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Introduction

Welcome to the 2007 ACPRC journal. We are the new editors and over the next three years we look forward to the opportunity to continue to provide clinicians in respiratory physiotherapy with a forum for dissemination of their research, audit and clinical experiences.

This year, in order to align our journal with other scientific journals, we have introduced a peer review process. Contributors will receive expert feedback on submissions prior to acceptance for publication. We would like to encourage physiotherapists involved in clinical research or post graduate study to consider submitting their work; we would also encourage academic staff involved in the organisation of Masters modules/courses to facilitate colleagues to submit suitable projects/ dissertations for consideration. The new ACPRC website provides the authors guidelines and will also provide an electronic version of the journal.

The 2007 journal has contributions from acute and chronic respiratory care which we hope will be of interest to our readers.

The deadline for submission of articles for the next journal is January 2008 so start planning!

Best regards

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Current practices in respiratory competence training

A survey of out-of-hours physiotherapy services in hospitals in the Republic of Ireland

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Summary

The aim of this study was to identify various models of practice for provision of competency training for out-of-hours physiotherapy services in the Republic of Ireland using a questionnaire survey.

The results showed that there are a wide variety of training methods currently used. Not all hospitals assessed staff competency to provide out-of-hours physiotherapy service and in those hospitals that did assess competence the processes for assessment were variable. A standardised training package could help formalise provision of competency training for out-of-hours physiotherapy.

Keywords:
out-of-hours physiotherapy, on-call physiotherapy, competence training.

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Introduction

Out-of-hours physiotherapy respiratory service is delivered outside of the normal physiotherapy department working hours, and includes weekends, evenings and emergency on-call duties. It is targeted at patients who have developed significant cardio-respiratory compromise requiring urgent physiotherapy intervention and the need for intervention is justified by evidence based practice (CSP 2004). It is the responsibility of the out-of-hours physiotherapist to assess such patients, and through a process of clinical reasoning implement an appropriate treatment regime and then re-evaluate the patients respiratory dysfunction.

For several reasons, physiotherapy staff are often reluctant to participate in provision of the out-of-hours service and concerns have been raised about the abilities of some physiotherapists to provide such services (Byrne 2002). Members of the cardio-respiratory clinical interest group of the Chartered Society of Physiotherapy (CSP) conveyed their unease about the ability of

some junior physiotherapists to practice within this speciality until further post-graduate training has been acquired (CSP Frontline 2001). The availability of specialty cardio-respiratory care is unique within physiotherapy in that, in most hospitals, all members of staff are obliged to maintain a core level of competence in this area of care in order to participate in the out-of-hours service. This is the case regardless of the clinical speciality that they pursue in their normal daily work or their level of seniority, experience or expertise. Hospitals within the Republic of Ireland are unlikely to possess sufficient staff numbers to roster out-of-hours staff exclusively from those working specifically in the field of respiratory care on a daily basis, as sometimes happens in the larger hospitals in the United Kingdom.

There is a paucity of relevant literature or robust clinical evidence pertaining to out-of-hours services (Dixon and Reeve 2003, Jones et al 1992). There has been a recent evaluation of on-call service preparation and education provision in the UK (Gough and Doherty 2007), but there is currently no information available on the out-of-hours physiotherapy services within the healthcare system of the Republic of Ireland.

Aims

The aims of this study were to establish the training available for staff providing an out-of-hours physiotherapy service, and to identify methods used to assess staff competence in hospitals within the Republic of Ireland.

Methodology

Initially a critical review of relevant literature was undertaken, from which a draft survey questionnaire was developed. The draft questionnaire was reviewed by academic and clinical experts in the field of respiratory care. Piloting was undertaken by five physiotherapists from the North Eastern Health Board area (Republic of Ireland) who are affiliated with a regional respiratory special interest group.

The database of subjects was comprised of adult public hospitals in the Republic of Ireland that are designated academic teaching, regional and general hospitals as identified by the Department of Health and Children (2004) (n=35 hospitals). The survey questionnaire was sent to a named senior or clinical specialist physiotherapist in respiratory care in all hospitals. One hospital was omitted from the study as no out-of-hours physiotherapy services were provided. The final number of eligible hospitals included in the study was 34.

Ethical approval was granted at the University of Ulster, Jordanstown, Northern Ireland and the Mater University Hospital, Dublin, Republic of Ireland, in 2005.

Efforts were made to positively influence response rates, including use of a named recipient, acknowledgement of the endorsement of a higher education authority, coloured ink and stamped addressed envelopes (Edwards et al 2001). Confidentiality was assured to all respondents. Analysis was completed using SPSS version 13.0 using a variety of descriptive statistical methods.

Results

The final overall response rate was 94.12% (n=32 / 34), which is above the level considered scientifically sound in a self-administered postal survey (Lessler & Kalsbeek 1992).

Current training for on-call

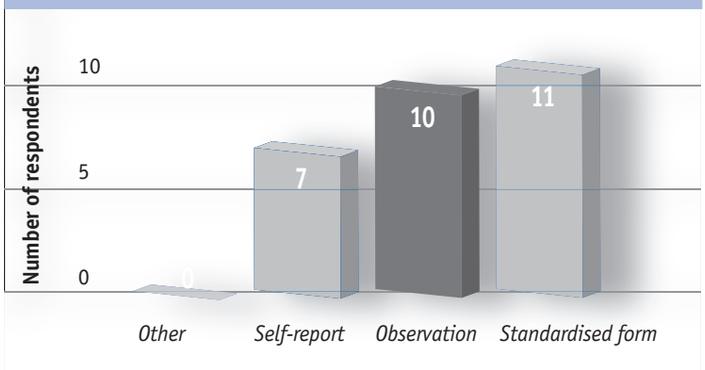
There were formal competency training programmes available for staff in 71.9% (n=23) of the hospitals surveyed. 28.1% (n=9) had no formal training programme in place. The training provided was available in many forms. Many hospitals offered various combinations of the following training: in-service training (22/23), co-treatment with senior respiratory staff (23/23), resource manual for self-directed learning (17/23), protected reflection time (1/23). In 2/23 departments practical skills training sessions were utilised.

Where training was provided, respondents were asked to identify the responsible training providers. Senior respiratory physiotherapists bore the greatest responsibility for provision of competency training activities (22/23) in most hospitals.

Competency training was also provided by staff physiotherapists, managers, clinical specialists and seniors from all clinical specialties in various hospitals (3/23). 4/23 hospitals reported that they had formal competency training provided by “other” persons, namely company representatives providing specific pieces of equipment.

Only three hospitals (9.4%) surveyed had a policy on the minimum amount of competency training for out-of-hours working to be provided for staff. One hospital insisted on a minimum of 4 hours per annum; another set a minimum limit of twelve hours annually. A third hospital stated that a policy was in place to deal with the issue of the minimum acceptable amount of competency training time annually, but omitted the response to the question specifying the time stated in this policy.

FIGURE .1 Assessment method



Formal Assessment of competency for on-call

There was a process in place to formally assess competence for out-of-hours service provision in 40.6% (n=13) of the hospitals surveyed. Conversely, there was no assessment of the levels of competence in 59.4% of hospitals surveyed.

Where competence was formally assessed, it was predominantly the responsibility of senior respiratory staff (10/13), with a lesser role played by clinical specialists in respiratory (3/13). In 7/13 of hospitals a system of self-assessment was in use. The process for assessment of competence was variable throughout the hospitals surveyed. Respondents were asked specifically about the use of standardised forms, observation of clinical skills by senior staff, self-report or any other forms that may be in use. The results are outlined in Figure 1.

In 7/13 hospitals competence was assessed in all staff within the department. One hospital examined the competence of staff grade physiotherapists only, while a further two hospitals tested only newly recruited staff members.

Where there were "other" criteria for the selection of staff to be assessed for competence, one hospital assessed all staff about to become part of the out-of-hours service provision team. A second hospital assessed all staff who participate in this service, and a final hospital expected staff to undertake self-assessment if they had not provided routine respiratory care for some time

Discussion

The majority of hospitals in Republic of Ireland have formal training programmes in place to deliver education with regard to the out-of-hours physiotherapy service. Where formal training programmes exist, the most popular method is observation by and co-treatment with more senior respiratory staff, followed by in-service training and provision of resource materials. Each training option is useful for different purposes and should be tailored to meet the specific training needs of individual staff members. The focus of all training should include task completion and skill acquisition (Epstein & Hundert 2002), as well as clinical reasoning, problem-solving and the application of theory to practice (Thomas 1990, Boss 1985). The least frequently used method of competency training, protected reflection time, was routinely in use in only one of the hospitals surveyed. This is most likely to be as a result of the competing time demands faced by all physiotherapists.

Senior respiratory and clinical specialist respiratory staff most frequently provided this training however this may not be currently reflected in their clinical caseloads, and frequent cancellation and deferral of training activities may result from the demands on staff to manage patients with acute respiratory compromise. Involvement of managers and clinical interest groups is required to standardise the structure, content and resource implications of competency training programmes in line with available evidence, which could then be modified in line with local requirements.

Staff physiotherapists were responsible for the delivery of competency training in only 15.6% (n=5) hospitals surveyed. Their value as a training resource should not be underestimated as they have prolonged exposure to the respiratory service through the rotation system. The input of staff physiotherapists could be formalised through the rotation appraisal and objective setting process.

There were policies in place in only three hospitals surveyed to define the amount of time that staff are required to spend on competency training for the out-of-hours service per annum. This ranged from four to twelve hours per year. Further work would be required to develop recommendations on the amount of training required for staff to develop and maintain clinical competence in this area.

In half of hospitals surveyed there was no formal assessment of competence. This indicates that in a large number of hospitals throughout the State, physiotherapists who do not routinely work in respiratory care are providing that service without having received regular assessment of their competence. This could potentially present a significant risk in practice to cardio-respiratory patients who are possibly already significantly compromised through their pathological process.

Where competence was assessed, it was predominantly the responsibility of senior and clinical specialist respiratory staff. This appears to be in line with good practice, as senior staff members would be most familiar with the treatment protocols in their hospitals and have greater depth of understanding of the evidence base underpinning respiratory physiotherapy interventions.

A significant number of respondents stated that self-assessment was the assessment method of choice in their hospitals. There should be a formalised method for completion of the self-assessment, with appropriate supporting documentation. Self-assessment is useful but requires that staff have adequate insight into the various domains of competence to accurately complete the assessment.

Where competence was formally assessed, the use of a standardised form was the most popular method. The content and rigour of such a form would benefit from further analysis. The second most popular method of staff assessment involves direct observation of clinical practice by a senior or clinical specialist staff member (31.3%; n=10). This is an objective performance assessment that examines various clinical skills as well as the problem solving and clinical reasoning abilities of staff. The criteria by which staff are assessed, observed and receive feedback should be carefully defined and be available to all staff prior to such an intervention.

A smaller number of hospitals (21.9%; n=7) rely on self-report from staff members as to their competence and training needs for the out-of-hours service provision. As with self-assessment forms, adequate insight into the domains of and requirements for out-of-hours competence is required by staff members in order to accurately carry out this process. Ideally, some framework or guideline should be available to staff to inform this process.

Some hospitals surveyed had a policy of assessing all of the physiotherapy staff in their departments, regardless of grade or clinical experience. This may be a good model of practice, as it makes no assumptions about the competence levels of its staff members, offers opportunities for staff to discuss concerns and allows for training provided to be specifically tailored to the assessed needs. In other hospitals newly-recruited staff to a department are the sole focus for assessment in two hospitals (6.3%), and one other hospital (3.1%) formally examines only staff grade physiotherapists. Both of these practices will provide valuable information on the performance and abilities of new and junior staff, and allow for appropriate rostering for the out-of-hours service. It does, however, lead to a situation where competence is assumed for all other physiotherapists regardless of area of clinical practice or experience levels.

Conclusion

The procedures in place for training and assessment of competence to provide the out-of-hours physiotherapy services throughout the Republic of Ireland are not uniform. This may result in variable quality in the services provided for patients requiring out-of-hours physiotherapy. Where formal assessment and training for competence in the out-of-hours physiotherapy service was undertaken, it was largely the responsibility of senior respiratory staff to train all members of the physiotherapy department. This additional educational responsibility should be reflected in the staffing levels for respiratory care and should be accommodated in the clinical to non-clinical time ratio allocation for these staff members.

In conclusion a standard training package should be accessible to all staff providing out of hours physiotherapy service and formal assessment of competence should be standard practice in all hospitals that provide an out-of-hours physiotherapy service.

Key points

- The procedures for formal training and assessment for competence to provide the out-of-hours physiotherapy services throughout the Republic of Ireland are not uniform.
- Where formal assessment and training for competence in the out-of-hours physiotherapy service is undertaken, it is largely the responsibility of senior respiratory staff to train all members of the physiotherapy department.
- A standard training package should be accessible to all staff providing out of hours physiotherapy service and formal assessment of competence should be standard practice in all hospitals that provide an out-of-hours physiotherapy service.

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Is non-invasive ventilation a useful weaning tool for successful extubation?

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Non-invasive ventilation, weaning, extubation.

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Summary

Non-invasive ventilation (NIV) as a weaning tool is relatively new, and there appears to be limited research investigating this topic. The studies in this review appear to support NIV as a weaning tool in the post extubation phase when NIV is used on a more continuous basis. NIV has the potential to prove beneficial to both patients, and hospital trusts.

Introduction

"Non-invasive ventilation is a mode of partial ventilatory assistance in which the ventilator supports the patient's triggered inspiration" (European Respiratory Society 2001).

Non-invasive ventilation (NIV) has been a successful tool in the management of different patient populations, particularly in the treatment of patients with chronic respiratory disorders.

Randomised controlled trials have been pursued in the use of NIV in the acute stages of respiratory failure with results showing that "NIV is an effective treatment for acute hypercapnic respiratory failure, particularly in chronic obstructive pulmonary disease" (British Thoracic Society 2002). This statement has been classed as a grade "A" recommendation by the British Thoracic Standards of Care Committee, demonstrating the efficacy of NIV in this selected population.

The development of NIV as a weaning tool is a relatively new concept. Weaning is described as "the process of reducing or removing ventilatory support" (Piper & Ellis 1998). "Weaning failure has significant independent association with increased risk of death, prolonged intensive care stay and transfer to a long term care or rehabilitation facility" (Epstein 1997). The European Respiratory Society (ERS) (2001) also support this, reporting that endotracheal intubation and prolonged invasive mechanical ventilation are often accompanied by complications that carry their own morbidity and mortality. "The application of NIV in such situations as post-extubation failure may be an attractive strategy that deserves future study" (ERS 2001).

One important study that examined the use of NIV post-extubation was performed at the Royal Brompton Hospital by Udwadia et al (1992). Since this time a number of randomised controlled trials and small studies have looked at the use of NIV as an aid to weaning from mechanical ventilation and/ or an aid to prevent reintubation. The Intensive Care Consensus (Evans 2001), commented that the "data suggests that new indications for NIV may include assistance in weaning and the avoidance of reintubation". They also stated that "shortening weaning time and avoiding reintubation represent promising indications for NIV". The BTS (2002) also stated as a grade "B" recommendation standard of care, "NIV has been used successfully to wean patients from invasive ventilation and should be used when conventional weaning strategies fail". All this potential support for the use of NIV as a tool for weaning provides some justification for the need to

examine and review existing trials related to this topic.

Purpose

The purpose of this review is to examine the evidence for the use of NIV as a weaning tool in order to determine if NIV is a useful adjunct to facilitate successful extubation.

Methodology

A detailed literature search for articles, published after 1990, was carried out using the clinical databases, AMED, Cinhal, EMBASE and Medline.

For the purpose of this review the term "non-invasive ventilation" (NIV) will be used synonymously to cover all terms used to describe the technique of positive pressure ventilation supplied without the use of an endotracheal tube, unless otherwise stated. Retrieved articles were reviewed and information which was relevant to the aims of this review was extracted and summarised.

Results

Five studies were identified that specifically studied NIV as a tool for weaning, (Ferrer et al 2003, Nava et al 2005, Kilger et al 1999, Girault et al 1999, Keenan 2002), four of these were randomised controlled trials.

Two studies showed positive results for the use of NIV as a weaning tool, Ferrer et al (2003) and Nava et al (2005). The other three studies, Kilger et al (1999), Girault et al (1999) and Keenan (2002) demonstrated no significant advantage of NIV in their results.

The two studies that demonstrated clinically significant evidence for the use of NIV in the post extubation period were randomised controlled trials (Ferrer et al 2003, Nava et al 2005).

Ferrer et al (2003) proposed that "in patients with persistent weaning failure, earlier extubation, taking advantage of NIV, would reduce the period of invasive ventilation and hence decrease the incidence of complications associated with prolonged mechanical ventilation and improving survival". Forty three patients, 77% of whom had chronic pulmonary disease, were randomly assigned to receive either invasive ventilation/ conventional weaning (22 patients), or extubation onto NIV (21 patients), following three failed spontaneous breathing trials (SBT), on three consecutive days, branding them "difficult to wean."

The study was stopped after 50% inclusion as the planned interim analysis revealed significant differences between the two study groups. Results of the NIV group showed that the mean duration of invasive ventilation was decreased by 11 days, total period of ventilatory support was decreased by 9 days, ICU length of stay was reduced by 11 days and total hospital stay was decreased by 13 days. The incidence of serious complications (nosocomial pneumonia and septic shock) was higher in the conventional weaning group with 16/22 patients developing serious complications, versus 5/21 in the NIV group. This was reinforced by a decrease in need for a tracheostomy due to a reduction in duration on invasive ventilation and an approximate 50% reduction of reintubation in the NIV group, however this did not prove clinically significant.

Obvious limitations were the increased amount of sedation. This may have increased complication incidences in the conventional weaning group, but this may not be able to be controlled ethically. Weaning regimens were also very different between the two groups, but again this would be associated to the mode of ventilation being offered and therefore difficult to control between the two groups.

Nava et al (2005) investigated the use of NIV as a preventative measure. They proposed that by utilising NIV in the first 48 hours post extubation, in a selected population deemed "high risk" that this would prevent respiratory failure and therefore decrease the need for reintubation and its associated risks. Patients considered to be at high risk of developing post extubation respiratory failure were described as patients that required more than 48 hours mechanical ventilation and who had chronic hypercapnia, congestive cardiac failure, ineffective cough and excessive tracheobronchial secretions, more than one failure of a weaning trial, more than one co-morbid condition, and upper airway obstruction. Ninety seven patients were enrolled into the study.

All patients were mechanically ventilated for more than 48 hours and then underwent a spontaneous breathing trial for 1 hour. When this was tolerated patients were ventilated for a further 1-2 hours and then randomised to receive either standard medical therapy (comprising of oxygen therapy and standard treatment as decided by attending, unblinded physicians) or NIV.

The study design states that both groups received the same care from nursing staff, respiratory therapists and daily physiotherapy sessions. It is worth noting that none of these interventions were recorded, which may lead to possible bias by for example staff not blinded to the intervention.

Results showed a significant reduction of 16% in the incidence of reintubation in the NIV group. The need for reintubation was found to be associated with a 60% increase in risk of ICU

mortality and patients that did require reintubation had a statistically higher ICU length of stay compared with those that did not. Therefore the use of NIV in this study was deemed statistically significant in reducing the risk of ICU mortality.

The results from three studies did not support any significant benefit from NIV for weaning (Kilger et al 1999, Girault et al 1999, Keenan et al 2002).

Both Keenan et al (2002) and Kilger et al (1999) investigated using NIV in the post-extubation period. Keenan's study instigated NIV once respiratory distress was evident, whereas Kilger's study initiated NIV 30 minutes post-extubation.

The study by Keenan et al (2002) was a randomised controlled trial comprising of 81 patients of which the majority had pre-existing respiratory or cardiac disease. They discovered no difference in reintubation rates between patients that received NIV plus standard therapy, compared to patients that received standard therapy alone.

Kilger et al (1999) studied a small population of 15 non-COPD patients. They assessed changes in respiratory parameters during invasive ventilation and then during acute respiratory insufficiency post extubation, whilst using NIV. Results showed some improvements in oxygenation and respiratory parameters, but they were not clinically significant.

Girault et al (1999) compared NIV and invasive pressure support ventilation (IPSV) as a systematic extubation and weaning technique in patients with acute on chronic respiratory failure, and therefore chronic respiratory pathologies. It was a randomised controlled trial involving a total of 33 patients. The study found that there were no differences between the two groups in terms of gas exchange. There was a small decrease in the invasive ventilation duration with NIV however, the results showed no significant difference in the reduction of morbidity, complications, or length of hospital or ICU stay.

Discussion

Although two studies showed positive results for the use of NIV as a weaning tool (Ferrer et al 2003, Nava et al 2005) and three did not (Kilger et al 1999, Girault et al 1999, Keenan 2002) overall there appears to be some evidence to support the benefit and use of NIV as a weaning tool provided it is not applied intermittently. It is important to note that in the three studies demonstrating no significant benefit NIV was delivered using individual research protocols, NIV was applied intermittently, for varying amounts of duration, and interspersed with spontaneous breathing with oxygen therapy (Keenan et al 2002, Kilger et al 1999, Girault et al 1999). The other studies Nava et al (2005) and Ferrer et al (2003) studies delivered NIV continuously for a set duration, 48 hours in the Nava et al (2005) study and for at least the first 24 hours in the Ferrer et al (2003) study. This could prove to be of great significance in clinical practice and in the development of future studies as both these studies demonstrate that NIV used more continuously post extubation, can be a very successful weaning tool.

One important consideration of the Nava et al (2005) study was that the criteria adopted in which to reintubate may have been too strict. It was considered appropriate to reintubate with a pH of <7.35, whereas in the COPD population this may not always be appropriate and other respiratory parameters should be consulted in addition to this. While this may have had some potential to bias the results, the preventative application of NIV may still be of clinical benefit at least for a very selected population of patients at high risk of developing post-extubation respiratory distress (Nava et al 2005).

The randomised controlled, multi centre trials included in this review have great relevance to the debate around the use of NIV as a preventative tool in the post extubation period. Other important studies were identified which did not meet the inclusion criteria for this review, but which still offer relevant information relating to the use of NIV for weaning. For example a randomised, controlled trial performed by Celikel et al (1998), although not looking at the use of NIV post-extubation found very positive results for the use of NIV versus standard therapy in preventing intubation in patients with COPD and acute respiratory failure. The results showed that 93.4% of patients in the NIV group improved, compared with 60% in the standard therapy group, of which the remaining 40% then improved with NIV. The results implied that "early utilization of NIV in an ICU population significantly decreased the need for invasive mechanical ventilation and also decreased length of stay when compared with standard therapy" (Celikel et al 1998). These results could be compared to those of Nava et al (2005) and Ferrer et al (2003), which again promote the early instigation of NIV in preventing reintubation.

Also an interesting report on the use of NIV in patients with neuromuscular disorders showed promising opportunities for the use of NIV to facilitate weaning (Goodenberger et al 1992). It reported two case studies with patients with neuromuscular respiratory failure, where nasal NIV was used in substitution to long term invasive ventilation via a tracheostomy. Both patients successfully continued

to be ventilated with NIV via nasal masks, improving their quality of life and functional independence. This again offers some support for the proposed hypothesis that a patient receiving long term tracheal invasive ventilation could possibly be weaned with the substitution of nasal NIV, without removing the tracheostomy tube in the initial phase, resulting in the possibility of decreased reintubation rates.

An important consideration relating to all studies on NIV are the complications associated with NIV and different interfaces. The studies in this review reported varying degrees of complications associated with interfaces, with the majority reporting facial soreness/necrosis. Ferrer et al (2003) reported that 29% of patients using face or nasal mask reported nasal bridge ulceration. Nava et al (2005) reported that 19/48 patients developed some form of complication with facial skin redness/abrasion proving most common. Celikel et al (1998) also reported 46% of patients studied suffered with facial skin necrosis. Interestingly, all patients in the study by Nava et al (2005) used NIV continuously for 48 hours and patients in the study by Celikel et al (1998) received NIV for prolonged periods. This suggests that with increased duration or continuous use of NIV, the risk of skin necrosis is increased. In practice this could be overcome by using more than one type of interface in rotation.

Conclusion

In general there appears to be some evidence to support the use of NIV as a weaning tool provided it is not applied intermittently. It may be successful when used either very early in respiratory failure or as a preventative measure prior to respiratory failure developing. It has demonstrated more success when used continuously for duration of time, between 24-48 hours, with the majority of success in high risk COPD patients. The preferred use of different interfaces is non-specific.

The information from this review could help inform physiotherapists and practitioners when developing their role relating to future NIV services. Expanded use of NIV could result in vast improvements in healthcare with decreased mortality rates, reduction in length of hospital and ICU stays and huge savings in costs as a result of these dramatic outcomes.

Key points

- There is some evidence to support the use of NIV as a useful weaning tool for successful extubation.
- NIV post extubation has demonstrated more success when used continuously for a duration of time between 24-48 hours, with the majority of success in high risk COPD patients.

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Mixed severity rehabilitation classes for COPD patients - Are they successful?

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Summary

This qualitative evaluation of pulmonary rehabilitation explores patients' perception of classes of mixed severity of COPD, and considers how patients feel about the process of rehabilitation in relation to severity of their disease. We identified that, on the whole, patients found classes of mixed severity a positive experience and highlight that patients would like rehabilitation at an earlier stage in their disease.

Introduction

Physical training for patients with respiratory disease is not a new concept, indeed it was known to be beneficial in the early nineteenth century. However, in the United Kingdom, routine prescription of exercise has only become common in the last decade or so. Fortunately, the management of Chronic Obstructive Pulmonary Disease (COPD) has changed considerably over the years. But even today, with strong evidence supporting the benefits of physical training (Lacasse et al 2006), survey data suggests that less than 2% of appropriate patients receive pulmonary rehabilitation (The British Lung Foundation & The British Thoracic Society 2005). The success of rehabilitation has been well documented (Lacasse et al 2006), however much of this literature comes from studies of patients with moderate to severe COPD. There are few qualitative papers in the area and little from the perspective of the patient. We have recently reported on the benefits of rehabilitation in a mild COPD population, assessed using the Medical Research Council (MRC) Dyspnoea Grade, and showed positive effects in these patients (Garrod et al 2006). In the UK mild COPD is usually managed in primary care and many rehabilitation programmes are funded from Primary Care Trusts. However, an audit of clinical rehabilitation identified that the majority of referrals to rehabilitation were from hospital consultants or physiotherapists and very few from general practitioners and primary care (Garrod et al 2004). Referrals to rehabilitation classes, therefore, tend to consist mainly of patients with more severe breathlessness. For the purpose of this study we specifically chose to include

patients with mild and severe breathlessness scores. We were interested in the impact of mixed severity classes on patients, and in patient perceptions of rehabilitation according to the severity and trajectory of illness.

Methods

Two patients with severe COPD were invited from those who had completed a pulmonary rehabilitation course in St George's Hospital, London and three patients with mild COPD from primary care. No patients refused to be interviewed. The rehabilitation classes are run continuously and patients attend for a period of 7 weeks (14 sessions). The assessment records were examined and patients were selected sequentially from the list by severity of illness. Two patients with severe COPD were interviewed individually and three patients with mild COPD were interviewed in a group. Full ethical consent was obtained from Wandsworth Health Authority Local research Ethics Committee (London, UK).

Patients were stratified according to baseline breathlessness using the MRC Dyspnoea Grade (Bestall et al 1999). Mild patients were those who described themselves as "troubled by breathlessness on strenuous exertion" or "short of breath when hurrying" (i.e. MRC grades 1 & 2) and severe patients described themselves as "too breathless to leave the house or breathless after undressing" (i.e. MRC grade 5).

Semi-structured interviews with the 2 patients with severe disease took place in a room in St George's Hospital and took approximately 1 hour. A focus group session with the 3 patients with mild disease also took one hour. A trained physiotherapist and an expert in pulmonary rehabilitation conducted both interviews. Open ended questions were asked about the patients' experiences of the rehabilitation classes in both the individual interviews and the focus group. The interviews were tape recorded and transcribed and then coded and analysed using the "one sheet of paper" (OSOP) method (Zeibland & McPherson 2006). Three main themes arose out of the analysis.

Timing of the rehabilitation course

In this study both patients with mild and severe COPD were asked how they had first heard of the rehabilitation classes. Many patients were not aware of rehabilitation classes prior to referral and, many of them were not referred until a long time after their initial diagnosis. Issues concerning the timing of rehabilitation in light of severity of illness, arose from discussions around the experience of rehabilitation.

Miss BF with mild COPD said she had waited a long time before being referred on the course:

"Mine was about six years before I actually had any information on it".

Whereas Miss CB, also with mild COPD was sent soon after her initial diagnosis:

"Yes, we got sent straight away almost. After the consultant referred me. I didn't even know about it".

It seems rehabilitation classes are not widely publicised and patients did not have prior knowledge about rehabilitation or its benefits.

Mrs RT (mild) explained:

"…because I had suffered for about 30 years before I was diagnosed and so I already knew I needed something, but I didn't know what".

Interviewers went on to ask the patients if they were satisfied with the length of time between having a diagnosis and starting the rehabilitation course. All patients thought they should have been given the opportunity of starting the course earlier.

Mrs MP (mild) said:

"Yes, the sooner the better. Especially with the breathing exercises, because I didn't even know about breathing exercises."

Similarly Mr DH with severe COPD explained how he felt people may benefit more were they referred earlier in the illness.

"The fact that I wasn't any better, at the end of it. But that's only a personal thing. It's not your fault, or the way you run your classes. It's the fact that I just didn't get any better. You did a really good job, all of you. It's well worth it, but as I say it's, I would think it's more cost effective. People who are starting to be on the road to chronic oxygen shortage, for them to start it earlier".

Comparison with others

Being in a class of mixed ability had positive and negative effects on the patients. For some patients the thought that they might see others worse off than themselves was perceived as threatening, while for others it was a positive experience.

Mr DH (severe) explained how he found the patients with mixed severity of illness in the rehabilitation course encouraged him to try and prevent his condition worsening and affecting him more than it currently does.

"Actually it makes you realise how much worse you've got, but it makes you realise how much worse you can get if you don't try to do as much as possible … I think also it makes you realise you're not as bad as you think you are".

He also went on to explain why he really liked the group classes.

"I like it. Really it's, you feel that, one thing is that you feel

you're not the only one. So you don't sit there and feel sorry for yourself. Whereas, if you had a nurse, physio coming, you still feel I'm the only bloke who has to do this, poor old me. But when you get to a group of people who, some of them are worse than you, you appreciate that come on, get on with it, you can do it".

Miss BF (mild) identified how seeing others with similar problems helped her overcome her embarrassment associated with breathlessness. In terms of airway obstruction her disease was mild, however, she had lived with the condition for a number of years and embarrassment predominantly diminished her activity levels.

"And I went on one of the classes they have there, and I found that there were other people who were the same as me and I didn't feel ashamed. Now I'm always ashamed of my physical, what I'm not able to do. I used to hide it from everyone. But now when I get out of breath, I don't care if someone sees me (puffing). When I used to years ago, when I was like that. I would hide so no one would see me".

For the more severe patients favourable comparison with others was not always possible. Mrs DJ did enjoy the course despite the severity of her condition, but she found comparing her condition with other patients upsetting.

"Disappointed, because I couldn't do it. And I would have liked to have been able to. The course itself I think is a brilliant idea. For anybody that wants to try, you know. Anybody who wants to try and do more, I would love to have done more. I really would. And as for that guy walking up the corridor, I would have given anything to keep up with him. I did try to start off with, the first half a dozen steps and that's my lot. I know that's my lot and there's no point in getting upset about it".

The social side of rehabilitation classes

Patients with COPD frequently have difficulty going out and meeting other people and they can suffer isolation at home. Sometimes, this is because physically it is difficult to walk or travel far but emotional factors also feature. Jones et al (2004) described how patients found getting out of breath was "frightening" and "embarrassing", they avoided becoming breathless by taking less exercise and become housebound and isolated. Rehabilitation, in the group format, provided opportunities to improve social aspects of individuals' lives.

Miss CB was already doing exercises but attending the classes encouraged her to mix with people.

"A great difference. I do exercise at home anyway. But having people there and being told how to do it properly and give far more, something to build up. Rather than at home just doing it and then that's it. I like coming in and mixing with people, and you know when you a bit slow it's one of the most helpful things".

Since finishing the classes she now goes regularly to the gym with other people she met on the course. Mrs RT went on to say:

"Yes, that's another good thing we made friends. So at the end of the day it's very good…Is more like a social club as well and that it is good knowing other people are the same (as him)".

Everyone thought laughter is a good form of medicine. Some patients definitely had fun during the rehabilitation courses. We reported how Mrs DJ mentioned she was disappointed by her lack of progress. However, for her the social side of the course made up for this. She even tried to repeat the course she had enjoyed it so much.

"I do agree it's a damn good course… well I tried to get back so it must be good. We had a good laugh…"

Discussion

This paper describes the experiences of patients with COPD who attended a rehabilitation course with patients of mixed ability. We were interested in the views of patients with mild and severe COPD, and how they might benefit from being part of such a mixed group. In the usual clinical care of COPD, it is likely that the only encounter a patient will have with other patients with the same condition will be in the outpatients' clinic. These encounters are often brief. As the condition worsens social isolation increases with patients often becoming housebound (Donaldson et al 2005). In this study, patients of different severity were specifically targeted for rehabilitation. The most striking issue repeatedly mentioned was the support and improved understanding patients gained from being part of a mixed group and how this provided strong motivation to persevere with rehabilitation. We found that the element of group interaction was positive, even for the woman who admitted she could not keep up. Patients reported that contact with others of mixed severity COPD improved their confidence in coping with their illness.

Limitations

This study was limited by the small sample size and the use of different interview techniques. Logistical transport arrangements for the severely affected patients restricted us to using individual interviews while patients with mild COPD were able to use their own transport and could attend a focus group. The interviews were carried out by a member

of staff who was involved in the rehabilitation groups, although the patients were encouraged to be honest in their answers as they might improve classes for others. We realise that different ways of interviewing may elicit different information however we had to work within our restrictions.

Conclusion

Whilst the numbers in this study were small and saturation of the data was not achieved, the information gained supports our present delivery of rehabilitation, and should be seen as an initial exploration of this area rather than definitive insight.

Key points

- Patients considered pulmonary rehabilitation classes made up of those with mixed severity of disease successful.
- On the whole, patients found the experience of mixed groups positive
- Patients with severe disease highlighted the need for rehabilitation earlier in the course of this disease.

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The effect of positioning on lung volumes: implications for physiotherapy management of the surgical patient

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Summary

It is unclear to what extent positioning could enhance lung volumes in patients following surgery and/or increase respiratory muscle strength. This review examined some of the evidence for incorporating positioning post-operatively. Functional residual capacity appears to be decreased in supine and slumped positions, and the upright posture may improve lung volumes, and so assist in the prevention of post-operative pulmonary complications.

Introduction

The physiotherapy management of patients during the post-operative phase varies immensely from hospital to hospital in the UK (Jones et al 1992). Physiotherapy interventions post abdominal surgery include positioning, breathing techniques and mobilisation (Brooks et al 2001). These techniques focus on restoring and maximising respiratory function and lung volumes, through for example positioning, by placing patients in more upright positions to carry out breathing exercises, manual techniques and mobilisation. There may be some physiological rationale for the inclusion of optimal positioning, as patients are at increased risk of respiratory complications post-operatively and general anaesthetic and pain both have inhibitory effects on respiratory muscle strength (Siafakas et al 1999). It has been proposed that upright postures elicit greater lung volumes. The increases in forced vital capacity (FVC) and forced expiratory volume in one second (FEV1) in upright positions is based on the concept that recumbent positioning restricts movement of the diaphragm through its compression by the abdominal contents and viscera. This causes small airway closure secondary to compression of the basal airways (Hough 2001), which, combined with the post-operative occurrence of reduction in functional residual capacity (FRC), contributes to poor ventilation/ perfusion (V/Q) matching and reduced airway clearance (Wahba 1991). Appropriate positioning may therefore be used to optimise ventilation distribution, improve lung volumes, V/Q matching, gas exchange and respiratory muscle strength, and reduce the incidence of

TABLE 1. Study characteristics and results summary

Study Authors (First author, year)	Study Design	Study population (number, gender, age, smoking history)	Positions tested	Outcome measures	Conclusions
Crosbie, 1985	Student practical exercise	n=20 4M:16F 17-30 years Smoking history: N/A	Sitting in a straight backed chair Supine lying Prone lying Slumped half lying	VC FEV_1	Decrease in VC and FEV_1 in all positions compared to standard values. The decrease was greatest in the slumped position.
Gounden, 1986	Within-subject experimental design	n=73 18M:55F 17-23 years Smoking history: N/A	Sitting lean forward Sitting erect Supine lying	MIPS MEPS	Significant differences in the ventilatory muscle function values and lung function values as a result of changes in position, with supine lying resulting in the greatest reduction.
Jenkins, 1988	Within-subject experimental design	Study 1 n=20 10M:10F 27-29 years Smoking history: All non-smokers Study 2 n=10 10M:0F 56-60 years Smoking history: 1 current smoker, 7 ex-smokers, 2 non-smokers	Sitting upright in chair Half lying Slumped sitting Supine lying Right side lying Left side lying Study 2 Seated	TLC VC IRV FRC RV ERV Study 2 FEV1 FVC FRC VC TLC RV PEFR PaO2 PaCO2	Study 1 FRC is at its lowest in supine lying compared to sitting. VC, TLC, RV do not show significant change as a result of postural alteration. Study 2 Lung volumes were reduced post-operatively and the patients were hypoxic. Slumped sitting was associated with the lowest FRC in all patients both pre- and post- operatively.
Manning, 1999	Within- subject experimental design	n=19 8M:11F 50-74 years Smoking history: 9 non-smokers, 10 ex-smokers	Sitting in a firm high-backed chair Side lying (right and left)	FVC FEV_1 SBN_2 test DLCO test	Side lying on either side reduces FVC and FEV1.
Ogiwara, 2002	Within subject experimental design	n=20 10M:10F 21-28 years Smoking history: All non-smokers	Sitting Half lying Slumped half lying Supine lying Right side lying Left side lying	PImax PEmax	No significant difference in PImax or PEmax in any of the postures tested.
Peacock, 1982	Within- subject experimental design	n=15 4M:11F 19-35 years Smoking history: All non-smokers	Foetal Trendelenberg Supine lying Lean-standing High-grasp-standing	VC	High-grasp-standing and lean standing positions were associated with a minimum of 10% increase in vital capacity compared to foetal and trendelenberg positions.

Abbreviations: *ERV – Expiratory reserve volume FEV_1 – Forced expiratory volume in 1 second FRC – Functional residual capacity FVC – Forced vital capacity IRV – Inspiratory reserve volume MEPS – Maximum static expiratory pressure MIPS – Maximum static inspiratory pressure $PaCO_2$ – Partial pressure of carbon dioxide PaO_2 – Partial pressure of oxygen PEFR – Peak expiratory flow rate PEmax – Maximal positive expiratory pressure PImax – Maximal negative inspiratory pressure RV – Residual volume TLC – Total lung capacity VC – Vital capacity*

post-operative pulmonary complications (Tucker and Jenkins 1996).

With the varying range and number of physiotherapy treatment approaches available it is important to ensure the efficacy of each approach, particularly in the age of financial accountability, cost saving and staffing pressures in the NHS of the 21st century. Currently it is unclear to what extent positioning could enhance lung volumes and/or increase respiratory muscle strength. It is also unclear whether positioning techniques alone could be appropriate for some post operative patient populations and reduce the incidence of post operative pulmonary complications.

Aim

The aim of this review was to summarise some of the evidence relating to the use of positioning to facilitate increases in lung volumes and respiratory muscle strength in the patients post-operatively.

Methods

Relevant trials were identified using a computerised search of the following databases: Allied and Complementary Medicine Database (AMED) 1985 to 2006, Cumulative Index to Nursing and Allied Health Literature (CINAHL) 1982 to 2006 and Medline, 1966 to 2006. The following search terms were used: position, positioning, lung volumes, physiotherapy, FEV, FVC, FRC and respiratory muscle strength. The title and abstract were screened in order to identify relevant studies relating to the specific aims of the review. The studies were then reviewed and the relevant information was extracted and summarised and/or tabulated. Methodological quality was not formally assessed and a narrative critical appraisal was undertaken.

Results

The search strategy resulted in the identification of 6 studies to be included in this review, ranging in publication date from 1982 to 2002. Five of these studies were a within-subjects experimental design, and one study used the results from a practical teaching session of physiotherapy undergraduates. A total of 177 subjects were studied, of which 64 were male and 113 were female, and the age of subjects ranged from 17 to 74 years. The characteristics of the studies are outlined in Table 1.

A wide variety of positions were tested in the included studies, although five out of six studies included supine lying and sitting. Outcome measures varied widely and vital capacity was the most frequently used measurement for lung volumes. Outcome measures for respiratory muscle strength also varied for example Gounden (1986) used maximum static inspiratory and expiratory pressure, and Ogiwara & Miyachi (2002) used maximal positive inspiratory and expiratory pressure. The main conclusions from each of these studies is summarised in Table 1.

Relationship between positioning and lung volumes

There were five studies which examined the relationship between positioning and lung volumes and the main conclusions from these studies are summarised in Table 1 (Jenkins et al 1988, Gouden 1986, Crosbie and Myles, Peacock et al 1982, Manning et al 1999). In general, while four out of five studies concluded that lung volumes decreased more in recumbent positions [Jenkins et al (1988); Gouden (1986); Crosbie and Myles (1985); Peacock et al (1982)], these studies had methodological flaws and were predominantly carried out on young, healthy individuals making it difficult to extrapolate the results to a surgical population.

Jenkins et al (1988) concluded that FRC was at its lowest in the supine position compared to sitting, but did not find significant changes in vital capacity (VC), total lung capacity (TLC) or residual volume (RV) due to postural alteration. However, in patients following coronary artery bypass graft (CABG) TLC, FRC and VC were all decreased in more recumbent positions pre- and post-operatively, and were at their worst at around 48 hours post-operatively. Small sample sizes make it difficult to extrapolate the results to the wider population and their conclusion that maximum benefits for the patient occur in prone lying is beyond their scope as they did not test this in the study. However, the results do show that a decrease in FRC occurred in slumped sitting in both healthy subjects and those after CABG, indicating that patients should be encouraged to avoid this position.

The study by Crosbie and Myles (1985) appear to support Jenkins et al (1988) and concluded that there was a decline in values for VC and FEV1 between sitting, supine lying, prone lying and slumped half lying, although these were only deemed to be significant between sitting and slumped. The data was collected by 20 inexperienced, first year physiotherapy students assessing each other, and this poor study design impacts negatively on the reliability of the data and therefore the conclusions drawn. Peacock et al (1982) found that "high grasp standing" maximised lung volumes compared to lean standing, supine, trendelenberg and foetal. With the exception of

supine, these are not positions that are routinely used, and, indeed, many patients may have difficulty achieving safely. The small sample group of predominantly young healthy females in both these studies further reduces the applicability of these studies to clinical practice. Similarly, Gouden (1986) with a larger sample group of 57 healthy and predominantly female subjects and 16 non surgical patients with asthma, provided evidence that lung volumes are decreased in the supine position for both normal subjects and those whose respiratory system is compromised.

Building on this research, Manning et al (1999) studied the effects of side-lying on lung function in older individuals and concluded that side-lying on either side decreases FVC and FEV1 in older people without cardiopulmonary disorders. While the lack of randomisation in this study may have adversely affected the reliability of these results the results do appear to support the argument that upright sitting is a preferable position for the post-operative patient compared to side-lying.

Relationship between positioning and respiratory muscle strength

There were three studies which examined the relationship between positioning and respiratory muscle strength and the main conclusions from these studies are summarised in Table 1 (Ogiwara and Miyachi 2002, Siafakas et al 1999, Gounden 1986).

Ogiwara and Miyachi (2002) studied the effect of posture on ventilatory muscle strength, and also examined intra-tester reliability. Maximal negative inspiratory pressure and maximal positive expiratory pressure were measured in 20 young healthy individuals in the following six positions; sitting, half lying, slumped half lying, supine lying, right side lying and left side lying. There were no statistically significant differences between positions. This research would appear to suggest that positioning does not have an effect on respiratory muscle function in normative studies, however the authors did recognise that those with an already compromised respiratory system may be greater impacted upon by position. In addition to the measurements of muscle strength this study did report that the highest inspiratory and expiratory volumes were recorded in the most upright position and the lowest values in slumped sitting which would support previous evidence that positioning does have an effect on lung volumes.

Gounden (1986) studied the effect of positioning on maximum static inspiratory pressure (MIPS) and maximum static expiratory pressure (MEPS) in order to examine the effect of posture on ventilatory muscle performance. This study concluded a small, but statistically significant, effect of position on respiratory muscle function with supine lying resulting in decreased values for both normal and respiratory compromised subjects.

Discussion

This review identified six studies that examined the effect of posture on lung volumes and/or respiratory muscle strength. In general the majority of the results relating to the effect of positioning on lung volumes support that supine and slumped lying positions decrease FRC and so these are likely to be less favourable positions for patients post operatively. There was no agreement as to the effect of posture on respiratory muscle function, with one study concluding there was no statistical difference (Ogiwara 2002) and the other study (Gounden 1986) concluding that significant differences did exist.

Several factors impact on the respiratory dynamics following surgery. Decreased lung volumes may result from a variety of factors including decreased lung compliance, decreased FRC and increased lung closing volume (LCV). The aging process itself causes a decrease in lung compliance as the elastic fibres in the lung begin to deteriorate (Connolly 1996) and the joints in the thoracic cage stiffen. FRC may either increase or decrease as a result of aging and pathology (Stocks and Quanjer 1995), but any decrease is exacerbated post-operatively due to the effect of general anaesthetic, supine positioning and dysfunctional respiratory muscles (Wahba 1991). Respiratory muscles are compromised post-operatively due to surgical incision through the muscle bulk, effects of general anaesthesia on the contractile ability of the muscle and the effect that sedatives can have on the neural structure and function of muscles (Siafakas et al 1999). Additionally, airway closure is more prevalent among individuals who are breathing at low lung volumes, which may leave them at higher risk of atelectasis, low oxygen saturations and consequent hypoxaemia (Dean 1985). In addition decreased lung volumes put patients at increased risk of poor gas exchange and infection, and many patients are put in the supine position for operations or end up in slumped lying positions in bed. All these factors in addition to the findings of this review provide some rationale for the inclusion of positioning to increase lung volumes and to possibly improve respiratory function and strength.

It is unclear whether there are some surgical populations

where positioning could be used in isolation to improve lung volumes and the studies included in this review did not examine this specifically. Due to time constraints and heavy case loads on surgical wards, physiotherapists are not always involved with all surgical patients and/or often have to limit the treatment time; positioning is an easy method for patients to use independently in between physiotherapy treatments and for the nursing staff to monitor.

Positioning has other important benefits to the post-operative patient, particularly in the early days following surgery when mobility may be decreased, and nursing care should be combined with positioning which will benefit the respiratory system and the cardiovascular and circulatory system.

Limitations

There were some limitations to this review. Firstly it is difficult to know whether the search strategy identified and retrieved all relevant studies, and so there may be some omissions. Secondly it is difficult to extrapolate results from studies which included mostly healthy subjects to patients who have actually undergone a surgical procedure. Thirdly elements of both the review process and the types of studies selected could bias the overall conclusions, for example, study quality was not vigorously appraised, and a high proportion of females were included, and these elements should be considered in any future reviews on this topic.

Conclusion

In conclusion, most studies in this review agree that supine and slumped lying positions should be avoided following surgery as they decrease lung volumes. The upright positioning may minimise decreases in lung volumes and lung function and assist in the prevention of post-operative pulmonary complications.

However, there is still a need for further research to focus on the impact of positioning directly on elderly post-operative patients as the majority of research has to date been carried out on young, healthy, predominantly female, subjects. There is also a need for research to determine whether the effect of positioning alone is sufficient treatment for some particular patient groups or whether it should always be combined with other physiotherapy treatments.

Key points

- Post-operative patients are at increased risk of decreased lung volumes.
- FRC appears to be decreased in supine and slumped positions, and the upright posture may improve lung volumes.
- Further research in this area is needed which includes older adults with a range of respiratory pathologies who have undergone surgery, and also to determine whether positioning is a sufficient treatment on its own in some surgical populations.

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Current physiotherapy practice for post-operative cardiac patients

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Summary

Post-operative physiotherapy management of cardiac patients is variable across the UK. The aim of this study was to evaluate current UK practice, and to evaluate this practice in light of available evidence. The results show inconsistent practice across the UK with some areas of practice lacking evidence. There is a need for centres to share good practice and develop services in line with the current evidence.

Introduction

Physiotherapy management is influenced by a number of factors, including resources, service set up, patient type (private versus NHS), and patient group (high versus low risk). It has been recognised that the provision of a physiotherapy service will also be influenced by personal experience and established practice (Reeve & Ewan 2005). It is therefore accepted that it is very difficult to standardise assessment and treatment approach, as practice that may be appropriate for one centre may not be so for another.

There have been numerous questionnaire surveys based on current physiotherapy practice for cardiac patients within the UK. Little has been done, however to use such results to help develop service delivery in this field and to promote evidence based practice.

Aim

The aim of this study was to ascertain and evaluate current national practice, and to evaluate this practice in light of available evidence.

Methods

Information about current physiotherapy practice in the area of cardiac surgery was collated at an Association of Chartered Physiotherapists in Respiratory Care (ACPRC) cardiothoracic study day in 2005. All delegates worked in the field of cardiothoracic physiotherapy, and were senior physiotherapists. The majority of delegates were at Senior I, Clinical Specialist, Superintendent or Lecturer grade, with the remainder at Senior II grade. Most delegates had a total of over 4 years experience working in the cardiothoracic field, with 6 having 10 or more years experience in the speciality.

Delegates were asked a series of questions about their current physiotherapy practice. Questions were read aloud and displayed on a screen at the front of the lecture theatre. Delegates were then requested to score their answers for each question on an anonymous pre-formatted score sheet which was collected at the end of the session. A choice of 4 answers was given for each question, as it is thought that this is more likely to polarise peoples' answers than a 3 point scale. Delegates were asked to give the answer that most represented their current practice, and were

Table 1. Summary of responses to some key questions.

Question	Always	Often	Rarely	Never
Do your routine (no-respiratory compromised) patients perform Lower Thoracic Expansion Exercises (LTEE's)	68.2%	22.7%	4.5%	4.5%
Do you use incentive spirometry for post operative cardiac patients?	4.5%	9.1%	22.7%	63.6%
Are routine post operative cardiac patients seen twice daily?	18.2%	54.5%	13.6%	13.6%
Does your treatment include pacing advice?	31.8%	38.2%	0%	0%
Do your post operative cardiac patients usually practice stairs post operatively?	81.8%	9.1%	9.1%	0%
Does your assessment or treatment of cardiac patients post operatively include upper limb exercises?	68.2%	18.2%	18.2%	0%
Does your assessment or treatment of cardiac patients post operatively include lower limb exercises?	54.5%	27.3%	27.3%	4.5%
Does your assessment of post operative cardiac patients include postural advice?	27.3%	36.4%	36.4%	0%

reassured that all score sheets would be completely anonymous. Questions specifically concerned patients undergoing cardiac surgery via a sternotomy incision and were not limited to coronary artery bypass graft cases. Results were collected and collated by the author.

Results

There were 22 respondents in the consensus voting. Other questions were posed in relation to respiratory interventions, timing and intensity of intervention, stairs and musculoskeletal considerations. Table 1 shows the summary of responses relating to some of the key questions. All respondents reported that they normally assessed/ treated patients on the morning of Day 1 post operatively. Post operative cardiac patients were normally mobilised >20m on Day 2 (68%) and Day 3 (32%). Physiotherapy treatment includes pacing advice always (32%) or often (38%). Most respondents used stair assessment for their cardiac patients. Some respondents used the stair assessment as an exercise test (22%), a functional test (41%); or as both an exercise and functional test (32%). Stair assessments were conducted Day 3-5: Day 3 14%; Day 4 59%; Day 5 18%.

Discussion

The results clearly show variation in practice between cardiothoracic centres in the UK. The question must be asked as to what cardiothoracic physiotherapists base practice on, and in the absence of good quality evidence for some aspects of practice how can efficient quality services be developed for our patients?

Types of intervention

The consensus results showed that over 90% of practitioners still regularly used Lower Thoracic Expansion Exercises post cardiac surgery for routine (i.e. non-respiratory compromised) patients. There are several studies examining the efficacy of deep breathing exercises post cardiac surgery, and whether removal of them as a treatment technique adversely affects patient outcome. In Pasquina's (2003) systematic review of respiratory physiotherapy post cardiac surgery he noted that eighteen trials tested eight regimens of prophylactic physiotherapy, and suggested that this variation in prophylactic physiotherapy may be due to a lack of a gold standard for this group of patients.

Brasher et al (2003) compared a group of patients post cardiac surgery who undertook a treatment regime of ambulation compared with a group who undertook ambulation and deep breathing exercises. This well designed study showed that there was no discernable difference in the number of post-operative pulmonary complications between the two groups, nor any significant differences between the groups for any pulmonary function parameter measured.

Stiller et al (1994) aimed to determine whether prophylactic physiotherapy affected the incidence of post-operative pulmonary complications after coronary artery surgery. This group investigated the need for deep breathing, and whether the frequency of intervention would affect outcomes. They found no statistically significant difference in the incidence

of post-operative pulmonary complications between patients who had no physiotherapy compared to those who had physiotherapy up to 4 times per day.

Jenkins et al (1994) and Johnson et al (1995) found similar results, concluding that deep breathing exercises had no added benefit to a regime of ambulation and sputum clearance. Patient focused outcomes such as anxiety levels, compliance and adherence with therapy were not tested in any of these studies.

One study by Westdahl et al (2005) did find a significant reduction in the amount of post-operative atelectasis in a group of patients performing deep breathing exercises with a positive expiratory pressure blow-bottle device (10cmH_20). This, however, did not translate into a reduced incidence of post operative pulmonary complications, a reduced hospital stay or improved oxygenation.

The consensus voting undertaken showed a small percentage (13.6%) always or often used incentive spirometry. Overend et al (2001) undertook a systematic review on the effect of incentive spirometry on post operative pulmonary complications and could find no evidence to support its use. The lack of evidence to support its use combined with additional expense raises questions concerning the appropriateness of this regime.

Timing and intensity of intervention

All respondents reported that the first post-operative intervention was provided the morning after surgery, with up to 41% of clinicians often or always performing a pre-operative assessment on patients. There is little evidence available regarding the optimal time for intervention. The need to identify those patients who have respiratory compromise by way of early assessment, must be balanced with efficient and effective delivery of advice and education, which may be as late as day 2 or 3 post-operatively.

If rationalising post-operative intervention, it becomes necessary to have a robust mechanism for early identification of those who do need timely respiratory treatment. Hulzebos et al (2003) performed a retrospective audit of patients who had experienced post-operative pulmonary complications to develop a model to predict risk of post operative pulmonary complications in a group of 117 patients who had undergone coronary artery bypass surgery. They found that the predictive factors for developing post-operative pulmonary complications were age >70, diabetes, having a productive cough, and a smoking history, whilst the protective factors against developing post-operative pulmonary complications were having an inspiratory vital capacity of >75% predicted and a predicted maximal expiratory pressure of >75%. Lazar et al (1995) found that the pre-operative factors that significantly increased length of stay post cardiac surgery were repeat or more complex surgery (valve and CABG), congestive heart failure, renal failure and pre-operative hospitalisation.

Patman et al (2001) undertook a study to determine the need for physiotherapy in the intubated period post-operatively. Whilst there was a large sample size (236), there was no standardisation of treatment regime for patients randomised to the treatment group, nor is it specified when or how frequently intervention occurred, making it difficult to draw valid conclusions.

When asked how quickly patients mobilise more than 20m post-operatively, 68% of clinicians stated it was day 2. 32% wait until day 3 to mobilise patients more than or equal to 20m. There is little evidence in the literature to guide this, and it often comes down to limitations such as drips and drains or cardiovascular status. Certainly the literature points to earlier rather than later ambulation, but is no more specific than that.

Frequency of intervention

73% of delegates reported often or always assessing and treating routine patients twice per day. This is controversial, especially in the current financial climate. Van der Peiljl et al (2004) compared a high frequency to a low frequency treatment regime. They found that there was no difference in length of stay or incidence of post-operative complications between the groups. There was, however, a higher level of patient satisfaction in the high intensity group.

Exercise and discharge advice

100% of respondents indicated that they always or often give patients pacing advice as part of their post-operative regime and also gave discharge advice in some capacity. The vast majority of clinicians (>90%) regularly include advice about sternal healing, building exercise tolerance, return to activities of daily living and cardiac rehabilitation. There is currently no evidence showing the outcome of specific areas of longer term advice for patients to facilitate phase two, three or four of cardiac rehabilitation. It seems that this particular aspect of post-operative care is based on experience of the problems that patients develop, and seems generally consistent from one centre to the next.

Stairs

Over 80% of clinicians always practiced stairs with patients prior to discharge, with 40% of those using it as a functional test, 23% using it as an exercise test and 32% using it as both a functional and exercise test. Of those practising stairs with patients post-operatively 14% practiced on day 3, 59% on day 4, and 18% on day 5 or later.

There is no evidence available to support the practice of stairs post operatively. Experience shows it as a useful tool to put into practice pacing advice and has also been cited as a good confidence boosting exercise for patients prior to discharge. The only paper looking at stair climbing post coronary artery surgery (Cockram et al, 1999) was only able to conclude the lack of any adverse physiological affect rather than any benefit.

Musculoskeletal considerations

The majority of clinicians include upper and lower limb exercises (68% and 54% respectively) in their post-operative treatment. A further 64% included postural advice in their post-operative treatment. Only 41% of clinicians, however, frequently included advice or exercises for musculo-skeletal or postural problems on discharge.

There are a limited number of studies looking at the incidence of musculo-skeletal complications post cardiac surgery, and certainly there is little evidence upon which to base one's practice. Stiller (1997) reports an incidence of 30% of patients post cardiac surgery presenting with shoulder girdle or back pain. She attempted to evaluate the effect of an eight week exercise regime in preventing the onset of shoulder girdle dysfunction and back pain, but demonstrated no difference between a group performing no exercise and those performing exercises on a daily basis.

El-Ansary (2000) tested the hypothesis that there would be a higher incidence of musculo-skeletal dysfunction in patients who had undergone internal mammary artery harvesting compared to those without. The study was of poor validity and reproducibility with subjective, outcomes only and significant variability in the timing of assessments.

Limitations

It is recognised that the consensus voting that took place may not be completely reflective of practice in the UK, as there was not representation from every cardiothoracic centre. In considering future evaluations of this kind, it would have been useful, as in Reeve and Ewen's study, to ascertain what practice was based on i.e. personal experience, evidence, or surgeon preference. Clinical practice and research have evolved since this study and so it will be important to repeat and update these findings on a regular basis.

Conclusion

Reeve and Ewan (2005) found that whilst 45% of clinicians cited literature as something they based their post-operative physiotherapy practice on, 75% cited personal experience and 67% cited established practice as a basis for clinical practice. Whilst there may be a discrepancy between the literature available and current practice, particularly of respiratory intervention for routine patients, the consensus of this group of experienced senior clinicians is to mobilise patients early and to use limb exercises and pacing advice as tools to optimise post-operative recovery.

The face of cardiothoracic surgery is changing, with advancing surgical techniques, a growing Grown-up Congenital Heart (GUCH) population, an increasingly elderly population with more peri-operative risk factors and diminishing resources with which to provide a service. We have to be responsive to these changes to ensure we are providing the best possible service for our patient group.

Key Points

- Clinicians need to review practice in light of available evidence to ensure patients receive the best post-operative physiotherapy
- Open exchange of ideas and experiences between physiotherapists working within the cardiothoracic field will ensure patients receive the best post-operative physiotherapy

ACKNOWLEDGMENTS

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Angela Martin is Cardiac Champion for the ACPRC and carried out this project as part of her activities as champion.

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case study

Investigating the effect of inspiratory muscle training

A case report on a patient with chronic asthma

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Informed consent: The subject gave informed consent for the results of her treatment and her photograph to be published.

Keywords:
asthma, bronchiectasis, inspiratory muscle training, test of incremental respiratory endurance.

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Summary

The aim of this case report was to investigate the effect of inspiratory muscle training (IMT) using the Test of Incremental Respiratory Endurance (TIRE) in a 38 year old female who is a chronic asthmatic. The subject carried out IMT at home seven days a week for six weeks using TIRE. Measurements recorded pre- and post-training included lung function tests (LFTs), tests of respiratory muscle strength and endurance, symptom related questionnaires and auscultation. There was an improvement in all outcome measures. We conclude that TIRE IMT resulted in increased respiratory muscle strength (RMS) and respiratory muscle endurance (RME), improved LFTs and reduced adventia with associated positive effects upon biopsychosocial status.

Introduction

The Test of Incremental Respiratory Endurance (TIRE) is a form of inspiratory muscle training (IMT) and is based upon the training theory that inspiratory muscle function can be improved by performing IMT at 80% of sustained maximal inspiratory pressure (SMIP) within a programme of incremental training (Chatham 2000, Enright et al 2004, Enright et al 2006).

Deconditioning of the inspiratory muscles in chronic lung disease contribute to dyspnoea and decreased exercise capacity (Czaika 2002). Therefore improving inspiratory muscle function is thought to improve exercise tolerance.

Improving inspiratory muscle function can benefit patients suffering from respiratory pathology as well as healthy individuals (Chatham 2000, Enright et al 2004, Enright et al 2006). These effects of IMT using the TIRE have been investigated in patients with severe restrictive lung disease (Chatham 2000), cystic fibrosis (Enright et al 2004), COPD (Czaika et al 2002), chronic heart failure Laoutaris et al 2004), and

healthy subjects (Chatham 2000, Enright et al 2006). IMT has been used in asthma (Ram et al 2003) but with equivocal results which may be due to a paucity of well designed trials and variable IMT methodology.

A secondary effect of IMP is improved sputum clearance in some cystic fibrosis patients (Chatham et al 2004) although conflicting results have been demonstrated in non-cystic fibrosis bronchiectasis (Patterson et al 2004) when TIRE IMT was compared with active cycle of breathing techniques (ACBT).

Aim

The aim of this study was to investigate the effect of IMT in a patient who is a chronic asthmatic and who was also being investigated for the presence of bronchiectasis. It was proposed that in this individual TIRE IMT would aid sputum clearance and improve inspiratory muscle function.

Case history

Mrs A is a 38 year old with asthma since childhood. Recently, the patient complained of a gradual onset of a "tight" chest, a persistent cough productive of green sputum, decreased exercise tolerance, dyspnoea and fatigue. These were unresponsive to changes in medication.

At the time of the study Mrs A was working 3 days a week as a lecturer, with reduced physical activity which she attributed to decreased exercise tolerance. No change in medication occurred during the study.

A computed tomography (CT) scan showed mild dilation, fibrosis and sputum retention in both lower lobes consistent with early bronchiectasis.

Measurement tools

The same dry wedge spirometer (Vitalograph, Buckingham, UK) was used to determine forced expiratory volume in one second (FEV1), forced vital capacity (FVC) and FEV1/FVC ratio. Inspiratory muscle testing was conducted by using TIRE IMT (Ionescu 1998) using the RT2 device (DeVilbliss Healthcare, UK Ltd). A psychosocial assessment was also taken using the Hospital Anxiety and

Table 1: Changes in lung function

	At onset	After 6 weeks	Magnitude of change
FEV_1 (litres)	2.1	2.2	+4.76%
FEV_1 (% predicted)	70.23%	73.58%	+3.35%
FVC (litres)	3.1	3.45	+11.29%
FVC (% predicted)	89.60%	99.71%	+10.11%*

** May be considered clinically significant*

Table 2: Changes in respiratory muscle strength and function

	At onset	After 6 weeks	Percentage increase
Maximum inspiratory pressure	91cm	105cm	15.38%*
Accumulated area (indicating work capacity)	14,292	19,312	35.12%*

**May be considered clinically significant*

Table 3: Changes in the Chronic Respiratory Disease Questionnaire

	At onset	After 6 weeks	Percentage Decrease
Dyspnoea	16.6	14.3	13.86*
Mastery	23.1	19.3	16.45*
Fatigue	15.0	12.1	19.34*
Emotion	30.8	25.3	17.86*
Total	85.5	71	16.96*

**May be considered clinically significant*

FIGURE 1. Patient using the TIRE

Depression (HAD) questionnaire (Zigmond & Snaith 1983). Activity level was measured using a recall questionnaire (Wilson et al 1986) and the Chronic Respiratory Disease Questionnaire (CRDQ) (Guyatt et al 1987). The presence of secretions was monitored by auscultation.

Procedure

Mrs A used the TIRE for six weeks (see figure 1). Each time the equipment was used the patient made a maximum inspiratory effort from residual volume (RV) to total lung capacity (TLC), giving a template unique to that individual (see figure 2). To train the inspiratory muscles this sustained maximum inspiratory pressure (SMIP) curve was reduced by 20% to an 80% target template (Laoutaris et al 2004). Training was performed three times a week. On the remaining 4 nights of the week the patient used the TIRE with a 40% target template with 20 second intervals to facilitate airway clearance until she felt that she had cleared any sputum present.

Results

There were clinically important increases in lung function, respiratory muscle strength (RMS) and respiratory muscle endurance (RME) *(Table 1 and 2)*. At commencement of the programme there were coarse inspiratory and expiratory crackles and a low pitched inspiratory wheeze in both bases. After six weeks the chest was clear. The anxiety score changed from 4 to 0 after 6 weeks and the depression score changed from 5 to 0 after 6 weeks. The scores were within the normal range at baseline although they were lower after six weeks of TIRE IMT. The physical activity questionnaire changed from 27.5 METS at onset to 63.6 METS after 6 weeks which is considered to be clinically significant. Scores were lower in all domains of the CRDQ after 6 weeks *(Table 3)*.

Discussion

This study has shown that a 6 week programme of TIRE IMT improved inspiratory muscle function, exercise capacity, psychosocial status and improved expectoration of chest secretions in a patient with asthma and with CT scan results consistent with bronchiectasis. These findings support the primary aims of this investigation which were to identify whether TIRE IMT could aid sputum clearance and improve inspiratory muscle function. These findings are consistent with the review conducted by Ram et al (2003) showing an increase in MIP in asthmatics, following IMT.

However, the findings do contrast with that of Newell and Stockley (2005), regarding threshold IMT in bronchiectasis and those of Patterson et al (2004) using the TIRE to aid sputum clearance in bronchiectasis. The aforementioned started training at 30% of MIP and built up by 5% each week to 60% MIP at the conclusion of the study. This represents a lower workload not applied through a full inspiratory volume range in contrast to the 80% SMIP load used in this case report. The short term cross over study of sputum clearance by Patterson et al (2004) showed increased sputum clearance in patients using ACBT compared to the usual TIRE loading. This was itself in contrast to the study in cystic fibrosis patients using the same 80% loading (Chatham et al 2004). However, in this case report the 40% SMIP template was used to symptomatically clear any retained secretions.

The patient commented that she felt the resisted breaths set at 40% SMIP were very effective for sputum removal because the inspiratory period was longer (approximately 25 – 30 seconds) compared with when training at 80% when the inspiratory period lasted 15 – 20 seconds. The longer inspiratory time may facilitate air movement distal to retained secretions (Zach 2000) thus enhancing sputum removal. In addition the 40% loading is less fatiguing than the original TIRE IMT programme.

It is postulated that a combination of the increases in inspiratory muscle strength and endurance with enhanced sputum clearance resulted in changes in lung function. It is

proposed that these changes led to an increase in the patient's level of physical activity, with an associated improvement in psychosocial status.

The aim of the study did not include an investigation into adherence to treatment programmes, but it was interesting that Mrs "A" commented that she found the TIRE acceptable (compared to ACBT and postural drainage) because "normals" carry it out and the biofeedback is very motivating.

Over the past year Mrs "A" has continued to use the TIRE (once a week at 80%) but also plays badminton for two hours twice a week. If she feels her chest condition is deteriorating she will use the TIRE more than once a week and also use it at 40% to enhance sputum clearance.

Conclusion

The aim of the study was achieved in that it found that the use of the TIRE resulted in effective sputum clearance and an increase in inspiratory muscle function. An unanticipated outcome of the study was in terms of adherence in that the patient commented on how she was able to adhere to the programme because the treatment was "socially acceptable" and the biofeedback was very motivating.

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Reviews

Move on up

Available from:
Move on up
Freepost PO Box 70
Bracknell Berkshire BG12 4GR

'Move on Up' is a programme of different exercises which can be issued only by a healthcare professional responsible for managing and treating individuals with Chronic Obstructive Pulmonary Disease (COPD).

It was developed and produced in 2006 as a collaborative project between St Georges School of Physiotherapy, Kings College Hospital London and the Association of Chartered Physiotherapists in Respiratory Care to help support individuals with COPD by encouraging them to understand the importance of regular exercise, increase their physical activity and illustrate the benefits that they can hope to gain by working through the different levels of exercise on the DVD/ video. The programme was also reviewed by the research unit from the General Practitioners in Airways Group with Boehringer Ingelheim and Pfizer supporting the project as a clinical tool for medicine.

The 'Move on Up' road show launches were held across the country in 2006 and 2007 with invites going out to healthcare professionals working closely with COPD patients in primary and secondary care, to demonstrate the clinical objectives of the DVD/ video and how it can support and integrate into current COPD services.

The recurrent question and concern that was raised by the attendees at the launch venues was 'Is 'Move on Up' a substitute to Pulmonary Rehabilitation?' The answer to this question is a resounding 'No'. Move on Up is a basic exercise programme for patients with COPD which has several uses; these are:

1. To assist healthcare professionals by providing a basic exercise programme in areas where Pulmonary Rehabilitation is scarce
2. To introduce patients with COPD to the concept of exercise whilst they are waiting to start on a Pulmonary Rehabilitation programme - which may have long waiting lists.
3. To offer COPD patients a choice at the end of Pulmonary Rehabilitation to continue exercising if they do not wish to continue on more formal post-rehabilitation exercise schemes.

There is a wealth of robust evidence documenting the importance of Pulmonary Rehabilitation in the management of COPD, it is one of the cornerstone treatments. Thankfully the number of Pulmonary Rehabilitation groups is increasing in the United Kingdom in both hospital and community sites to meet the increasing demand. Unfortunately this is still a slow progress, so surely any practical clinical tool that helps to encourage COPD patients to exercise, allowing them to appreciate and see the benefits that they will gain by exercising will only help and not hinder. It is important however that the Move on Up exercise DVD/Video is issued by an appropriately trained healthcare professional who is actively involved in the management and treatment of COPD and is aware of certain conditions e.g. unstable angina that the DVD/video should not be issued to. It is crucial that a healthcare professional working with COPD patients issues the exercise DVD/video as this guarantees that the correct advice is given to the patients about how to use the DVD/video which includes completing the Exercise Diary, a standard issue with all the DVD/videos, and to make sure that the patients read the 'Exercise How To Guide' – also included with the DVD/ video. It is important that where possible Move on Up should be provided in conjunction with Smoking Cessation programmes, disease education and optimised pharmaceutical management to ensure it is used to its full potential.

There is now a significant drive to improve Chronic Disease Management both in primary and secondary care, often with minimal ring fenced funding to try and achieve the expectations laid before us. Providing services in the current format as we have always done is acceptable but there also needs to be more creative projects which address the needs of COPD patients and subsequently improve COPD services with minimal impact on resources. The Move on Up DVD/video is one such creative project. It is admittedly a work in progress which is to be formally evaluated, so before we all throw our hands up in horror, exclaim how on earth it could possibly work and insist on finding fault with it, please step back and see this exercise programme for what it is - providing COPD patients with a treatment choice.

Reviewed by Mandy Dryer, Clinical Specialist Respiratory Physiotherapist, Manchester Royal Infirmary.

Exercise Therapy: Prevention and treatment of disease

John Gormley & Juliette Hussey (2005)
Blackwell Publishing £25.99

This text is edited by physiotherapists with contributions from professionals in various fields. It presents a comprehensive examination of the use of exercise therapy in the

prevention and treatment of disease.

Section one introduces the reader to normal responses to exercise while section two focuses on the effects of exercise in cardiovascular, respiratory, diabetes and obesity, neurological and musculosketal conditions (such as arthritic conditions and low back pain). As this section covers a wide range of diseases it facilitates consideration of exercise physiology in individuals with co-morbidities.

Chapters on measurement of physical fitness and habitual physical activity, and guidelines for exercise prescription give general information that can be applied within each condition.

The book ends with chapters on adherence to exercise and promoting physical activity. Chapters are written by experts in the respective fields and are well referenced.

There are few illustrations and figures, however the text is easy to read and understand. Perhaps as the evidence base grows later editions of this book will detail exercise physiology in people with cancer and also the elderly and children.

This would be a useful text not only for undergraduate and qualified physiotherapists, but also any Allied Health Professional involved in health promotion and exercise rehabilitation.

Reviewed by Lisa Kent, Health and Rehabilitation Sciences Research Institute, University of Ulster, Northern Ireland.

Dyspnoea in advanced disease: a guide to clinical management

Booth S, Dudgeon D (eds) (2006)
Oxford University Press, £32.95

This book provides an interesting and informative approach to the management of breathlessness. The first chapter gives some depth to the physiology of breathlessness as it is currently understood and provides a useful refresher of the physiology of breathing. The subsequent chapters deal with breathlessness in different patient groups including cardiac related breathlessness as well as that from respiratory causes. There are chapters on different approaches to the management of breathlessness including non-pharmacological interventions and the management of breathlessness in palliative care. At times this book can seem a little repetitive as each chapter's author discusses the physiological factors most relevant to their patient group, but this may be an advantage to those who like to dip into chapters rather than read a book from cover to cover. The contributors often discuss concepts such as length-tension relationships of muscle and neuro-ventilatory dissociation as 'new' knowledge in the understanding of breathlessness. I found it reassuring that physiotherapists were well versed in the basic principles of the physiology of breathlessness knowing that muscle physiology is part of the staple diet of physiotherapy education. Neuro-ventilatory dissociation is a concept that has been around for many years. It is described well and discussed clearly in this book although there is considerable inconsistency in terminology between contributors which is distracting but forgivable.

There is mainly a medical focus to this book with limited discussion of the contributions made by the rest of the multidisciplinary team. Many of the physiotherapy techniques used in the management of chronic and end-stage breathlessness are mentioned, although the explanations are at times a little misguided and no direct link is made to physiotherapy.

This book would be of value to more experienced physiotherapists working in cardiology, respiratory care, paediatric respiratory care and palliative care.

Reviewed by Catherine E. Thompson, Senior Physiotherapy Lecturer, York St John University

Journal of the Association of Chartered Physiotherapists in Respiratory Care

INSTRUCTIONS FOR AUTHORS

Submissions may take the form of review papers, research reports, audit reports, case studies, editorials, conference reports, equipment reports and reviews of books, CDs or DVDs. Student contributions are welcomed.

Please use double-spacing throughout, with a 4 cm margin on the left, with no headers and footers (other than page numbers), and without footnotes unless these are absolutely necessary, all pages must be numbered.

Articles should normally be no longer than 2000 words (editorials, case studies 1000 words and book reviews 250 words). They should be emailed to jm.bradley@ulster.ac.uk and b.oneill@ulster.ac.uk with the files named as follows

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- Tables: Author, date of submission, title of Table e.g. Smith011206Table1
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Please provide up to 4 keywords
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The introduction should have a clear rationale and purpose/aim or state the question that the paper sets out to answer.

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Interpretation of the results obtained in the study should be offered here. The findings must be considered in relation to previous work and in terms of whether the aim specified in the INTRODUCTION has been achieved. Suggestions should also be included for the improvement of the study. Furthermore recommendations for future research should be offered.

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