COMMENTARY

The Path to Large-Scale High-Flow Nasal Cannula Deimplementation in Bronchiolitis

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Bronchiolitis is back. After almost 3 years of masking, social distancing, and scowling at anyone who coughed nearby, respiratory syncytial virus, influenza, and a panoply of other viruses are back with a vengeance, pushing hospitals that care for children to their limits. We no longer need to worry about whether resident trainees and newly minted nurses and respiratory therapists will gain enough experience caring for respiratory patients. However, the return of bronchiolitis also likely signals a return to normal business in other respects of bronchiolitis care, and along with it, concerns about addressing length of stay and overuse. It is, therefore, timely to have the results of a large, national quality improvement (QI) collaborative on high-flow nasal cannula (HFNC) use led by Byrd et al[1] on behalf of the American Academy of Pediatrics' Value in Inpatient Pediatrics network, published in this issue of *Hospital Pediatrics*.

In the years after the boom of floor-based HFNC use in bronchiolitis, several teams have explored the effectiveness of this modality on a population level. Multiple studies, including 2 randomized trials, have revealed that HFNC does not improve lengths of stay, duration of supplemental oxygen administration, or rates of PICU admission.[2–4] Additionally, HFNC correlates with increased hospital costs because the interface itself is 16 times more expensive than standard nasal cannula.[3] As such, the use of HFNC may be optimally reserved as rescue therapy for infants who fail standard oxygen supplementation, rather than a routine early intervention.[5] In the context of bronchiolitis's abrupt and vicious return to pediatric floors, the evidence suggesting HFNC's limited utility outside of the ICU is particularly relevant. Now, more than ever, it is crucial to characterize the clinical contexts in which floor-based HFNC is used.

Byrd et al conducted a retrospective observational study of nearly 8300 hospitalizations across 61 hospitals as part of the American Academy of Pediatrics Value in Inpatient Pediatrics Network Quality Improvement Collaborative.[1] Participating sites reported on existing policies and hospital characteristics and reviewed electronic health record data for some or all (depending on volume) of their bronchiolitis patients with respect to HFNC use. The study findings include that more than one-half of patients (52%) over the 16-week study period received HFNC, with a range of 11% to 93% among study hospitals. Reductions in HFNC duration and length of stay (12 and 15 hours on average, respectively) among hospitals that practice a deliberate "pause" or delay in the initiation of HFNC from the emergency department were intriguing and warrant further exploration. Finally, and unsurprisingly, the data revealed less HFNC utilization among hospitals that restrict use to the PICU.

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Hospitalists nationally will likely be interested in what seems to be the largest snapshot yet of HFNC use in the United States. The 82-percentage point range among hospital utilization rates is striking, and although our field lacks a broadly established definition of appropriate HFNC use, this range likely reflects a certain amount of overuse. Unfortunately, the study team did not collect data on overall bronchiolitis volume per hospital, which might assist in interpreting the range of initiation rates in the study hospitals. The authors also note that their study's opt-in approach may have influenced their baseline HFNC use rate. It seems reasonable to conclude that hospitals voluntarily participating in this data collection (and even paying a fee to do so) may have higher baseline rates of utilization, but it is by no means a certainty. In addition, these hospitals' interest and willingness to pay the study fee could also indicate more engagement about practice change, which may or may not be related to their utilization rate. Regardless of these study features' influences on the authors' descriptions, HFNC usage appears nonetheless to be a national problem given the study's impressive number of hospitals, the diversity of hospital type, and the extent and variation of HFNC use.

For HFNC, like continuous pulse oximetry, nebulized racemic epinephrine, albuterol, and hypertonic saline, what initially seemed like promising ideas sure to improve outcomes ultimately revealed themselves to be of limited or no benefit at the population level. However, they have persisted despite a lack of evidence to justify widespread use. On a fundamental level, humans have a tendency toward action and an inherent dislike of watching infants breathe rapidly. With new therapeutics on the horizon and a new tool always in development, we as clinicians will likely again grapple with these difficult decisions about whether to lean into that new product or if it is better to hold back. Our experiences seeing HFNC adoption balloon in the last decade should reinforce the virtues of restraint, especially with respect to new innovations in care when the direct benefit to the patient and system is unclear. For HFNC, which is already so widely used, culture change may be difficult when hospital personnel is in constant flux; even hospitals without a large trainee presence still experience turnover. Large studies of how to prevent the adoption of novel interventions of uncertain benefit and, importantly, how to reliably deadopt them will be important.

With Byrd et al's findings, the extent of total HFNC use nationally is clearer. It seems fairly evident in the study hospitals that simple, structural barriers, such as limiting HFNC to the PICU or initiating a pause in the emergency department are associated with less use. It is possible that some use could be curtailed in this manner, but the process of unlearning a practice at an institution in which HFNC use is high is likely to be different from an institution in which the practice never became common, to begin with. So, what is the roadmap to large-scale, nationwide HFNC deimplementation? We suggest the following steps:

1. Our profession needs to reach a consensus around the definitions of appropriate HFNC use. If, ultimately, we believe that no patients outside of the ICU warrant HFNC, then Byrd et al's study would provide a clear picture of national HFNC overuse. However, without consensus on what constitutes appropriate use, we will continue speculating about the "right" percentage of bronchiolitis patients who ought to be receiving HFNC. Because trials to date have not revealed a clear population of patients on the basis of age or underlying condition who are most likely to benefit from HFNC, this may be challenging. Established consensus methods, such as the Rand/UCLA appropriateness method, which has been used to develop national guidelines for physiologic monitoring,[6,7] could be applied in this situation. It will be key to partner with national organizations (including the American Academy of Pediatrics, which organized and managed the project that is the subject of this editorial) to produce practice guidelines based on the consensus and to help to endorse, publish, and further disseminate the guidelines. This framework will then, finally, allow us to know the extent of guideline discordant HFNC use, which could be directly measured in a large group of hospitals, such as was done in the Eliminating Monitor Overuse Study.[8]
2. Next, it would be helpful to understand the barriers and facilitators to deimplementing guideline discordant HFNC use. This project could be completed by using qualitative interviews of clinicians at high- and low-overuse hospitals in a process called "deviance sampling."[9] After barriers and facilitators have been identified, the next logical step is to determine how the barriers might be most successfully addressed to support deimplementation. This information will specifically facilitate deimplementation strategies that could be tested on a large scale to determine which might be best at reversing our recalcitrant HFNC practices. An established method called "Implementation Mapping"[10] is a great tool for this job.
3. The final step is to go big: test deimplementation strategies in a large trial. QI methods, especially multicenter endeavors, have many strengths. Where QI is limited, however, is in understanding the "why" behind how interventions may work, the what behind what types of tools are likely to succeed, and the how behind sustaining improvement. Answering these types of questions in implementation studies has proven necessary with other, recalcitrant types of overuse in our field to promote sustained practice change and make the case for hospital-level investment. Large implementation studies that can yield generalizable knowledge undoubtedly require external funding and infrastructure supporting participating hospitals, but it can be done in our field.[11] There is room for thoughtful QI to work alongside and in

tandem with implementation science, and we believe both will be necessary to realize lasting change.

Together, as a field, we can change the culture around routine HFNC use in bronchiolitis. As we have demonstrated with countless bygone interventions that preceded HFNC, we can safely do less, and we have the data to prove it. Now, it is our duty to implement this robust evidence into practice. If we do not act quickly, we will continue to tacitly endorse the nonevidence-based care of most infants admitted to our hospitals.

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