Inpatient bronchiolitis outcomes in North America have changed substantially during the past 4 decades. Annual deaths associated with bronchiolitis in the United States were once estimated as high as 4500 in the 1980s, with subsequent estimates revising this figure to 510 annual deaths between 1979 and 1997, then 56 to 121 annual deaths by the late 2000s. Although a 100-fold reduction in mortality could be construed as emblematic of medical advances, changes in coding practices and epidemiologic disease definitions likely play a larger role in this evolution. Willer et al highlight more examples of how diagnostic coding strategies and associated research definitions continue to be associated with surveys of the bronchiolitis landscape.

As pediatric mortality has decreased in the developed world, research focus has shifted to improving care efficiency. In line with this trend, Willer et al examined resource use for bronchiolitis hospitalizations during the past decade using a high-quality multicenter database, the Pediatric Health Information System (PHIS). They found increasing inflation-adjusted standardized unit costs per hospitalization during the study period without any significant changes in mortality or length of stay. As in previously published studies, they found a corresponding increase in intensive care unit (ICU) admissions and a surge in the proportion of children receiving noninvasive ventilation, despite stable use of invasive mechanical ventilation. The authors posit that the observed trends may be driven by an increase in the use of high-flow nasal cannula (HFNC) therapy, which is commonly either initiated or managed in ICUs. Citing a lack of established, objective criteria for initiating HFNC therapy, the authors question whether the subjective assessments of respiratory distress that lead to the use of HFNC therapy may be more indicative of “physician behavior” than patient condition.

Characterizing disease patterns in administrative data provides an essential vantage of how care is delivered over time. Our understanding of bronchiolitis epidemiology has improved with the increasing availability and accumulation of large, multicenter, administrative databases containing patient-level data. For example, using consistent methods leveraging the PHIS database, mortality associated with bronchiolitis has been observed to decrease from 14 per 10,000 admissions in 2002-2003 to 4 per 10,000 admissions in 2011 in the United States, suggesting improvements in care over time and providing important context for the present work. Interpreted one way, the stable survival rate of 99.9% between 2010 and 2019 noted by Willer et al represents a lack of significant improvement. However, few clinicians would argue that the goal of HFNC therapy is to further reduce mortality in bronchiolitis. Similarly, to our knowledge, there has never been evidence that HFNC therapy reduced the duration of bronchiolitis; it is considered a supportive treatment.

For children with bronchiolitis, HFNC therapy can help maintain functional residual capacity with positive airway pressure, facilitate breathing by overcoming nasopharyngeal resistance due to edema and secretions, and wash out physiologic dead space. It is by these mechanisms that HFNC therapy is thought to possibly reduce the need for mechanical ventilation. Among children with respiratory distress not requiring invasive ventilation, it is likely that HFNC therapy helps to reduce the work of breathing and improve patient comfort. However, to our knowledge, there are no well-established objective respiratory distress scales for bronchiolitis, nor do administrative databases harbor the necessary vital sign data and respiratory assessments to conduct such analyses. Therefore, it is unlikely that databases such as PHIS, which contains no data on vital signs or work of
breathing, offer sufficient granularity to discern whether HFNC therapy reduces discomfort in infants with bronchiolitis.

Assessing whether the pattern of increasing bronchiolitis admissions to the ICU is associated with an actual increase in costs vs simply a measured increase of a database metric is also unclear because it would require a breakdown of both the fixed and variable costs attributable to the care of inpatient bronchiolitis. As aptly noted by Willer et al in their limitations section, the standardized unit cost in the PHIS database is not necessarily reflective of actual charges billed to insurance or paid by families. Variable costs include purchased supplies, such as disposables and medications. Fixed costs typically represent more than 80% of inpatient costs and include the physical plant (hospital and ICU) where care is provided, necessary diagnostic equipment (such as x-ray machines), and the personnel who provide care. By associating the increase in bronchiolitis costs with the increase in bronchiolitis ICU admissions, Willer et al suggest that a main factor associated with the significant increase in standardized unit costs are the fixed costs of ICU care. Importantly, declaring a causal relationship between increasing costs and admission to the ICU would require directly attributing an increase in ICUs to the desire to admit children with bronchiolitis to this care setting. It is true that the number of pediatric ICU patient beds has been increasing for some time in the United States, an expansion that has been noted to outpace the increase in the pediatric population since at least 1995 up to the time of the last study in 2016. What is less clear is whether this expansion of ICU beds occurred, at least in part, to accommodate children with bronchiolitis or whether, instead, children with bronchiolitis are being cared for in ICUs that expanded for other reasons.

Non-value-added treatments associated with costs ultimately borne, at least in part, by the families of children with bronchiolitis constitute harm and must be avoided. Willer et al recognize that the increasing use of diagnoses codes for respiratory failure has been coincident with patterns of increasing HFNC use and ICU admissions, with more patients ultimately assigned to the respiratory failure APR-DRG (All Patient Refined Diagnosis Related Group), representing an increase in diagnostic coding intensity. This is another important finding that reaches the limitations of the data source, generating questions worthy of additional investigation but no conclusions. Respiratory failure is technically defined, for billing purposes, as having 2 of the following 3 criteria present: (1) partial pressure of arterial oxygen less than 60 mm Hg (or pulse oximetry <91%) on room air, (2) partial pressure of carbon dioxide greater than 50 mm Hg with pH less than 7.35, and (3) signs and symptoms of acute respiratory distress, such as tachypnea, grunting, or retractions. Many children admitted to the hospital with bronchiolitis will meet these objective criteria, irrespective of a need for HFNC therapy, suggesting that the coding practices may be improving over time to achieve more appropriate reimbursements.

Before therapies such as HFNC and patterns of use such as increasing ICU admissions become the focus of medical reversal and deimplementation initiatives, there is a need for more detailed data that accurately reflect the patient’s response to these aspects of care and that are uninfluenced by changes in coding practices designed to maximize reimbursements. Summaries of administrative data cannot capture the tremendous heterogeneity of patient illness apparent at the bedside. Moreover, given that most children do well with bronchiolitis in the developed world, the real challenges facing practicing pediatricians are how to most efficiently minimize transient discomfort associated with respiratory distress while also recognizing and rescuing the edge cases of bronchiolitis that could be lethal without the use of intensive treatment. Willer et al have highlighted the need for validated measures of respiratory distress; well-designed, prospective observational studies; and randomized clinical trials that will help our field refine the management of bronchiolitis.
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