Is pulmonary index score suitable for the evaluation of paediatric acute asthma?

The aim of this work was to evaluate whether the pulmonary index score was a suitable tool for the assessment of paediatric acute asthma in an emergency department, compared with the National Asthma Council Guidelines.

Methods
This was a prospective controlled trial conducted between February 2006 and February 2008 at the Children's Hospital at Westmead, Australia. Children aged 1–12 years presenting to the emergency department (ED) with acute respiratory distress and wheeze typical of acute asthma were included. Patients were recruited nonconsecutively during February and winter months of each year of the study period. All physicians and nurses participating at the study were familiar with the National Asthma Council Guidelines (NACGs) and were trained in pulmonary index score (PIS) use. Informed oral consent was provided by the parents. Each child was assessed independently by a physician and a nurse at the same time, before the patient's first dose of salbutamol. Physicians were allocated to assess children using the PIS on odd days and nurses on even days, and vice versa for the NACG assessment. So, each child was evaluated with the PIS and the NACGs at the same time. The data collected were further analysed using statistical software. In order to assess the internal consistency of the four different items in the PIS, the Cronbach $\alpha$ internal consistency coefficient was calculated.

Results
65 children (38 males and 27 females) were recruited for the study, with a mean age of 5.4 years. Most of them were classified as having mild (52%) or moderate (37%) asthma, and 26% had severe asthma, according to the NACGs. Nearly one-third were admitted to the hospital. The mean PIS was 6.1. According to statistical analysis, a PIS of $\geq 6$ had a sensitivity of 85%, specificity of 75% and an area under the receiver operating characteristic (ROC) curve of 0.896 (95% CI 0.822–0.970) for predicting nonmild cases. A PIS of $\geq 8$ had sensitivity of 88%, specificity of 77% and an area under the ROC curve of 0.874 (95% CI 0.792–0.957) for predicting severe cases. To evaluate agreement between the NACGs and the PIS, median PIS values were compared across different categories of asthma severity classified according to NACGs. The median PIS values for the mild, moderate and severe NACG categories were 3.0, 7.0 and 8.0, respectively. Moreover, there was a significant difference ($p < 0.001$) in mean PIS values between patients who were admitted to the hospital and those who were not, with a mean PIS values of 8.4 and 5.0 for admitted and nonadmitted patients, respectively.

Conclusion
This study demonstrated that the PIS could predict, with high sensitivity and specificity, the different categories of asthma severity according to the NACGs, and that the PIS could be applied as an useful tool for the assessment and monitoring of acute asthma attack in children in the ED.

Message
The pulmonary index score, compared with National Asthma Council Guidelines, seems to be a suitable, safe and simple-to-use tool to evaluate children with acute asthma attack in a paediatric emergency department.

Competing interests
None declared.

Original article

Editorial comment
Acute asthma attacks remain a major complain in the ED, especially in children. Therefore, a simple and quick assessment tool is needed to standardise and make easier the management of asthma in ED. In children, especially in the acute phase, lung function tests are impractical and not useful. In Australia, where the present trial was conducted, the most widely accepted acute asthma assessment measure is based on the NACGs, which divides asthma into mild, moderate and severe. The NACGs are based on several examination findings and on lung function tests. It has been shown to be a valid tool in assessing acute asthma in children [1, 2]. The PIS is composite of objective clinical observations and not of lung function tests, and it has been validated for use in children with acute asthma attacks.
asthma as well as adults [3]. The absence of lung function tests in the PIS is the most consistent advantage compared with the NACGs. It is already known that during acute asthma attacks, especially in children, lung function tests are not reliable and often are impractical. The PIS was published more that 20 years ago, and further asthma scores are based on the PIS with some modifications.

The PIS score seems to be a simple and useful tool to assess acute asthma, and this study confirms this impression, but there are some additional considerations. It is true that the PIS is based on objective clinical observations, such as respiratory rate, but these are not all easily used in all children. The authors stated that the inspiratory-to-expiratory ratio should be measured by tapping out or counting the seconds required in each phase, but in a small child with a respiratory rate of 50 breaths per min, this could be difficult to count. The rating of the use of accessory breathing muscles and the wheezing auscultation could probably be learned, but these require additional training for nurses, who see the patients first, and for young trainee doctors. Undoubtedly, the PIS is simpler and easier than the NACGs, especially in children, but a larger study should be performed to better highlight in which age the PIS could be more useful.

Moreover, we slightly disagree with the authors, who suggest that the PIS may be a useful adjunct to the current NACGs. This adjunct would only take longer to assess children in the ED, who should be assessed as quickly as possible in order to rapidly start the best therapy.

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References