Neonatal respiratory therapy in the new millennium: Does clinical practice reflect scientific evidence?

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Respiratory therapy has historically been considered the primary role of the physiotherapist in neonatal intensive care in Australia. In 2001 a survey was undertaken of all level three neonatal intensive care units in Australia to determine the role of the physiotherapist and of respiratory therapy in clinical practice. It appears that respiratory therapy is provided infrequently, with the number of infants treated per month ranging from 0 to 10 in 15 of the 20 units who provide respiratory therapy, regardless of therapist availability. The median number of respiratory treatments per month during the week was three, and on weekends it was one. Respiratory therapy was carried out by physiotherapists and nurses in 54.6% of units, by physiotherapists only in 36.4% of units, and by nurses only in the remaining 9% of units surveyed. There was also a diminution of the role of respiratory therapy in the extubation of premature infants. A review of the literature shows that overall the use of respiratory therapy reflects current evidence. The question remains whether it is possible to maintain the competency of staff and justify the cost of training in the current healthcare economic climate. It seems probable that the future role of physiotherapists in neonatal intensive care unit may be in the facilitation of optimal neurological development of surviving very low birth weight infants. [Hudson R and Box RC (2003): Neonatal respiratory therapy in the new millennium: Does clinical practice reflect scientific evidence? Australian Journal of Physiotherapy 49: 269–272]

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Introduction

With improvements in technology and medical care, increasing numbers of very low birth weight infants are surviving the neonatal period (Australian and New Zealand Neonatal Network 1999). Physiotherapists are frequently found as members of the highly skilled team contributing to the infants’ outcome. Although the physiotherapists’ role varies between neonatal intensive care units, it has traditionally focused on the respiratory care of the infant.

Investigations into the effect of respiratory therapy have frequently had small sample sizes, a variety of infants and have used a range of respiratory techniques (Dall’Alba and Burns 1990, Etches and Scott 1978, Finer et al 1979, Finer and Boyd 1978, Fitzpatrick et al 1988, Tudehope and Bagley 1980). Therefore, the ability of clinicians and medical practitioners to make evidenced-based decisions is impeded.

The effect of pre-extubation respiratory therapy, as differentiated from a post-extubation protocol, on the incidence of post-extubation atelectasis in infants has yet to be investigated in a clinical trial. Nonetheless in 1992 it was reported that pre-extubation respiratory therapy occurred in 9 of the then 14 units in Australia (Lewis et al 1992).

More recently, controversy has surrounded the use of respiratory therapy in neonates with the reporting of an association between respiratory therapy and the brain lesion postnatal encephaloclastic porencephaly (PEP) (Cross et al 1992, Harding et al 1998). However, this association between respiratory therapy and neurological status has subsequently been questioned by the same research team in a larger retrospective audit and by other researchers (Beeby et al 1998, Knight et al 2001).

Until 2001, the practice of physiotherapy in the neonatal intensive care unit of this large tertiary hospital reflected the most current available recommendations (Bertone 1988). In 2001, a review of clinical practice in Australia was undertaken in light of more recent literature and the lack of conclusive evidence and considerable variation in reported practices. The aim was to determine whether the proposed clinical protocol revisions reflected best practice and were consistent with the current clinical practice of experienced clinicians within the physiotherapy profession.

Methods

A questionnaire was sent to the physiotherapy departments of all hospitals in Australia listed on the website as members of the Australian and New Zealand Neonatal Network. Two institutions were excluded as one did not have a neonatal intensive care unit and the other hospital had been closed. Items for inclusion in the questionnaire were identified from the literature and from discussions
with experienced clinicians (copies are available from the author).

A search of the literature was conducted from commencement of the database until February 2002. The following resources were searched: PEDro, PubMed, the Cochrane Library and Ovid databases, Medline and CINAHL. All studies were considered if they addressed the use of respiratory therapy in the neonatal or premature population. Previously published systematic reviews were included with individual studies verified by the authors.

Surveys were circulated to the physiotherapists of each of the 21 institutions. Participation was then followed up by telephone with a response time of three months permitted.

Completed questionnaires relating to clinical practice in 2001 were included if received by 31 March 2002. All data were coded to ensure anonymity, collated and verified using database software.

Discussion with the executive officer, Southern Health Research Ethics Committee, indicated that specific ethics approval was not required for this project reviewing best practice.

Data analysis Qualitative analysis was undertaken and is presented descriptively. The order of importance of criteria used to indicate the commencement of respiratory therapy was determined by summing scores given for each item by each institution. Each participating institution ranked each criterion in its order of importance from 1 (highest) to 10 (lowest). Therefore, the minimum possible score for any criterion was 20 and the maximum possible score was 200. A lower score indicated higher priority for the criterion in the process of clinical decision-making for the commencement of respiratory therapy.

Results

Data were obtained from 20 of the 21 institutions surveyed (95.2% response rate) with participation from all Australian States and Territories. Characteristics of the neonatal intensive care unit and the physiotherapy services provided are given in Table 1.

A total of 15 out of 20 units (75%) provided respiratory therapy services. Three of the five institutions not providing respiratory therapy had physiotherapists trained in this intervention. There was considerable variation in the number of trained physiotherapists available at each institution (Table 1) but this was not related to the number of beds in the neonatal intensive care unit (Pearson’s $r = 0.14, p > 0.05$).

Although most neonatal intensive care units had a physiotherapist present from Monday to Friday, it was reported that active respiratory therapy was provided by either a physiotherapist or nurse in 54.5% of neonatal intensive care units. In the remaining neonatal intensive care units, 36.4% had respiratory therapy treatments provided by physiotherapy staff only, compared to 9.1% by nursing staff only. Competency testing of physiotherapy staff providing respiratory therapy was practised in 80% of units. Physiotherapists contributed to the process of developing competency in the nursing staff providing respiratory care in only 30% of the units. Lectures, checklists and competency testing were the most common methods used by both professions, but physiotherapists also used formal training packages more frequently than did nursing staff.

A weekend service provided by physiotherapists was available in 55% of units performing respiratory therapy, as was a 24-hour service (Table 1). Providers varied between rostered staff and staff on-call, with a variable but overall very low demand for this service (Table 1).

The responses of the 15 neonatal intensive care units providing active respiratory therapy were collated to determine the order of importance of the criteria used to commence treatment with an infant. Using the Delphi technique, the ranked order of importance was as follows

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Table 1. Summary of respiratory physiotherapy service delivery in 15 level 3 neonatal intensive care units surveyed in Australia 2001.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Median</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of ventilated beds</td>
<td>20</td>
<td>10</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>No. of trained physiotherapists</td>
<td>18</td>
<td>4.5</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>No. of physiotherapists in unit daily</td>
<td>18</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>No. of respiratory treatments/month*</td>
<td>15</td>
<td>3</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Weekend service availability (hours)</td>
<td>11</td>
<td>8</td>
<td>0</td>
<td>24</td>
</tr>
<tr>
<td>No. of weekend treatments/month*</td>
<td>11</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>No. of after hours treatments/month*</td>
<td>11</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

*Some respondents provided ranges when asked to estimate the frequency of service. When a range was provided the maximum was used.
from the most important: changes on chest x-ray (33), thick secretions (40), copious secretions (52), increasing oxygen requirements (66), change in ventilatory parameters (68), auscultation findings (76), palpation findings (77), chronic lung disease (92), prophylactic (107) and, finally, a combination of factors (115).

Twenty-five percent of units provided pre-extubation respiratory physiotherapy. The main reasons for instituting this intervention were history of previous extubation failure or presence of excessive secretions (80%). Other reasons, such as referral from medical staff or chest x-ray results, were reported in 40% of cases. No neonatal intensive care unit used this intervention as a routine procedure, or for infants with chronic lung disease.

Techniques used by physiotherapists providing respiratory therapy to infants in neonatal intensive care units are as follows: postural drainage no tip (35%), postural drainage with tip (0%), non-specific positioning to alter ventilation (75%), vibrations (75%), percussion (75%), positioning prior to treatment (55%) and pre-extubation suction (55%). Other techniques used by physiotherapists in the overall management of neonates included water pillows (15%), peanut pillow (50%), nest (90%) and techniques such as education, Fraser chair, bean bags and action pads (30%).

Discussion

The response rate to this survey was extremely high (95%). The survey indicated that respiratory therapy continues to be an integral part of the physiotherapist’s role in the majority of neonatal intensive care unit in Australia.

The use of respiratory therapy is much lower than reported by Lewis et al (1992). Regardless of physiotherapy staff availability on a weekday, weekend, or after-hours basis, a median of three treatments were provided per month. In 36% of units physiotherapists were the only providers of this therapy, but respiratory therapy was shared between nurses and physiotherapists in 55% of units. It is of interest that the survey by Lewis et al (1992) found no units in which respiratory therapy was provided solely by physiotherapists. As only physiotherapists participated in the current survey, it is possible that the estimated service utilisation does not reflect overall unit practice. The question remains whether the investment in staff training is warranted given the reported use of this intervention with neonates. Furthermore, with fewer infants being treated, and more than one profession being involved in service provision, the issue of clinical competency being maintained over time requires consideration.

The reasons given in the current survey for not providing respiratory therapy were that it is associated with PEP and intraventricular haemorrhage, poor staffing levels, and neonatologist’s preference. Decline in respiratory therapy practice since the 1988 survey by Lewis et al (1992) cannot be based on the association between respiratory therapy and PEP or other abnormal neurological outcomes, as this association has recently been disputed by a number of authors (Beeby et al 1998, Knight et al 2001). Medical advances such as surfactant therapy and nasal continuous positive airway pressure may have contributed to the change in the pattern of service provision (Davis and Henderson-Smart 2000, Soll 2000).

This survey has confirmed that the most frequent criteria for initiation of respiratory therapy are chest x-ray changes and thick or copious secretions. This finding is consistent with Lewis et al (1992). Despite methodological flaws in the current available evidence, these criteria are consistent with the specific goals of respiratory therapy intervention (Dall’Alba and Burns 1990, Etches and Scott 1978, Oberwaldner 2000). It appears that routine or prophylactic interventions are not provided by physiotherapists, and manual techniques are used by the majority of therapists in neonatal intensive care units in Australia. The use of non-specific positioning had not been reported previously, however it appears to be used by the majority of clinicians. This may reflect the current trend toward non-specific positioning for physiotherapy in the paediatric and adult respiratory populations (Parker and Prasad 1998).

It is in the prevention of post-extubation atelectasis where respiratory therapy practice has altered the most. Currently, 25% of units report that respiratory therapy is part of the extubation process, a change in practice in 46% of units (Lewis et al 1992). The decline in the use of respiratory therapy certainly reflects the findings in the literature (Al-Alyian et al 1996, Bloomfield et al 1998), and the advent of post-extubation nasal continuous positive airway pressure (Davis and Henderson-Smart 2000). The results of a systematic review suggested that respiratory therapy may have a role in preventing reintubation of infants who have previously failed extubation (Flendy and Gray 2001). Respondents cited excessive and thick secretions and previously failed extubations as the reasons for the intervention. Thus, the decline in units providing respiratory therapy within the extubation process appears to be the result of consideration of the evidence. It may be that infants who are at high risk of failing extubation because of sputum retention may benefit from respiratory therapy in conjunction with nasal continuous positive airway pressure. A study to date has investigated the effects of pre-extubation respiratory therapy alone or in conjunction with nasal continuous positive airway pressure.

Conclusion

This survey demonstrates that the physiotherapist’s role is evolving in response to medical advances and current evidence. It seems that the proposed clinical protocol revisions at this institution reflect best practice based on the highest levels of evidence currently available. It is unclear whether the effort to maintain competency and clinical expertise is viable given the very small numbers of infants requiring this service. While the majority of surviving very low birth weight infants do not require respiratory therapy, the management of other problems emerging in the surviving neonatal population, such as the neurological
sequelae of prematurity, becomes a challenge for physiotherapists who want to allocate resources well and provide evidence-based treatment.

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References


