Outside of being born, viral bronchiolitis is the most common reason for a child to be hospitalized in the US, and among the costliest from the US health care system perspective. Given the prevalence of the condition, any regularly employed low-value care practice can quickly add up. Using continuous pulse oximetry for noncritically ill children hospitalized due to bronchiolitis is often cited as an example given the self-resolving oxygen desaturations that frequently occur in this condition. In this issue of *JAMA Network Open*, Moretti et al present the results of an economic evaluation for the use of continuous pulse oximetry for children hospitalized with bronchiolitis in 6 Canadian hospitals.

This cost-effectiveness analysis was conducted alongside a 2021 randomized clinical trial and included children hospitalized with stabilized bronchiolitis who were enrolled and randomized to either receive continuous or intermittent oximetry monitoring during their hospital stay. Clinical outcomes for patients, including length of stay and revisits after discharge, were followed prospectively. The authors appropriately adopted a health care system and an expanded societal perspective that accounted for broader value elements such as lost productivity and out-of-pocket costs for families. Presenting both perspectives is important and shows the relative value of intermittent oximetry monitoring compared with continuous pulse oximetry based on different viewpoints. According to the results from both perspectives, which accounted for the parameter uncertainty through probabilistic sensitivity analysis, the authors found no substantial difference in costs between the intermittent and continuous pulse oximetry monitoring strategies for children with stabilized bronchiolitis.

Having randomized trial data and a rigorous economic evaluation for a common condition like bronchiolitis is an overdue change of pace in pediatrics, where the evidence underpinning practices relies on a preponderance of observational data and where cost-effectiveness data accounting for family spillover effects are limited. The results from this study bring up several points for further discussion. First, as the authors point out, the Canadian global health care system is unique, and the health care system findings might be less applicable to the US health care system. Based on this, the policy implications for children hospitalized in the US remain uncertain, and it is implausible that a single study will change current clinical practice. For instance, given the wide confidence intervals in the current study, we may expect even more uncertainty in the context of a less standardized system with multiple payors in the US. Second, micro-costing for nurse or respiratory therapist time assessing patients and responding to pulse oximetry monitor alarms, which are numerous but infrequently actionable, was not available for this study. In addition to the direct nursing care hours needed to review and respond to monitor alarms, the likelihood that essential nursing care is left undone due to unnecessary monitoring-related interruptions is high and difficult to financially quantify. Future studies should strongly consider the value to the health care system of understanding the person-time involved in interventions like continuous monitoring, especially in view of the current crises the US health care system related to professional nursing shortages.

There have been recent national efforts to address continuous pulse oximetry overuse for bronchiolitis, including an active multicenter deimplementation trial, and the most recent update of the bronchiolitis care practice guidelines from the American Academy of Pediatrics made clear that continuous pulse oximetry is an optional part of patient care based on a number of known detrimental effects of related to its use. Of paramount importance to patient safety include the well-known issue of alarm fatigue and the also well-known (although maybe less discussed) practical aspects of pulse oximetry like young kids getting completely tangled up in wires or the small but real
possibility of skin reactions and even ulcers from the probe itself. Whether continuous pulse oximetry use prolongs length of stay in patients with bronchiolitis is still up for debate, but in relatively stable patients it does not seem less safe than intermittently assessing oxygen saturation. Furthermore, despite years of research, a leading and widely scalable approach to interpreting the absolutely monumental amount of data passively collected from these monitors remains elusive, calling into question what exactly their role should be in patient surveillance outside of settings where minute-to-minute data are required to titrate respiratory support and vasopressors. Yet, tension remains between these factors and the perceived benefits of using continuous oximetry when children are hospitalized. Many families and clinicians may still prefer continuous monitoring for reasons that are less readily or objectively measured. Anecdotally and in clinical practice, sometimes a number can be easier to react to, and the monitor data can serve as something the health care team can focus on, rather than the less easily described gut feelings and unease about every patient’s uncertain trajectory. The costs of intermittent vs continuous pulse oximetry are relevant to the debate, and the findings from Moretti et al add to that conversation but only paint part of the picture. Likely, the absence of a significant cost difference based on the current study will not tip the balance for those who generally prefer a specific pulse oximetry monitoring strategy.

Taken in context with the current growing body of literature about using continuous monitors for children in the hospital, how should we think about these results? Is a cost-effectiveness analysis enough? There are numerous fairly well-described negatives for a health system that uses continuous pulse oximetry when it is unlikely to provide actionable information. Alarm fatigue, which was initially highlighted by The Joint Commission as a critical patient safety issue over a decade ago and remains on its list of national patient safety goals, and alarm-mediated task interruptions likely have important consequences, which are still being uncovered. Continuous pulse oximetry in bronchiolitis is one of the most well-studied use cases for monitoring in pediatrics, but there are a multitude of other reasons continuous monitors are utilized in the hospital that lack an evidence base. Certainly, there are instances where titration of therapies necessitates immediate feedback, in which case a continuous monitor data stream is critical for making care decisions. In other, less tightly controlled circumstances, when does the balance for continuous monitors shift from clearly adding value to a patient’s care to primarily generating data more likely to serve as an interruption than to provide actionable information?

While the findings of the current study did not indicate a preferred pulse oximetry monitoring strategy for children hospitalized with bronchiolitis from an economic standpoint, with the ongoing overuse of non-evidence-based therapies in bronchiolitis, including x-ray imaging, steroids, and bronchodilators, the potential for financial waste driven by overuse in bronchiolitis continues to be high. Ongoing studies aiming to understand how to influence clinician behavior toward evidence-driven use of continuous monitoring and other therapies will bring important knowledge on how to address low-value care practices globally. Equally important and less easily accomplished is understanding the safest and most appropriate use of continuous monitors for all hospitalized patients. Using continuous monitors in a manner that supports safe patient care while avoiding alarm fatigue and deploying them alongside processes that emphasize interdisciplinary communication and support excellent and individualized clinical professional judgment is the key to achieving the best patient and health-system outcomes.
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