Commentary: What's in an algorithm?

Joshua S. Wolovits, MD,^{a,b} and Camille L. Hancock Friesen, MD^{b,c}

From the ^aDivision of Critical Care, Department of Pediatrics, University of Texas Southwestern Medical Center, Dallas, Tex; ^bDivision of Pediatric Cardiothoracic Surgery, Department of Cardiovascular and Thoracic Surgery, University of Texas Southwestern Medical Center, Dallas, Tex; and ^cChildren's Medical Center, Dallas, Tex.

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Address for reprints: Camille L. Hancock Friesen, MD, 1935 Medical District Dr, Dallas, TX 75235 (E-mail: Camille.HancockFriesen@UTSouthwestern.edu).

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Joshua S. Wolovits, MD (left), and Camille L. Hancock Friesen, MD (right)

Central Message

This quality improvement initiative was associated with reduced chest tube duration and hospital costs. It also serves as a template for other protocols aimed at reducing variability in practice.

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The “triple aim” as articulated by the Institute for Healthcare Improvement includes improving population health, improving patient experience, and reducing health care costs.¹ Although tackling this is no small undertaking, reducing variability in practice is one strategy used to achieve this set of aims.² In this issue of the *Journal*, Bertrand and colleagues³ present a well-designed and well-executed quality improvement project aimed at reducing variation in a common postsurgical practice: chest tube management and removal. Although seemingly mundane, the effect of reducing variation and optimizing timing of chest tube removal has never been assessed. Does more timely chest tube removal improve patient experience and reduce health care costs?

In 126 patients with 277 chest tubes in the course of 20 months, Bertrand and colleagues³ instituted a process aimed at reducing chest tube duration by (1) standardizing removal criteria on the basis of historical mean volumes of output preceding chest removal and (2) performing twice daily assessments of chest tube removal “readiness.” The results of this simple practice change are impressive, with a reduction in the average chest tube duration by 14 hours (61 hours before implementation vs 47 hours after implementation). The 22% reduction in time to chest tube removal was associated with significant reductions in hospital length of stay and costs.³ The rate of chest tube reinsertion, a balancing measure, was unchanged. This lack of change supports the contention that there was no incremental risk associated with earlier removal. Although this reduction in time to chest tube removal is admirable, the low reinsertion rate opens up the question of whether this strategy could be even more “aggressive.”

Bertrand and colleagues³ used the electronic health record to implement this initiative by developing a “chest tube rounding navigator” tool that prompts assessment of readiness for removal and documentation of chest tube status. This process is instructive not just for providing a road map for replicating early chest tube removal in other

institutions but for informing other quality initiatives aimed at reducing practice variation. Might a similar strategy be applied to other common practices with possibly similar positive effects, such as routine blood draws and radiography?

The applicability of this algorithm is not universal. Exclusions including chylothorax, high-volume drainage, neonates, and univentricular repairs resulted in the inclusion of only 126 patients in 20 months, with an average STAT category of only 1.7. Although we certainly agree with the initial implementation of such an algorithm for the “healthiest” patients requiring cardiac surgery, its applicability and impact in more complex cardiac patients is still unknown.

The reduction in time to chest tube removal was associated with significant reductions in hospital length of stay and cost, but the direct effect on these outcomes should be taken with pause. Although earlier chest tube removal may improve patient experience, it is not intuitively obvious how an average 14 hour reduction in time to removal is associated with a nearly 3-day reduction in length of stay. The relationship between these variables is likely nuanced and potentially confounded by concomitant hospital-wide initiatives aimed at reducing length of stay and costs. In addition, although the results presented suggest wide adoption of the practice change, noted by narrowed confidence

limits, the sustainability of this practice change is not addressed in this report.

With this algorithm, Bertrandt and colleagues³ have enhanced quality and value through a structured systems-level approach to a universal element of pediatric cardiac surgery, namely chest tube management. Clearly more than just an algorithm, this is an example of optimal delivery of modern health care.

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