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Summary

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

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Keywords:

Physiotherapy
Intensive care
Critical Illness
Rehabilitation

Introduction

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

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

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

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

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

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

Method

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

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

Results

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

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

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

Table 1. Patient demographic details

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

Table 2. Unit details (18 bedded unit)

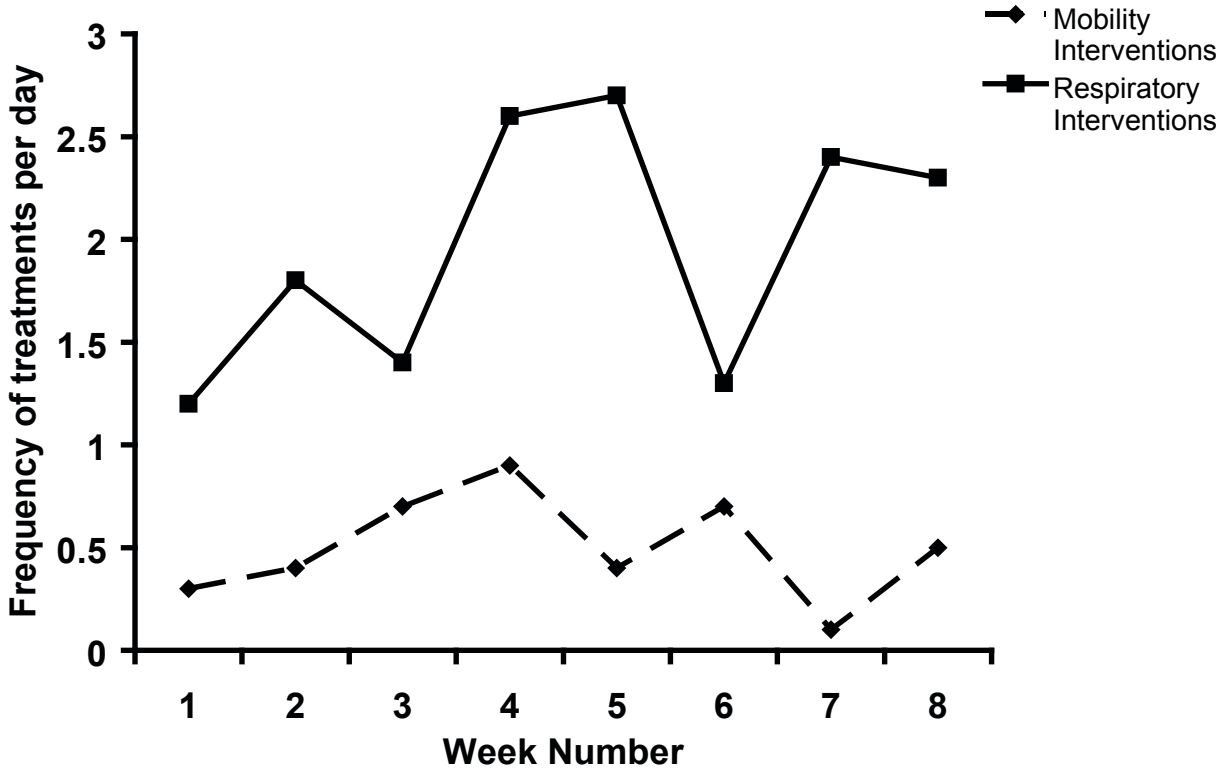
Week	1	2	3	4	5	6	7	8
Number of patients	20	14	11	8	3	2	1	1
	Daily frequency of interventions (Median)							
Respiratory Assessment	1	1.3	1.2	1.1	1.1	1.1	1.86	1.83
ACBT*	0	0	0	0	*	0	*	0.17
Modified ACBT*	0	0	0.3	0.3	1	0.1	0.29	*
IPPB	*	0	0	0	*	0.2	*	1.67
Positioning	0.1	0.1	0	0	0.1	*	0.14	0.17
Suction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

Table 3 Average daily frequency of respiratory interventions delivered * Not Used

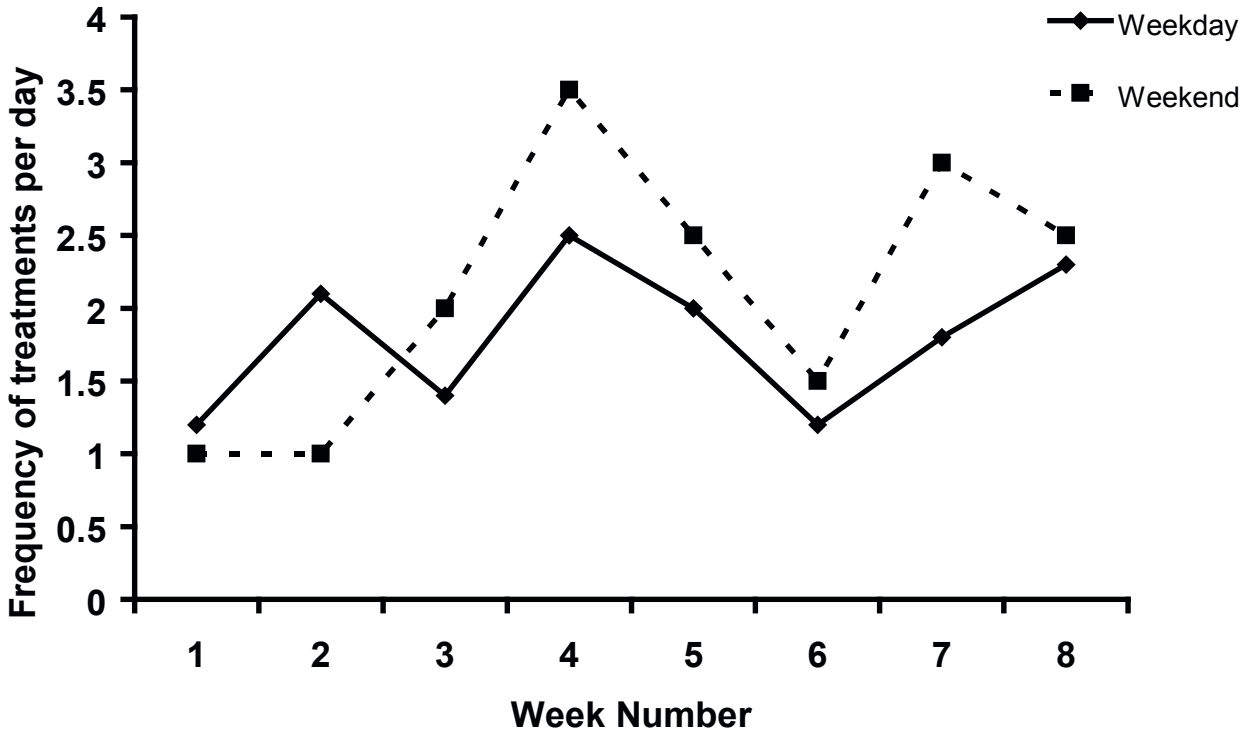
Week	1	2	3	4	5	6	7	8
Number of patients	20	14	11	8	3	2	1	1
	Daily frequency of interventions (Median)							
Passive ROM	0.2	0.2	0	0.2	0.1	0.1	0.14	*
Active exercises	0	0.1	0.2	0.3	0.3	0.3	*	0.5
Bed edge sit	*	0	0	0	*	0.1	*	*
Encore to transfer with footplate	*	0	*	0	*	0.2	*	*
Walking/stepping with encore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

Table 4 Daily frequency of mobility interventions delivered * Not Used

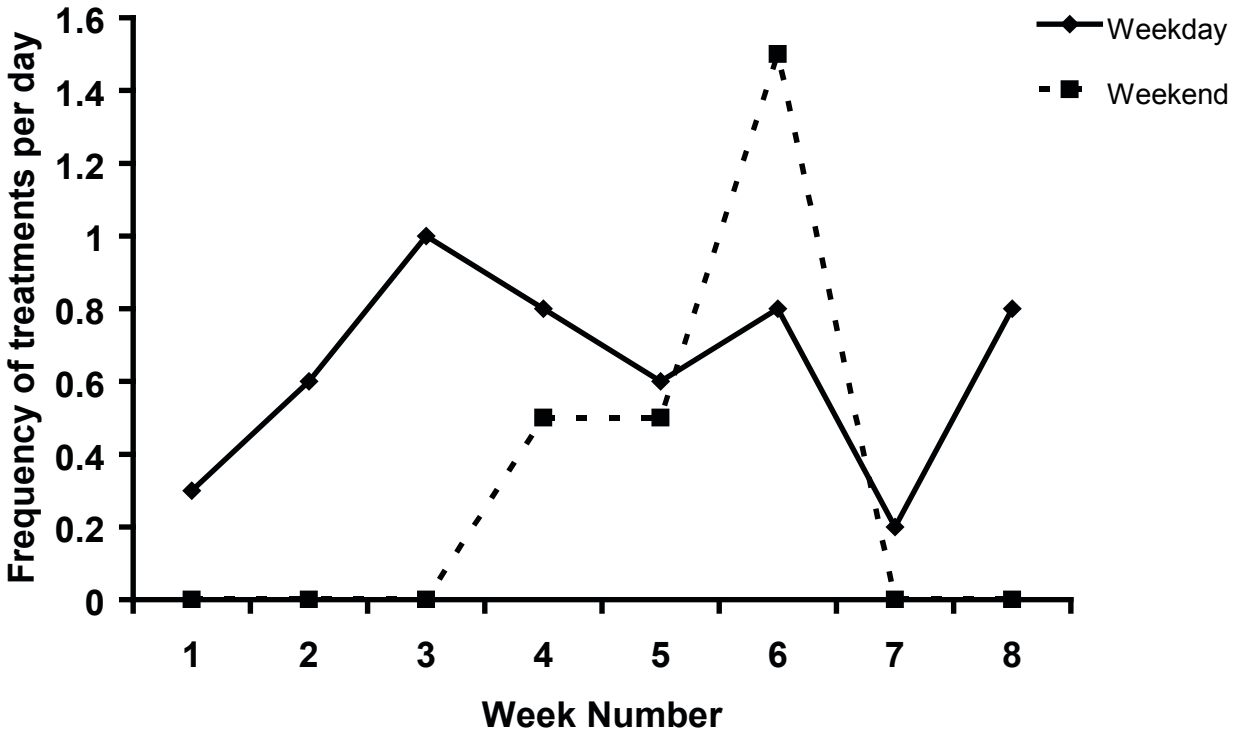
A comparison of the frequency of collective respiratory and mobility interventions was calculated. Graph one illustrates the frequency of respiratory and mobility interventions for week one and each subsequent week. The daily frequency of respiratory treatments was always higher than mobility treatments during each week. The frequency of mobility treatments was increased in later weeks (Weeks 3, 4 and 6) for patients with a more prolonged stay, although they are still receiving less than one mobility intervention per day.



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



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



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

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

Discussion

The results of this service evaluation indicate that at the time of data collection physiotherapy in our ICU predominantly provided 'respiratory interventions' and the frequency of 'mobility interventions' was low. These results were inconsistent with the perceptions of the physiotherapy staff working in this ICU, who felt they took a pro-active approach to rehabilitation within the unit. This raises the question of whether there is as much rehabilitation within intensive care as is suggested by postal questionnaires.

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

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

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

The physiotherapy team which covered the 18 bedded general ICU (comprising 6 level 2 beds and 12 level 3 beds) also covered a 12 bedded general HDU (level 2 beds), two 36 bedded surgical wards and provided ad hoc cover to the general day surgery unit. The team consisted of two whole time equivalent (WTE) band 7 clinical specialists, one WTE band 6 rotational specialist physiotherapist, two WTE band 5 rotational therapists and a 0.5 WTE band 3 technical instructor. This made for a busy and heavy caseload, although it was not felt by the team that the low rates of mobility interventions can be solely attributed to staffing levels. It could be suggested that interventions delivered were influenced by the physiotherapists perception of traditional 'chest physiotherapy' within the ICU including techniques such as MHI, positioning and manual techniques (Ntoumenopoloulos et al 2002). These results indicate that physiotherapists may prioritise these respiratory interventions over mobility and rehabilitation interventions. A contributory factor at the time of this evaluation may have been that there was no local protocol or guideline for mobilisation of this patient group. However this is now being addressed at a national level in Scotland and may influence future levels of mobility interventions. A further study following the introduction of this national protocol could evaluate it's impact on current levels of rehabilitation.

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

ICU both on weekdays and at the weekend.

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

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

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

Conclusion

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

Acknowledgements

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