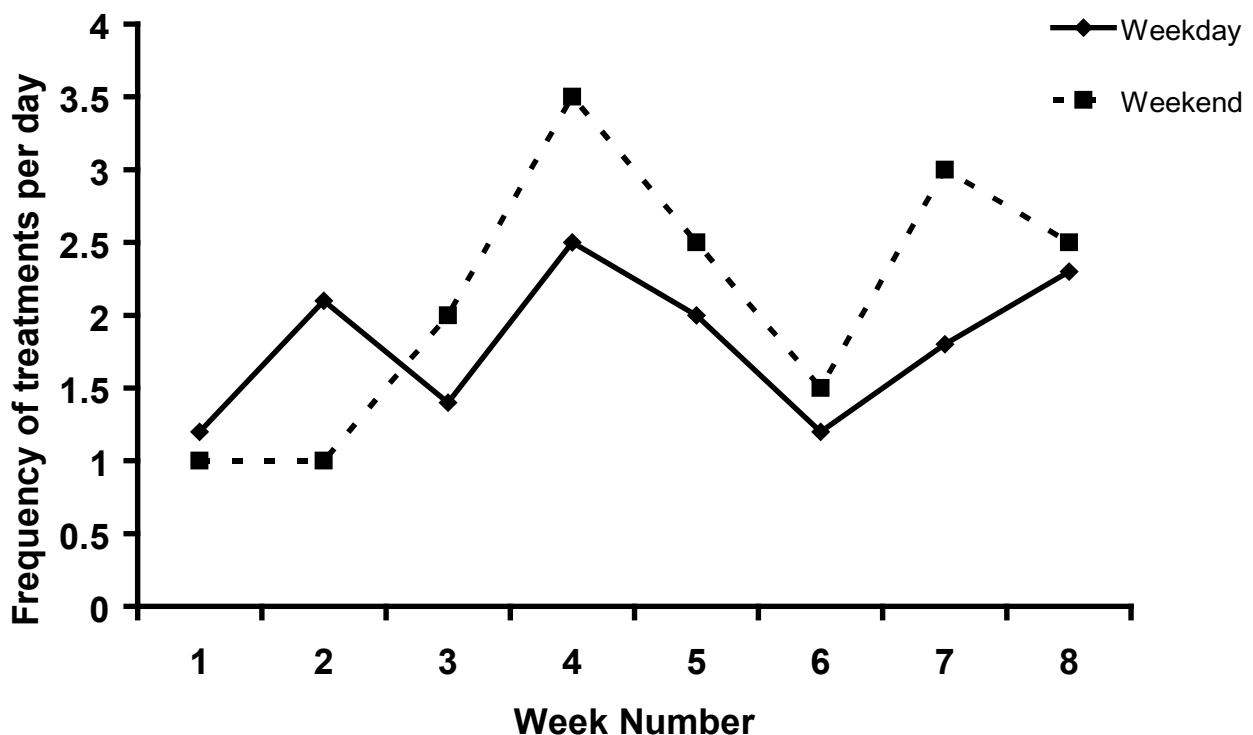


A comparison of the frequency of collective respiratory and mobility interventions was calculated. Graph one illustrates the frequency of respiratory and mobility interventions for week one and each subsequent week. The daily frequency of respiratory treatments

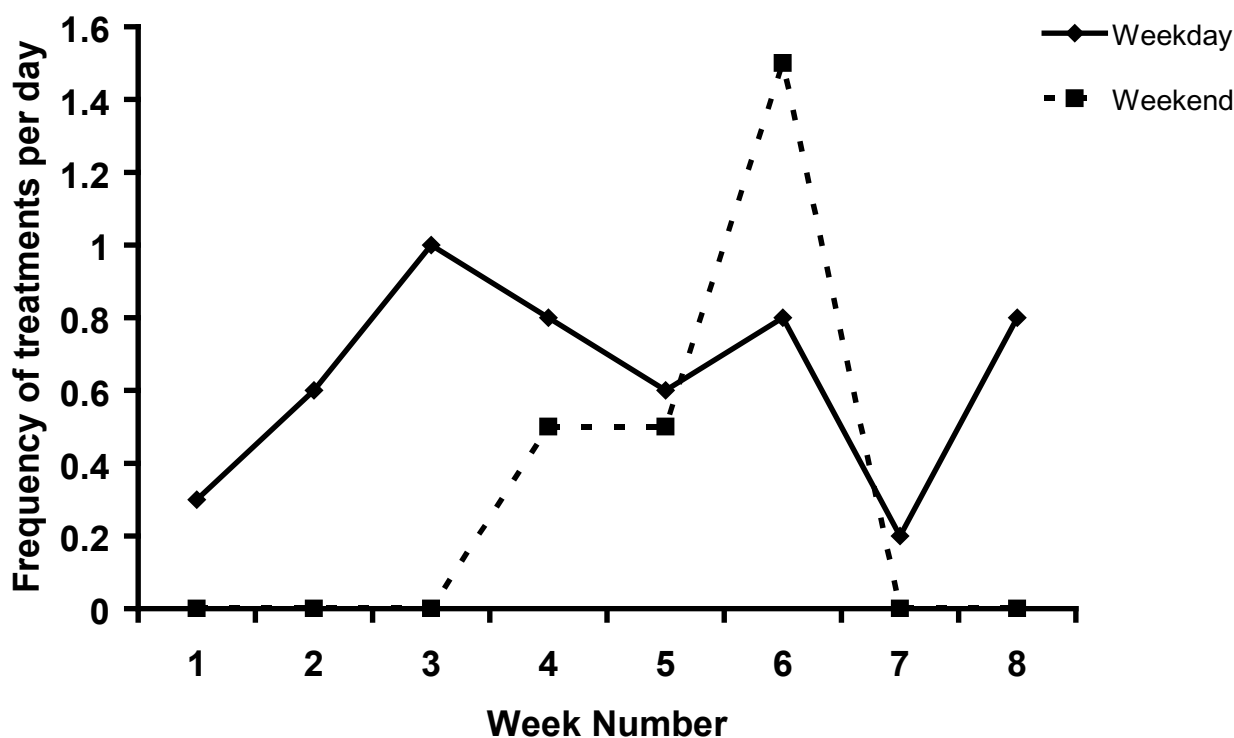
was always higher than mobility treatments during each week. The frequency of mobility treatments was increased in later weeks (Weeks 3, 4 and 6) for patients with a more prolonged stay, although they are still receiving less than one mobility intervention per day.



Graph 1. A comparison of the frequency of mobility and respiratory interventions



Graph 2. Frequency of respiratory treatments on a weekday versus a weekend.



Graph 3. Frequency of mobility treatments on a weekday versus a weekend.

Interestingly, when the frequency of respiratory treatments was compared between a weekday and at the weekend the rates of respiratory treatments were always at least one respiratory intervention per day. Graph two illustrates the frequency of weekday and weekend respiratory interventions and interestingly shows the frequency of respiratory interventions at the weekend was higher than on a weekday. In contrast, the frequency of mobility interventions was low on a weekday and even lower on a weekend, indicating that physiotherapy interventions to assist mobility were rarely delivered to patients during their intensive care stay (Graph 3).

## Discussion

The results of this service evaluation indicate that at the time of data collection physiotherapy in our ICU predominantly provided 'respiratory interventions' and the frequency of 'mobility interventions' was low. These results were inconsistent with the perceptions of the physiotherapy staff working in this ICU, who felt they took a pro-active approach to rehabilitation within the unit.

This raises the question of whether there is as much rehabilitation within intensive care as is suggested by postal questionnaires.

When the results of this service evaluation were categorised into respiratory and mobility interventions it became clear that while respiratory interventions were delivered at least once a day the frequency of mobility interventions was much less. Other than a daily respiratory assessment the most frequent respiratory interventions delivered in our intensive care unit were suction followed by manual hyperinflation with other interventions such as ACBT, positioning, IPPB, supported cough and weaning being undertaken less frequently. Mobility interventions demonstrated consistently low rates of passive range of movement and active exercises, with even lower rates of sitting over the edge of the bed, transfers and walking. There are similarities between the content of our clinical practice within ICU and other studies, such as active exercises, bed edge sit and transferring out of bed (Thomas et al 2009; Skinner et al 2008; Lewis 2003). However, further comparison with previous studies is difficult as



this service evaluation has examined how often interventions are taking place on an individual basis. This is in contrast with previous studies that have recorded what interventions have taken place but not on an individual basis. This provides a picture of practice within our ICU.

Benefits to the respiratory system and avoidance of complications associated with bed rest through mobilisation have been reported (McWilliams et al 2008; Needham 2008; Clini & Ambrosini 2005; Zafiroopoulos et al 2004). In severe critical illness neuromuscular dysfunction, muscle weakness and impaired physical function are common and severe. It has been suggested that in order to address these adverse effects there needs to be greater and earlier physical rehabilitation within ICU (Skinner et al 2008; Lewis 2003). McWilliams (2008) compared the outcomes of patients within ICU that were 'mobilised' within five days of admission and those that were not due to staffing shortages. Patients were deemed to have begun 'mobilisation' when they were sitting on the edge of the bed or out in the chair, and could progress all the way to mobilising independently. The patients mobilised by their 5th day had a median length of ICU stay of 4 days (range 2-18), compared to 9 days (range 3-29) in the patients that were not mobilised. However, the participant numbers were small (n=17 mobilised by day 5, n=14 deemed ready but not mobilised by day 5) and it was unclear whether the two groups were similar although there was no difference in Apache II scores between groups. The suggestion that earlier mobilisation in appropriate ICU patients warrants further investigation. This need is highlighted by guidelines on rehabilitation after critical illness published by NICE (2009), who suggest formal assessment and structured rehabilitation programs. The guideline is predominantly based on expert opinion, again echoing the need for further research.

The physiotherapy team which covered the 18 bedded general ICU (comprising 6 level 2 beds and 12 level 3 beds) also covered a 12 bedded general HDU (level 2 beds), two 36

bedded surgical wards and provided ad hoc cover to the general day surgery unit. The team consisted of two whole time equivalent (WTE) band 7 clinical specialists, one WTE band 6 rotational specialist physiotherapist, two WTE band 5 rotational therapists and a 0.5 WTE band 3 technical instructor. This made for a busy and heavy caseload, although it was not felt by the team that the low rates of mobility interventions can be solely attributed to staffing levels. It could be suggested that interventions delivered were influenced by the physiotherapists perception of traditional 'chest physiotherapy' within the ICU including techniques such as MHI, positioning and manual techniques (Ntoumenopoloulos et al 2002). These results indicate that physiotherapists may prioritise these respiratory interventions over mobility and rehabilitation interventions. A contributory factor at the time of this evaluation may have been that there was no local protocol or guideline for mobilisation of this patient group. However this is now being addressed at a national level in Scotland and may influence future levels of mobility interventions. A further study following the introduction of this national protocol could evaluate it's impact on current levels of rehabilitation.

The lower number of mobility interventions was even more apparent at the weekend with very low levels of mobility interventions delivered. Weekend staffing levels and skill mix are considerably altered from weekday staffing, with 4.5 WTE physiotherapists of varying in-patient backgrounds available for the whole hospital. Mobilisation is included in the emergency duty intervention matrix which ensures that all staff are competent in its delivery. However, the priority of 'chest physiotherapy' appeared to influence the frequency of respiratory interventions over mobility interventions when staffing was restricted. This suggests a need for additional education and training, and further supports the need for a guideline or protocol for the delivery of mobility interventions within the



ICU both on weekdays and at the weekend.

A limitation of this study is that barriers to mobility interventions were not recorded but it is suggested that the underlying medical and surgical conditions of the patients may have been a contributory factor limiting mobility interventions. Such barriers included repeated trips to theatre, inotropes and open surgical wounds. The weekday physiotherapy team do mobilise patients with endo-tracheal tubes and tracheostomies insitu. Although, it could be hypothesised that weekend staff would consider ventilation a barrier to mobilisation. Future evaluation should include a record of all these issues. In addition, the study population was sicker than the average unit population as indicated by APACHE score, length of ventilation and ICU length of stay. However, it must be recognised that the unit details in Table 2 include all patients that passed through the ICU during the 2007-2008 financial year, and not just those that were intubated for greater than 48hours with an ICU stay of greater than 4days. It is therefore not surprising that the patient population studied was found to be sicker.

Furthermore, to facilitate future research there is the need to develop a common language for rehabilitation in ICU. There is inconsistency with terms used to describe rehabilitation in ICU including exercise prescription (Skinner et al 2008), mobilisation, early mobilisation (McKay, Ellis & Johnston 2005), rehabilitation, early rehabilitation (Lewis 2003) rehabilitation practices (Norrenberg & Vincent 2000) rehabilitation activity and active rehabilitation (Thomas et al 2009). The different terms often refer to the same or similar interventions. However, there does appear to be consensus about the aims of these interventions, including improved cardiopulmonary and physical function, to minimise the adverse effects of bed-rest, reduce the incidence of post-operative pulmonary complications, aid weaning from mechanical ventilation and reduced length of stay (McKay, Ellis & Johnston 2005; Lewis 2003). An agreed common

language would be useful for future work.

There are obvious limitations to this service evaluation. It was undertaken on a small number of patients, in one Scottish ICU and over a short period time. It is also important to note that only patients with an ICU stay of greater than 4 days and intubated for greater than 48 hours were included. This limits the generalisability of these results to all patients. Further large-scale evaluation of service provision would be useful to further illuminate the levels of rehabilitation received by patients in intensive care.

## Conclusion

Previous studies indicate that 'rehabilitation' is delivered to patients in ICU (Thomas et al 2009; Skinner et al 2008; Lewis 2003; Norrenberg & Vincent 2000). The results of this service evaluation demonstrate that in our hospital rehabilitation was delivered but the frequency was low. Future work should establish on a larger scale the actual rehabilitation received by patients on intensive care.

## Acknowledgements

I Cornwall BSc (Hons).

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# Extracorporeal membrane oxygenation (ECMO) and H<sub>1</sub>N<sub>1</sub>: a single case study from a ventilatory and physiotherapy perspective.

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### Summary

***The single case study describes the ARDS (Acute Respiratory Distress Syndrome) strategies adopted and the challenges of physiotherapy management of ECMO for H<sub>1</sub>N<sub>1</sub>. Knowledge and experience gained ensured uncompromising treatment of sputum retention and volume loss with specific ECMO considerations. This has contributed significantly to the preparedness for future flu pandemics.***

### Introduction

Two hundred and eight cases of H<sub>1</sub>N<sub>1</sub> were admitted to Newcastle Upon Tyne Hospitals NHS Foundation Trust (NUTH) during the flu season. Twenty five percent were transferred to critical care. As part of the national response to the surge in cases of H<sub>1</sub>N<sub>1</sub>, NUTH was licensed to use ECMO. This case study will review the management of an H<sub>1</sub>N<sub>1</sub> patient admitted, with particular attention to the physiotherapy input. Only the rescue therapies specifically discussed will be reviewed.

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### Case Report

A 49 year old male was admitted with a three week history of malaise, headaches, fever and anorexia. He had shortness of breath, rhinorrhoea and a non productive cough. Past medical history was insignificant. With a pyrexia of 38.5°C, raised C-reactive protein, bilateral infiltrates on radiograph and arterial blood gases of pH 7.54 PaCO<sub>2</sub> 3.63kPa PaO<sub>2</sub> 7.06kPa, he required 15L O<sub>2</sub>. The patient was treated with tamiflu and H<sub>1</sub>N<sub>1</sub> swabs were obtained.

The critical care team facilitated a rapid admission to the high dependency unit. Facial CPAP (continuous positive airway pressure) at 5cmH<sub>2</sub>O and a FiO<sub>2</sub> of 0.65 (fraction of inspired oxygen) was commenced. Over the following 48 hours pyrexia continued with increasing CPAP and oxygen demands. H<sub>1</sub>N<sub>1</sub> was confirmed. Physiotherapy treatment centred on positioning and ventilation/perfusion (V/Q) optimisation.

Elective intubation was inevitable. Ventilatory and oxygen requirements continued to increase and could no longer be managed noninvasively. Shortly after intubation the patient was positioned prone for 15 hours with minimal secretions present on suction.

Worsening hypoxaemia lead to high frequency oscillatory ventilation (HFOV). Initially

oxygenation improved, but this was not maintained despite increasing the mean pressure. PaCO<sub>2</sub> rose significantly, and whilst some permissive hypercapnia can be expected, pH dropped to 7.14 and PaCO<sub>2</sub> rose to 13.6kPa. At this stage, conventional ventilation was resumed and optimised. The patient was referred for ECMO and a bed subsequently became available. On commencement the patient had a Murray Score of 4.

Once established on ECMO, ventilation was reduced to rest settings. Auscultation was unremarkable and suction yielded small volumes of secretions. Bronchoscopy on day 12 showed essentially normal airways, mucosa and small amounts of loose secretions. Unlike other ECMO patients lung compliance remained relatively normal. On day 5, an attempt was made to wean off ECMO but the patient significantly desaturated. The gas flow across the membrane (the sweep) was reduced to zero on three further occasions with similar deterioration in oxygenation, despite optimal conventional ventilation. Prone position was consequently used to maximise recruitment prior to further reductions in sweep. Antibiotics were prescribed following positive cultures. The addition of nitric oxide did not facilitate this process. By day 16 ECMO was discontinued and conventional ventilation commenced.

During the ECMO run physiotherapy consisted of critical care chest care in terms of suction, vibrations and positioning. Reduction of sedation elicited an effective cough reflex facilitating clearance of secretions. Limb care primarily involved passive range of movement exercises with attention to joint range of movement and muscle length. ACTs (Activated Clotting Time) were noted prior to treatment and, if not within range, physiotherapy was not conducted.

Sixty two days after admission the patient was discharged to the respiratory ward. Weaning was slow, complicated by a left lower lobe pneumonia and pneumothorax that required draining.

## Discussion

The resurgence of H<sub>1</sub>N<sub>1</sub> placed increasing demands on critical care beds. Clinical boundaries were challenged, with centres adopting ARDS therapies more frequently.

Several countries reported the impact of the 2009 H<sub>1</sub>N<sub>1</sub> flu pandemic. The majority found young, healthy individuals presenting with acute and rapid hypoxaemic respiratory failure (Munster et al, 2009). Co-morbidities included obesity, chronic respiratory disease, pregnancy, post partum, hypertension and diabetes (Dominguez-Cherit et al 2009, Kumar et al 2009). Mortality rates ranged from 14.3% to 41% with differences being attributed to epidemiology, patient treatment, selection bias and usual baseline care (White and Angus, 2009). Hypoxia was identified as an independent risk factor for mortality (Dominguez-Cherit et al, 2009).

With the prospect of a re-emergence of H<sub>1</sub>N<sub>1</sub> and the unpredictability of the viruses' nature, strategic planning by critical care units became paramount. Deaths occurred in emergency departments due to insufficient critical care beds (Dominguez-Cherit et al, 2009). Recommendations included regional centres treating the most critically ill, telephone medical advice by experts and availability of clinical expertise at all times during the peak season (White and Angus, 2009). Those requiring protracted ventilation and intensive care management were responsible for the lasting impact on critical care services (Hato et al, 2010).

Delayed presentation by the patient to our Trust is inexplicable as the literature reported onset of symptoms to admission as 4 to 6 days (ANZ ECMO 2009, Dominguez-Cherit et al 2009, Kumar et al 2009, Rello et al 2009). The impact this may have had on the severity of disease and length of stay is difficult to determine. However the early use of Olseltavmir supports a reduction in progression to critical illness



(Smith et al, 2010).

Early identification and timely admission to critical care for respiratory support is essential as evidenced in this case study (Dominguez-Cherit et al 2009, Patel et al 2010, Ramsey et al 2009). Intubation rates as high as 85% were reported with H<sub>1</sub>N<sub>1</sub> patients that were managed non-invasively (Kumar et al 2009, Ramsey et al 2010). However, milder cases may benefit from non-invasive ventilation, preventing critical care admissions.

### **H<sub>1</sub>N<sub>1</sub> ARDS Therapies**

ARDS rescue therapies have significantly reduced mortality (Erikson et al, 2009). Several studies have described the use and efficacy of these therapies with H<sub>1</sub>N<sub>1</sub> (ANZ ECMO 2009, Dominguez-Cherit et al 2009, Kumar et al 2009, Napolitano et al 2010, Rello et al 2009).

Protective ventilation with tidal volumes of <6ml/kg of predicted body weight limits volutrauma and barotrauma. Similar principles were applied for H<sub>1</sub>N<sub>1</sub> associated ARDS with marginally higher tidal volumes (Dominguez-Cherit et al 2009, Kumar et al 2009). The implementation of this approach resulted in 8 to 15 days of ventilation (ANZ 2009, Cianchi et al 2011, Dominguez-Cherit et al 2009, Kumar et al 2009, Rello et al 2009). Conventional ventilation initially achieved adequate gas exchange, in the case study, with protective lung strategies being applied.

Prone positioning is thought to improve oxygenation through: redistribution of ventilation and perfusion, more uniform pleural pressure gradient, decreased cardiac compression, improved mechanics of the diaphragm and drainage of secretions (Sinclair and Albert 1997). Prone positioning is not advocated routinely but with severe hypoxaemia it has demonstrated sustained improvements in oxygenation (Sud et al, 2008). This was evidenced within the case study and, although incidence of its use with H<sub>1</sub>N<sub>1</sub> is low, it may negate the need for ECMO

(Napolitano et al, 2010).

HFOV was applied as a consequence of severe hypoxaemia, despite optimal ventilation, on repositioning supine. Gas exchange is achieved by delivering very small tidal volumes at high frequency limiting alveoli overdistention. Recruitment is promoted by the application of higher mean airway pressure and maintenance of this during inspiration and expiration prevents end expiratory alveolar collapse (Sud et al 2010, Downar and Mehta 2006). Improvement in oxygenation has been documented, without any significant difference in mortality compared to conventional ventilation. (Chan et al, 2007). The OSCAR trial, a large multi-centre trial, is currently in progress. HFOV was used with approximately 10% of patients in critical care with H<sub>1</sub>N<sub>1</sub> (Dominguez-Cherit et al 2009, Kumar et al 2009).

When medical and ventilator management are optimal, and the risk of death from ARDS is greater than 80%, veno-venous ECMO is indicated (Napolitano et al, 2010). The oxygenator assumes the function of the lungs via an external circuit and ventilator pressures are reduced to decrease the risk of ventilator related lung damage. However, ventilation may still marginally contribute to oxygenation with veno-venous ECMO as there is still pulmonary blood flow. The CESAR trial was a landmark multicentre, prospective, randomised trial in adults with severe acute respiratory failure (Peek et al, 2009). Survival without disability at 6 months with ECMO was significantly improved, compared to 'best practice' conventional management. The patient in this case study met the CESAR trial criteria with potentially reversible respiratory failure, a Murray Score >3 and less than 7 days ventilation. The Extracorporeal Life Support Organisation (ELSO) registry in 2009 supported this, as mortality significantly increased with more than 6 days of ventilation prior to ECMO for H<sub>1</sub>N<sub>1</sub>.

The incidence of ECMO was 11.6% in mechanically ventilated patients, with a



mortality rate of 21% (ANZ ECMO, 2009). This case reflects the patient demographics and severity of hypoxaemia prior to ECMO in the literature. All patients received at least one rescue therapy. In comparison, the ECMO 'run' was a similar length of time but duration of mechanical ventilation, critical care length of stay and total length of stay were higher for the patient in this case study. This could be attributed to the complications of spontaneous pneumothorax, rectal bleeding, a urinary tract infection, critical illness polyneuropathy and a chest infection post ECMO decannulation. If the patient is unlikely to survive without ECMO the limited evidence demonstrates a positive effect.

Weaning from ECMO is challenging and several therapies were used to facilitate decannulation. Prone position for recruitment optimisation was supported in the literature (Napolitano et al, 2010). Nitric oxide has been used as a rescue therapy with ARDS acting as a pulmonary specific vasodilator, improving oxygenation. Evidence of efficacy is limited with no significant difference in mortality or duration of ventilation. In this instance it was used once in conjunction with prone lying, after several unsuccessful attempts off ECMO.

### **Physiotherapy Management**

The ESICM task force produced recommendations with regards to physiotherapy with critically ill patients (Gosselink et al, 2008). It stated that accurate and thorough assessment would ensure effective and safe treatment. Positioning was used to optimise V/Q and reduce work of breathing due to the high degree of oxygen and PEEP dependence non-invasively. There was no evidence of retention of secretions at this point.

Positioning, suction and manual hyperinflation (MHI) may be used to facilitate clearance of secretions, recruit atelectasis and improve V/Q matching with intubated patients. Closed circuit suction is advisable with high levels of

PEEP as disconnection from the ventilator may lead to significant desaturation and further lung trauma. Knowledge of the pathophysiology of ARDS, in addition to objective measures of lung compliance, will guide the use, or not, of manual hyperinflation (MHI). A manometer should be used if MHI is indicated, with a PEEP valve as appropriate. Inspiratory holds via the ventilator may be a useful alternative. Evidence for manual techniques is limited. Expiratory vibrations with MHI increase peak expiratory flow and a PIF/PEF ratio of <0.9 is recommended to facilitate clearance of secretions (Shannon et al, 2010).

Prone lying may result in an increased volume of secretions however this was not observed in this case study. Attention should be paid to careful positioning of limbs, limiting common peroneal and ulnar nerve injuries. Respiratory assessment with HFOV is indicated as auscultation may lead to identification of pneumothoraces.

The biggest challenge faced by the physiotherapy team was the assessment and treatment of an ECMO patient from both a time and knowledge perspective. Initially this steep learning curve was daunting. Once knowledge base had been addressed and the principles of ECMO were understood both the patient and environment were less intimidating. It also became apparent that the approach to treatment planning was ultimately the same for any critically ill patient. The only ECMO specific contraindications to physiotherapy treatment were evidence of bleeding or deviation from strict limits of heparinisation. An accurate assessment is paramount and auscultation essential even if a white out on chest radiograph is evident. Rest ventilation may give an indication of lung compliance and MHI should be carefully considered with relation to the pathophysiological process of ARDS. Unlike other H<sub>1</sub>N<sub>1</sub> ECMO patients, the case study did not demonstrate severely reduced lung compliance. The incidence of barotrauma was reported between 8.3% and 10.3% with H<sub>1</sub>N<sub>1</sub> (Domiguez-Cherit et al 2009, Kumar



et al 2009). A significant pneumothorax was observed in this case along with a computerised tomography scan that reported significant lung fibrosis, demonstrating the fragility of the patient's lungs. Bronchoscopy will allow a more informed decision regarding treatment and should be observed by the physiotherapist where appropriate. Retention of secretions should be treated belligerently with suction, manual techniques and positioning within the safe limits of clotting. No adverse events were observed in this case study. Low levels of sedation allowing an effective cough reflex on suction are advantageous. Physiotherapy chest care is essential with ECMO patients to ensure that resolving consolidation is effectively treated minimizing retention of secretions and volume loss.

The development of the NICE Guidelines for Rehabilitation After Critical Illness has highlighted the need for stratified rehabilitation. Critical illness polyneuropathy was evident on reduction of sedation and range of movement exercises were progressed appropriately. Weaning was compromised by rehabilitation, leading to alternation of each on a daily basis. Independent mobility was achieved with a stick and the patient attended daily gym sessions prior to discharge. A referral was then made to Pulmonary Rehabilitation.

## Conclusion

In summary, the case study is an example of the presentation and management of the most severely affected critically ill H<sub>1</sub>N<sub>1</sub> patients. Rapidly deteriorating acute hypoxaemia requires early treatment within critical care with prompt invasive ventilation. Implementation of ARDS rescue therapies demonstrate some improvement in oxygenation but not overall mortality and this is reflected with H<sub>1</sub>N<sub>1</sub> associated ARDS. In patients who have reached their ceiling of ARDS care, ECMO has additional survival benefits as evidenced in this case study. Physiotherapy management of ECMO patients was intimidating initially due

to lack of experience and knowledge. Once the principles of ECMO were fully understood it became apparent that treatment was as for any other critically ill patient, with specific considerations. Sputum retention and volume loss should be targeted aggressively. The knowledge and experience gained with this patient and others during the flu season has contributed significantly towards preparedness for future pandemics.

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# A case report to discuss the effect of physical rehabilitation following a structured six week programme of exercise.

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### Summary

***Randomised controlled trials are lacking in assessing rehabilitation treatments post critical illness. This research attempted to assess if exercise can assist physical recovery. An adequate sample size was not recruited. Two participants completed this study with the experimental participant making a greater improvement. Exercise could thus have a role in physical recovery post critical illness. Further research is recommended.***

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### Keywords:

**Critical illness**  
**Physical recovery**  
**Exercise**

### Introduction

Research has demonstrated an impaired quality of life post critical illness including reduced energy levels (Niskanen et al, 1999), extreme weakness (Van Der Schaaf et al, 2004), dyspnoea upon exertion (Weinert et al, 1997), anxiety/ depression (Angus et al, 2001) and an alteration to work life patterns (Kvale et al, 2003).

As Intensive Care Unit services are acknowledged as some of the largest consumers of hospital funds (Chaboyer and Elliott 2000) there is a financial impetus to develop treatments that improve health outcomes post critical illness. Recent NICE guidelines note that research on rehabilitation treatments has mainly been observational and Randomised Controlled Trials (RCT) have been lacking (NICE 2009). There exists a need therefore to develop robust interventions to improve patients' quality of life.

## Method

This study attempted to carry out an RCT as part of an MSc to assess the effect of a structured programme of exercise upon physical recovery post critical illness. Unfortunately it was not possible to recruit an adequate sample size. This report focuses on the two individuals that participated. The first was randomised to the experimental group consisting of a 6 week programme of exercise. The second was randomised to the control consisting of normal day to day activities. Physical status was measured by, exercise tolerance using the Incremental Shuttle Walk Test (ISWT), generic health status using the self administered Short Form 36 version 2 (SF-36 v2TM) and fatigue using the Revised Piper Fatigue Scale (RPFS).

## Results

Table 1 shows the demographic details of both participants.

Both sustained acute illness however the Experimental Participant (EP) suffered from chronic illness. Despite similar length of critical care stay, time on a ventilator differed. Baseline and post intervention scores for both participants are outlined in table 2.

### A) Exercise Tolerance

Both participants exceeded the expected improved exercise tolerance of 52 metres and demonstrated the biggest improvement within all three outcome measures. Baseline exercise tolerance for the Control Participant (CP) was more than four times greater than for the EP. The latter trebled distance walked post intervention.

### B) Fatigue

Both participants reduced their total fatigue score post study thus making progress. As there is no comparative evidence an improvement was expected for the EP who improved by 6% more than the CP. Baseline fatigue score for her was almost 100% greater than his hence

she was much more fatigued pre study.

Figure 1 shows a further breakdown of component results for the RPFS.



	Control	Experimental
Gender	Male	Female
Age	42	60
Diagnosis	Legionella pneumonia	Bronchiolitis obliterans organising pneumonia (boop)
Past medical history	Nil of note	Rheumatoid arthritis, Chronic obstructive pulmonary disease, investigation for previous boop.
Length of time on ventilator	11days	4 days
Length of time on intensive care	18 days	17 days
Complications	Acute respiratory distress syndrome, Multi organ failure	Tracheostomy

Table 1: Demographic details for participants

	Control pre	Control post	Progress made by control	Experimental pre	Experimental post	Progress made by experimental
ISWT(total distance walked)	260m	450m	↑ distance by 87%	60m	190m	↑ distance by 158%
RPFS(total fatigue score)	4.4	3.7	↓ fatigue by 15%	8.0	6.35	↓ fatigue by 21%
SF36v2						
• PHS	29 NBS= 53.01	42 NBS= 53.01	↑PHS by 45%	29 NBS= 46.71	33 NBS=46.71	↑PHS by 14%
• MHS	44 NBS= 49.07	38 NBS= 49.07	↓MHS by 14%	16 NBS= 50.93	26 NBS= 50.93	↑MHS by 63%

Table 2: Baseline and post intervention scores for both participants

ISWT = Incremental Shuttle Walk Test; RPFS= Revised Piper Fatigue Scale;  
 SF36v2 = Short Form 36 version 2.  
 PHS = Physical Health Summary; MHS= Mental Health Summary  
 NBS = Norm Based Scoring

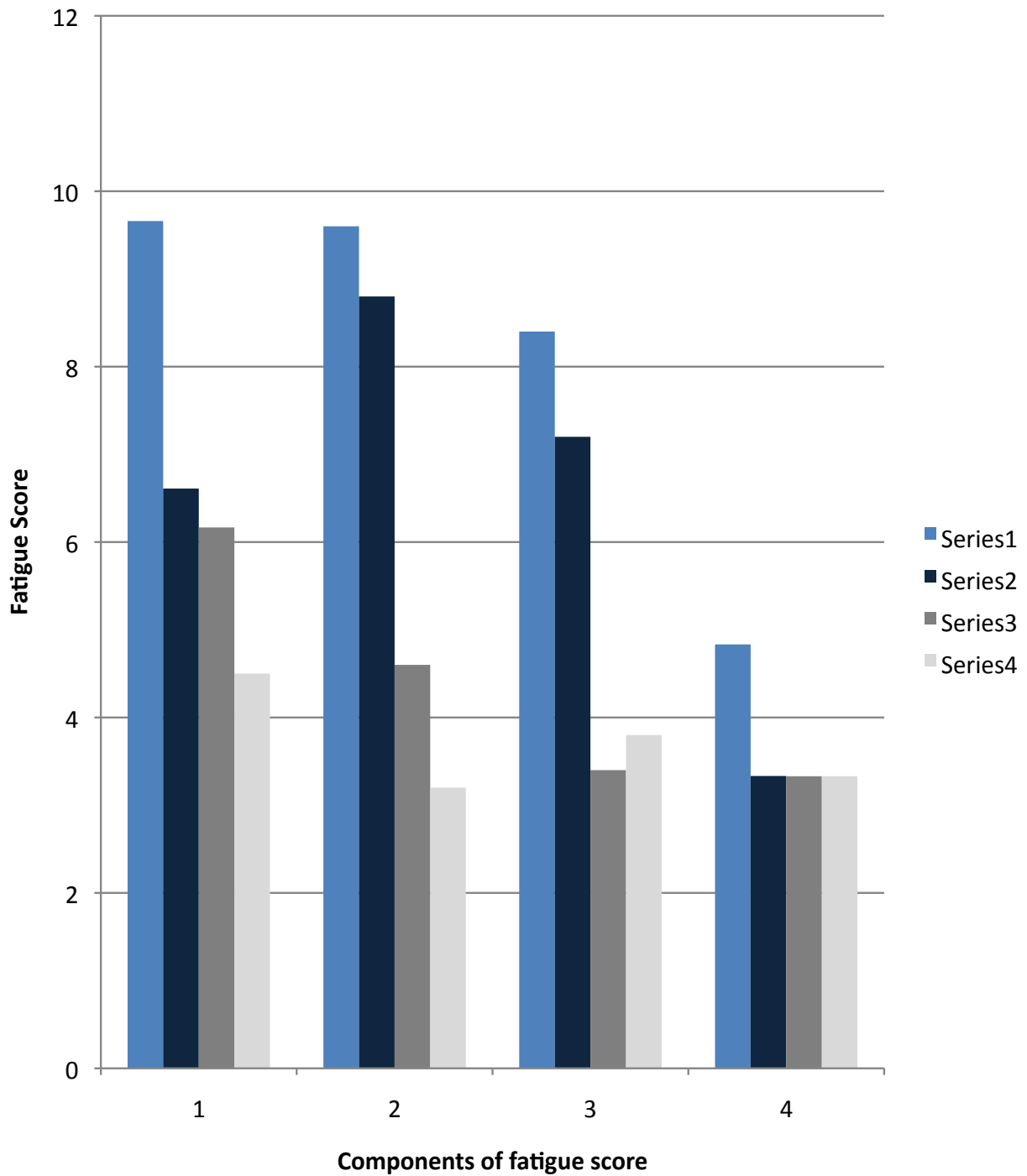


Figure 1: Component scores for Revised Piper Fatigue Scale for experimental participant pre (series 1) and post (series 2) intervention and for control participant pre (series 3) and post (series 4) intervention.

Components of fatigue score:

1 = Behavioural/Severity 2 = Affective meaning 3 = Sensory 4 = Cognitive/Mood

Fatigue Score:

On a scale of 0-10, with 0 being no fatigue

The EP improved in all components of fatigue but mainly in severity and mood despite demonstrating severe fatigue which caused a high level of distress. Intensity however reduced by 50%. The only symptom that deteriorated was feeling tired which increased by 10%. This contrasts with 30% for the CP. Ability to socialise and carry out hobbies increased by 50%.

The CP only improved in 2 areas of fatigue, severity and affective meaning. He still felt fatigued at work and distress caused by fatigue increased 10% post study but was 50% less disagreeable. Main improvements within

these two categories included sexual activity which improved by 50% and socialising was less affected by fatigue.

The CP deteriorated in the sensory aspect of fatigue especially with respect to feeling tired and sleepy. He stayed the same however for the mood component of fatigue despite deteriorating in concentration.

### C) Generic Health Status

Figures 2 and 3 outline the results which are divided into physical (PHS) and mental health summary (MHS).

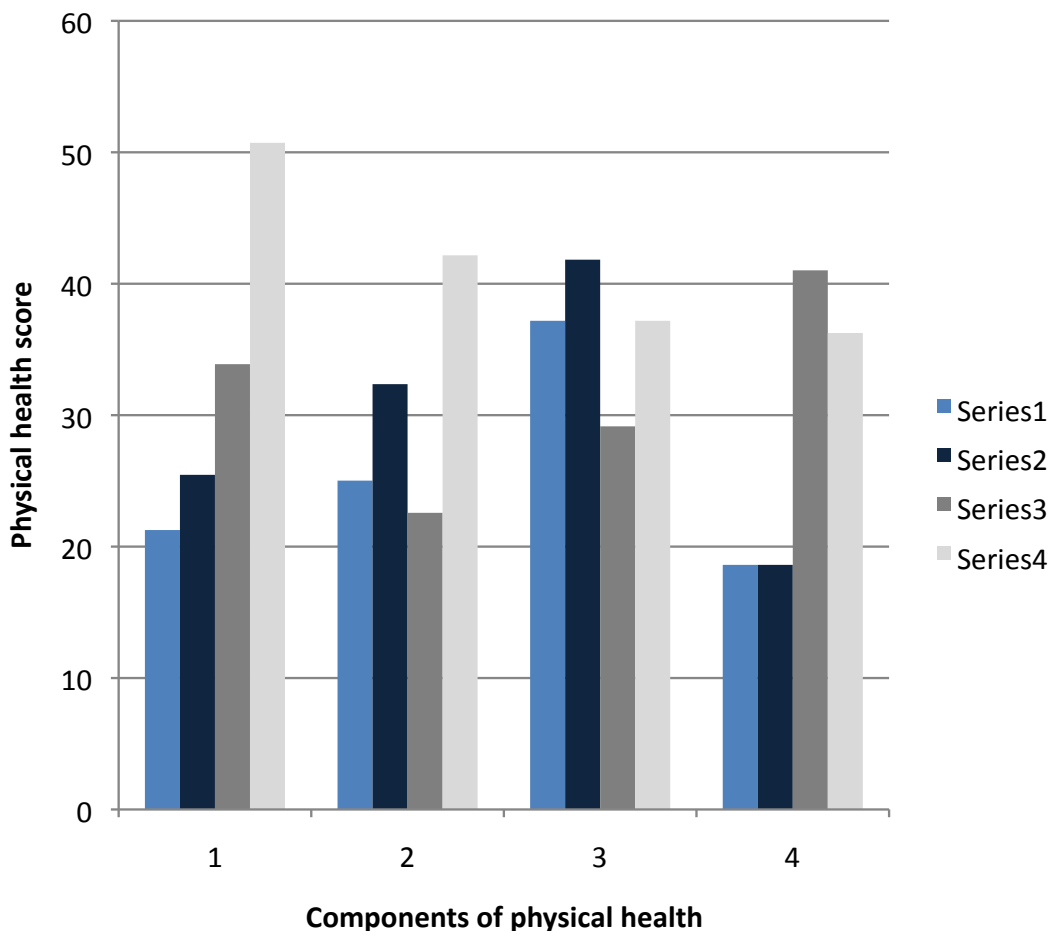


Figure 2: Component scores for SF36v2 for experimental participant pre (series 1) and post (series 2) intervention for physical health summary and for control participant pre (series 3) and post (series 4) intervention.

Components of physical health:

1 = Physical Function 2 = Role Physical 3 = Role Bodily Pain 4 = General Health

Physical health score:

On a scale of 0-100 with 50 taken as the average as compared with the general United States Population.



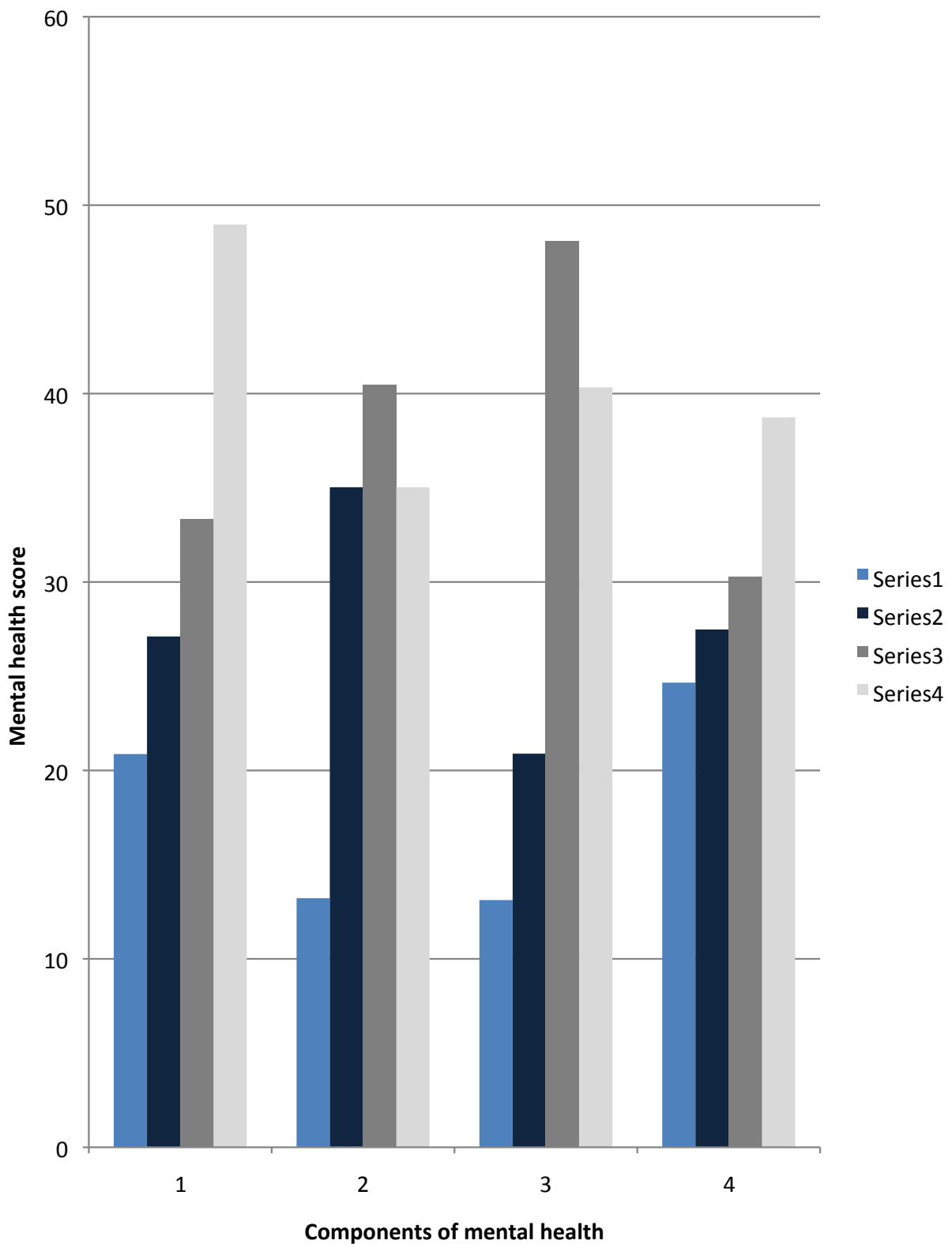


Figure 3: Component scores for SF36v2 for experimental participant pre (series 1) and post (series 2) intervention for mental health summary and for control pre (series 3) and post (series 4) intervention.

Components of mental health:

1 = Vitality 2 = Social Function 3 = Role Emotional 4 = Mental health

Mental health score: On a scale of 0-100 with 50 taken as the average as compared with the general United States population.

## i) PHS

Both participants had exactly the same PHS score pre study despite very different measurements of exercise tolerance. They each made improvements in all components except general health which stayed the same for the EP and got worse for the CP. He did not feel as healthy as others and expected his health to get worse. In accordance with norm based scoring for the SF-36v2TM (Ware et al 1994), with 40 being significantly impaired, both had significant impairment in PHS pre study. The sub-component of physical function was worse post study for the EP with only 2/10 aspects improving as opposed to 8/10 for the CP. This is demonstrated by her score being only 25.46 after intervention as compared with 50.72 for the CP. Despite doing and accomplishing more and not feeling as limited, difficulties were still experienced by her. In contrast the CP improved in all physical roles especially doing more work bringing this aspect above the significant impairment level. Pain reduced from moderate to mild for the EP making this a good improvement. It also reduced in severity for the CP but still interfered with work.

## ii) MHS

The EP improved in all 4 sub components of MHS while the CP only improved in 2, social function and role emotional getting worse. He still felt 'down in the dumps', 'downhearted' and 'low'. Within vitality the EP felt less worn out however the CP improved in all aspects but especially in feeling tired a little as compared with most of the time pre study. This component therefore changed from significantly impaired pre study to average impairment post study, that is,  $\geq 50$ . The EP made a huge improvement in social function, trebling her score from pre to post study.

Overall for the generic health status measurement with the exception of bodily pain the EP scores were still significantly impaired for all components of the physical and mental health sections post intervention. The CP

scored bodily pain, general health, social function and mental health as significantly impaired, that is 50% of both the physical and mental health components.

## Discussion

This study was limited by the failure to achieve the required sample size in a reasonable length of time.

Improvements were made by both participants and were anticipated as a result of natural recovery. Unfortunately they were not comparable pre study and therefore direct comparisons are difficult to make.

It was anticipated that the EP would have made a greater physical recovery as a result of the treatment intervention. Indeed the results show that the EP had a better percentage improvement from pre to post study in 3 of the 4 measures. Exercise tolerance improved by 158% as compared to 87% for the CP, fatigue improved by 21% as compared to 15% and mental health summary improved by 63% as compared to a 14% deterioration. These improvements were all despite the EP being more impaired in these measurements both pre and post study.

The poor measurements are not a surprise as she already suffered with several illnesses. Reduced exercise tolerance, increased fatigue and reduced perception of general health could have been features of those illnesses. In addition the acute illness could have caused a greater deterioration to her already impaired state as compared with the CP. It is therefore very encouraging that the EP made greater improvements overall. This could have been due to a greater potential and is a valid reason for providing intervention but cannot be verified due to a lack of pre ITU measurements. It is also possible that the treatment intervention caused the difference in improvement.

Despite spending a longer time on a ventilator and thus sedating drugs the CP did not



deteriorate to the same reduced level of physical status as the EP as measured by the ISWT and RPFS and MHS. This is likely due to his younger age and absence of pre-existing health disorders. PHS however improved most for the CP at 45% as compared with 14% for the EP. Questionnaire results for this measure indicated that he was accomplishing a lot more and with a variety of activities as compared with the EP. This could have been due to an unlimited physical lifestyle pre illness and therefore no restriction to attempting physical activities.

The greatest percentage improvement for both participants in this study was made in relation to exercise tolerance. This is an important finding as it is often overlooked in clinical practice in preference for independent mobility in order to allow speedy discharge from hospital.

Fatigue improved in all categories for the EP and by more than 6% than for the CP. Perhaps to be anticipated was that the CP felt more sleepy and tired post study which could be explained by his return to work during the study. This could have subsequently impacted on his ability to concentrate which was worse post study. It also appears from the results that he was becoming acclimatised to the sensation of fatigue with it feeling 50% less agreeable but still he found it distressing. For a previously fit man this could have led to frustration. He also had the ability to compare his working ability from pre to post critical illness. Thus only 2 of the 4 categories of fatigue improved for him in this study.

The EP did not work as a result of ill health but tiredness post study was only worse by 10% as opposed to 30% for CP. The treatment intervention for the EP was new to her and could have provided an enjoyable, social environment hence similar results to the CP were not found in this category. Despite having a more positive attitude to fatigue post study, the EP still scored 9 of the 22 fatigue measures as very high. Perhaps a longer duration of treatment was required to decide if any further

improvement could have been made but this would require further research. At some stage it would have been expected that fatigue would have levelled to incorporate her pre existing illness.

With regards to perceived health status post study it is clear that both participants scored themselves as significantly impaired in both PHS and MHS scores. Table 2 outlines the expected norm based scoring for gender and age. Despite different starting and end points and individual differences it is important to listen to patients needs. If impaired health is perceived then this will impact upon ability to return to their lifestyles and this in itself supports the idea that individual needs should be assessed. Support and guidance could then be offered on an individual basis. Ideally this would incorporate support for mental health problems. A positive outcome for the EP was a huge improvement in social function as compared with a slight deterioration for the CP. The treatment intervention did lend itself to this and could again be offered to those patients who feel that this is an area for improvement in their lifestyle post critical illness.

It is difficult to determine if the treatment intervention contributed in any way to improvement made by the EP. The only improvement that the EP made that the CP did not was in mental health summary score. This could have been attributed to the treatment intervention or due to experience of living with two chronic illnesses.

When compared with norm based scoring both participants have much lower scores than individuals of the same gender and similar age and indeed have similar scores to patients suffering with chronic illness. The CP also shows similarities to patients suffering with depression. This is an important finding as it may indicate that those patients admitted to the intensive care unit without prior illness can struggle to recover psychologically afterwards. This must not be underestimated in a persons' ability to recover and should be borne in mind



when intervening or assessing an individual's physical recovery from critical illness. This study also indicates that those who have immediate support and follow-up treatment may not experience such psychological impact even when a chronic illness is present. This finding would require further investigation.

In this study the outcome measure for exercise tolerance and the treatment intervention may not have been suitable to assess all patients' recovery needs at the point of hospital discharge. Considerations would have to be given to outcome measures used and treatments offered which may have to be individualised. As part of an individual's recovery it would be important to include treatment that not only addressed their new sustained illness but also potential fatigue, reduced quality of life and reduced exercise tolerance associated with intensive care admission.

A critical lesson to draw from this attempt to conduct an RCT amongst this patient group is the difficulty of recruiting patients in sufficient numbers to adequately address research questions relating to improved efficacy. This is also attested to by the lack of previous RCT's in this area. This presents serious challenges to the implementation of evidence-based practice amongst this population, which has ethical implications for the care that is currently given. There are no easy ways to address these issues, which are clearly going to bedevil any research in this field, by the very nature of this particular patient group. Multi-site, long-term recruitment would be one way of addressing this conundrum.

## Conclusion

Due to the extremely small inclusion rate in this study it is not possible to make any definite conclusions. Despite both participants making improvements it is not possible to determine if exercise enhanced spontaneous recovery. The EP however did make a greater improvement

than the CP. A larger multi centre trial is recommended in order to assess if exercise offers any extra benefit over spontaneous recovery.

## Key Points

**Spontaneous physical recovery is possible post critical illness.**

**Exercise post critical illness may enhance spontaneous recovery thus improving quality of life**

**Assessment and treatments may have to be individualised to accommodate individual needs.**

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# Effects of different manual hyperinflation techniques on PIF:PEF ratio in a test lung model, when used to enhance airway clearance.

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## Background

Secretion clearance occurs via two-phase gas-liquid flow when the peak-inspiratory flow to peak-expiratory flow ratio (PIF:PEF) is  $\leq 0.9$ . Manual hyperinflation (MHI) techniques are used to enhance airway clearance, but variation in the technique may influence the PIF:PEF ratio. This study aimed to identify optimal MHI techniques and explore current practice in terms of PIF:PEF ratios.

## Method

Fourteen qualified cardiorespiratory physiotherapists performed one 'current practice' MHI trial (CP) and five standardised MHI trials (below) in random order, using a test lung model and a 2-or 0.5-litre reservoir bag.

- A: 1-second inspiration, rapid-release
- B: 3-second inspiration, rapid-release
- C: 1-second inspiration, inspiratory plateau, rapid-release
- D: 3-second inspiration, inspiratory plateau, rapid-release
- E: 1-second inspiration, slow-release

Each trial incorporated ten breaths. Airflow

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was measured continuously through a NICO2 monitor.

## Statistics

Data were normally distributed and analysed using PASW 18. Means (SDs) for all trials were calculated and compared with PIF:PEF ratio of 0.9 using a one-sample t-test.

## Results

The mean PIF:PEF ratios from A,B,C & D were all  $< 0.9$ , but only B, D and CP achieved statistical significance (PIF:PEF ratio B&D: 0.46, ( $p < 0.001$ ), CP ratio: 0.61 ( $p < 0.01$ )). 14/14, 12/14 and 11/14 physiotherapists achieved PIF:PEF ratios  $< 0.9$  in B, D and CP respectively. The worst technique was E (PIF:PEF ratio: 2.3, ( $P < 0.001$ )) in which 13/14 ratios exceeded 0.9.

## Conclusion

Longer inspiratory times and rapid-release were most reliable in reducing PIF:PEF ratio, whilst fast inspiration and slow-release should be avoided. This data suggest how MHI could be potentially standardised and optimally applied in clinical practice.



# Ambulatory oxygen improves the effectiveness of pulmonary rehabilitation (PR) in selected patients.

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<sup>1</sup> Surrey Community Health

## Background

The acute effect of supplemental oxygen on exertion is well documented although its use in PR has not yet been clearly established. Two small studies have previously shown no benefit; this may have been due to study power or methodology. Our study investigated whether ambulatory oxygen provides additional benefit to patients undergoing PR who meet the 2006 UK Department of Health criteria for ambulatory oxygen use.

## Method

A single blind (researcher) randomized controlled trial compared the effect of a six week programme either with or without ambulatory oxygen. This study was powered to show an 80% difference between groups. Eligible patients were those who desaturated on baseline exercise testing by > 4% to < 90% and whose exercise tolerance improved by > 10% with ambulatory oxygen. Outcome measure included the Endurance Shuttle Walk Test (ESWT) and the self report Chronic Respiratory Questionnaire (CRQ-SR).

## Results

Between September 2007 and June 2009 62

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patients consented; one patient withdrew to use ambulatory oxygen, ten dropped out of PR. The majority of subjects had Chronic Obstructive Pulmonary Disease; eight had another chronic respiratory condition. Groups were similar at baseline except for weight and BMI (higher in the room air (RA) group). A greater improvement in ESWT was found in the oxygen group (p=0.000) (Table 1). When the acute effect of oxygen is excluded the oxygen group improved by 75% more than the RA group; this did not meet statistical significance since the study was powered to show an 80% improvement. The oxygen group gained improvements in three CRQ-SR domains (emotion, fatigue and mastery) above the minimally clinically important difference (MCID) but this was not the case for the RA group; the difference between groups for these domains also reached the MCID.

Improvements in the dyspnoea domain were similar between groups, although the oxygen group walked 490. (122%) further.

## Conclusion

For patients who desaturate and with an acute positive response to oxygen, ambulatory oxygen significantly enhances the effect of PR.

	RA group	O2 group	Difference	95% CI	p
Mean change m (SD)	401 (391)	891 (477)	490	245 - 735	0.000*
Mean change % (SD)	77 (76)	199 (214)	122	32 - 211	0.009*
Mean change secs (SD)	380 (358)	682 (311)	302	113 - 491	0.002*

Table 1: ESWT outcome

\*Unpaired t-test



# Missed opportunities for access to COPD outreach.

Morris K<sup>1</sup>, Bahadur K<sup>1</sup>, Osman L<sup>1</sup>, McDonnell L<sup>1</sup>, Jones G<sup>1</sup>, Kahr V<sup>1</sup>, Davidson C<sup>1</sup>

<sup>1</sup> Guys and St.Thomas' Foundation Trust

## Background

The Chronic Obstructive Pulmonary Disease (COPD) Outreach Team is multidisciplinary, working with patients in primary and secondary care. The team's purpose is to improve the care of local COPD patients in adherence with national directives<sup>1 2</sup>. This includes assisted discharge schemes, self management plans and access to a 24 hour telephone service.

Currently patients enter the COPD Outreach pathway by attending A&E or admission to acute wards. Audit has shown patients are managed along the pathway in a clinically governed and timely manner. However, it was felt that there may be other opportunities to identify COPD patients other than through their emergency hospital attendance.

## Method

We collected information on patients admitted with an acute exacerbation of COPD (AECOPD) diagnosed by a physician over a 2 month period. We identified which services they had utilised before admission and whether they were known to the COPD Outreach Team.

## Results

Of those patients admitted, 66% (37) were known to the COPD Outreach Team. Of those not known to the team, 79% (15) had previously attended chest clinic.

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Male	30 (54%)
Female	26 (46%)
Median Age years (IQR)	73 (68 – 84)
Median hospital LOS days (range)	7 (2 – 38)
Hospital Mortality	7 (13%)
Registered with COPD service	37 (66%)
• Utilised 24/7 telephone support service	0
Not registered with COPD service	19 (34%)
Previous hospital outpatient chest clinic attendance	15 (79%)
Others	4 (21%)

## Conclusions

Early identification and intervention are known to be key factors in the management of COPD. Our results demonstrate that patients admitted with AECOPD were seen in hospital clinics without referral to specialist COPD services. Furthermore, patients do not utilise the 24/7 specialist support service prior to admission. Promotion and education of staff and patients is needed. Our plan is to extend the COPD outreach team service into hospital outpatient clinics to support this.

## References

<sup>1</sup> Consultation on a strategy for services for Chronic Obstructive Pulmonary Disease (COPD) in England. Department of Health 2010.

<sup>2</sup> Chronic Obstructive Pulmonary Disease: Management of chronic obstructive pulmonary disease in adults in primary and secondary care. National Clinical Guideline Centre 2010.



# An investigation into the effects of high frequency chest wall oscillation on global lung impedance changes in children with cystic fibrosis.

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<sup>2</sup> Cystic Fibrosis Unit, Great Ormond Street Hospital for Children NHS Trust

## Background

This prospective feasibility study aimed to investigate changes in global lung impedance following airway clearance treatments with high frequency chest wall oscillation (HFCWO) in children with cystic fibrosis (CF). Global impedance, measured using electrical impedance tomography (EIT), is a surrogate measure of tidal lung ventilation (LV).

## Method

Children with CF aged 6 to 16 years were recruited to the study. EIT measurements were made before and after the treatment using 16 electrodes around each child's chest. Standardised settings were used for HFCWO (the Vest<sup>®</sup> Airway Clearance System Model 105, Hill-Rom<sup>®</sup> UK Ltd.) treatment. SaO<sub>2</sub> was measured continuously and standardised visual scores were used to assess the comfort of HFCWO.

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## Statistics

Global relative impedance changes ( $\Delta Z$ ) after HFCWO were compared with the baseline for each participant (paired t-test). An increase in impedance represented an increase in air in the lung and a 'successful' airway clearance treatment. Correlation between  $\Delta Z$  and changes in SaO<sub>2</sub> was examined.

## Results

Six children (3 female) (mean(SD) age 13.3(2.7) years) with mean(SD) FEV<sub>1</sub>% predicted 53.3(16.2)% participated. There was a significant reduction in global  $\Delta Z$  in 3 participants during the hour after HFCWO ( $p < 0.05$ ). Group changes in SaO<sub>2</sub> showed small but statistically significant reductions after HFCWO (mean difference -0.5, 95% confidence interval -0.99 to -0.06). There was no correlation between changes in SaO<sub>2</sub> and  $\Delta Z$ . Four participants reported significant discomfort as a result of HFCWO.

## Conclusions

Significant reductions in both  $\Delta Z$  and SaO<sub>2</sub> and the reported discomfort levels are of concern. Further research to evaluate the effects of HFCWO on LV in children with CF is required.



# What are the factors influencing physiotherapists' delivery of respiratory care in a military field hospital in Iraq and Afghanistan.

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## Objective

British military physiotherapists (MPs) have a complex clinical role during operational deployments, requiring competency in both musculoskeletal and respiratory skills. In peace-time this concentrates on rehabilitating soldiers with musculoskeletal injuries for return to active duty.

However MPs still appear reluctant to deliver respiratory care on the deployed intensive care unit despite training for this role. The purpose of this research was to explore the attitudes and perceptions of MPs in terms of their perceived competence and confidence in delivering respiratory care.

## Method

Qualitative study: Regular Commissioned MPs that had been on active duty in a role requiring the provision of respiratory care were interviewed.

## Statistics

Thematic Framework Analysis

## Results

The main themes emerging from the data are: "lack of confidence in competence" and "confusion and interpretation in the deployed physiotherapy role".

The dominant factor influencing these themes was the lack of support for and clarity about the deployed respiratory role from senior management. This in turn influenced how MPs were able to acquire and maintain their skills and revealed inadequate training opportunities. This has led to a lack of confidence in competence and reluctance of the MPs to use respiratory skills in the operational environment.

## Conclusions

Regular commissioned MPs are actively minimising their respiratory role on operational tour. This study suggests a need for clarification of the respiratory role for deployed MPs and revision of policies and training programmes, in order for MPs to fulfil their respiratory role effectively. There is a need to provide more frequent and ongoing bespoke respiratory support and training.





# Patients' perspectives of an adult in-patient respiratory physiotherapy service: a focus group analysis pre and post a 7 day working pilot.

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## Objective

To identify factors important to patients' receiving in-patient respiratory physiotherapy, in order to inform and evaluate the development of a 7-day working service.

## Method

Focus groups (FGs) were conducted to explore patients' experiences. One FG was held prior to a 7-day working pilot another, 6-months later. Discharged patients who received respiratory physiotherapy during their admission were invited to participate. Facilitated FGs were conducted using open questions. Taped transcripts were analysed to identify common themes important to patients'.

## Results

Six participants were recruited to the first FG and two to the second. Four themes were identified as being important; autonomy, continuity, priority and communication.

Patients' comments relating to priority:

"When I come in I need to see someone that

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day" (First FG)

"There is rationing. You don't have the same amount of physios at the weekend" (First FG)

"I remember the physios seem to have more time ... More willing to spend more time" (Second FG)

"...so you felt like you were more of a priority (compared to pre 7 day)" (Second FG)

Patients' comments related to communication:

"...physios have an important role in communicating with the doctor about progress of the patient" (First FG)

".....you need to understand who the people are that are coming to see you and what their role is." (Second FG)

## Conclusion

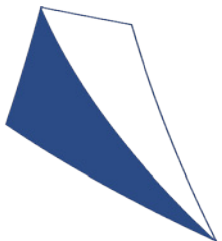
A 7-day working service appears to address factors, regarded as important to patients, centred around continuity of care at weekends. Seven-day working continued to meet patients' expectations in respect of their communication experiences.







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