Respiratory disease

Automated cough sound analysis shows promise as a diagnostic tool

Analysis of cough sounds captured on a smartphone can potentially be used to help diagnose common respiratory conditions in children, a study from Western Australia has shown.

In order to develop the diagnostic algorithm, a total of 852 sound datasets were collected from children with various respiratory conditions using an iPhone6. These conditions included croup, upper respiratory tract disease (URTD), lower respiratory tract disease (LRTD), asthma/reactive airway disease (RAD), bronchiolitis, and pneumonia.

The phone was held 25-50 cm away from the mouth with the microphone angled towards the subject at 45º to avoid air hitting the microphone. The sound datasets were combined with demographic data, clinical histories and investigation results. A proprietary software app was used for the work. An automatic cough detector was developed which identifies cough sounds from a continuous audio stream.

Clinical diagnoses were confirmed by panels of experienced clinicians and data discarded in the absence of agreement.

The diagnostic algorithm was then tested in a prospective study of 585 children aged 29 days to 12 years. None of these children had been involved in the study to develop the algorithm.

Cough sounds were recorded in typical clinical environments and the first five samples analysed together with up to five symptoms derived from patient/parent reported history.

The diagnoses obtained from the automated cough analyser were compared with consensus diagnoses determined by the clinical adjudication panel of paediatricians following a review of hospital charts and investigation results.

The positive percent and negative percent agreement values between the automated analyser and the clinical reference group are shown in table 1, above.

The differential diagnosis of respiratory conditions can pose a challenge even for experienced clinicians with diagnostic support services. Training and experience are key determinants of accurate identification of airway sounds during auscultation.

The algorithm can be integrated into smartphones which also serve as the cough sound acquisition device. This approach offers the potential of accurate diagnostic cough assessment. Furthermore, it could become a useful tool when access to other investigations is not available.

The study authors conclude: 'We have demonstrated that automated cough analysis delivers good diagnostic accuracy in detecting common childhood respiratory diseases including pneumonia, RAD, croup, bronchiolitis, upper and lower respiratory tract disorders. It can be used as a diagnostic aid for childhood respiratory disorders.'

They add that further evaluation of this method is needed in a range of settings including the community, hospitals, ambulatory care, and telehealth.

Table 1

Positive and negative percent agreement values between the automated analyser and the clinical reference group

All children Condition	Positive % agreement	Negative % agreement
Asthma/RAD	97%	91%
Pneumonia	87%	85%
LRTD	83%	82%
Croup	85%	82%
Bronchiolitis	84%	81%
Aged 2-12 years		
Asthma/RAD	98%	88%
Pneumonia	85%	80%
LRTD	80%	83%
Croup	87%	83%
URTD	80%	77%

LRTD = lower respiratory tract disease RAD = reactive airway disease
URTD = upper respiratory tract disease

DR PETER SAUL

Porter P, Abeyratne U, Swarnkar V et al. A prospective multicentre study testing the diagnostic accuracy of an automated cough sound centred analytic system for the identification of common respiratory disorders in children. *Respir Res* 20,81(2019) doi:10.1186/s12931-019-1046-6