LETTERS TO THE EDITOR

Respiratory rate and pneumonia in infancy

Sir,—Dr Berman et al have presented an interesting and comprehensive paper about the use of respiratory rate in infants in the diagnosis of pneumonia.1 This is an important topic because counting respiratory rate is a critical aspect of the World Health Organisation acute respiratory illness programme. One of the difficulties has been the normal range of respiratory rate in infants when they are awake.2 Berman et al suggested that our results (mean (SD) 61 (18) minutes) were too high because they did not carry out studies using electronic monitoring. Unfortunately, electronic monitoring is not a satisfactory gold standard for respiratory rate because studies in awake babies have movement artefact and the study of sleeping babies is not appropriate for routine clinical practice. Our range of respiratory rate for sleeping babies was similar to those in the published literature (42 (12) minutes).

They suggest that the use of a stethoscope or a hand on the chest for counting the respiratory rate in our study may have stimulated the infants to breathe faster than normal. Their own observation studies could result in a respiratory rate 14 breaths/minute higher than that obtained by observation. This may be possible, although it was not our observation. We used this technique simply because we found it very difficult to count respiratory rate by observation and wanted to use a technique that could easily be used in all babies regardless of their state. It was our experience that respiratory rate could be counted by observation accurately in sleeping or ill babies because they lie still and often have increased respiratory effort. It was surprisingly difficult in lively healthy babies because they move approximately once a second and also breathe shallowly and irregularly.

Berman et al compare our data with a study in which respiratory rate was counted by observation in a community in Peru. Unfortunately, even that data can not be considered to represent the respiratory rate range of normal infants because the children were selected for the study only if they had a cough.

Unfortunately, the authors make a common statistical mistake when calculating sensitivity, specificity, and predictive values for pneumonia using respiratory rate above or below 50 or 60 breaths/minute. Their data were collected only from selected children seen in hospital. In their Denver study the infants were only seen if they had a cough or congestion and in the Vellore study the infants presented with a runny nose or cough.

The authors had no data from normal infants. Sensitivity, specificity, and predictive values are accurate only for the populations from which the data were derived and cannot be applied to infants in the community. Even using this selected data the sensitivity of a respiratory rate of 60 or more for lower respiratory infection was only 65% in Denver and 58% in Vellore. To be a useful screening test for pneumonia, respiratory rate measurement must have a much higher sensitivity.

Before it can be claimed that respiratory rate is a useful screening tool for pneumonia data must be presented using a simple technique of proved accuracy and repeatability from children with pneumonia and normal children in the communities where it will be used.

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Dr Berman and Simoes comment:

We appreciate the opportunity to respond to Dr Morley's comments and annotation. The issue of the usefulness of simple clinical signs to identify pneumonia is important and we agree that it is necessary to document the range of respiratory rate counts in infants with and without acute respiratory infections. Interpretation of studies is impaired by the use of different counting methods. Unfortunately there is no counting method that can be considered a gold standard. It is possible that differences in respiratory rates reported in studies may partially reflect the different methods used to obtain them. Our own study comparing simultaneous counts obtained by observation, electronic pneumograms, and echocardiographic tracing documents differences between these methods.3 Our annotation pointed out that counting with a stethoscope or by placing a hand on the abdomen may itself result in differences compared with obtaining counts by other methods. The use of a 15 second counting interval would also increase any consistent difference by a fourfold factor. We agree with Dr Morley that respiratory rates in very active 'lively' infants is difficult regardless of the counting method. Our recently completed study corroborates this finding.

The World Health Organisation (WHO) chose to develop respiratory rate thresholds based on data obtained using 60 second observed counts. This choice was made for operational reasons, based on the need to train community health workers to count respiratory rates without using a stethoscope. The WHO respiratory rate thresholds have been designed to be used on subjects who have respiratory symptoms of cough or coryza. The case management guidelines are not relevant for healthy infants and children without respiratory symptoms. It is for this reason that sensitivity, specificity, and predictive value should be calculated on populations with respiratory symptoms. The predictive value of the respiratory rate threshold for pneumonia will vary with the prevalence of the pneumonia in the population with respiratory symptoms. It was not our intention to generalise sensitivity, specificity, and predictive value to the total population of children with and without respiratory symptoms.

We agree that the sensitivity and specificity of the WHO respiratory rate threshold applied to infants under 2 months of age is not as good as that in older infants and children. Further research is needed to evaluate the usefulness of the threshold in association with other clinical signs to diagnose pneumonia in that age group. Studies are underway in the Gambia and the Philippines to clarify these issues.


Diagnosis of pneumothorax by echocardiography

Sir,—Over the last 18 months we have performed frequent echocardiograms on ventilated neonates as part of a study on haemodynamics.4 Pneumothorax is common in this setting. We report three cases where pneumothorax was first suspected on echocardiography.

Case reports

Case 1

This infant, born at 41 weeks' gestation with birth weight 2370 g, was ventilated after birth asphyxia and meconium aspiration. A chest x ray picture at 4 hours showed no air leak. At 22 hours the heart was difficult to see echocardiographically and was best seen from the right sternal edge. There was no clinical deterioration. Transillumination was negative. A further chest x ray picture showed a small left pneumothorax which was managed conservatively. Five hours later, radiography showed no air leak and echocardiographically the heart was easily seen and normally positioned.

Case 2

This infant, born at 25 weeks' gestation weighing 785 g, was ventilated for hyaline membrane disease. There was no air leak on a chest x ray picture at 4 hours. At 16 hours, on echocardiography, the heart was difficult to see and displaced to the right. Transcutaneous carbon dioxide had risen from 4.5 to 6.9 kPa over the previous half hour. Transillumination showed left tension pneumothorax. After drainage, the heart was no longer displaced on echocardiography.

Case 3

This infant, born at 27 weeks' gestation weighing 1040 g, was ventilated for hyaline membrane disease and birth asphyxia. A chest x ray picture at 10 hours showed no air leak. Echocardiography at 14 and 36 hours showed poor myocardial function. From 48 to 52 hours systolic blood pressure fell from 40 mm Hg to 32 mm Hg despite support. At 52 hours the heart was difficult to see echocardiographically but was displaced to the left with the apex tilted cranially. Transillumination showed right tension pneumothorax. After drainage the blood pressure rose to 58 mm Hg; echocardiography showed an easily seen, normally positioned heart.

The heart is normally easy to see echocardiographically in the neonate ventilated for hyaline membrane disease. In these cases the heart was difficult to see from the left sternal edge, and was displaced away from the air leak; this was presumably due to a combination of mediastinal shift and interposing air, which is impervious to ultrasound. Unilateral pulmonary interstitial emphysema has mimicked these findings, hypertrophied...