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Key Words: congenital heart disease, single ventricle, extracorporeal membrane oxygenation

EDITORIAL COMMENTARY

Neonatal outcomes and length of stay: A firm grasp of the obvious?

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Central Message

Patients with prolonged ICU stay after congenital cardiac surgery have suboptimal late outcomes. Residual cardiac disease and selection of surgical strategy both appear to be important to this phenomenon.

See Article page 720.

Mori and colleagues' analysis of the association of intensive care unit (ICU) length of stay and outcomes in neonates after congenital heart surgery,¹ on the surface at least, seems to state the obvious: if a newborn is in the ICU for an extended period, they are a member of a subgroup of patients who are at increased risk of mortality. It is tempting to set the authors' research aside with that observation, concluding there is little to be learned here. That would be unfortunate, however, as this manuscript offers more nuanced, and in some respects surprising insights into an association most of us would take for granted.

First, while an association between ICU length of stay and mortality is firmly established conceptually, the magnitude of this phenomenon is quite sobering. One in four of these patients, no matter the underlying anatomy, will die in the hospital and nearly half will die within

1 year (using ICU admission as time zero). Of those who survive to hospital discharge, only two-thirds are alive at 1 year, compared with 92% for those who did not experience prolonged ICU stay. Thus, these data do not simply state the obvious; they emphatically highlight a subgroup of patients whose mortality risk (double that of the national average for a patient undergoing a

Norwood procedure²) demands our collective focused attention.

Second, the analysis calls attention to the role of residual lesions in populating the beds of the ICU with patients who will be there for a prolonged stay. True, non-cardiac conditions have a marked prevalence among these patients, and the contribution to ICU chronicity of these inscrutable problems cannot be dismissed. Yet 1 in 5 patients in this series required an unplanned cardiac reoperation. The impact of residual disease after congenital cardiac surgery on outcome is well documented and recent studies have explored the role of timing of correction of residual lesions in early outcomes.³⁻⁵ This analysis further highlights the importance of ensuring the optimization of mechanical arrangements for these patients and prompt eradication of residual disease whenever feasible.

The authors' most striking discovery, however, relates to the interplay of prolonged ICU stay and anatomic substrate. Biventricular patients requiring prolonged ICU stay experience a dramatic drop in 8 year survival, from 95% in those not requiring such a stay to 69% in those requiring such a stay. In contrast, single-ventricle patients' 8 year survival diminishes as well, but much less dramatically, falling from roughly 85% to 68%. Read that again. The predicted 8 year survival of a patient who requires a

prolonged ICU stay is the same whether they have 2 or 1 ventricles. This echoes the findings of Hickey et al⁶ and challenges the notion that biventricular end states are somehow protective or result in better late outcomes.

Hence, while the authors might be accused of "a firm grasp of the obvious," their work instead reveals the story within the story. It reminds us that there is much we do not presently understand about these vulnerable patients, and to improve their outcomes will require our continued focus and energy.

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