Who belongs on the “fast track”?

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The benefits of early extubation of children after congenital cardiac surgery have been recognized for more than 30 years; this practice is part of the postoperative protocol in most major pediatric cardiac centers.¹ Recently, a number of studies have attempted to define the feasibility and utility of a clinical strategy of early extubation of neonates and children after surgery for congenital heart disease.² In this issue of the *Journal*, Harris and colleagues conclude, on the basis of their experience with more than 600 patients, that virtually all pediatric patients can be safely extubated either immediately in the operating room or within 24 hours after surgery.

Early restoration of spontaneous cardiorespiratory function seems logical for all patients, however, it may be particularly complicated for neonates and certain other subgroups of postoperative patients. Higher metabolic demands, a proportionately greater negative impact of cardiopulmonary bypass on cardiac and respiratory function, and diminished respiratory and cardiac reserve place these patients at higher risk for failure of early extubation. The health care provider must weigh the risks of prolonged extubation, such as ventilator-associated lung injury, prolonged sedation, and delayed feedings, against potential negative consequences of premature extubation, such as more complex postoperative care, increased work of breathing, negative hemodynamic effects, and the possibility for reintubation. Early extubation in the operating room is further encumbered by requiring transport of the patient after this important intervention and the “hand-off” of the patient’s care.

The current study of Harris and colleagues was a linked database analysis of 613 consecutive patients at a single center undergoing congenital heart surgery. Intraoperative extubation was achieved in 71% of patients and early extubation (within 24 hours) in 89%, and both were associated with lower mortality and rates of reintubation. In the neonatal population, 63% were also extubated with

24 hours. Harris and colleagues conclude that most children can be extubated either in the operating room or within 24 hours and that this strategy will result in lower morbidity rates and shorter intensive care unit and hospital stays.

This study is one of only a few that have attempted to apply an early extubation strategy to virtually all patients and represents another important step toward our understanding of these issues. One concern, however, is that although neonates were included in the study, they constituted a relatively small proportion of the total group (16%). Those included are not truly a representative sample and are skewed toward lower complexity (96% had Risk Adjustment for Congenital Heart Surgery score of ≤ 3). Approximately two-thirds of neonates were extubated within 24 hours; however, the reintubation rate was 11.5% (significantly higher than the 4%-6% often quoted in the literature²).

Harris and colleagues state that clinical predictors of successful extubation are poor and that protocols may be superior to objective, data-driven parameters. Their protocol used a subjective evaluation of the patients’ readiness for extubation. Patients in the early extubation cohort were found less likely to have postoperative complications and had shorter intensive care unit and hospital stays. Because of the nonrandomized nature of the study and the lack of a control group, there is inherent selection bias, making it impossible to assign cause and effect to these relationships. The sickest patients were placed in the delayed extubation group from the outset, and thus it is their condition, not the policy of extubation, that is directly related to the results. Propensity matching could have been used to reduce the effects of confounding in this study.

Although it is feasible to extubate neonates within 6 to 12 hours after surgery, many believe that it may not be prudent. Neonates undergoing complex repairs have a higher incidence of early low cardiac output states, dysrhythmias, and pulmonary vascular lability, all more easily managed in the intubated patient.^{3,4} The exaggerated negative intrathoracic pressure generated by early spontaneous (struggling) breathing in the setting of perioperative reduced lung compliance can increase left ventricular wall stress and act as a potent negative inotrope.⁵

The current study by Harris and colleagues is important in that it is one of the largest reviews published. It helps to elucidate further the feasibility of early extubation. Unfortunately, all the studies to date have been of poor methodologic quality. Among them there has only been a single randomized controlled trial comparing early with delayed extubation, and it appears underpowered and thus not definitive.⁶ The desire to return quickly to normal

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physiologic status—"the patient came in breathing"—must be tempered by an understanding of the underlying physiology and the negative consequences of our interventions. That said, this study should provide stimulus for future randomized investigations to clarify further the optimal timing of extubation.

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