Respiratory Noises: How Useful are They Clinically?

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KEYWORDS

• Noisy breathing • Validity and reliability
• Wheeze • Rattle • Stridor

As the parents of infants and young children will attest, ''noisy breathing'' is extremely common in this age group. Whereas a multitude of different noises have been described in the literature, the most frequently used terms are ''wheeze,'' ''rattle,'' ''stridor,'' ''snore,'' and ''nasal snuffle/snort.'' Conventional wisdom, based on empiric evidence and basic physiology, is that these noises emanate from specific anatomic sites within the respiratory system (**Table 1**). Thus, correctly identifying these noises is of major clinical relevance, in terms of localizing both the site of obstruction, and the most likely underlying cause.

There is a vast array of underlying conditions, both congenital and acquired, that can produce these noises. For example, in a major textbook on pediatric respiratory disease there are more than 35 listed causes of wheeze, and a similar number for stridor.[1] However, for practical purposes, most noises will be attributable to a relatively small number of common, underlying conditions. **Table 2** lists the most common acute and persistent causes of these noises.

Although the clinical utility of these respiratory noises is often assumed, unfortunately, distinguishing these noises from each other can be very difficult. Many children will have multiple noises, as the obstruction to airway is often extensive (eg, inflammation involving both upper and lower airways), the noise may vary from minute to minute, and some noises will not clearly fit one of these simple descriptors. This difficulty in categorizing the noise is worse when the noise is intermittent, described by the child's parent, and not confirmed by the clinician. Further, even when heard by the clinician agreement between clinicians on the terminology of these noises is far from perfect.

Because these noises can be considered as either a symptom (when reported on history by a parent) or a sign (when confirmed on physical examination by a clinician) it is crucial that we have high-quality research evidence regarding both the validity (accuracy or closeness to the truth, when compared with a ''gold standard'') and

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Pediatr Clin N Am 56 (2009) 1–17
doi:10.1016/j.pcl.2008.10.003 **pediatric.theclinics.com**
0031-3955/08/$ – see front matter

Table 1
Common noises and the site of origin

Noise	Site of Origin
Wheeze	Intrathoracic airways
Rattle	Either or both intra- and extrathoracic airways
Stridor	Extrathoracic airways
Snore	Oro-naso-pharyngeal airway
Snuffle/snort	Nasal passages/naso-pharynx
Grunt	Alveoli/lung parenchyma

the reliability (repeatability) of these symptoms and signs.[2] Reliability includes both intraobserver reliability (ie, whether the clinician will agree with himself/herself when observing the same sign on two separate occasions), and between-observer reliability (ie, whether two clinicians, or parent and clinician, will agree when both observe the same physical sign).

The purpose of this article is to appraise the published research evidence concerning respiratory noises in infants and young children, with particular emphasis on the validity and reliability of these noises, and their subsequent clinical relevance and diagnostic significance. Numerous textbooks and narrative reviews have comprehensive descriptions of the clinical features of the conditions that can cause noisy breathing, and these will not be elaborated on here. Rather, this review will focus on evidence relating to validity and reliability of these noises (symptoms and signs), and whether we can improve the utility of these reported and observed noises by the use of technology, such as video recordings or computerized acoustic analysis.

It must be pointed out that despite noisy breathing being an extremely common clinical problem, there is a paucity of high-quality clinical research evidence concerning these key questions. The available evidence is from observational studies, and using the Grade approach[3] is automatically assigned as ''low'' level evidence. There are also inconsistencies and the data are sparse. Moreover, it is clear that much of the evidence has come predominantly from several research groups, particularly in the United Kingdom. Consequently, further research could have an important impact on the conclusions drawn from the current evidence presented here.

Table 2
Common clinical causes of noisy breathing

Noise	Acute	Persistent
Wheeze	Intermittent asthma/Viral-induced wheeze	Infants: Transient early wheeze (TEW) Older children: Persistent asthma
Rattle	Acute viral bronchitis	Chronic sputum retention (neuromuscular disorders)
Stridor	Acute laryngotracheobronchitis (or viral "croup")	Laryngomalacia (or "infantile larynx")
Snore	Acute tonsillitis/pharyngitis	Chronically enlarged tonsils and adenoids
Snuffle	Acute viral head cold ("coryza")	Allergic rhinitis