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Introduction

Welcome to the Association of Chartered Physiotherapists in Respiratory Care (ACPRC) journal for 2015. The original articles this year focus on critical care with three service evaluations aiming to enhance clinical decision-making in order to develop more efficient services. Elliot, p27, used the plan, do, study, act (PDSA) cycle to develop local critical care rehabilitation guidelines for use in a district general hospital and Twose and Jones, p14, explored the limitations of implementing rehabilitation within a tertiary mixed dependency critical care unit. These two studies demonstrate how routinely collected data can be used to implement prudent health care. This theme was also evident in Sanger p43 who describes the development of a screening tool which provides a safe and effective method of identifying patients requiring physiotherapy following cardiac surgery. Gaining support and funding for service improvement projects is often difficult and Douglas and McLoughlin p63 provide a reflective account on their successful experience. Complementing the current ACPRC on-call project described at this year's conference, Bendall and Watt p4 is an empirical study exploring undergraduates' perceptions of preparedness for emergency on-call physiotherapy.

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The 2015 conference, held in Cheltenham, was built around the theme of "Walking in the steps of the patient: Integrating theory and practice" reflecting the importance of involving and listening to the people we care for. The sessions led by patients and carers set the scene superbly for real patient centred care that was complemented by sessions on pre-operative risk, the challenges of assessing breathlessness and exercise in critical care. The practical workshops and interactive case studies were extremely well received and allowed for in depth discussion on physiotherapy management of respiratory problems. Four oral posters were presented, all having strong clinical relevance, scientific rigour and high standards of presentation, two of which are published within this journal, p61-65.

We hope you enjoy this issue of the ACPRC journal and that it inspires you to get writing. One of the roles of the research officer is to offer support to novice researchers, at any stage of the research process so please feel free to utilise this service. Author guidelines with detailed instructions have been updated and can be found on the ACPRC website www.acprc.org.uk.

With best wishes

Una Jones PhD MSc MCSP
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Final-year physiotherapy undergraduate students' perceptions of preparedness for emergency on-call respiratory physiotherapy: a questionnaire survey.

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Summary

Objective: To explore the perceptions of preparedness amongst final-year physiotherapy undergraduate students for emergency on-call respiratory physiotherapy.

Research design used: A web-based questionnaire survey.

Setting of the study: Undergraduate dissertation project which surveyed final-year physiotherapy undergraduates at Cardiff University in 2014.

Selection criteria: Invitations to complete the questionnaire were

sent to 88 final-year physiotherapy students.

Description of main results: The response rate was 82%. Of respondents, 58% did not know until the second year of study that physiotherapists may be required to complete on-call working. Whilst on clinical placement, 29% had completed a 'shadow on-call'. The prospect of undertaking on-call working once qualified worried 71%. Once qualified, discussion and reflection upon on-call experiences would be important to 97% of those surveyed.

Overall conclusions: This study provides insight from one

University. The findings emphasise the need for practices to be in place for supporting those that are worried about being on-call. Opportunities for discussion and reflection have also been identified as important. Exploration of the objectives further through interviews or focus groups is warranted, in particular the experiences that undergraduates have gained through completing a 'shadow on-call' on clinical placement. The study findings may aid undergraduate respiratory curricula design both at a local and national level and could augment further exploration of factors surrounding implications and opportunities for on-call workforce development for newly qualified physiotherapists.

Introduction

The provision of emergency on-call respiratory physiotherapy plays a prominent role in the management of critically ill patients (Gosselink 2008). Novice physiotherapists feel less confident about on-call and require more support than expert physiotherapists (Dunford et al. 2011). On-call has also been reported as a key stressor for novice and newly qualified physiotherapists (NQPs) (Mottram and Flin 1988; Thomson 2000; Parry 2001; Dunford et al. 2011). The views of students nearing qualification, in relation to their preparedness for on-call, is therefore pertinent to academics, clinical educators and managers, in order for students to be appropriately supported in their transition.

Student clinical placement experiences have a

direct effect on the perceived level of personal competence (Bennett and Hartberg 2007). However, the types of experiences faced during on-call working are not always possible during a placement, and therefore other opportunities in preparing students for on-call working are important. Case studies are demonstrated as valuable learning opportunities (Case et al. 2000) alongside students being taught to appreciate the value of high cognitive skills, to encourage reflection and critical appraisal (Higgs and Jones 2008).

Cardiorespiratory is seen by undergraduates as having an emotional dimension, relating to the context of patient care where acute illness and end-of-life issues are common place (Roskell 2006, cited in Roskell 2013, p. 133). These issues are likely to be more profound during on-call working; therefore time given to undergraduates to gain context-specific experience may better prepare students for practice (Thomson 2000). Opportunities for reflective practices related to empathy, coping and interpersonal communication in a discursive and supportive environment are recommended methods for fostering confidence (Roskell 2013).

Alongside this, junior physiotherapists have identified a 'shadow on-call' as a welcomed method for graded exposure to this clinical environment (Parry 2001), although the occurrence and availability of such practices both for undergraduates and NQPs has not been reported.

In the on-going development, of both undergraduate cardiorespiratory curricula and the on-call workforce, the study aimed to explore final-year physiotherapy students':

- perceptions of preparedness for undertaking emergency on-call respiratory physiotherapy post-qualification



Methods

A non-experimental questionnaire design was used to explore the perceptions of final-year physiotherapy undergraduate students at one University. At the time of survey, students had completed seven out of eight clinical placements and the University on-call specific sessions were timetabled after the study concluded.

The School of Healthcare Sciences Cardiff University Ethics Committee granted ethics approval. In the absence of an existing validated questionnaire appropriate to the study's objectives, an online questionnaire was purposely designed, which included demographic information and questions based on the themes from the literature. Closed questions formed the basis of the questionnaire, with answer categories pre-selected from the literature review. Open questions were also used where necessary to allow information richness within the data (de Vaus 2002). A questionnaire design enabled information to be gathered from a large targeted sample (Gillham 2007). The anonymous nature of questionnaires was considered as an appropriate method for respondents to answer in a more open manner, in comparison with other qualitative methods (Boynton and Greenhalgh 2004).

The questionnaire was piloted on three randomly selected final-year students who were then excluded from the study. Piloting led to some minor amendments to layout, wording of two questions and changes in the use of the conditional branching feature within the web-based questionnaire design package. The remaining 88 final-year students received an invitation to participate with a covering e-mail providing information about the purpose of the study and assured anonymity. Consent was assumed on completion and return of questionnaires. A reminder email was sent to maximise response rate (Fox et al. 2003).

Analysis of results was completed in two parts.

Descriptive data was analysed and frequencies presented in the form of tables and charts using Microsoft Excel. Emerging themes from open questions were analysed manually using conventional content analysis.

Results

An acceptable response rate of 82% (N=72) was obtained. Table 1 illustrates the demographic profile of respondents.

Attribute	Number of Respondents (n=72)
Gender	
Female	51
Male	21
Age (years)	
18-21	52
22-26	15
27-34	4
35+	1

Table 1: Demographic profile of respondents

At the time of completing the questionnaire, all respondents were aware that physiotherapists undertake on-call working and Table 2 illustrates the time when respondents first became aware.



Time that respondents first became aware of on-call working	Number of respondents (N=72) Number (%)
Pre-admission to course	15 (21%)
First year	11 (15%)
Second year	42 (58%)
Third year	4 (6%)

Table 2: Time when respondents first became aware that physiotherapists complete on-call working

Figure 1 depicts the way respondents first became aware of on-call, with almost half (47%) finding out during placement. Other responses were: University (4%) and Family/Friends being in the profession (4%).

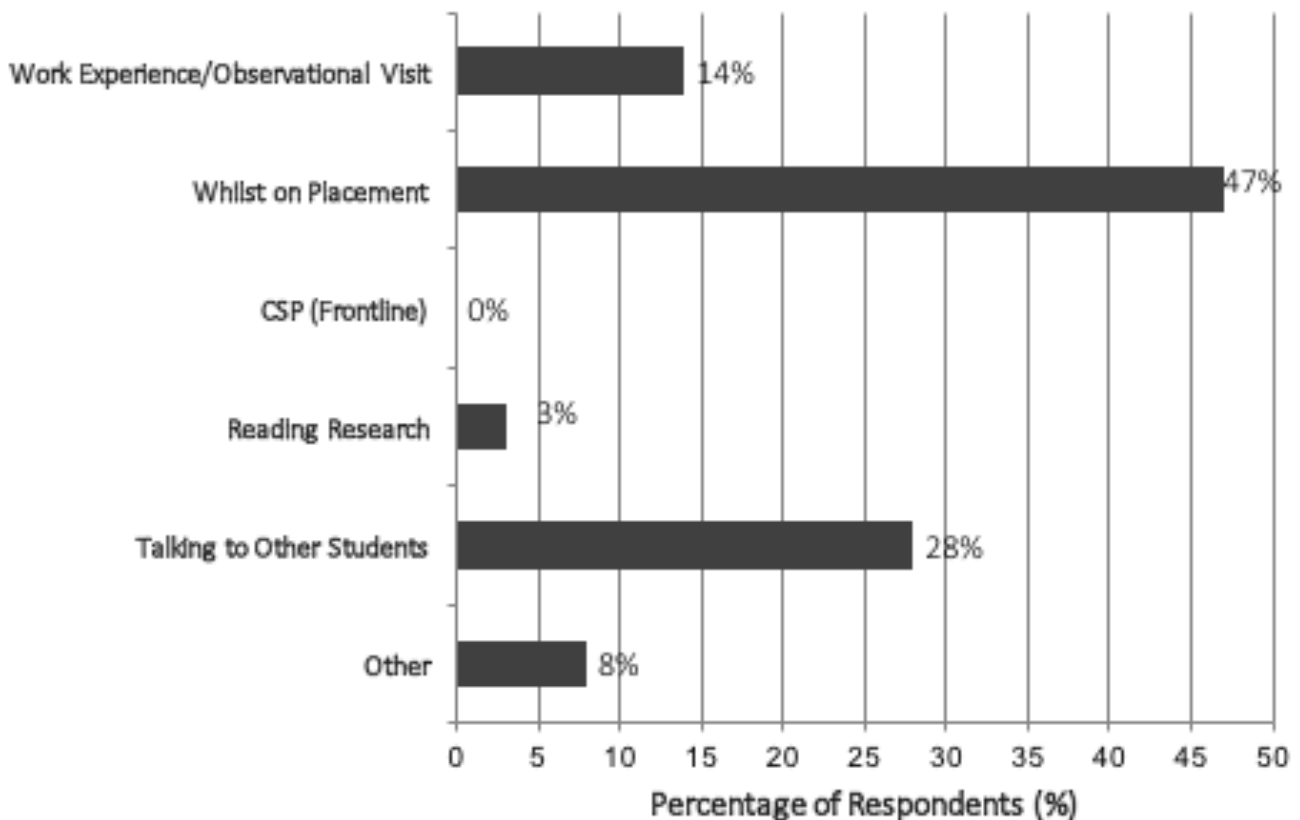


Figure 1: Way that respondents first became aware of on-call working

Five respondents had yet to complete a cardiorespiratory placement and 67 respondents (93%) had completed a cardiorespiratory placement in an acute hospital. Other than a named respiratory placement, respondents were asked if they had gained respiratory experience in other placement(s) and Table 3 demonstrates the responses. More than one placement could be stated.

Clinical Area	Number of Responses
Neurology	27
Paediatrics	15
Trauma and Orthopaedics	11
Oncology	9
Care of the Elderly	9
Community	6
Medical Rehabilitation	5
Burns and Plastics	4
Renal	3
Cardiac Rehabilitation	2
Mental Health	2
Learning Disabilities	1
Outpatients (Chest Clinic)	1

Table 3: Outside of a named respiratory placement clinical areas where respondents had gained respiratory experience

A 'shadow on-call' had been completed by 29%. Specific on-call preparation at undergraduate level was felt by 92% to be necessary; clinical respiratory placement (68%) and scenario-based teaching (21%) were selected as the best methods. In contrast, six respondents (8%) did not feel it was necessary, the reasons given were: not required as on-call training would be provided once qualified (4%) and that undergraduate teaching should focus on the basics only (3%). One respondent did not make further suggestions.

The majority of respondents (66%) thought they had not experienced enough undergraduate respiratory practical skills to support them in undertaking on-call once qualified. Table 4

details which practical skills respondents would have liked more practise of at undergraduate level.

Clinical Skill	Number of Responses
Suction	25
Ventilators	8
Manual Hyperinflation	8
Intermittent Positive Pressure Breathing	6
Cough Assist	4
Tracheostomy Management	3
Manual Techniques (i.e. vibrations)	2

Table 4: Clinical skills to support on-call working that respondents would have liked more practise of at undergraduate level

Table 5 provides the experiences that respondents would have liked at undergraduate level to support them in undertaking on-call once qualified.

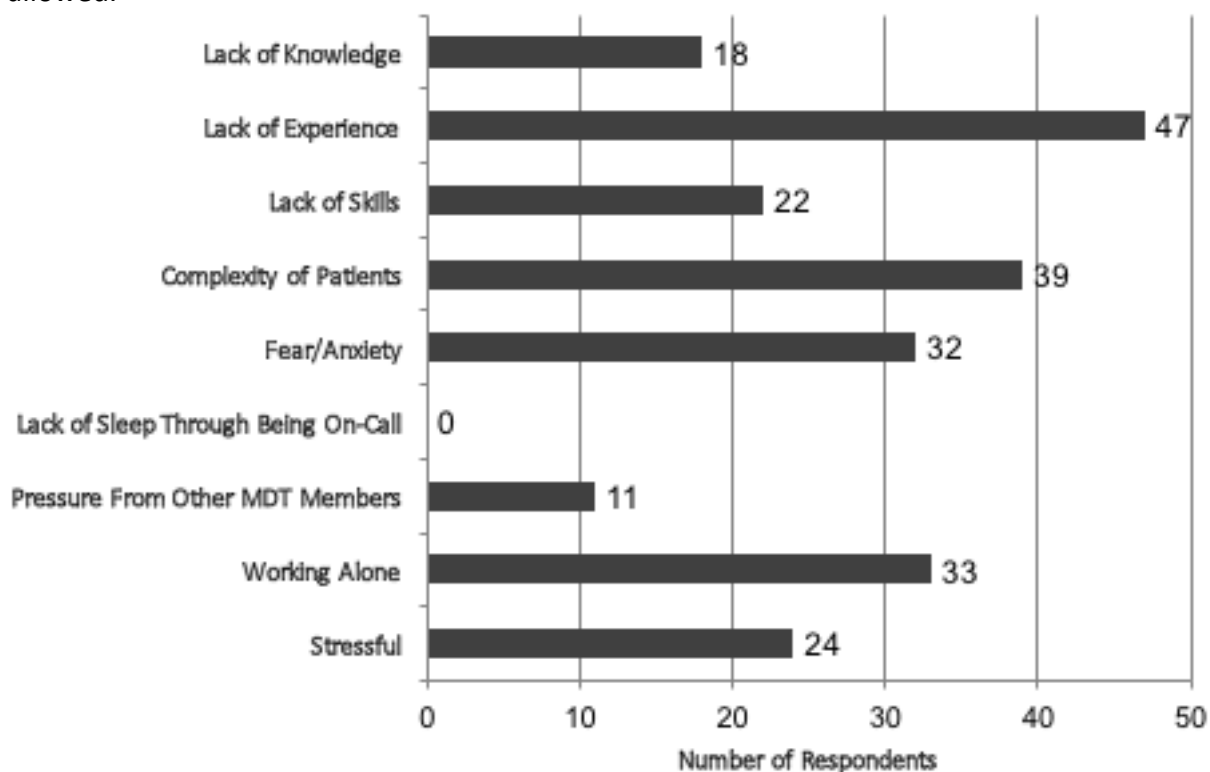


Experience	Number of Responses	Examples of Supporting Quotes
More practice in general	12	"All practical skills are taught, but more practice is needed to become competent"
Shadowing	4	"Shadowing an on-call physio would be beneficial"
Emergency Protocols	4	"More practice of emergency procedures"
Not undergone a respiratory placement	3	"Not yet completed my respiratory placement, but feel after some practice and gaining an insight and understanding I will have"
Scenario-based work	2	"Problem based practical scenarios"
ITU/HDU Experience	2	"Different pieces of equipment used (particularly on ITU)"
Complex Patients	1	"...treatment of complex head/spinal injury patients"
Confidence	1	"Cannot think specifically which skills but I do not feel confident as a respiratory physio, on-call would be intimidating"

Table 5: Experiences to support on-call working that respondents would have liked to have had at undergraduate level

Of respondents 71% were worried (N=51) regarding the prospect of undertaking on-call working once qualified. Figure 2 represents the concerns given. More than one option was allowed.

Figure 2: Aspects of on-call that worry respondents



Seventy respondents (97%) believed having the opportunity to discuss and reflect upon their on-call experiences would be important to them post-qualification. The reasons that were given for this are given in Table 5.

Theme	Number of Responses	Examples of Supporting Quotes
Learn/Develop	12	<i>“Develop you as a professional and make positive changes to your work”</i>
Sharing of Knowledge	4	<i>“I think it is beneficial to discuss these with other physiotherapists to also gain a wider basis of understanding and ideas to learn from other people too”</i>
Clinical Reasoning Developing	4	<i>“To continue to improve clinical reasoning skills and conviction in own decisions on the ward and over the phone...”</i>
Confidence	3	<i>“...improve practice and build knowledge and confidence for the next time that situation may arise”</i>
Strengths and Weaknesses	2	<i>“Will be able to analyse strengths and weaknesses to learn and improve”</i>
Confirmation	2	<i>“...you have to do on-call by yourself so there won’t be anyone with you at the time”</i>

Table 5: Themes with supporting quotations as to perceptions of reasons why discussion and reflection is important

Discussion

The aim of this study was to explore the perceptions of preparedness for on-call working amongst final-year physiotherapy undergraduate students. The study has emphasised the need for support mechanisms to be in place for undergraduates worried about on-call, alongside opportunities for further practice of skills and regular discussion and reflection.

Awareness

All respondents were aware that they might be required to complete on-call working once qualified. The majority found out in the second year of the undergraduate course, with almost half finding out during clinical placement.

This timeframe corresponds with the clinical placements beginning in the second year at the University surveyed. Pre-admission, only 21% of respondents were aware that physiotherapists completed on-call duties, which suggests that these students may not have been fully aware of the potential scope of their role post-qualification. The questionnaire did not ask respondents to detail their views on whether on-call working would have impacted on their decision in selecting physiotherapy as a career. As it is reported that recruitment to cardiorespiratory physiotherapy may be of concern (Roskell and Cross 2003) this may be an interesting aspect to further consider.

Whilst it is recognised that career choices may be influenced by post-graduate experience, it is identified that cardiorespiratory placements

should be offered at undergraduate level to develop early interest within a specialty (Bennett and Hartberg 2007). At the time of surveying, 93% of students had completed a cardiorespiratory placement in an acute hospital, which may help to bridge the gap between theory and practice. Although not a focus of the questionnaire, this may have an impact on attitudes towards on-call working and specialism in the cardiorespiratory field (Bennett and Hartberg 2007) and highlights a topic for future study.

Perceptions on preparedness

The completion of a cardiorespiratory placement may not offer experiences of the type faced during on-call working. Therefore to support students in their transition to on-call, it is important that University learning and teaching practices are helping students to develop practical skills alongside theoretical knowledge. The majority surveyed felt they did not have enough experience, at undergraduate level, of clinical skills to work on-call post-qualification. However in a study of novice physiotherapists, despite their anxieties, they were better prepared for on-call working than predicted (Dunford et al. 2011).

Not all Universities are able to offer physiotherapy undergraduates a cardiorespiratory placement (Roskell 2013). Similarly to previous research (Bennett and Hartberg 2007), this study demonstrated that students are recognising the opportunities to broaden cardiorespiratory knowledge and skills on other clinical placements. This also evidences the holistic approach to patient management across specialties.

Opportunities for students to 'shadow' the on-call process whilst on clinical placement are being provided. This practice has been recommended by NQPs (Parry 2001) and the professional body (CSP 2004) as a cost effective way for graded exposure. These real time methods augment the simulated development of clinical reasoning skills in the University

setting, whilst also providing opportunities for reflection and critical appraisal (Higgs and Jones 2008). A questionnaire design did not enable exploration of the perceived value that students attributed to shadowing experiences; further investigation through qualitative methods is recommended.

Of respondents, 92% felt that including on-call specific training at undergraduate level was necessary; however 4% reported that it was not required as it would be provided post-qualification. Whilst the provision for on-call training for qualified physiotherapists has been reported as commonplace; the content, delivery, duration and methods vary considerably (Gough and Doherty 2007). Therefore for some students their expectations of on-call training provision may not match the reality.

Reflective practice is an important component of clinical practice and professional development (CSP 2011; HCPC 2013) and is a valuable tool for novice physiotherapists, as complex clinical scenarios are likely to be encountered (CSP 2004). Embedded reflective practice in cardiorespiratory curricula has not been found in all Universities (Roskell 2013); however it aids the transition from novice to expert (Case et al. 2000). It is a positive sign that 97% of students surveyed have recognised the value of this, and affirms the need for opportunities to be in place within University and clinical placement environments for reflective and discursive practices related to empathy, coping and interpersonal communication (Roskell 2013).

As previously reported (Mottram and Flin 1988; Thomson 2000; Parry 2001; Dunford et al. 2011) this study also found that students (71%) were worried about the prospect of undertaking on-call work. Lack of experience and complexity of patients were the most commonly cited reasons for this worry. Embedded within these responses, the reported worry may also relate to cardiorespiratory care being seen by students as an emotive specialty, where on-call



working in particular involves the management of acute illness and end-of-life aspects of care (Roskell 2013). Ongoing opportunities at University and clinical placement, to help students develop strategies to manage these complex and emotive situations may help reduce this worry.

Conclusions

The findings of this study can assist both academics, to better prepare future undergraduate students for on-call working post-qualification, and physiotherapy managers, in supporting newly-qualified physiotherapists through the transition to on-call working.

This was a small study carried out within one University and this may impact on the ability to draw more general conclusions. The timing for the distribution of the survey may have impacted on the responses provided, as not all placements and University sessions had been completed. A survey at a later stage may therefore have resulted in different views. This study evidences that clinical placements are offering students the opportunity to complete a 'shadow on-call'; the value of this, from the perspectives of student, newly-qualified and expert physiotherapist are worthy of further investigation.

The findings have raised some interesting points, which would benefit from future work using interviews and focus groups, to provide a depth of understanding to the views, experiences, beliefs and motivations on the topic of on-call working amongst final-year physiotherapy students. The continued focus on the best methods to ensure appropriate preparation and transition for on-call work, amongst undergraduates, remains important.

Key points

- **Anxieties amongst final-year physiotherapy students about on-call working are evident**
- **Clinical placements are providing**

undergraduate students with the opportunity of completing a 'shadow on-call'

- **Physiotherapy undergraduates are gaining respiratory experience across a range of clinical placements**

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A service evaluation exploring limitations to rehabilitation within critical care.

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Summary

Purpose: Early rehabilitation has been shown to reduce both critical care and hospital length of stay, and can reduce the significant effects of critical illness on physical and non-physical morbidity. A major component of the rehabilitation pathway is a patient's ability to sit on the edge of the bed (SOEOB). Furthermore, the time taken from admission to first SOEOB acts as a marker of patient progress with rehabilitation, and allows cohort comparison. The aim of this service evaluation was to examine physiotherapy practice to determine barriers or limitations to completing a SOEOB, to compare with other research findings and to assess the median time from

admission to first SOEOB.

Method: A 4-week service evaluation was completed in a 32-bed tertiary mixed dependency Critical Care. Physiotherapists working on critical care were asked to document every day, and for every patient, whether a SOEOB was completed and if not, to document the primary limiting factor and any additional factors that contributed.

Results: During this service evaluation, 17.1% of the 433 physiotherapy sessions examined involved a SOEOB. The primary reason for non completion of a SOEOB was the level of patient sedation (47.9%), which is higher than shown in other similar

research. Other factors included the presence of advanced neurosurgical assessments and interventions, unstable spinal injuries and cardiovascular instability. The median time from admission to first SOEOB was 11 days.

Conclusion: This service evaluation has highlighted current practice and compares similarly with other available literature. Using this data, guidance on limitations to SOEOB has been produced and will be further evaluated.

Introduction

Previous research has demonstrated the profound disability that many critical care 'survivors' report after discharge from hospital (Desai et al., 2011). The National Institute for Health and Care Excellence highlighted the extent of the problem in their guidelines. 'Rehabilitation after critical illness (2009)'. This has been further supported by international research highlighting the role of early rehabilitation starting within the intensive care (Morris et al., 2008). Throughout the research, the structure of the rehabilitation follows common themes, with 'sitting on the edge of the bed (SOEOB)' a key milestone within any rehabilitation programme (Stiller et al., 2004; Zafiroopoulos et al., 2004).

Despite this recognition of the need for rehabilitation, there remains limited guidance on the decision making process on appropriateness for completing such rehabilitation. Stiller and Phillips (2003) outlined a series of safety considerations based on a wide range of physiological factors. These factors included analysis of past medical history, cardio-vascular reserve (resting heart

rate, blood pressure, ECG), respiratory reserve (oxygen saturations, respiratory pattern, PaO₂/FiO₂ and maintenance of mechanical ventilation) as well as 15 haematological and orthopaedic considerations.

Garzon-Serrano et al., (2011) identified that barriers to mobilisation may be patient related (as identified by Stiller and Phillips, 2003), but also may be a reflection on clinicians opinion or cost related. The authors' purported nurse and physical therapists identify different barriers for mobilisation. Furthermore routine involvement of physical therapists in directing mobilization treatment may promote early mobilization of critically ill patients through more a relaxed exclusion criteria for early mobilisation.

This reduction of exclusion criteria and the safety of early rehabilitation was further supported by Bailey et al., (2007) who purported that early activity is feasible and safe in respiratory failure patients. In 1449 rehabilitation events only 14 adverse events were recorded, none of which required additional therapy or resulted in an increase in length of stay. However, the authors did not describe their local procedures or guidance on initiating rehabilitation.

Using the research already discussed as well as a range of other literature, an expert consensus and recommendations on safety criteria for active mobilization of mechanically ventilated critically ill adults was produced in 2014 by Hodgson et al. The aim of the study was to develop a clear consensus on safety parameters for mobilising mechanically ventilated adults. Following a comprehensive literature review the potential safety considerations were summarised in four key categories. As with other research, the presence of an endotracheal tube (ETT) was not considered a contraindication to early mobilisation, whereas a total of 23 factors (respiratory 3, cardiovascular 10, neurology 6, other 4) were considered to be a direct contraindication.

Most recently McWilliams et al., (2015) demonstrated that early structured



rehabilitation in mechanically ventilated patients is not only safe but also increases critical care discharge mobility and reduces length of stay (ICU length of stay 16.9 days v 14.4 days). Within this quality improvement project, the authors suggested their own criteria in determining appropriateness to complete rehabilitation. This criterion was much more succinct than that previously suggested by Hodgson et al., (2014) and Stiller & Phillips (2003). Indeed McWilliams et al., (2015) suggested only 6 criteria preventing completion of bed-based rehabilitation. These criteria were then further adapted to consider the nine main restrictions to SOEOB (see figure

Figure 1: Exclusion criteria used within McWilliams et al. (2015)

- Small dose of vasoactive agents (e.g. > 0.10 mcg/kg/min noradrenaline or equivalent) for haemodynamic stability (maintain Mean arterial pressure >60)
- Mechanically ventilated with FiO₂ >0.6 and/or PEEP >10
- Neuromuscular paralysing agents
- Acute neurological event
- Unstable spine or extremity fractures with contra-indications to mobilise
- Active bleeding process
- Poor tolerance of Endotracheal tube
- Open abdomen or high risk for dehiscence
- Haemofiltration via femoral line

McWilliams et al. (2015)

The research by McWilliams et al., (2015) provided an opportunity to evaluate local procedures and considerations for rehabilitation in critical care. Furthermore it provided a clear benchmark to compare rehabilitation practice with a view of identifying potential areas for service improvement. Therefore, the aims of this service evaluation were to:

1) To explore the reasons that a sit on the edge of the bed was not completed

2) To compare these reasons with the exclusion criteria identified by McWilliams et al., (2015) in order to produce local safety guidance criteria

3) To calculate the average time taken from admission to critical care to first sit on edge of the bed to allow comparison with previous literature

Methods

The service evaluation was completed within a 32-bed, mixed dependency critical care unit. The critical care unit admits patients from all major specialities including general medicine, trauma (including spinal trauma), neuro-critical care and surgery. The critical care physiotherapy team consisted of 4.2 whole time equivalent staff and aimed to complete rehabilitation for each patient on a daily basis (excluding weekends).

The service evaluation was completed over a 4-week period in early 2015 and included all patients admitted to critical care, for greater than 48 hours, during the evaluation period (both level 2 and 3 admissions). Patients were considered for appropriateness to SOEOB from day 1 of admission. On each day the attending physiotherapist documented whether a sit on the edge of the bed was completed. If the rehabilitation was not possible the physiotherapist was asked to document the primary reason for non-completion, and any additional factors that prevented rehabilitation from occurring. These additional factors should have prevented a SOEOB in the absence of the named primary reason. A number of potential reasons were provided to guide the physiotherapists (see appendix 1) but these were not exclusive. The physiotherapists working within critical care were asked to be as explicit and detailed as possible when providing reasons for non-completion (e.g. provide information on level of sedation, rate of inotrope infusion or tolerance of ETT). In addition, data was collected regarding the time between admission and first SOEOB. Due to local service arrangements and resources weekend days were not evaluated, nor were patients undergoing elective surgeries that follow alternative care pathways e.g. enhanced recovery.

During the evaluation period there were no changes to the allocation or prioritisation of physiotherapy treatments provided to critical care. The evaluation was not designed to

increase regularity of completion of a SOEOB, but it aimed to investigate physiotherapists reasoning and decision making.

Due to the evaluative nature of the project, no approval was required from local research and development or ethics committees. The completion of the evaluation was approved by the clinical director for critical care.

Descriptive statistics were used to summarise the data recorded. Reasons for non-completion of SOEOB were analysed using frequency and percentage calculations. A sub-group was created using the data from the patients that had received 5 or more days of mechanical ventilation. The sub-group was then used to compare the findings of the current evaluation with those of McWilliams et al., (2015) to identify areas for further consideration and potential service improvement.

Results

During the 4-week service evaluation period a total of 78 patients were included and consisted 433 physiotherapy assessments of suitability to SOEOB. Of these assessments, 74 (17.1%) sessions consisted of a SOEOB, compared to 359 (82.9%) sessions in which no SOEOB was completed. The study only included patients that had been admitted for 48 hours or more. Further demographics are displayed in table 1.

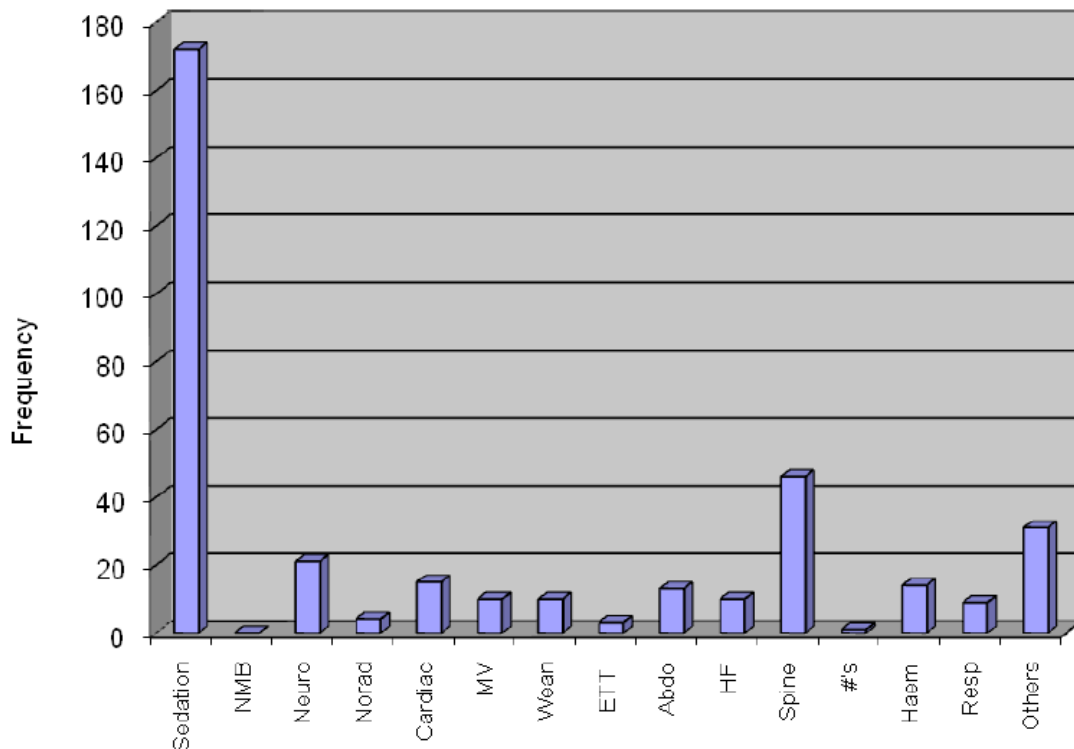
Table 1: Demographics of study population

	All Patients (n=78)	>5 days MV (n=47)
Age, years	60 (19-84)	58.5 (19-83)
Length of ICU stay, days	8.5 (2-91)	15 (5-91)
Duration of MV, days	7 (0-82)	17 (5-82)
APACHE II Score	16 (0-31)	18 (0-31)
Primary Diagnosis, frequency (%)		
Neurosurgery	20 (25.6)	14 (29.8)
Cardiovascular	7 (8.9)	6 (12.7)
Vascular	6 (7.6)	2 (4.3)
General Surgery	18 (22.8)	11 (23.4)
General Medicine	7 (8.9)	7 (14.9)
Urology Surgery	6 (7.6)	1 (2.1)
Thoracic Surgery	2 (2.5)	0 (0.0)
ENT	2 (2.5)	0 (0.0)
Haematology	1 (1.3)	1 (2.1)
Trauma	9 (11.4)	5 (10.6)
Method of Ventilation		
Ventilated via ETT	1 (1.3)	1 (2.1)
Ventilated via Tracheostomy	29 (37.2)	21 (44.7)
Self ventilating via Tracheostomy	30 (38.5)	18 (38.3)
Self ventilating	18 (23.1)	7 (14.9)



Primary reasons for non-completion of SOEOB were categorised into 15-key themes and the frequency that each occurred was calculated (see figure 2). A complete record of reason for non-completion can be seen in appendix 1.

Figure 2: A graph to show frequency of primary limitations to SOEOB



Sedation = Riker Sedation Agitation Scale; NMB = Presence of neuro-muscular blocking agents; Neuro = Presence of external ventricular drain or intracranial pressure monitoring; Norad = Use >0.1mcg/kg/min of Noradrenaline; Cardiac = Presence of abnormal heart rate, rhythm or blood pressure; MV = Presence of FiO₂>0.6 or PEEP>10; Wean = Current weaning or sprinting; ETT = Presence of endotracheal tube; Abdo = Presence of open abdominal wound; HF = Presence of femoral haemofiltration; Spine = unstable spinal injury or completion of enforced bed-rest; #'s = Presence of fractures limiting SOEOB; Haem = Presence of altered blood results e.g. Platelets and / or haemoglobin count; Resp = Deterioration in respiratory function; Others = any factor occurring only once

As shown in figure 2, of the 359 non-completion sessions, 172 (47.9%) were due to the patients sedation state as measured using the Riker Sedation Agitation scale (Riker et al., 1999). Further investigation showed that in 123 sessions the patients sedation score was 1 e.g. patient unrousable with minimal or no response to noxious stimuli. The frequencies for levels of sedation were 37, 5, 0, 5, 2 and 0 for Riker Sedation Agitation scores 2, 3, 4, 5, 6 and 7 respectively.

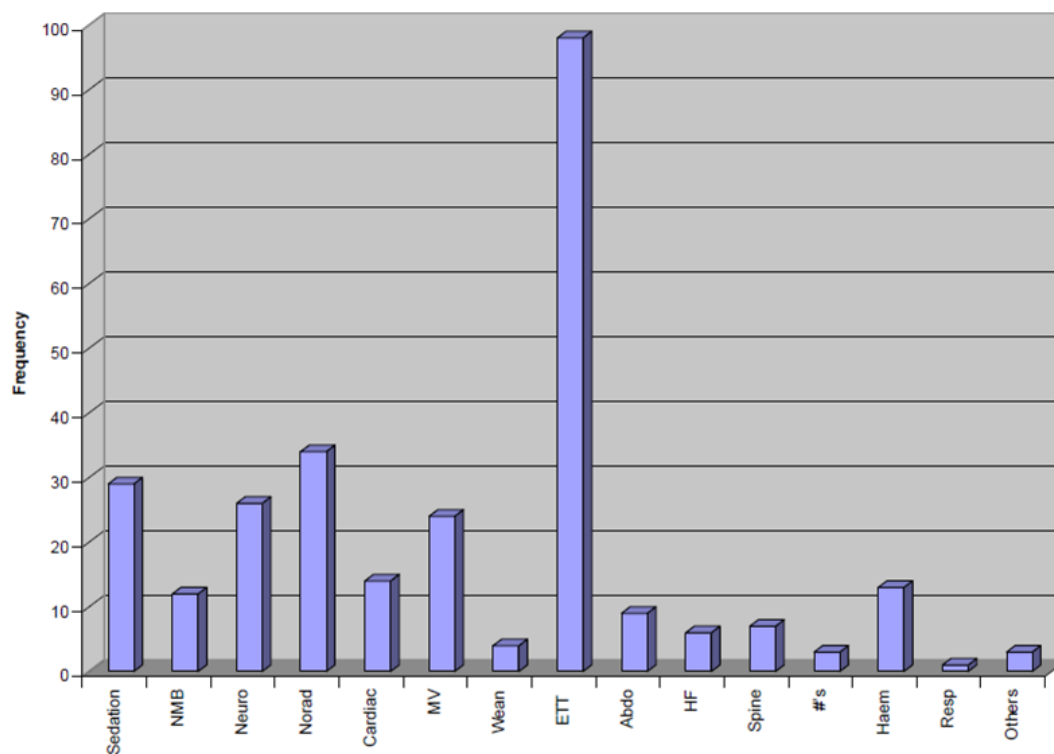
Table 2 compares the primary reason for non-completion of SOEOB with the restrictions identified by McWilliams et al., (2015).

In addition to the primary reason for non-completion of SOEOB, any additional considerations were recorded and collated into themes. This data is represented in figure 3.

Table 2: Frequency of primary limitations to SOEOB compared to exclusion criteria from McWilliams et al. (2015)

Restriction to SOEOB	Frequency	Percentage
Small dose of vasoactive agents (e.g. > 0.10 mcg/kg/min noradrenaline or equivalent) for haemodynamic stability (maintain Mean arterial pressure >60	4	1.1%
Mechanically ventilated with FiO ₂ >0.6 and/or PEEP >10	10	2.8%
Neuromuscular paralysing agents	0	0.0%
Acute neurological event	21	5.9%
Unstable spine or extremity fractures with contra-indications to mobilise	47	13.1%
Active bleeding process	14	3.9%
Poor tolerance of Endotracheal tube	3	0.8%
Open abdomen or high risk for dehiscence	13	3.6%
Haemofiltration via femoral line	10	2.8%

Figure 3: A graph to show frequency of secondary / alternative limitations to SOEOB



Sedation = Riker Sedation Agitation Scale; NMB = Presence of neuro-muscular blocking agents; Neuro = Presence of external ventricular drain or intracranial pressure monitoring; Norad = Use >0.1mcg/kg/min of Noradrenaline; Cardiac = Presence of abnormal heart rate, rhythm or blood pressure; MV = Presence of FiO₂>0.6 or PEEP>10; Wean = Current weaning or sprinting; ETT = Presence of endotracheal tube; Abdo = Presence of open abdominal wound; HF = Presence of femoral haemofiltration; Spine = unstable spinal injury or completion of enforced bed-rest; #'s = Presence of fractures limiting SOEOB; Haem = Presence of altered blood results e.g. Platelets and / or haemoglobin count; Resp = Deterioration in respiratory function; Others = any factor occurring only once

As can be seen in figure 3, the most common additional consideration was the presence of an endotracheal tube (n=98), followed by requirement for noradrenaline (n=34). The presence of neuromuscular blocking (paralysing) agents is also highlighted (n=12).

In addition to assessment of suitability to SOEOB, data was collected regarding time from admission to first SOEOB. A total of 27 patients completed their first SOEOB during the evaluation period, with a median time from admission being 11 days (1 to 45 days). For the greater than 5 days of mechanical ventilation subgroup, 22 completed a SOEOB with median time from admission of 15 days (1 - 45).

Discussion

Within the four-week evaluation period a total of 433 physiotherapy assessments were undertaken for assessing suitability to SOEOB. In those instances where a SOEOB was not completed, 15 key themes were identified, with the most common being patient sedation levels. When considering all of the patients included, the median time from admission to first SOEOB was 11 days.

Early rehabilitation has previously been shown to be safe and effective in aiding the recovery of patients post critical illness (Morris et al., 2008). Furthermore it can reduce both critical care and hospital lengths of stay, as well as reducing the adverse effects on physical and

non-physical morbidity (Nydahl et al., 2014; McWilliams et al., 2011). The ability of a patient to SOEOB is a key marker within critical care rehabilitation (Stiller et al., 2004; Zafiroopoulos et al., 2004). The aim of this evaluation was to determine the potential barriers to patients completing a SOEOB, to compare these reasons with previous research and also to explore the median time scale from admission to first SOEOB.

The most common reason for non-completion of a SOEOB within this evaluation was the level of patient sedation (measured using Riker Sedation Agitation Scale). Sedation accounted for 47.9% of all primary reasons. This is compared to only 15% being reported by Nydahl et al. (2014). Similarly, McWilliams et al., (2015) did not recognise sedation as a limitation to SOEOB. In contrast Hodgson et al., (2014) suggested that patients that are either very agitated / combative or are unrousable / deeply sedated should not be considered for out of bed exercises.

Clearly there appears to be a discrepancy in the effect of sedation on early mobilisation. Potential reasons for this difference may be the ethos of critical care medicine in differing centres or nations (Nydahl et al., 2014) or differences in patient population being evaluated. The current evaluation was completed within a tertiary critical care centre which cares for acute spinal and neurological injuries which may result in an increased requirement for sedation. Equally, different critical care units have different sedation policies. Within the host organisation all patients undergo daily sedation holds (unless clinical reason for non-completion), however unless the sedation hold is prolonged rehabilitation does not tend to occur at these times. This is in contrast to Schweickert et al., (2009) who concluded that strategies for whole-body rehabilitation, consisting of interruption of sedation and physical therapy in the earliest days of critical illness, was safe and well tolerated, and resulted in better functional outcomes at hospital discharge, a shorter

duration of delirium, and more ventilator-free days. Although not explicitly known, the host organisation of McWilliams et al., (2015) may have different policies on sedation use and hence may give rise to its absence on an exclusion list and also may reduce time from admission to first SOEOB.

Within the current study, in addition to sedation, other reported primary reasons were the presence of unstable spinal injuries (12.81%) and advanced neurosurgical intervention such as external ventricular drains (EVD's) or intracranial pressure (ICP) monitoring (5.85%). Of note, the presence of an ETT was only reported as the primary limitation on three occasions (0.8%). However, when additional/secondary factors were considered, the presence of an ETT was reported on 98 occasions (27% of sessions where no SOEOB was completed). Unfortunately it is unclear from the data whether the presence of an ETT would have prevented a SOEOB from occurring if no other limitations were present e.g. not also presenting with Riker sedation agitation score of 1. Whilst not fully investigated, Nydahl et al., (2014) reported lower occurrences of rehabilitation with those orally intubated (4.0%) compared to those ventilated via a tracheostomy (15.3%). Similarly the current study reported a SOEOB only being completed for 1 patient (1.3%) compared to 29 (37.2%) being ventilated via a tracheostomy. Clearly there are occasions where a SOEOB with a patient ventilated via an ETT is not appropriate, i.e. patient is intolerant of the tube and has a high risk of accidental extubation. In addition, the presence of an ETT may be explained by the more frequent use of deep sedation. However, literature also suggests that if done in a safe manner, there are no adverse effects to mobilisation with endotracheal tubes present (Zafiroopoulos et al., 2004). This is an area that clearly warrants closer examination within the host organisation and wider critical care network.

Other limitations reported included sedation levels (n=29); where sedation was not the primary reason, use of neuromuscular blockers



(n=12), requirement for noradrenaline of greater than 0.10 mcg/kg/min (n=26) and high mechanical ventilation requirements (n=24; PEEP >10 and/or FiO₂ >.60). A number of additional factors were also reported as shown within the results section and included cardiovascular instability; advanced weaning strategies (e.g. structured weaning plan already challenging respiratory function) open abdominal wounds and haematological considerations such as abnormal platelet or haemoglobin levels. These additional factors have also been recognised in previous research (Hodgson et al., 2014; Stiller and Phillips, 2003).

These limiting factors, both primary and additional, were compared to those reported by McWilliams et al., (2015). In their study, 'Enhancing rehabilitation of mechanically ventilated patients in the intensive care unit: A quality improvement project', the authors suggested nine-key considerations to SOEOB.

The nine limiting factors proposed by McWilliams and colleagues account for 34% of those reported within the current evaluation. When level of sedation is added as a consideration, this comparison is increased to 82%. Both the current study, and that by Nydahl et al., (2014) also considered cardiovascular instability as an important consideration (4.2% in current study; 17% in Nydahl et al., 2014). Based on the above and local practice regarding weaning, the following recommendations have been produced regarding limitations to SOEOB (see figure 4). Whilst there will still be occasions where patients may present with none of the recognised restrictions, it is felt that these encapsulate the majority of the caseload involved.

Figure 4: Suggest exclusion criteria for SOEOB

- 1) ***Riker Sedation Agitation Scale of 2 or less and / or presence of neuromuscular paralyzing agents***
- 2) ***Cardiovascular compromise secondary to abnormal rate or rhythm***
- 3) Use of vasoactive agents (e.g. > 0.10 mcg/kg/min noradrenaline or equivalent) for haemodynamic stability ***and / or inability to maintain Mean arterial pressure >60***
- 4) Mechanically ventilated with FiO₂ >0.6 and/or PEEP >10
- 5) ***Completion of advanced weaning strategies – to liaise with attending consultant***
- 6) ***Respiratory deterioration requiring additional review or therapy***
- 7) Acute neurological event (***including presence of ICP monitoring or EVD***)
- 8) Unstable spine or extremity fractures with contra-indications to mobilise
- 9) Active bleeding process
- 10) Poor tolerance of Endotracheal tube
- 11) Open abdomen or high risk for dehiscence
- 12) Haemofiltration via femoral line

McWilliams et al., (2015) reported that the average time from admission to first mobilisation was 9.3 days prior to initiating their quality improvement programme, and 6.2 days post. However, during this service evaluation the median time was 11 days. However, when the samples are matched (e.g. only those requiring mechanical ventilation for greater than 5 days) the median time for this study is 15 days. Potential causes for the difference in time to first SOEOB (15 Days v 9.3 days in control group and 6.2 days in intervention group for McWilliams et al., 2015) were related to differing practices with use of sedation (discussed previously) and potential differences in timing of tracheostomies (also has relationship with use of sedation). Furthermore, the completion of the quality improvement programme itself would have reduced the time to first SOEOB. This would have obviously occurred in the intervention group, but it is likely there will have been a change in practice within the control group secondary to changes in ethos towards rehabilitation in critical care. In comparison to other research, Knott and colleagues (2015) used a similar selection process to the current study and reported a median time from admission to first SOEOB as 10 days. In addition, Hodgson et al., (2015) reported a time to early mobilisation of 5 days, however further examination of the data shows that 70% of these early mobilisations were bed exercises or passive transfers. The effect of the inclusion of these activities will have reduced the timescales provided as patients are likely to be ready to complete bed exercises before completing a SOEOB. Further research is clearly needed that directly compares patient groups and also compares sedation practice as this may allow the host organisation to reduce time to first SOEOB with its potential benefits on length of stay and physical morbidity.

A number of limitations were present during this evaluation period. The main limitation was Hawthorne effects present as a result of completing the evaluation. Challenging clinicians to explore their reasoning for not

completing a SOEOB may have in fact resulted in more rehabilitation occurring. Similarly, the provision of potential limitations (listed in appendix A) to SOEOB may have guided clinicians reasoning. This is especially apparent when considering the presence of an ETT. It is difficult to determine whether, in the absence of the primary limitation, the ETT would have prevented rehabilitation occurring or if it was noted purely because of it being within the data collection worksheets.

During the evaluation period there were no reported adverse events during rehabilitation and no patient mobilised out of bed experienced removal of an ETT or other artificial airway, intravascular catheters or sustained a fall.

Conclusion

This service evaluation has highlighted the current practice within a 32-bed, tertiary mixed dependency critical care unit. Data collected has been compared to current literature and recommendations have been produced to demonstrate patient appropriateness for completion of rehabilitation involving a sit on the edge of the bed. These recommendations will now be used within local practice to guide clinician's decision making.

Key Points

- Rehabilitation involving a sit on the edge of bed (SOEOB) occurred in 17.1% of all physiotherapy treatment sessions
- Where a SOEOB was not completed, the main reason was patient sedation (47.9%)
- The median time from admission to first SOEOB was 11 days

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Appendix 1 – Potential Reasons for Non-completion of SOEOB

SIT ON EDGE OF BED COMPLETED (can be part of rehab session)	Primary Reason	Other Reasons	Comments
Reason For Non-completion			
Too sedated / reduced GCS			<i>State sedation score and GCS</i>
Neuro-muscular blocking agents			<i>State drug</i>
EVD			
Raised intra-cranial pressure			
Vasoactive agents – type and dose (mcg/kg/min)			<i>State vasoactive agent and dose</i>
Unstable cardiac rhythm			<i>State rate and rhythm</i>
High mechanical ventilation requirements			<i>State PEEP and oxygen requirements or HFOV</i>
Weaning/ sprinting			<i>Weaning plan / sprinting plan</i>
Presence of ETT			<i>State tube tolerance and grade of intubation</i>
Open abdomen or high risk for dehiscence			
Haemofiltration via femoral line			
Unstable spine			
Extremity fractures with contraindications to mobilise			<i>State fracture</i>
Active bleeding process			<i>Bleeding location</i>
Other (including staffing)			<i>State:</i>

Appendix 1 – Primary Reason for Non-completion of SOEOB

Reason	Sedation Score (Riker Sedation Agitation Scale)							Neuro-muscular blocking agents
	SS1	SS2	SS3	SS4	SS5	SS6	SS7	
Frequency	123	37	5	0	5	2	0	0
Reason	Acute Neurological Injury							Noradrenaline Requirements (mcg/kg/min)
Frequency	EVD	ICP Monitoring	0.00-0.10	0.10-0.20	0.20-0.30	0.30-0.40	0.40-0.5	
Reason	Cardiovascular Compromise							Weaning / Sprinting
Frequency	15	6	0	1	1	0	1	
Reason	Ventilator Requirements							Presence of ETT
Frequency	Heart Rate	Heart Rhythm	Temperature	Blood Pressure	FiO2 >060	PEEP >10	2	
Reason	Active Bleeding							Other
Frequency	9	3	0	2	8	2	3	
Reason	Femoral Haemofiltration							Platelets <50
Frequency	Respiratory Deterioration	Unstable spinal injury	Extremity fracture	Open abdomen	10	4	10	
Frequency	9	46	1	13	10	4	10	31

Development of critical care rehabilitation guidelines in clinical practice: a quality improvement project.

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Summary

Rehabilitation in critical care has the potential to restore lost function and improve quality of life on discharge, but patients are often viewed as too unstable to participate in physical rehabilitation. Following a physiotherapy service evaluation of the provision of critical care rehabilitation, a number of concerns were raised in our practice. It was identified that there was a need to standardise pathways for clinical decision making in early rehabilitation so interventions are safe, timely and consistent. Plan, do, study, act (PDSA) cycles were used as a

method for quality improvement within this setting. Following a literature review, participants trialled an existing protocol but felt it did not fully meet the needs of clinicians and patients. At Medway NHS Foundation trust we developed our own, local evidence based critical care rehabilitation guidelines which incorporate core components from existing literature. These guidelines may assist physiotherapists and other members of the MDT with evidenced based decisions and clinical reasoning to ensure safe and timely interventions when rehabilitating the critically ill.



Introduction

It is well documented that following periods of critical care, patients can suffer complex physical and non-physical complications that significantly affect function, ability to work and family relationships (Stiller, 2000, Gosselink et al, 2008). Research into rehabilitation and early mobilisation within critical care has confirmed multiple benefits as highlighted in Figure 1.

The publication of NICE Guidelines (CG83) Rehabilitation after Critical Illness in 2009 advocates the need for a structured rehabilitation programme to commence as early as clinically possible. This should include an individualised, structured rehabilitation programme that addresses both physical and psychological needs of the patient. This is further supported by the recently published Guidelines for the Provision of Intensive Care Services (GPICS) (2015) which recommends critical care units provide rehabilitation encompassing physical, functional, communication, social, spiritual, nutritional and psychological aspects of care using nationally agreed assessments and outcome measures.

Early rehabilitation is both safe and feasible within the critical care setting (Bailey et al, 2007; Zeppos et al, 2007) although sessions sometimes do not occur due to patients being deemed to unwell, following physical assessment (Bahadur et al, 2008). This may be due to the definition of early rehabilitation being unclear (Mansfield, 2008), the critical nature of the environment or it could be sound clinical reasoning (Bahadur et al, 2008). Critical care rehabilitation could be approached by the implementation of protocols (Morris, 2007), yet the evidence base is still lacking (McWilliams, 2015; European Respiratory Society of Intensive Care Medicine (ESICM) 2008). This may impact on clinical reasoning and the decision to rehabilitate in this critical setting. Further knowledge is needed in order to standardise clinical decision making pathways for critical care physiotherapists so that interventions are timely and safe.

Relevance to Practice

Medway Maritime is a district general hospital serving a population of 360,000 with 550 beds of which 25 are classified as level two or

Figure 1 Benefits of early mobilisation and rehabilitation in critical care

- Improves / restores physical function (Skinner et al, 2008; Thomas et al, 2002 & Topp et al, 2002)
- Improved quality of life on discharge (Thomas et al, 2002 & Topp et al, 2002)
- Increased muscle strength (Skinner et al, 2008)
- Increased exercise tolerance (Skinner et al, 2008)
- Reduces delirium by 50% (Hopkins et al, 2012)
- Improved emotional wellbeing following a critical care admission (Rattray & Hull, 2008)
- Reduced time to wean from mechanical ventilation (Gosselink, 2008)
- Decreased hospital length of stay (Hopkins et al, 2012)
- Reduces hospital readmission rates (Hopkins et al, 2012)

three. The critical care units comprise of a nine bedded mixed intensive care unit, ten bedded surgical high dependency unit (HDU) and a six bedded medical HDU. A review of the provision of critical care rehabilitation at the authors' hospital was conducted. Feedback was gained from physiotherapists, members of the MDT and patients / families, this is summarised in Table 1.

The key factors identified were:

- Discrepancies between physiotherapist's intervention according to grade and experience with more junior physiotherapy staff classifying patients as too unstable to participate in physical rehabilitation;

- How do you identify when it is safe to commence rehabilitation in the critically ill?
- Discrepancies within MDT about the type and duration of rehabilitation and exercise;
- The rehabilitation was not patient centred.

The physiotherapy team concluded it would be beneficial to implement the use of physiotherapy rehabilitation guidelines within critical care with the aims of:

- supporting clinical decision making;
- increasing confidence to less experienced staff;

Table 1 Review of physiotherapy provision to critical care

Feedback Themes	
Physiotherapists	<p>Poor MDT compliance with rehabilitation and weaning plans</p> <p>Bias of multidisciplinary team attitudes to quantity over quality</p> <p>Competing priorities with MDT (weaning vs rehabilitation)</p> <p>Rehabilitation participation affected by fatigue resulting from weaning or nursing interventions</p> <p>Lack of understanding regarding rehabilitation by multi- disciplinary team</p>
Multi-disciplinary team	<p>Concern that physiotherapists are too conservative / safe in their approach to rehabilitation</p> <p>Inconsistencies in approaches according to professions and grade</p>
Patients	<p>Like a structured programme with personal goals</p> <p>Like a variety of exercises in a variety of settings (eg attending gym)</p> <p>Concern that they are not respected as individuals</p>
Families	<p>Families receive different information from different professions</p> <p>Concern that the patient is progressed too quickly</p>



- standardising care;
- improving MDT communication.

Method

This study utilised PDSA cycles (plan, do, study, act). PDSA cycles provide a structure, on a small scale, for iterative testing of changes to improve quality of systems and is widely accepted in healthcare improvement (Taylor et al, 2013). Numerous cycles are completed as part of the process of continual improvement (Deeming Institute, 2015). All physiotherapists employed at the Trust were invited to participate in this study as part of the on call training programme. The Research and Development department acknowledged this project as service development thus did not require any further permission or approval in respects of ethics.

Cycle 1

To undertake a literature review of existing rehabilitation guidelines or protocols for critical care rehabilitation.

A literature search via AMED, CINAHL, PubMed, EMBASE and NHS Evidence databases was performed. Search terms are described in Figure 2.

Figure 2 - Literature Search Terms

1. **Physiotherapy Guidelines**
2. **Rehabilitation Guidelines**
3. **Early Mobilisation**
4. **Critical Care**
5. **Physiotherapy Guidelines and Critical Care**
6. **Rehabilitation Guidelines and Critical Care**
7. **Early Mobilisation and Critical Care**

Ten relevant clinical papers were identified which are summarised and reflected upon in Appendix 1.

After consideration of the literature, participants identified the guidelines devised by Stiller (2007), as a protocol that could be trialled within clinical practice. The rationale for the use of Stiller's guidelines included:

- Includes assessment of clinical risk;
- System based approach to assessment;
- Holistic;
- Sets boundary conditions / identifies adverse events;
- Clear / simple to follow;
- Applicable and valid to local critical care population.

Participants also thought it would be beneficial to trial an existing protocol and review this approach rather than designing a new protocol as this would be more time efficient. The implementation of this protocol would form the next cycle of the PDSA process, but it was recognised that it was likely that changes would be required to make it specific to our own Trust.

Table 2 Use of Stiller (2007) rehabilitation guidelines within physiotherapy

How often did you use the rehabilitation guidelines in critical care?	Always	Sometimes	Occasionally	Rarely	Never
Response	50%	15%	20%	10%	5%
Compliance	<p>Always used when on rotation to ITU (B5 / B6)</p> <p>Backed up my clinical reasoning (B5)</p>	<p>Awareness needs improving (B6)</p> <p>Good to have available if required (B6)</p> <p>Used when working on call (B7)</p>	<p>Depends on the patient (B6)</p> <p>Felt happy with my own clinical reasoning (B7 / B6)</p> <p>Good tool to discuss with junior staff, although we tend to discuss it (B7)</p>	<p>Only when working on call. (B7)</p> <p>Difficult to follow (B5)</p>	<p>Relied on rehab plan devised by ITU team when working on call (B5)</p>

Comments in brackets reflect grades of staff

Cycle 2

To implement a physiotherapy rehabilitation guideline for the rehabilitation of critically ill patients into clinical practice.

Guidelines and supporting resources were made available to the physiotherapy team at point of care to support practice. The period of evaluation was six months. At six months, a follow up survey was completed by the physiotherapy team.

Cycle 3

To evaluate the use of the rehabilitation guidelines and make further recommendations for clinical practice.

Participants were invited to complete the simple survey asking them about the frequency of use of the guidelines, see Table 2.



Figure 3 Key considerations for inclusion within Medway NHS Foundation Trust guidelines for the rehabilitation of the critically ill patient.

- Must be patient centred
- Must include a system based assessment
- Must consider other factors such as time, staffing and safety
- Must include a risk assessment
- Considers type and duration of exercise
- Assists therapists in identifying suitable progression
- Assists therapists in identifying adverse events
- Assists therapists to review intervention and set plans / goals with patient for ongoing care
- Must be in a clear, easy to read flow chart format
- Must be relevant to our clinical practice

Ninety five percent of the physiotherapists indicated that they would like to continue to use rehabilitation guidelines within critical care. However, 82% of the therapists highlighted the need to develop our own guidelines. At a follow up focus group, the participants suggested that our guidelines should be: flexible; patient centred; time efficient and be in a user friendly flow chart in order to standardise our approach to rehabilitation within critical care. They also identified that the guidelines should include type and duration of exercise, which may improve the MDT's understanding of physiotherapy and rehabilitation. These guidelines were developed by the participants in the fourth phase of this service development.

Cycle 4

Development of our own rehabilitation guidelines for critical care.

The participants took the key ideas, see Figure 3, from all the authors and research reviewed as part of this study to devise our own rehabilitation guidelines, see Appendix 2.

The guidelines have been designed not as a formal protocol, but to highlight key considerations that physiotherapists may consider when clinically reasoning as to whether the patient is suitable for rehabilitation. Type and duration of exercise are considered and the physiotherapist is prompted to review the

therapeutic intervention and its impact before making future plans.

Discussion

More patients are now surviving admissions to critical care, so there is an increasing recognition of the role of rehabilitation to facilitate patient recovery pathways to a high quality level of survivorship (Iswashyna, 2010). Connelly (2014) identified that physiotherapists still face many barriers to providing and meeting the NICE CG83 guidelines which include: lack of funding; limited resources and staffing; time constraints and a lack of evidence. Physiotherapists are challenged by this limited evidence in relation to type, intensity, frequency and duration of exercise therapy and the optimal timing of rehabilitation interventions (Connelly, 2014). It is acknowledged that the use of protocols in this complex decision making process of assessing a critical care patient's suitability to commence rehabilitation, the intensity and type of exercise, amount of supervision, duration and follow up would contribute to improved patient outcomes (O'Neil & McAuley, 2011). This service review identified a lack of critical care rehabilitation guidelines or protocols that translate well into clinical practice in the UK.

During this service review, participants identified that in our clinical setting, having fixed parameters and protocols does not work. These do not consider the patient's history, needs and wishes and that exercise cannot be prescribed rigidly within critical care due to the unpredictable nature of the work. They also felt the literature focussed on sequences of mobility (Morris et al, 2008, Gosselink, 2011 and Zomorodi et al, 2012), whereas our practice is more holistic in nature, focussing more on function, psychosocial needs and patient centred goals. This could be due to most of the research being conducted in North America where the provision of physiotherapy practice may differ or is provided by nursing staff or designated mobility teams. However, the use of the flowchart devised by Stiller (2007), an Australian study which has similar practice

to the UK, made the participants reflect on the impact rehabilitation may have on each body system and helped to highlight clinical considerations that they previously may not have thought about. When used in practice the Stiller (2007) flowchart was found to be quite confusing with large amounts of calculations or ratios to be considered, some of which we did not use on a daily basis.

The overwhelming reflections by physiotherapists regarding the use of rehabilitation guidelines was that they did not take into account the individual needs of the patient and the psychological benefit that exercise may bring. It also highlighted that we need to review the types and frequency of exercises and the MDT's understanding of the term rehabilitation as this often caused conflict between physiotherapists and MDT when deciding treatment plans. Pohlman et al (2010) and Hopkins et al (2007) both identified that critical care physicians and nursing staff may not entirely fully understand impairments caused by a prolonged critical care admission or the implementation, feasibility and safety of rehabilitation interventions

Conclusion

Following this service review, the participants surmised that in our clinical setting we were seeking to create Trust critical care rehabilitation guidelines that can act as a reference or teaching aid for all members of the MDT and that they will guide:

- clinical decision making in assessing a patient's suitability for commencing/progressing rehabilitation with an critical care patient;
- an appropriate risk assessment;
- a comprehensive physical and non physical assessment;
- options of rehabilitation interventions and approaches;



- the identification of adverse events and potential cessation of the intervention;
- time points of certain actions during the patient pathway;
- standards that should be met;
- promotion of increased adherence to rehabilitation programs by all members of the critical care team;
- patient centred care;
- promotion to include families within the rehabilitation pathway;
- promote adherence to NICE Guidelines CG83.

These guidelines, see Appendix 2 are currently being utilised in clinical practice and will be reviewed and amended as identified by the participants as ongoing PDSA cycles within the department.

Acknowledgements

The author and lead researcher would like to thank all the physiotherapists at Medway NHS Foundation Trust for their time, active participation, enthusiasm and hard work during this PDSA improvement project.

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Appendix 1 Summary and reflections of literature review

Paper	Description	Reflections by the participants
Kress (2009)	Use of objective parameters to determine the safe commencement of rehabilitation	Physiotherapists rejected such limited and fixed parameters as it did not individualise care and felt 'too prescriptive', although by having fixed parameters it did allow for discussions to be undertaken why rehabilitation did not occur.
Adler & Malone (2012)		
Skinner et al (2008)	Considers subjective, objective and environmental and cost factors that may influence physiotherapists decision making	Skinner et al (2008) and Morris (2007) studies utilised the commencement of rehabilitation based on the individual physiotherapist's clinical reasoning. Thus was rejected by the participants as this was our own current practice and the physiotherapists were looking for additional evidence that would support their clinical decision making.
Morris(2007)		
Morris et al (2008)	<p>Trialled the use of a mobility team who utilised a mobility protocol. This protocol comprises of four levels with different grades of activity in each</p> <p>The study did not report on the clinical decision making process and concluded that there continues to be limited evidence to guide clinicians in this process</p>	Morris (2008) and Gosselink (2011) appeared too prescriptive and didn't allow for individualised care or the unpredictable nature of critical care. Additionally, in reflection on the participants own practice that you have to take a more flexible approach to the type of exercise on a daily basis due to other factors such as staffing, time and fatigue levels of the patients.
Gosselink et al (2011)	Developed a 'start to move' flow diagram. The six levels each define the modality of body positioning and physiotherapy which are	



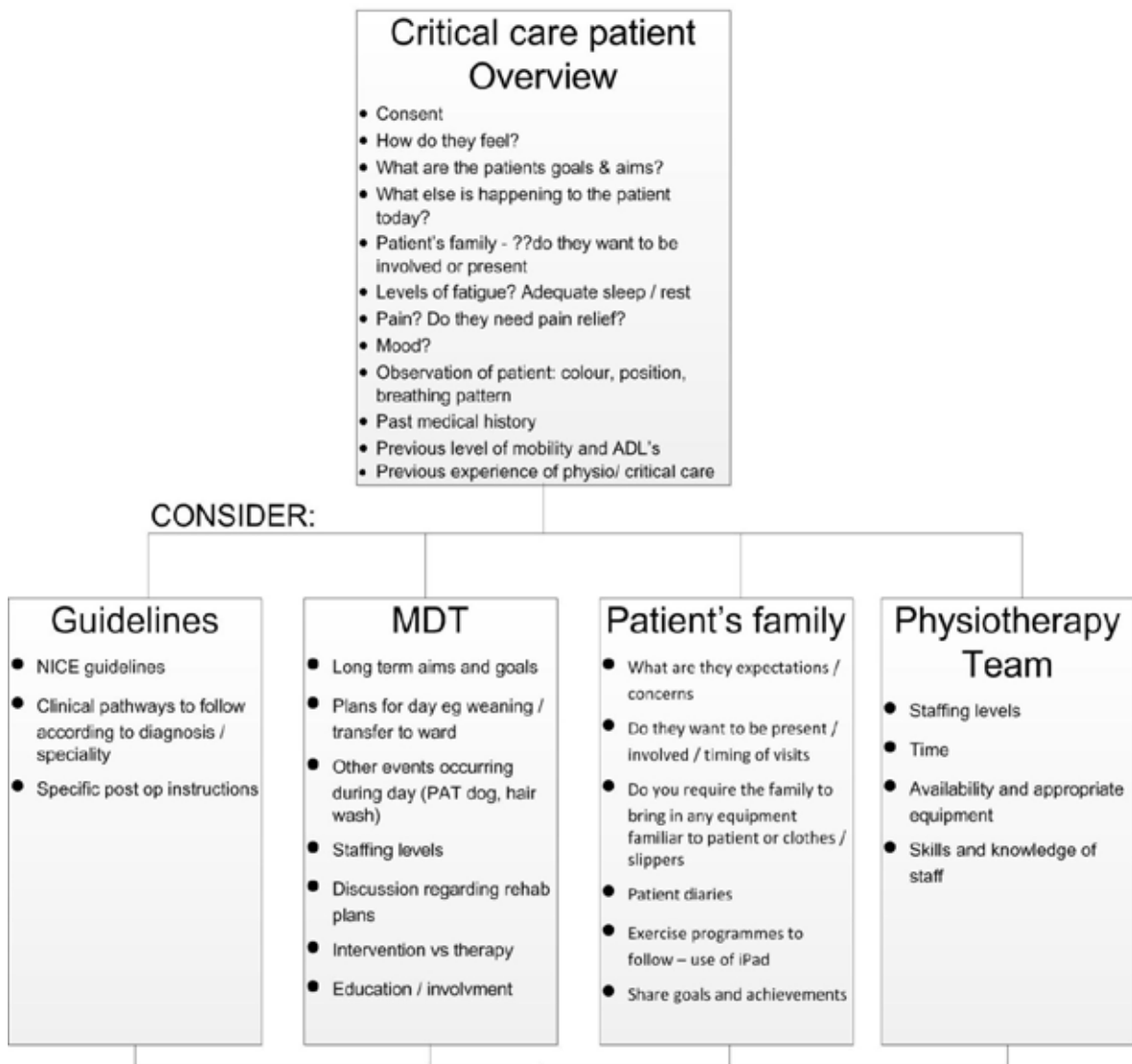
	based on assessment of medical condition, level of co-operation and functional status.	
Stiller (2007)	Highlighted a need for rehabilitation guidelines prior to mobilisation within critical care so to reduce the risk of detrimental effects and provided clinicians with guidelines based upon previous studies (Stiller & Philips, 2003; Stiller et al, 2004; Chang et al, 2004 & Stiller, 2000) and her own clinical experience that could be used to assess the feasibility and safety of commencing rehabilitation in critical care.	Participants liked the flow chart approach, it allowed for discussion with more experienced staff and also provided a measure of whether the patient was tolerating physiotherapy rehabilitation.
Zomorodi et al (2012)	Mobility protocol for nursing staff to follow	The decision tree does not take into account individual patients needs or goals. It was too focussed on mobility and did not have a holistic / whole body approach to exercise.
Hanekon (2011)	Algorithm designed to facilitate decision making within ICU.	This algorithm showed more consideration to the patient and MDT, however, they were looking for one guideline / flowchart that could be utilised at all stages of the patients rehabilitation pathway.
McWilliams et al (2015)	Development of an early and structured mobility protocol with inclusions and exclusions	The use of chart and table was found to be quite confusing and didn't want to be restricted by objective parameters as identified with Kress (2009) and Adler & Malone (2012). Also the participants wanted to include other more holistic, patient centred rehabilitation goals such as going outside and found this too restrictive as concentrated on sitting and ambulation only.

Medway NHS Foundation Trust Guidelines for the rehabilitation of the critically ill patient.

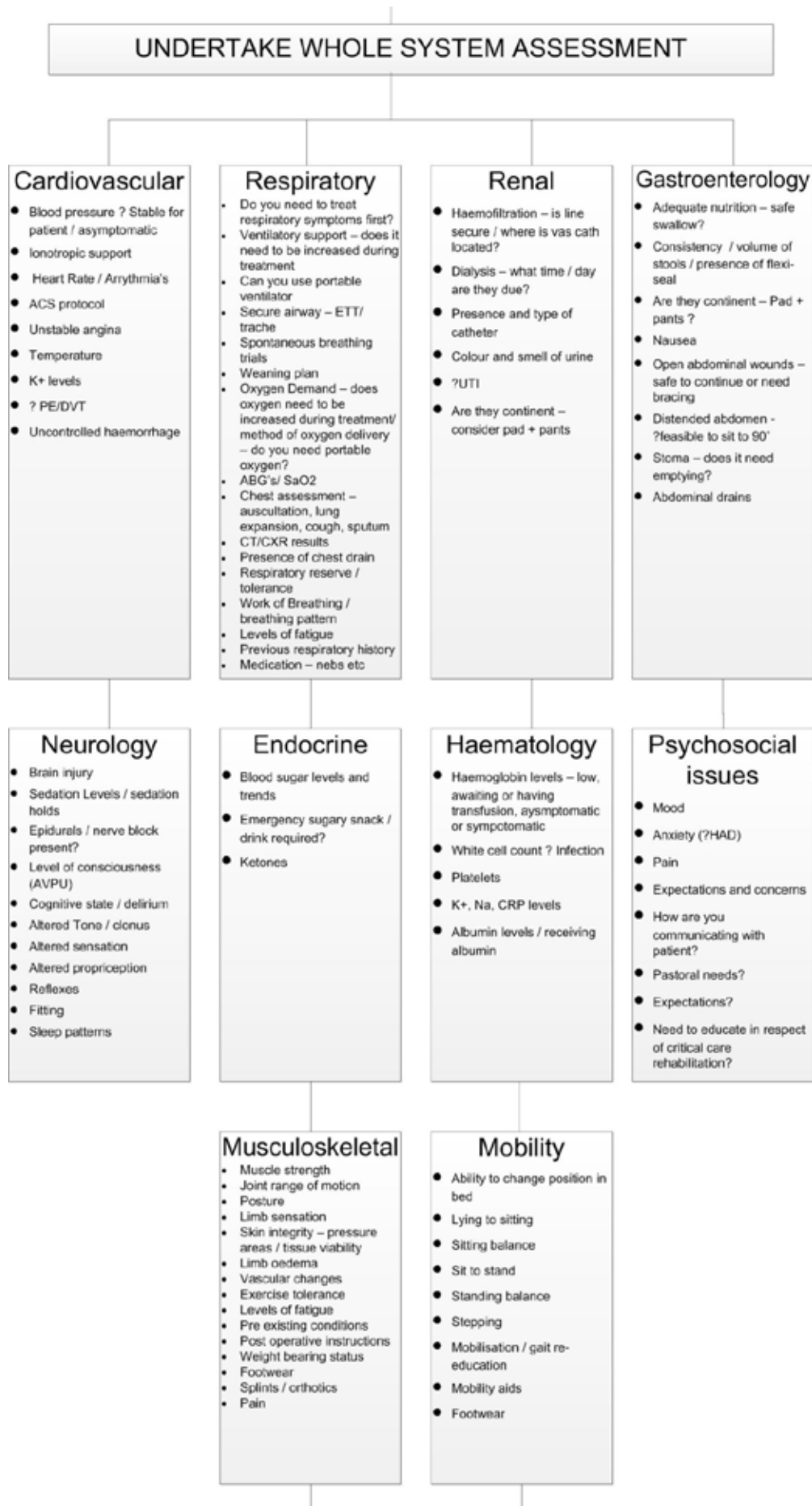
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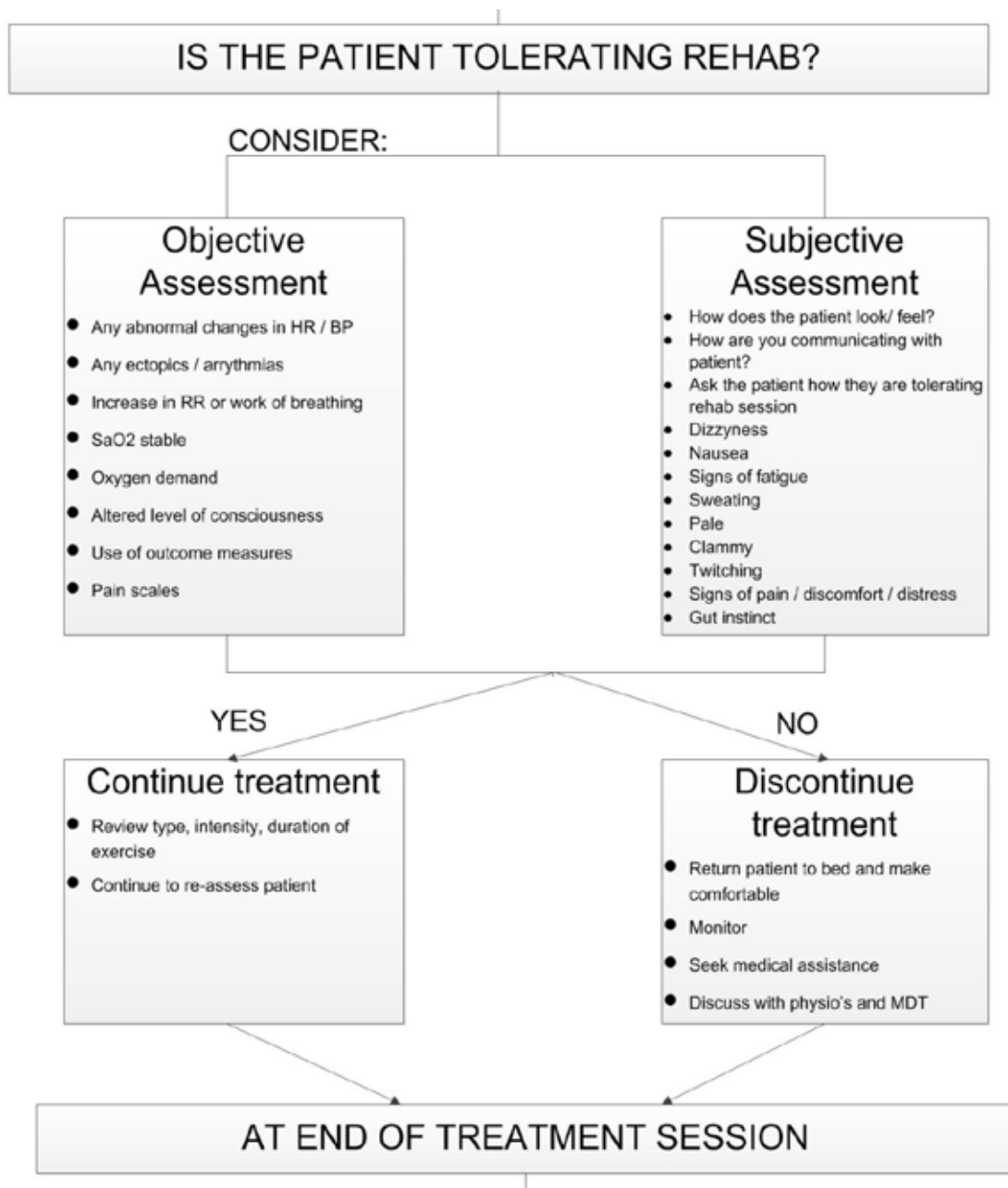
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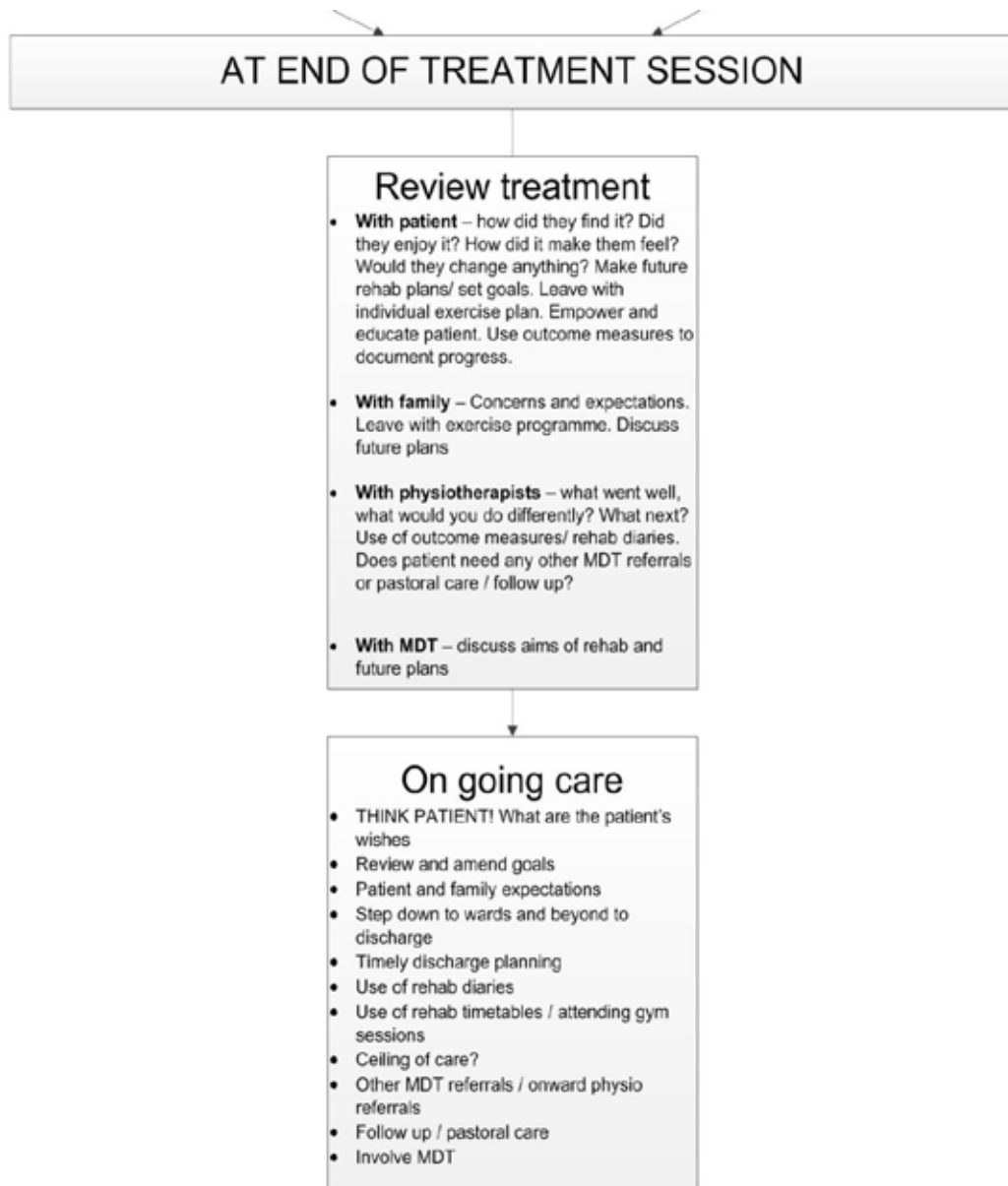
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Physiotherapy following cardiac surgery: A service review and trial of screening tool.

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Summary

Routine post-operative physiotherapy following cardiac surgery has little evidence to support it. However, it is still offered in 59% of institutions benchmarked, and at Newcastle Upon Tyne Hospitals (NUTH). Following a review of current practice at NUTH, a screening tool was developed to identify individuals who required physiotherapy input following cardiac surgery. This was based on their respiratory and functional status day one post-operatively. The screening tool was trialled for three months. Referral rates and reasons for referral during this period were examined. Only 38% of patients were identified as requiring physiotherapy input on the first post-operative day. Cardiothoracic critical care re-admission rates were also compared before and after the trial, with no difference found.

The screening tool described in this paper has been demonstrated to be a safe and effective method of identifying patients requiring physiotherapy following cardiac surgery.

Introduction

Cardiac surgery is defined as any surgery that involves opening the pericardium (The Society for Cardiothoracic Surgery in Great Britain and Ireland (SCTS), 2015). Some of the most common surgeries performed are valve surgery, coronary artery bypass grafts (CABG) and aortic surgery (SCTS, 2015). This service review considers post-operative care following isolated or combined valve replacement or CABG.

Physiotherapy following cardiac surgery is often a routine component of post-operative care. In many hospitals, patients are still seen post-operative day one (POD1) by a physiotherapist, regardless of their respiratory or functional status (Westerdahl and Moller 2010). Treatment is likely to include some



combination of: deep breathing exercises, active cycle of breathing technique (ACBT) and supported cough (Brasher et al. 2003). However, there is evidence to suggest that these exercises do not reduce the incidence of post-operative pulmonary complications (PPC), improve lung function, or reduce oxygen requirement following cardiac surgery (Brasher et al. 2003, Pasquina et al. 2003, Stiller et al. 1994).

The National Institute for Health and Care Excellence (NICE) clinical guideline 'Rehabilitation after critical illness' recommends the use of a short clinical assessment for all critical care patients, to identify those at risk of physical or non-physical morbidity (NICE, 2009). Examples given of physical risk factors include: being unable to self ventilate on 35% oxygen or less, an anticipated long duration of critical care stay, presence of pre-morbid respiratory or mobility problems and obvious physical or neurological injury (NICE, 2009). The majority of patients stay on critical care less than two days following cardiac surgery (Widyastuti et al. 2012), so could be considered at low risk of related physical morbidity. It is hypothesised that a screening tool based on fitness for ward level of care on POD1, respiratory and functional status could be used to identify those at increased risk of PPC or decreased physical function following cardiac surgery. This would allow resources to be focussed on those patients who would most benefit from physiotherapy input.

At the beginning of the service review, at Newcastle Upon Tyne Hospitals (NUTH), this patient group received advice regarding ACBT, supported cough and the importance of early mobilisation as part of their pre-assessment information pack in the form of a printed leaflet. All patients were then seen by a physiotherapist on POD1 following cardiac surgery. The patient's initial treatment was always in critical care. They were then followed up as required for the duration of their inpatient stay. All patients were also

seen on the ward post-operatively by a cardiac rehabilitation nurse, and referred to cardiac rehabilitation on discharge.

In order to undertake a service review, the aims of this study were to:

1. Compare current practice at Newcastle Upon Tyne Hospitals (NUTH) with those in cardiothoracic units nationally;
2. Audit the current physiotherapy service provision following cardiac surgery at NUTH;
3. Design and trial a screening tool to aid identification of individuals who would benefit from post-operative physiotherapy input.

Method

Aim 1: Comparing current practice at Newcastle Upon Tyne Hospitals (NUTH) with those in cardiothoracic units nationally

A benchmarking exercise was completed to compare current practice at NUTH with that of other hospitals nationally. Twenty-five cardiothoracic centres were asked "Is physiotherapy offered as routine care following cardiac surgery (e.g. AVR, MVR, CABG)?" Institutions were contacted via post, and three months was allowed for response.

Aim 2: Auditing the current physiotherapy service provision following cardiac surgery at NUTH

A convenience sample of 80 patients who had undergone cardiac surgery between April and August 2014 was used to review the current service. The following data were collected:

- Age, gender and operation
- Respiratory previous medical history (PMH)
- Whether patient was fit for the ward POD1



- Oxygen requirement POD1
- Content of physiotherapy treatments on critical care
- Total number of physiotherapy contacts during inpatient stay

Aim 3: Designing and trialling a screening tool to aid identification of individuals who would benefit from post-operative physiotherapy input

The results of this review were presented to the cardiothoracic multi-disciplinary team (MDT) in September 2014. It was agreed that a screening tool based on fitness for ward POD1, respiratory, cardiovascular and functional parameters would be trialled for three months, October 2014 to January 2015.

During this trial period, the following data were collected: number of patients identified as needing physiotherapy input POD1 using the screening tool, and reason why; number of patients subsequently referred to physiotherapy, and reason why. Critical care re-admission rates were also collected for the three months before, and the three months during the trial.

Ethics

In responding to the benchmarking question, physiotherapists gave their informed consent. The service review was completed using only data already collected routinely by the physiotherapy team when treating this patient group, so ethical approval was not required. Consultant approval, from both the cardiothoracic surgeons and intensivists, was granted prior to trialling the screening tool.

Results

Aim 1: Comparing current practice at Newcastle Upon Tyne Hospitals (NUTH) with those in cardiothoracic units nationally

Seventeen (68%) of the 25 institutions contacted responded to the benchmarking

question. Ten (59%) of these routinely offered physiotherapy to all patients following cardiac surgery. Of the seven that did not, five (29%) used a screening tool and two (12%) offered physiotherapy on referral only. One institution specified in their response that their screening tool was based on respiratory function, mobility and respiratory medical history.

Aim 2: Auditing the current physiotherapy service provision following cardiac surgery at NUTH

The results of the initial service review can be seen in Figure 1 and Table 1. Figure 1 shows that almost two thirds (65%) of patients were deemed fit for the ward POD1 by the surgical team. Of those that were not, 18% were intubated and ventilated (I+V), 11% required inotropic support, 7% required an intra-aortic balloon pump (IABP), 4% had uncontrolled pain and 14% required greater than 50% oxygen. Six patients (21%) were deemed not fit for the ward for other medical or surgical reasons. The service review notes did not have the reason for remaining on HDU for 25% of patients and so are labelled 'not documented'.

Section 1.1 of Table 1 illustrates the oxygen requirements by group. This shows that the majority of those fit for the ward required less than 40% oxygen, either delivered via nasal cannula or face mask. Only 17% of this group required either 40% oxygen or more via face mask, or high flow nasal cannula (HFNC). In contrast, the oxygen requirements of those patients not fit for the ward POD1 were much more diverse. Only 28% of this group required less than 40% oxygen. The largest subgroup was the 29% of patients who required more than 40% oxygen via face mask, as well as some patients who required either CPAP or were I+V.

The second section of Table 1 demonstrates the proportion of patients from each group who had a respiratory condition in their PMH. Of those fit for the ward POD1, 21% had respiratory PMH, compared to 25% in those



not fit for the ward.

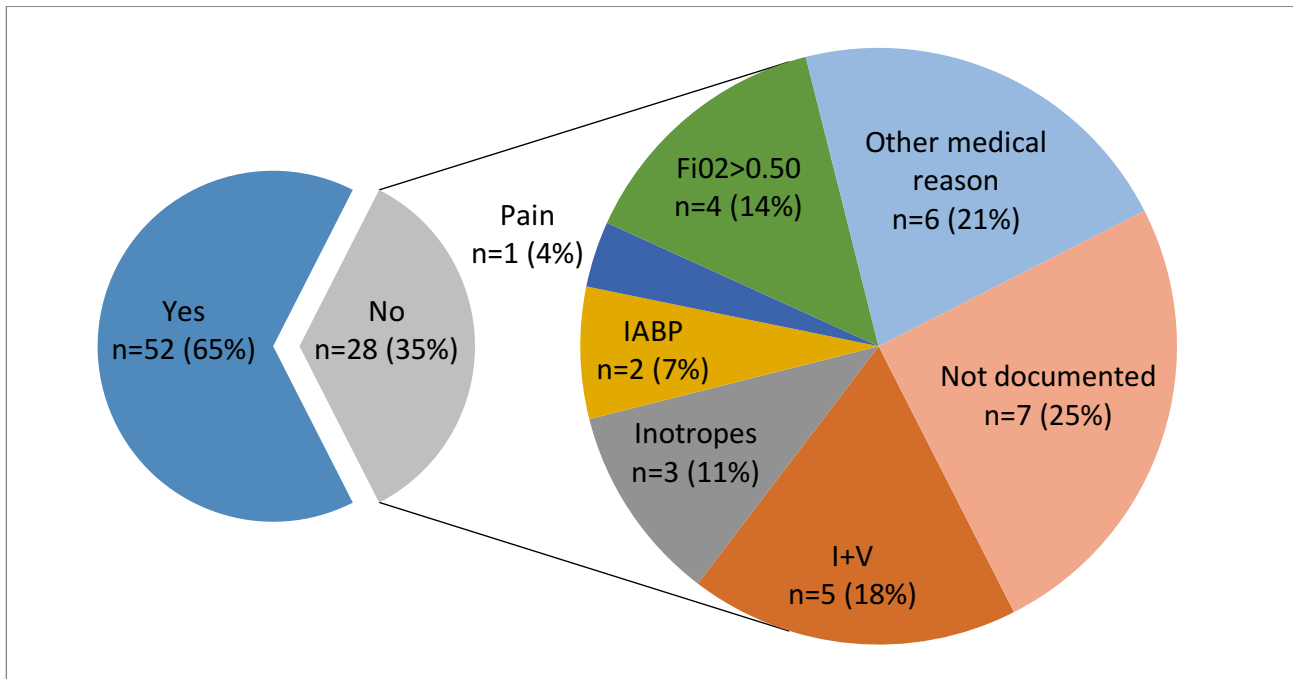
The last section of Table 1 shows the content of treatment received by each group. When reviewing the service, physiotherapists were asked to record exactly what treatment they did with patients fit for the ward POD1. If the patient was not fit for the ward, for example if they were I+V - all chest care treatments were grouped together as 'other chest care'. Similarly, any stretches, active-assisted or passive range of movement (ROM) exercises or positioning were classed as 'other'. This was because the proposed change of service, and therefore focus of analysis was on the former group. In this group, all patients were taught ACBT, supported cough and active ROM exercises. Only 8% of these patients were transferred out of bed with a physiotherapist. The remainder were either transferred out with the nursing staff on HDU, or did not get up until they arrived on the ward later in POD1.

Table 1. Oxygen requirement, previous medical history and physiotherapy treatment in those fit for the ward POD1 versus those not.

Parameter	Fit for the ward POD1 (N=52)	Not fit for the ward POD1 (N=28)
1.1 Oxygen requirement		
N (%)	N (%)	N (%)
≤4 litres via nasal cannula	35 (67%)	6 (21%)
<40% face mask	1 (2%)	2 (7%)
≥40% face mask	7 (13%)	8 (29%)
HFNC	2 (4%)	0 (0%)
CPAP	0 (0%)	2 (7%)
I+V	0 (0%)	5 (18%)
No data	7 (13%)	5 (18%)
1.2 Respiratory previous medical history		
None	41 (79%)	21 (75%)
COPD	4 (8%)	2 (7%)
Other	1 (2%)	1 (4%)
Not documented	6 (12%)	4 (14%)
1.3 Treatment provided on HDU		
ACBT with supported cough	42 (81%)	20 (71%)
Deep breathing exercises	12 (23%)	8 (29%)
AROM exercises	24 (46%)	15 (54%)
Other mobility	8 (15%)	11 (39%)
Other chest care	1 (2%)	5 (18%)

Key: HFNC=High flow nasal cannula, CPAP=Continuous positive airway pressure, I+V=Intubated and ventilated, COPD=Chronic obstructive pulmonary disease, HDU=High dependency unit, ACBT=Active cycle of breathing technique, AROM=Active range of movement.

Figure 1 Fit for the ward POD1?



Aim 3: Designing and trialling a screening tool to aid identification of individuals who would benefit from post-operative physiotherapy input

On the basis of this review, and following discussion with the cardiothoracic surgeons and intensivists, it was agreed to trial a screening tool. This is shown in Table 2. The screening tool comprised selected sections of the recommended discharge criteria for POD1 patients on NUTH critical care. The full criteria are shown in Table 3.

The parameters for each measured value on the screening tool are the same as in Table 3, with the exception of oxygen requirement. A patient could be deemed fit for the ward POD1 on up to 50% oxygen delivered with up to 50 litres of flow. However, an oxygen requirement of 40% or more, or the need for high flow, was a normal indicator for physiotherapy review at NUTH. Therefore this lower parameter was used. The team felt that respiratory PMH was not a good indicator of a patient's support or oxygen requirements POD1. For this reason, this was not included in the screening tool.

It is noted that 36 (45%) of the 80 patients reviewed satisfied both the criteria for being fit for the ward POD1, and required less than 40% oxygen via a low-flow device. It is these patients that would not have been offered physiotherapy, had the screening tool been in place.

The screening tool was used for three months, from October 2014 to January 2015. The demographics of the group of patients with whom it was used are shown in Table 4. Of the 154 patients screened, 59 (38%) required physiotherapy input POD1, 45 (29%) were later referred to physiotherapy by medical or nursing staff and 50 (33%) required no input.

Table 2. Screening tool

Parameter	Requirement
Respiratory rate	10-30
Neurological status	Alert, responsive to commands appropriately, moving all 4 limbs
pH	7.30–7.45
pCO ₂	4.5–6.5 kPa
pO ₂	>9.0 kPa
FiO ₂	<0.40 via low flow device
SpO ₂	> 95%
Blood pressure	Stable, with systolic pressure > 100mmHg
Cough	Adequate cough to clear secretions. Minimal secretions.
Pain relief	Comfortable with adequate pain control
Temperature	36–37.5°C

Table 3. Recommended critical care discharge criteria, POD1 following cardiac surgery.

Parameter	Requirement
Extubated	More than 3 hours ago
Respiratory rate	10-30
Drainage/bleeding	Less than 25mls/hour for 3 consecutive hours, or less than 500mls since theatre
Neurological status	Alert, responsive to commands appropriately, moving all 4 limbs
pH	7.30–7.45
pCO ₂	4.5–6.5 kPa
pO ₂	>9.0 kPa
FiO ₂	≤0.50
SpO ₂	>95%
Base excess	>-4
Blood pressure	Stable, with systolic pressure > 100mmHg
Cardiovascular support	All inotropes and vasodilators off
Cough	Adequate cough to clear secretions. Minimal secretions
Blood glucose	Stable
Heart rate	Sinus rhythm, unpaced HR>50
Pain relief	Comfortable with adequate pain control
Urine output	>0.5 mls/kg for the last 4 hours
Temperature	36–37.5°C
Other results	Post-operative full blood count/urea and electrolytes/liver function tests within normal limits. Morning bloods and chest x-ray ordered.

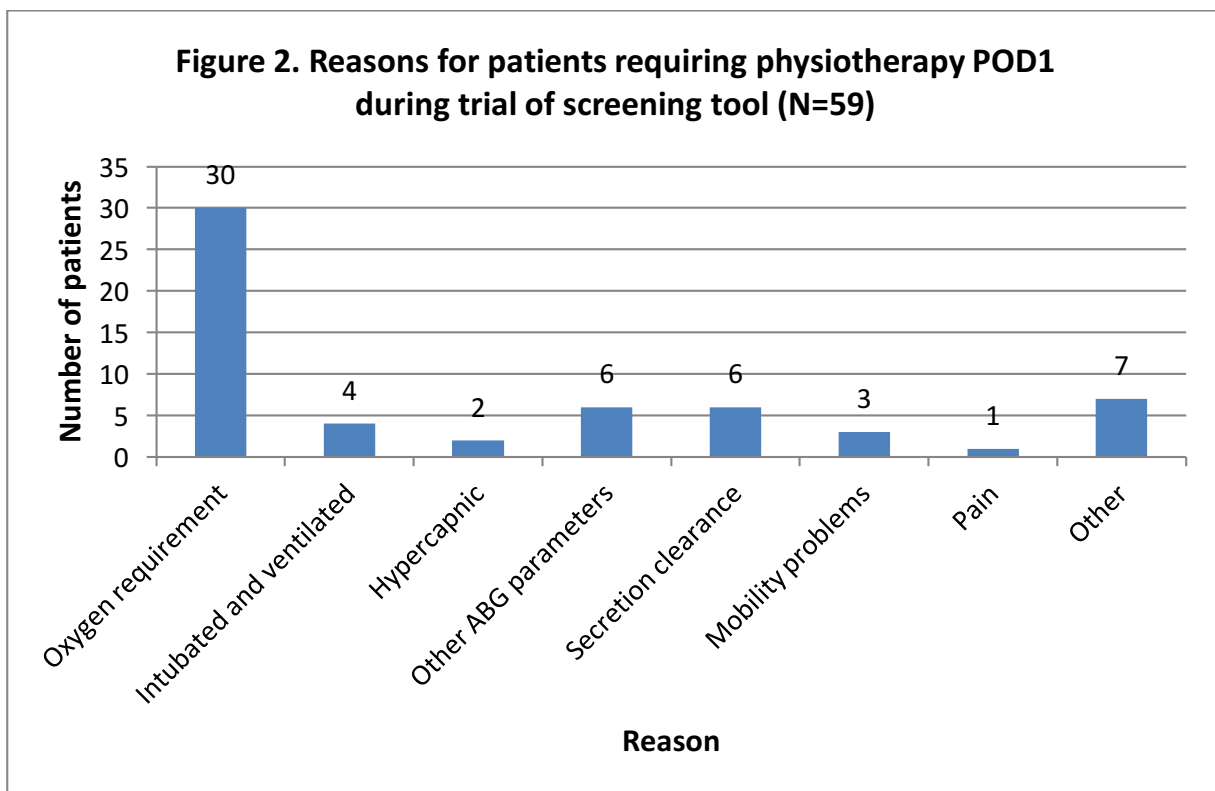


Table 4. Demographics and operation type in screening tool group.

Demographics	
Age (mean (SD))	69.14 (10.49)
Women	58
Men	96
Operation type	
CABG	61
AVR	59
AVR and CABG	19
MVR	11
AVR and MVR	1
AVR and TVR	1
MVR and TVR	1
PVR	1

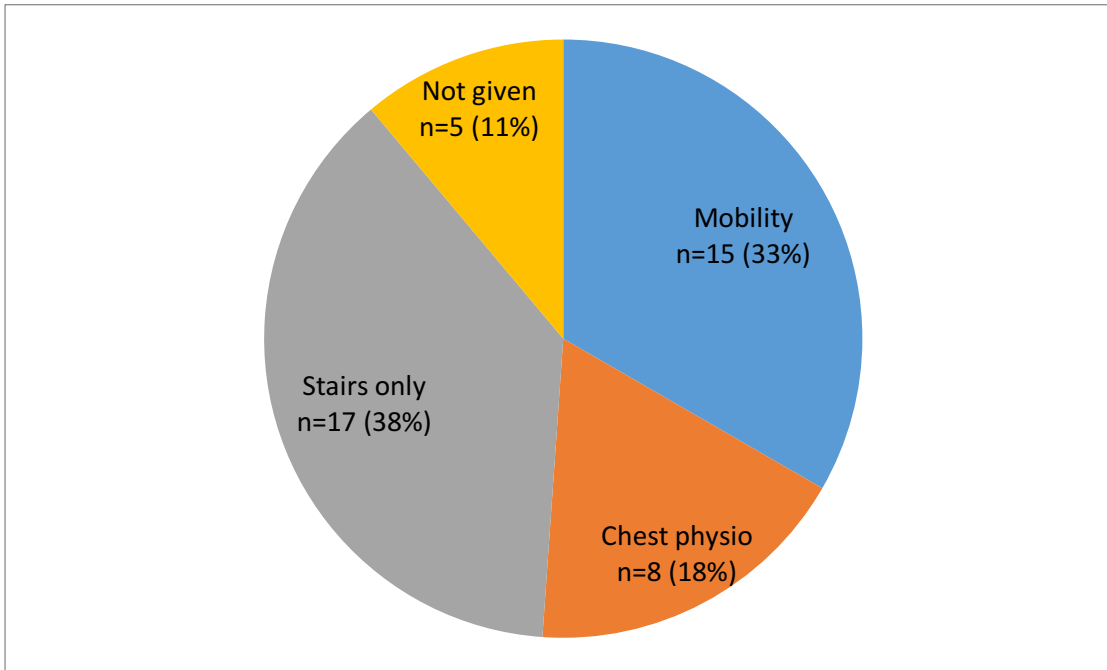
Key: CABG=Coronary artery bypass grafts, AVR=Aortic valve replacement, MVR=Mitral valve replacement, TVR=Tricuspid valve replacement, PVR=Pulmonary valve replacement.

For each patient identified as requiring physiotherapy input POD1, the reason is shown in Figure 2. Over half of the patients needed input because they required 40% oxygen or more. This category included those on high flow and CPAP. The ‘other’ category contained patients who had a medical reason for not being fit for the ward POD1 that was not included on the screening tool. This was most commonly the need for cardiovascular support, such as inotropes or an IABP. These patients were reviewed by a physiotherapist because it was felt they were at increased risk of pulmonary complications resulting from restricted mobility and a longer critical care stay.



For patients subsequently referred on the ward, the reason for referral is shown in Figure 3. Patients in the 'stairs only' category are those referred for a stair assessment for discharge, having not been referred for either chest or mobility previously. In this group, a single stair assessment was their only contact from physiotherapy. The mean number of physiotherapy treatments received in total was 4.08 (median 4) for those patients fit for the ward POD1, compared with 11.5 (median 9.5) treatments in those not fit for the ward. When these were compared using a Mann-Whitney U test the difference was statistically significant ($U = 53.50$, $N = 80$, $p < 0.001$).

Figure 3 Reason for referral to physiotherapy onward



Finally, the re-admission rate to cardiothoracic critical care during the screening tool trial was 10.67%. This is identical to the re-admission rate in the 3 months prior to the trial.

Discussion

Cardiac surgery is a common major surgery in the UK, with 34, 174 patients operated on in 2011/2012 (SCTS 2015). Traditionally, this patient group have all been seen post-operatively by physiotherapists. This is still the case in 59% of the institutions that responded to the benchmarking exercise. However, changing demands on physiotherapy services and the need for evidence-based practice mean that blanket provision of post-operative physiotherapy in this patient group should be questioned. This is reflected in the 41% of institutions that now provide post-operative physiotherapy either on referral only or via the use of a screening tool.

Pasquina et al. (2003) examined 18 trials in their systematic review of physiotherapy following cardiac surgery and concluded that physiotherapy as a prophylactic treatment to prevent PPC does not have a sufficient evidence-base. Of the four trials they reviewed that had a 'no intervention' control arm, none showed significant change in outcome with physiotherapy. However, they also comment on the paucity of high quality trials with 'no intervention' controls and insufficient length of follow-up periods in trials reviewed. Therefore, it would be difficult to use this review to argue for the complete cessation of a physiotherapy service following cardiac surgery.

The initial stage of this service review examined the level of respiratory support required post-operatively, fitness for the ward POD1 and respiratory PMH. This demonstrated the broad spectrum of support required POD1.

In particular, respiratory support ranged from minimal oxygen via nasal cannula to full mechanical ventilation. This highlighted the diversity of physical risk factors in this population.

Given that the ability to self-ventilate on 50% oxygen or less is one of the criteria for being fit for the ward POD1 it is unsurprising that this group had a much lower oxygen requirement. It is the subgroup of these patients that required less than 40% low-flow oxygen that are of particular interest in this review. It is this group (45% of the total sample) for which prophylactic physiotherapy provides little added value post-operatively.

It was noted that the incidence of a respiratory condition in a person's PMH was similar in both those patients fit for the ward POD1 and those not. Therefore, although formal statistical analysis was not undertaken, respiratory PMH seemed unlikely to be a predictor of support requirements POD1. This may be due to the eligibility for cardiac surgery. Those with severe respiratory disease are unlikely to be deemed fit for surgery. Therefore, this sample would necessarily contain only those with mild to moderate, well controlled, respiratory disease. For this reason, this parameter was not included in the screening tool. An argument for its inclusion might cite the NICE (2009) guidance, which specifies respiratory PMH as a risk factor for physical morbidity. However, this guidance is for a general critical care population, not only post-operative patients. Presence of respiratory PMH would be relevant to someone whose reason for admittance to critical care included respiratory failure, but not to the population considered in this review.

Patients fit for the ward POD1 received significantly fewer physiotherapy contacts than those that were not. This is consistent with the argument that the former are receiving only routine, primarily prophylactic physiotherapy. It is usual practice that patients seen on critical care POD1 will be reviewed again for a 'quick check' that afternoon. The results of this

review demonstrate that the content of these treatments is routine post-operative chest care. This is followed by at least one contact on the ward, usually to mobilise, and then an assessment on the stairs prior to discharge. This gives a minimum of four routine contacts, as per the median in this sample.

When designing the screening tool to trial, it was convenient to use the parameters already in place to guide surgical registrars in identifying individuals fit for the ward. No evidence was found to support or discourage the use of specific parameters for physiotherapy referral in a post-surgical population. It could be argued that alternative parameters should be used. However, these parameters identify individuals who are fit for the ward POD1, able to self-ventilate on less than 40% oxygen, alert, responsive and moving all four limbs to command. With the exception of respiratory PMH, excluded as previously discussed, these are the risk factors for physical morbidity suggested for consideration by NICE (2009). For this reason, it is suggested that these are appropriate parameters for referral to physiotherapy on critical care in this population.

During the three month trial period, no patients were referred for abnormality of any parameter not included in the screening tool. This supports the argument for suitability of the parameters included. Further support can be taken from the static critical care re-admission rate before and during the trial. This tool successfully identified patients with physical risk factors, so that routine physiotherapy was only withdrawn from individuals for whom this would cause no detrimental effects. It is a limitation of this review that a comparison between length of stay before and during the screening tool trial was not made.

It should be noted that fewer patients were screened in during the trial than was predicted following the initial service review. The reason for this is unclear; it may be a natural variation due to the small sample size. This is due to the short time period of both the initial audit and

trial, and is a limitation of this study. A review over a longer time period may have provided more consistent results.

The initial service review did not include an examination of referrals on the wards, so it is not known whether the number of referrals during the trial period differed because of the screening tool. This lack of baseline for this part of the service is a weakness of this review. It is noted that a significant proportion of referrals on the wards were for a stair assessment prior to discharge for patients who had received no previous physiotherapy input. The need for this assessment is questioned, and is the subject of a further service review now ongoing within the department.

Conclusion

Patients undergoing cardiac surgery vary significantly in the support they require post-operatively. There is insufficient evidence to support the provision of physiotherapy post-operatively regardless of respiratory or physical functioning (Pasquina et al. 2003). A screening tool based on indicators of physical morbidity has been demonstrated as safe to use on critical care. This satisfies the NICE (2009) recommendation for a short clinical assessment to identify patients at risk of physical morbidity, whilst optimising the use of physiotherapy resources.

Key points

- Over 40% of cardiothoracic departments nationally are already using either a referral or screening tool system for physiotherapy provision post-cardiac surgery.
- Using a screening tool based on physical and respiratory function only 38-45% of this patient group require physiotherapy input on critical care.
- The screening tool used in this study was demonstrated to be a safe and effective method for identifying those who require physiotherapy following cardiac surgery.

Acknowledgements

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Therapy Support Workers in Critical Care: A proposal for funding

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Keywords:

**Critical Care
Rehabilitation
MOTomed
Therapy Support Workers**

Summary

Complying with the compelling evidence that early rehabilitation intervention has both physical and psycho-social benefits for critically ill patients in their short and long-term recovery is a challenge for physiotherapists. The ability to consistently provide the recommended amount of therapy input was identified as an area of service development at a large NHS teaching Trust with current staffing levels. This article outlines a service improvement project that was successfully funded to address this. By employing two Band 4 Therapy Support Workers in Critical Care and the purchase of a MOTomed Letto 2® the aim is to be able to increase the intensity and frequency of therapy for patients during their recovery and demonstrate benefits to the patient, the Trust and commissioners.

Introduction

In 2014, our NHS Trust launched a 'Dragons' Den' style event for staff to pitch ideas to improve patient care and save money within the hospitals. The 'Dragons' included the Trusts chief executive, finance director, human resources director and two GP's. The 'dragons' invested in the best ideas which focused on the Quality, Innovation, Productivity and Prevention (QIPP) initiatives for improved patient care within the Trust. The event was open to all employees and the shortlisted candidates were invited to pitch their ideas to the Dragons' Den panel in October 2014. Therapy teams were strongly encouraged by their managers to write a proposal and excitingly our proposal was shortlisted. The idea was pitched to the 'Dragons' and they agreed to support it financially. This article will outline the proposal submitted and describe how funding was successfully secured to employ two Band 4 Therapy Support workers for one year and the purchase of a MOTomed Letto 2® (See Figure 1a and b). The aim of this service innovation is to facilitate faster discharge of patients from critical care (CC), resulting in multiple benefits for the patient, the Trust and commissioners.





Figure 1a & b: MOTomed Letto 2® can be used for lower and upper limb cycle ergometry in passive, active assisted or resistive modes.

Context

As a result of prolonged immobility and critical illness, intensive care unit acquired weakness (ICUAW) presents clinically as profound muscle weakness that requires multi-professional treatment. There is also evidence of poor mental health and quality of life among survivors of intensive care, including incidents of post-traumatic stress disorder (Wade et al., 2012). Patients on CC are exposed to various stress factors including fear, isolation, and inability to communicate in addition to developing a multitude of physical problems. According to The Intensive Care Society, (2013) standards that have been set in the stroke population for complex patient rehabilitation should be mirrored for this patient cohort. (NICE Quality Standards for Stroke, 2010 and Core Standards for Intensive Care Units, 2013).

Justification & Local Data

Approximately 65 patients are admitted to one of our CC units per month, and there is a particularly a high turnover of patients, 789 patients from July 2012 to June 2013. The CC unit where the project is taking place is a flexible Level 3 and Level 2, 17 bedded unit, its specialities include thoracic surgery, general surgery and haematology. The average length of stay was 5.5 days in 2013. Local data analysis demonstrated that approximately 100 patients have a length of stay over 10 days and 20

patients stay over 30 days (see Appendix 1). Critical Care remains an area where discharge is complex and frequently delayed, particularly in patients with a prolonged stay. Therapists play a crucial role within the multi-professional team (MPT) in facilitating discharge both in terms of maximising the patient's physical function and psychological recovery as well as promoting independence and safety.

The NICE, NG83 CC rehabilitation guideline, (2009) recommends that each patient has an assessment of their rehabilitation needs within 24 hours of admission to CC and states that patients must have a rehabilitation prescription on discharge from CC. This must be updated throughout the rest of the patient's stay in hospital (NICE Guideline 83, 2009). These stages in the patient's rehabilitation pathway were required to be completed in order to fulfill the TR3 A, B & C Commissioners Quality and Innovation (CQIUN) payment framework.

The Core Standards For Intensive Care Units, (2013: page 11) state: 'Patients receiving rehabilitation are offered a minimum of 45 minutes of each active therapy that is required, for a minimum of 5 days a week, at a level that enables the patient to meet their rehabilitation goals for as long as they are continuing to benefit from the therapy and are able to tolerate it'. With current staffing levels this was a real challenge at times.

The TSW role would primarily involve

increasing the frequency and intensity of rehabilitation for stable CC patients through one to one sessions under supervision from registered therapists. This would include daily MOTomed® exercise, cognitive therapies and functional rehabilitation tasks e.g. assistance with personal care. The TSW role would extend to patients who have initially required the expertise and skill from a registered therapist but have now reached a level of recovery by which their day to day rehabilitation could be provided by a TSW. An additional and important benefit would be the release of registered therapists to assess and manage more complex patients. The TSW would assist registered staff with more complex patients and provide administrative support. This will enable registered staff to comply with the NICE recommendations regarding rehabilitation

prescription and goal setting. The TSW role would also aid the smooth transition from CC to the ward area by providing follow up visits in the first few days after the patients transfer. This would be undertaken to ensure the rehabilitation prescription is being followed and adhered to (see Figure 2 for flowchart to show the TSW rehabilitation pathway). Transfer to a ward after CC can be a time of high anxiety for the patient and their family. Having the support of the TSW would ease this transition and help to maintain the rehabilitation momentum that can sometimes be lost in an unfamiliar setting. This support to maintain mobility and continued rehabilitation may play a part in preventing readmission to CC from complications associated with immobility e.g. chest infection.

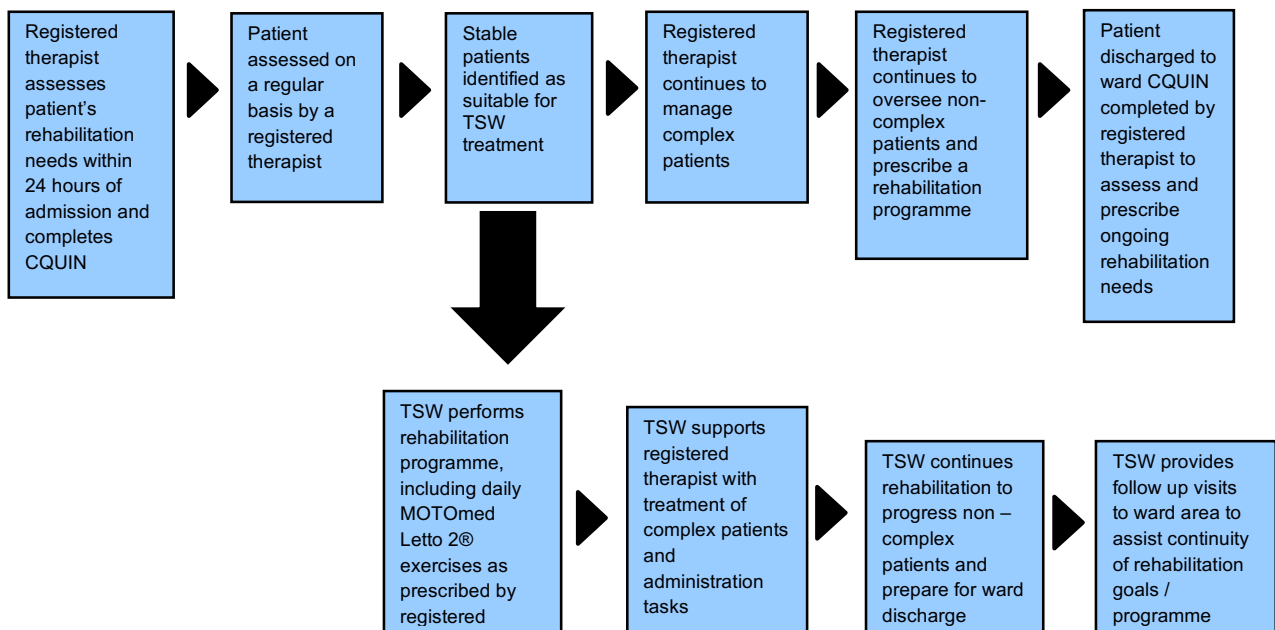


Figure 1: Flow chart of TWS pathway for patient care

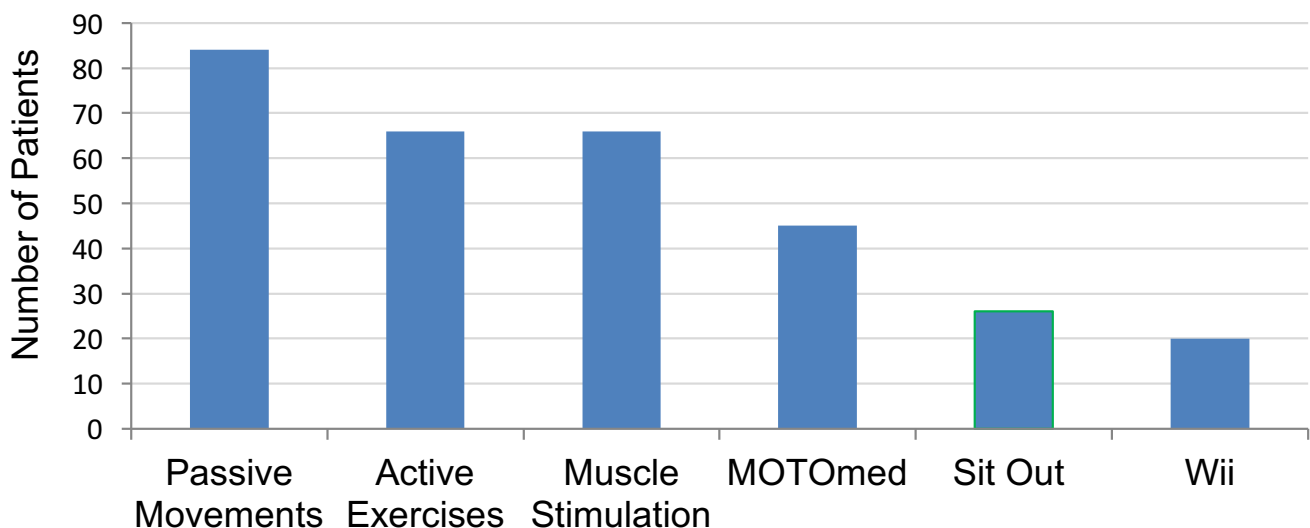
Service evaluation data

A service evaluation was performed in November & December 2013. The evaluations consisted of identifying patients that would have been suitable for rehabilitation input from the TSW on fourteen 'snapshot' days. Data was collected on the rehabilitation tasks that could be performed by a TSW in addition to usual physiotherapy care. These evaluations revealed that on 10 of the 14 days evaluated over half of the patients on the CC unit required active rehabilitation e.g. they were not too unwell or sedated.

In total 186 patients were included in the evaluation and it was demonstrated that 45 patients would have been eligible to perform MOTomed® exercises with a TSW, 66 patients could have performed active exercise with the TSW and 26 patients could have sat out in a

chair. For those patients not able to comply with active rehabilitation (e.g. due to sedation) 84 would have been eligible for a passive exercise program performed by the TSW (see Figure 3). Thus, demonstrating the scope for employing TSW to increase the rehabilitation input to critically ill patients. Over one week the service evaluation identified that 35 additional rehabilitation contacts could have been made by a TSW. An average of 7 contacts a day. Each treatment would take approximately 1 hour (including documentation), plus assisting the registered therapist with complex patients, following up ward patients and the potential to assist in a follow up clinic, this would equate to the workload of 2 whole time equivalents taking in to account annual leave. This service could deliver in the region of an additional 140 rehabilitation contacts per month from each TSW.

Figure 3: Activities that could be carried out by TSW during service evaluation



Criteria for referral to TSW

- Stable sedated and ventilated patients who require passive movements
- Stable sedated or awake patients who would benefit from MOTomed® passive, active assisted or resistive arm or leg cycling
- Awake patients who can perform active, active assisted or resistive exercises
- Patients who can be hoisted out with the nursing staff and TSW
- Patients who can transfer bed to chair with the assistance of 2 (TSW & nurse)
- Stable awake patients who would benefit from functional activities e.g. washing practice
- Stable weaning patients who may benefit from therapeutic touch e.g. hand massage & relaxation techniques
- Stable weaning patients who would benefit from cognitive stimulation e.g. Wii games

Quality, Benefits & Outcomes of Project

Patients

Schweickert et al., (2009) demonstrated that early physiotherapy and occupational therapy in conjunction with daily sedation holds in mechanically ventilated patients is safe, well-tolerated and has shown to result in more ventilator-free days compared with standard care, and a shorter duration of delirium. A number of publications have demonstrated evidence to support increasing physical rehabilitation in CC. Improved functional outcome, muscle strength, exercise capacity and activities of daily living in patients receiving early CC rehabilitation have all been shown. Cognitive rehabilitation will be increased by the TSW with supervision from an occupational therapist. Engagement in a range of activities of daily living will aim to orientate patients, reduce feelings of fear and isolation

and potentially reduce delirium. This type of work is already used successfully in patients with acquired brain injury.

Those patients on the TSW pathway will receive greater rehabilitation intensity and frequency improving the quality of the service and the patient's experience. Greater intensity of therapy (assessment and intervention) for all CC patients is recommended: national clinical guidelines for CC rehabilitation (NICE, 2009) state that each CC patient should receive 45 minutes of each therapy that they require over at least 5 days.

The Trust

Shortening length of stay for long-term patients would release potential for CC capacity for example elective surgical patients. It is envisaged that an improved ward handover and encouragement of continued rehabilitation goals on the wards will prevent CC readmission and could facilitate earlier discharge from the Trust.

Commissioners

Financial benefit of reducing excess bed days for more complex patients by at least one day. For patients whose stay on critical care is over 10 days the aim is to reduce their stay by 1 day and those whose stay is over 30 days by 4 days. There is also the potential for reducing readmission to hospital as patients will have better physical and psychosocial function on discharge home.

There are potential additional savings through reduced risk of infection as a result in reduced length of stay for elderly and vulnerable patients and the releasing of registered therapists to facilitate rehabilitation of more complex patients CC patients e.g. long-term weaning. Potential for releasing registered staff to provide more support to complex patients in ward areas to prevent CC admission.

In the document 'The Role of Assistant Practitioners in the NHS'; Skills for health expert paper (2011) Traché and Hill-Sakurai, (2010 page



6) state the role of assistant practitioners

'Allows lower level tasks to be undertaken by less-qualified and lower-paid staff, while freeing up the time of professional staff to spend on higher-value tasks, is seen as a key strategy in making the working arrangements within the health sector increasingly cost effective.'

This document also states:

'Having an extra person to undertake the simpler tasks can be used to allow an increase in the number of patients who can be seen, or to decrease the length of wait before being seen. It is a cost-effective way of increasing capacity.'

Timeline

- Recruitment – 6-12 weeks dependent on candidate notice period
- Training of the Band 4 TSW so that they are competent to perform rehabilitation with patients within 4 weeks
- Collection of data on patients seen by Band 4 TSW – interventions completed, length of stay and patient feedback
- Interview registered staff and ward staff regarding role for feedback

Reflection

When writing the proposal it was easy to justify the rationale to support increasing rehabilitation frequency and intensity for patients post critical illness from the current evidence base. This was also justified by citing the Core Standards in Intensive Care, (2013) which stated that patients should receive at least 45 minutes of therapy 5 days a week. Being able to demonstrate the potential cost savings was more difficult. To do this we had to rely on evidence from other acute settings for example, in neuro/stroke services that have demonstrated that 'extra' therapy compared to 'usual care' has reduced length of stay and has significantly improved functional independence and quality of life for patients (Peris et al., 2011). We used evidence

where cycle ergometry has been demonstrated to be safe and effective in improving exercise capacity (6 minute walking distance) and physical functioning score (SF-36) in critical care patients (Burtin et al., 2009). The CC data analyst was invaluable in providing data on our unit's admission numbers, length of stay and providing data about long staying patients as this was the group of patients we would target with increased rehabilitation sessions. The financial cost savings forecasted in the paper by Lord et al., (2013) were used to demonstrate the potential savings by increasing the intensity and frequency of early rehabilitation. To justify the potential reduction in the length of stay for patients staying over 10 days and those staying over 30 days we used the meta-analysis performed by Peiris et al.,(2011). Ultimately, the proposal had to demonstrate a benefit to patients, the Trust and commissioners. It was essential that we were able to demonstrate the 'need' and the predicted workload for employing TSW and this was done through performing the snapshot service evaluations to identify patients who would be suitable for referral to a TSW. This information was very important to be able to demonstrate the requirements we needed and demonstrate a role that could be fulfilled. From this data we were able to define their role, estimate time spent with the patient and forecast the number of patients who would benefit per month.

Data will be collected about patients who use the service to identify a number of physical outcomes. These include the Chelsea Critical Care Physical Assessment Tool (CPAx), Manchester Mobility Score, grip strength, quadriceps and biceps strength and first day of standing. We plan to identify if there is a reduction in length of stay across the unit and specifically a reduction in the length of stay for patients who stay over 10 by one day and by 4 days in patients who stay over 30 days through an analysis of retrospective data. A series of retrospective matched case studies will be used to support the data in particular for long staying patients (over 30 days). Patient and relative



feedback will be sought and we will perform focus group discussions with the MPT with regards to the acceptability of the service, in particular use of MOTomed® technology in the CC setting. We hope the CC directorate will see the benefits of this early rehabilitation approach and will continue to fund the service after the year.

Key Points

- Improvement in patient care and functional outcomes through increased frequency and intensity of rehabilitation on CC
- Reduction in length of stay in CC patients specifically those whose stay is over 10 days
- Greater compliance with NICE guidelines and CQUIN requirements
- Improved patient experience/satisfaction
- Potential to reduce CC and hospital readmission.

Acknowledgments

MOTomed Letto 2®Images Courtesy of Medimotion.

www.medimotion.co.uk

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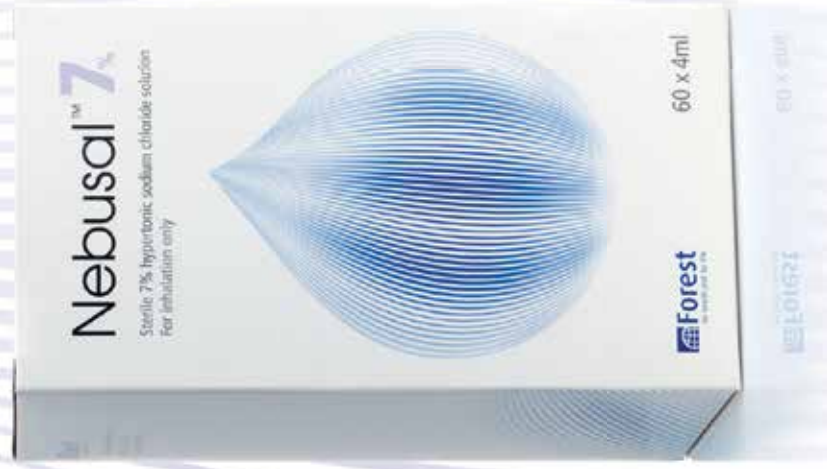
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References:

1. Kelleff F *et al.* *Respir. Med* 2011; **105**(12):1831–1835.
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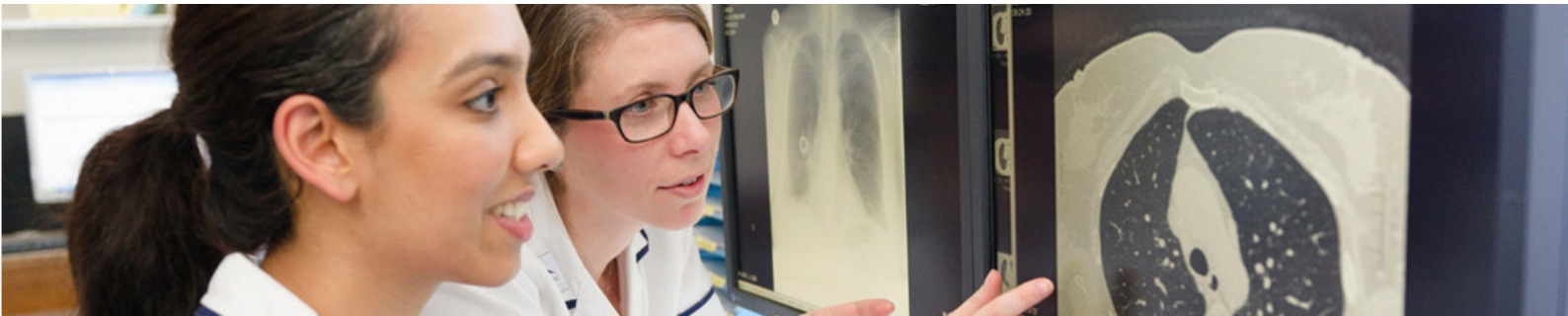


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**The posters in the following pages
were presented at the
ACPRC Conference 2015:**

Walking in the Steps of the Patient:
Integrating Theory and Practice



CHALLENGING CURRENT REHABILITATION PRACTICE

Mobilisation of intubated adults on intensive care is safe



MAY NEL & AMANDA FENTON, IMPERIAL COLLEGE HEALTHCARE NHS TRUST LONDON

BACKGROUND

Recent studies investigating the safety aspects of mobilising critically unwell adults who are deemed fit to do so via a thorough multisystem assessment, have found that early mobilisation of both tracheostomised and intubated patients has a low incidence of adverse events, with no reports of accidental loss of the artificial airway.

Early mobilisation away from the bedside is common in tracheostomised patients; however intensive care staff are often reluctant to pursue such activities in intubated patients due to concerns about accidental endotracheal tube removal, despite evidence to the contrary

AIM

To describe the experience of adopting early mobilisation of intubated adults in relation to accidental endotracheal tube removal during this practice

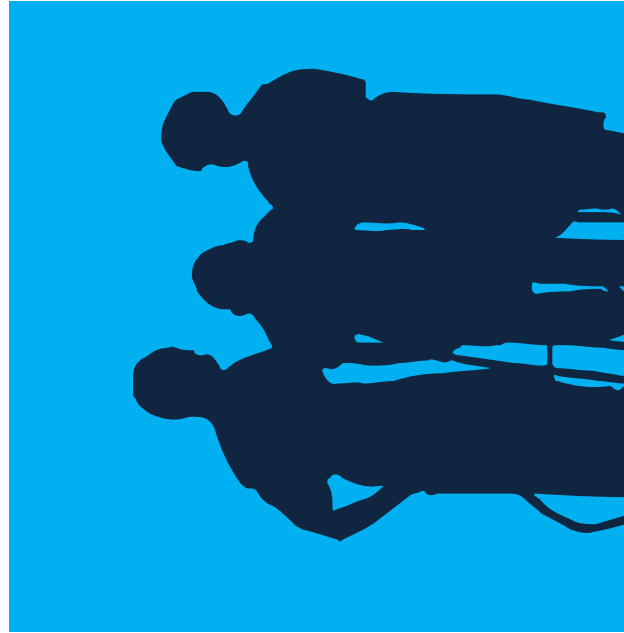
METHOD


Retrospective database analysis

Primary outcome - incidence of accidental endotracheal tube removal during mobilisation events

Secondary outcomes:

- To describe the **type** of mobility events
- Days to planned extubation or tracheostomy from the initial mobility event
- Days from admission to initial mobility event



Imperial College Healthcare 
NHS Trust

Mobilisation of intubated adults on intensive care is safe

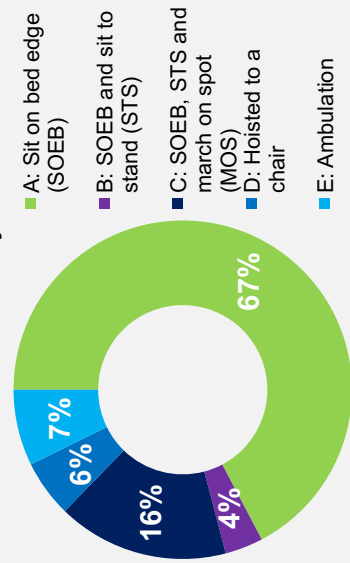


MAY NEL & AMANDA FENTON, IMPERIAL COLLEGE HEALTHCARE NHS TRUST LONDON

RESULTS

- No incidence of accidental loss of the endotracheal tube during mobility events
- Mean number of days from mobility event to either extubation or tracheostomy insertion was 6.5 (0-41).
- Mean day mobilised was Day 9.6 of ITU stay (2-26) with most patients achieving a mobility event on Day 8.

Mobility events n=55



DISCUSSION

Our results support recent literature describing the safety of early mobilisation in critically unwell ventilated adults, with either endotracheal or tracheostomy tubes.

We describe a range of mobility events executed in a discrete population of intubated adults without loss of the endotracheal tube.

Physiotherapists who are reluctant to mobilise patients based on the presence of an endotracheal tube may wish to challenge the reasoning behind their practice.

CONCLUSION

The presence of an endotracheal tube should not be an absolute barrier to the practice of early mobilisation



The safety of using an exercise bike in a post-operative cardiothoracic surgery population

P Earp & C Pereira

Royal Brompton & Harefield NHS Foundation Trust, London

Background

- It is well-recognised that patients who undergo cardiothoracic surgery are at a greater risk of pulmonary complications (Pasquina et al 2003), with a growing body of evidence supporting early mobilisation as a key intervention in post-operative rehabilitation (Stiller et al 1994, Brasher et al 2003).
- At Harefield Hospital exercise bikes are frequently used in circumstances where early mobilisation is more difficult to achieve.
- There is currently no published research regarding the safety of using exercise bikes in the rehabilitation of post-operative cardiothoracic patients.

Aim

- To record the incidence of significant haemodynamic changes and adverse events in patients using an exercise bike during physiotherapy treatment.

Method

- Over a five-month period, we collected data on all cardiothoracic patients (ward levels 1 – 3) whose post-operative rehabilitation included the use of an exercise bike; including their cardiovascular, respiratory and ventilatory status, presence of inotropes and ability to transfer.
- Adverse physiological responses were also recorded, in addition to other subjective or objective adverse incidents lasting more than 60 seconds.

Demographics (n = 39 patients)

Age, yrs (mean (SD))	46 (16)
Males	26
Females	13
Number of patients with their own airway	36
Number of patients with a tracheostomy	3
Number of treatment episodes on room air	55
Number of treatment episodes on O ₂	25
Number of treatment episodes on inotropes	8
Number of treatment episodes in Level 1 areas	8
Number of treatment episodes in Level 2 areas	49
Number of treatment episodes in Level 3 areas	23



The safety of using an exercise bike in a post-operative cardiothoracic surgery population

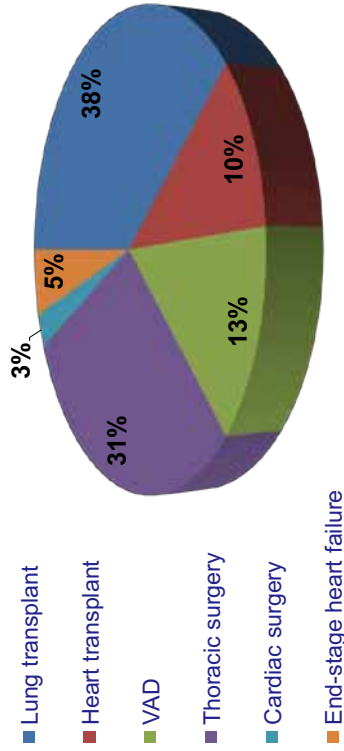
P Earp & C Pereira

Royal Brompton & Harefield NHS Foundation Trust, London

Results

- A total of 80 audit forms were completed for 39 patients.
- 38% of treatments occurred in the lung transplant population (Figure 1).
- Six (7%) adverse events were identified. 83% of these occurred in the lung transplant population.
- There was one recorded instance of >25% change in cardiovascular parameters.

FIGURE 1 Patient speciality pie-chart



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Discussion

- There appears to be no relationship between cardiovascular or respiratory status, level of assistance required to transfer, mode of ventilation or presence of inotropes and the risk of adverse event.
- The post-lung transplant population were more likely to have an adverse response than other patient groups.
- Physiotherapists should consider the use of exercise bikes as an alternative form of early mobilisation in post-operative cardiothoracic patients.

Conclusion

- **Exercise bikes are a safe means of providing post-operative rehabilitation in a cardiothoracic population.**



Book Review – Sandy Thomas

Physiotherapy in Respiratory and Cardiac Care 4th Edition 2014

Author:

Alexandra Hough

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This book, together with its online support material provides an outstanding and comprehensive resource for physiotherapists and other health professionals working with patients in respiratory and cardiac care. The book presents cardiorespiratory anatomy and physiology, patient assessment, respiratory and cardiac disorders and physiotherapy and general management strategies applied in a variety of settings, in a logical format. Each chapter contributes to the overall flow of the book and includes case studies, clinical reasoning questions and a list of recommended reading, enabling the reader to consolidate their learning. This is further supported in the online version with multiple choice tests and crosswords which help to motivate and challenge learners.

Alex manages to combine clear and concise basic explanations with complex clinical reasoning in an approachable way. Each chapter aims to help the reader towards an understanding of key concepts and to then apply these to physiotherapeutic and medical clinical decision making. This is helped by the use of numerous excellent pictures, flow charts, quotes in boxes, practice tips and well designed tables, supported by the use of humour and the inclusion of challenging statements, sometimes contentious, which encourage the reader to think and challenge their practice.

This is a comprehensive resource, complete with numerous references to inform and

support practice. Alex includes past as well as recent references in this text, and encourages the reader (through clinical reasoning questions) to consider their relevance and their potential usefulness to physiotherapy practice. She makes pertinent observations which are designed to stimulate the reader's interest and awareness, and an online list of references is provided to enable individuals to investigate the evidence base further.

This is an extraordinary book that captures the complexity of physiotherapeutic clinical reasoning in a unique way because it combines the knowledge base required for procedural and diagnostic reasoning with questions and comments designed to promote patient centred care. Each section includes quotes from patients which ensure that the patient voice is heard throughout and continually act as a 'reality check' for the reader, giving a context for the clinical information and promoting a collaborative approach to reasoning. The use of quotes in boxes, challenging statements in the text, and unexpected 'outside the box' suggestions helps to stimulate the level of thinking and critical reflection necessary for expert reasoning.

The clear presentation of underlying theory will be invaluable to students as well as to qualified physiotherapists working in respiratory and cardiac care, and the online material contains superb powerpoint presentations which will be useful to undergraduate tutors as well as CPD educators and those promoting learning in the clinical environment. A degree of experience and wisdom may be needed in order to fully engage with some of the more complex reasoning however, and to respond appropriately to the more controversial questions and statements.

Respiratory care practitioners are indebted to Alex for her contribution to this discipline. This is the sort of reference book that can be picked up again and again over the years –each time learning something new that can be applied to further develop one's expertise in respiratory care and physiotherapy.





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