ICU Use in Bronchiolitis: Why Has It Doubled?

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Health care expenditures make up a large and increasing proportion of the US gross domestic product. Pediatrics is not immune to the problem, because expenditures on child health services are now equivalent to half of the US defense budget. Trends in our most common pediatric inpatient diagnoses, such as bronchiolitis, provide insight into the problem. Despite an apparent decrease in hospitalizations for bronchiolitis, overall costs continue to rise.2

In this month’s issue of Pediatrics, Pelletier et al3 provide further information on the phenomenon of rising resource use for bronchiolitis. These investigators demonstrated a dramatic increase in ICU use for bronchiolitis over 10 years, without clear evidence for an increase in severity of the illness itself. Indeed, there is some evidence to the contrary, with stable to declining length of stay and frequency of invasive ventilation. In the last year of the study, 2019, nearly a quarter of bronchiolitis patients in these Pediatric Health Information System database (PHIS) hospitals were cared for in an ICU. Another notable trend was a sevenfold increase in the use of noninvasive ventilation (NIV), with nearly 10% of bronchiolitis admissions receiving this therapy in 2019.

Given the improbability that children with bronchiolitis are getting sicker, the authors suggest another possible driver for the increase in ICU usage could be the widespread adoption of high-flow nasal cannula (HFNC) oxygen therapy, a phenomenon that has occurred simultaneously with the increase in ICU use. Unfortunately, because there is not consistency in coding of HFNC, there is no way to prove this suggestion directly in the PHIS database. Although the sevenfold increase in NIV is highly suggestive, NIV can encompass a wide variety of technologies, and HFNC is coded as NIV in some settings and not distinguished as such in others. Further supporting this suggestion is the fact that HFNC was not allowed outside of the ICU setting in several hospitals contributing to the PHIS database during the study period.4

HFNC usage to treat bronchiolitis has exploded over the past decade, before the publication of any randomized trials. At least 5 proposed mechanisms for the efficacy of HFNC in bronchiolitis exist; however, actual clinical utility is still debated.5 We now have 3 randomized controlled trials published to date in which researchers compare HFNC to standard flow oxygen in bronchiolitis, with no association of the therapy with improvement in key outcomes, including ICU transfer, length of hospital stay, or duration of oxygen use.6–8 Indeed, the only significant finding in these studies was that infants not randomly assigned to HFNC were more likely to be started on HFNC. At best, researchers in these studies have answered a question about timing of therapy: delay in initiating therapy with HFNC did not incur negative outcomes.

Although we have no clear evidence HFNC is improving meaningful outcomes in bronchiolitis, Pelletier et al may be indirectly demonstrating the unintended cost of the widespread

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The adoption of the therapy, particularly at those institutions which only allow use of HFNC in an ICU setting. Furthermore, and somewhat counterintuitively, there is now literature to support the idea that introduction of HFNC on the general wards may not prevent, and may indeed increase, rates of patients transferred to the ICU.\textsuperscript{4,9,10} Coon et al surveyed leaders in PHIS hospitals and compared rates of ICU transfer in the 3 years before and after the adoption of HFNC on the general wards. They noted a paradoxical increase in ICU admission associated with HFNC on the general wards.\textsuperscript{4}

Pelletier et al may also be showing us something about how hard it has become to simply observe infants with respiratory distress due to bronchiolitis, an illness with a generally excellent prognosis. Physicians may feel it necessary to transfer patients to the ICU for HFNC because availability of the therapy and a sense of risk in delaying transfer, although the therapy has not been shown to improve outcomes. That decision incurs substantial costs. Faced with these data, the implications are clear. We need urgently to determine which infants truly benefit from the therapy so that we can reduce its use in the large population who incur only cost without benefit. Criteria for initiation for HFNC could be created, or even derived from the existing randomized controlled trials, and should be rigorously evaluated. Transfer to the ICU for parental or physician anxiety needs to be weighed against the increase in costs and risk associated with that transfer. Ultimately, as Pelletier et al point out, ICUs can be inherently dangerous places. Evidence is revealing we may be putting infants with bronchiolitis into ICUs without clear necessity, and this fact should prompt researchers to study and to address the problem.

**ABBREVIATIONS**

| HFNC: high-flow nasal cannula therapy |
| NIV: noninvasive ventilation |
| PHIS: Pediatric Health Information System database |

**REFERENCES**


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