

program has very high volume, the precision estimates are typically wide enough for any type of argument to be made.

Yes, a hospital could lose money on higher-risk, higher-resource consuming admissions/cases under a DRG reimbursement system; this would depend on the specific contract and variables therein. I, no doubt like the authors, believe in regionalization and collaboration

among programs to provide the best care for our patients. Doing so will likely require an open and honest discussion of Xv.

Reference

1. Woo JL, Anderson BR. Administrators: do you know how your pediatric cardiac surgeries are reimbursed? *J Thorac Cardiovasc Surg.* 2020;160:e153-4.

See Article page e153.



Commentary: Reimbursement models in pediatric cardiac surgery: The unrefined All Patient Refined Diagnosis-Related Group

Tara Karamlou, MD, MSc,^a
Hani K. Najm, MSD, MSc,^a and
Lars G. Svensson, MD, PhD^b

The brief report from Woo and Anderson¹ in this issue of the *Journal* aims to put some objective data around the notion of profitability, expense, and how the current All Patient Refined Diagnosis-Related Group (APR-DRG) payment system may not reward institutions adequately for high-complexity cardiac surgery among neonates. The financial analysis was well conceived (although perhaps incompletely explained) and, in a nutshell, demonstrated lower profitability ratios for cardiac surgery cases compared with noncardiac surgery cases. Reimbursement discrepancies were magnified for high-complexity cases as defined by those cases included in Risk-Adjusted Classification for Congenital Heart Surgery 1 levels 5 and 6.² In the wake of the Coronavirus Disease 2019 pandemic, federal and state



Tara Karamlou, MD, MSc

CENTRAL MESSAGE

Current reimbursement models, such as the APR-DRG, for pediatric cardiac surgery are imperfect and may not adequately reward high-complexity neonatal care.

initiatives to ensure financial viability of healthcare organizations and maintain a robust, highly trained physician workforce will be prioritized. An important formative step to the achievement of more stable healthcare delivery systems is the development of thoughtful reimbursement paradigms that are aligned with patient socioeconomic conditions, projected service-line expenses, and locoregional resources. Although Woo and Anderson¹ do not directly suggest the need for payment model reform, the data presented clearly illustrate the inequities and limitations of the current APR-DRG system.

The APR-DRG system is the most widely used reimbursement model in children's hospitals and categorizes patients according to similar clinical attributes.³ In this system, all neonates undergoing cardiac surgery who do not require extracorporeal membrane oxygenation are grouped into just 3 Diagnosis-Related Groups (DRGs) based primarily on weight and then stratified into severity

From the Divisions of ^aPediatric Cardiac Surgery and ^bCardiothoracic Surgery, Heart, Vascular and Thoracic Institute, Cleveland Clinic, Cleveland, Ohio.

Disclosures: The authors reported no conflicts of interest.

The *Journal* policy requires editors and reviewers to disclose conflicts of interest and to decline handling or reviewing manuscripts for which they may have a conflict of interest. The editors and reviewers of this article have no conflicts of interest.

Received for publication April 14, 2020; revisions received April 14, 2020; accepted for publication April 15, 2020; available ahead of print May 5, 2020.

Address for reprints: Tara Karamlou, MD, MSc, Cleveland Clinic Children's Hospital, 9500 Euclid Ave, M41-022A, Cleveland, OH 44195 (E-mail: karamlt@ccf.org).

J Thorac Cardiovasc Surg 2020;160:e156-8

0022-5223/\$36.00

Copyright © 2020 by The American Association for Thoracic Surgery

<https://doi.org/10.1016/j.jtcvs.2020.04.114>

levels. As correctly pointed out by the authors, the 3 DRG classes are not specific for cardiac surgery and are therefore equivalent for both cardiac and noncardiac procedures. Moreover, the severity levels were adapted primarily for adult Medicare patients and are not based on accepted congenital heart surgery risk-adjustment models or case-complexity scoring systems. No data that validate the ordinal severity scale as an accurate metric in the congenital cardiac surgery population are available, and most administrative datasets lack time-date stamping, hampering the ability for coders to discriminate between a comorbidity that would increase the severity score and a postprocedural complication. One alternative that we have explored at the Cleveland Clinic that may increase the fidelity of cost and reimbursement data is to combine Current Procedural Terminology (CPT) codes with DRGs, or, potentially supplanting DRGs with taxonomized CPT codes, which are more granular. Pilot results from payment bundles using a CPT-based tiered system at our center have proven to more accurately reflect the monetary investment and expense (ie, resource burden incurred) of clinical encounters.

The article is timely and highlights major issues with contemporary reimbursement models that lack pediatric-specific, value-based incentives and seem disconnected from the increasingly resource-intensive demands of high-performing contemporary congenital heart centers. Using profitability ratios that include reimbursement expense was an intuitive method to contextualize the malalignment of the APR-DRG system. Although I am sympathetic to the argument for regionalization of complex congenital cardiac surgery, we struggled with the authors' argument applied as a motivator for lower-quality centers to refer patients to perceived high-quality centers to maintain financial viability. We also were uncomfortable with the conclusion that centers of excellence should negotiate higher base rates because the designation "excellence" is both subjective and imprecise and because hospital base rates should ideally be tied to transparent quality metrics, even if the overall concept of quality evades clear definition.

Beyond the relevance and importance of the subject matter, this article sets a useful precedent among congenital cardiac surgery publications, in that it included the input of a health economist (Joyce Woo, MD). Papers investigating resource use and cost in our field are numerous (327 results in the last year based on a PubMed search). Unfortunately, many use oversimplified analyses that combine financial data with overall length of hospital stay and incorrect metrics (charges instead of cost), and lack contextual information critical to understanding whether increased monetary investments are justified. Given the provocative nature of the topic covered by Woo and Anderson,¹ including an

expert in econometrics was well conceived and added credibility to the study findings.

Generalizability of the findings from Woo and Anderson¹ may be reduced by the use of an administrative dataset, the Pediatric Health Information Systems that had limited participation in 2014 (46 centers), or the use of 6-year old data (likely chosen by necessity given that International Classification of Diseases 10th Revision codes are not presently mapped to Risk-Adjusted Classification for Congenital Heart Surgery 1 algorithms). However, these critiques are less relevant given that the Pediatric Health Information Systems database contains arguably the most robust pediatric inpatient financial data available, and wide disparities in case-mix over time among mostly large congenital heart centers are unlikely. A relevant criticism that may have affected the results was the selection of a fixed-base rate for all hospitals, which was derived by reviewing publicly disclosed Centers for Medicare & Medicaid Services rates. In reality, individual hospital base rates are highly variable and are negotiated depending on hospital bargaining positions within their local markets, patient socioeconomic factors, and payer mixes.

How can we synthesize data from studies such as the one by Woo and Anderson¹ to inform the conversation about optimizing reimbursement models? Traditional fee-for-service models, in which payment was tied solely to the volume of care provided, are clearly not viable solutions in the face of ever-rising healthcare expenditures. Advocates of pay-for-performance or value-based purchasing state that such systems improve overall quality of care, encourage competition and accountability fueled by transparent metrics and consumer choice, and redirect resources to critical aspects of population health. Critics highlight imperfect risk-adjustment systems, enhancement of healthcare disparities as hospitals avoid treating socioeconomic disadvantaged or high-risk patients (risk aversion), increased tendencies toward treating-the-test phenomena, and the inability to accurately attribute performance outcomes given that patients attain care from multiple providers.^{4,5} Advanced bundled-payment structures for cardiovascular care such as the APR-DRG system represent a middle ground between fee-for-service reimbursement and capitation. Although there are obvious flaws in these models, current 20-year projections that the number of Americans with cardiovascular disease will increase to 131.2 million (45% of the total US population) with costs expected to exceed \$1.1 trillion⁶ virtually guarantee more widespread adoption of advanced bundled-care reimbursement.

References

1. Woo J, Anderson BA. Administrators: do you know how your pediatric cardiac surgeries are reimbursed? *J Thorac Cardiovasc Surg*. 2020;160:e153-4.