Dr Backer is a consultant for W. L. Gore & Associates, Inc.

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.

REPLY: EMBRACING REGIONALIZATION WORLDWIDE

Reply to the Editor:

I greatly appreciate the comments of Dr Vervoort,¹ who in his letter to the editor encourages us to focus on the regionalization of congenital heart surgery on a global level. His summary statement that the question of regionalization is often one of revenue, pride, and/or politics is extremely accurate and telling.

Dr Vervoort points out that with the advent of new cardiac surgical centers in low- and middle-income countries, we must encourage them not to repeat the same mistakes that have already occurred in many high-income countries.

Governments developing new centers need to focus on fewer centers with greater volume per center to improve outcomes while simultaneously promoting efficiency, reducing health system costs, and ensuring specialized health workers across all layers of care.

This is exactly what was done in Sweden, and these changes should be recommended for existing health care systems not only in the United States but also for new pediatric cardiac surgical centers in developing countries.

There is increasing evidence that greater-volume centers properly located can both improve outcomes and actually decrease travel distance for those needing care. Those of us who live in high-income countries have learned this lesson the hard way and this error should not be repeated in low- and middle-income countries. Regionalization of care for children with congenital heart disease is now a truly global issue, and responsibility for its inception rests with our profession.

Carl L. Backer, MD

Section of Pediatric Cardiothoracic Surgery
UK HealthCare Kentucky Children's Hospital
Lexington, Ky
Cardiothoracic Surgery
Heart Institute
Cincinnati Children's Hospital Medical Center
Cincinnati, Ohio

Reference

1. Vervoort D. Centralization and regionalization of congenital heart surgery in a globalized world. *J Thorac Cardiovasc Surg.* 2021;161:e481.

<https://doi.org/10.1016/j.jtcvs.2020.09.095>

REPLY: TRUTH OR DARE—GLOBAL REGIONALIZATION OF CONGENITAL HEART CARE

Reply to the Editor:

I have always preferred the “dare” option, but I think in this particular game, where there are really no winners, I’m going with “truth.” Your turn...

Dare: In a response to the editor in this issue of the *Journal*,¹ Vervoort expands our argument² for regionalization of congenital cardiac surgery services beyond the borders of the continental United States. Vervoort argues that proliferation of centers within low- to middle-income countries (LMICs), a phenomenon he refers to as ‘fragmentation,’ will adversely impact quality and more importantly, fail to achieve the goal of increasing surgical coverage for 80% of the pediatric population with congenital heart disease (CHD). While I agree with the concept that the development of optimized cardiac surgery care delivery in LMICs should be based on a centralized structure, the success of this initiative depends on strategic alignment of domestic and foreign financial investments, training program establishment and expansion, and implementation of comprehensive mechanisms for data collection. Martin³ articulated the need to address these issues in his commentary to the American College of Cardiology in 2016, pointing out that only 7% of the population in developing countries has access to pediatric cardiac surgery and only 20% of the current pediatric cardiac surgery workforce practice in LMICs.

Concentrated efforts to build scalable, high-quality congenital cardiac surgical care within LMICs mandates initial investment in centralized training facilities that adapt empirically-derived best practices to local environments. Global quality-based registries with streamlined required data elements should be simultaneously employed to provide fundamental benchmarks for operative mortality and monitor the establishment of surveillance programs to record longer-term outcomes. The latter cannot be overemphasized, as follow-up for patients with CHD is paramount to reduce unnecessary acuity-based expenditures and limit overall population-based resource use. Coupling domestic investment with the considerable developmental aid from organizations such as Children’s Heart-Link will be required to offset the costs of these critical formative steps.

The author 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.

Truth: Although CHD has occupied the spotlight in the United States and other developed countries for the past 10 years—both positively, through multiple heart-wrenching and poignant stories of miracle-saves and negatively, through widely publicized professional and programmatic missteps—the disturbing truth remains that we must adopt pragmatic perspectives that contextualize the impact of CHD within that of other *major* pediatric health threats. That is, CHD-related mortality within developing countries is vastly eclipsed by 5 other leading causes of childhood death (which totaled 5.2 million in 2019⁴), including pneumonia, malaria, diarrhea and malnutrition, preterm birth, and birth asphyxia. Given that comparatively simple measures such as vaccination, clean water, and access to adequate perinatal services could be leveraged to mitigate approximately 4 million of these deaths, advocating to redirect resources and personnel to the provision of high-quality CHD services seems, well, a bit like eating Mark Twain's proverbial frog first:

“Eat a live frog first thing in the morning and nothing worse will happen to you the rest of the day.”

Tara Karamlou, MD, MSc
Division of Pediatric Cardiac Surgery and the Heart,
Vascular, and Thoracic Institute
Cleveland Clinic Children's
Cleveland, Ohio

References

1. Vervoort D. Centralization and regionalization of congenital heart surgery in a globalized world. *J Thorac Cardiovasc Surg*. 2021;161:e481.
2. Karamlou T, Johnston DR, Backer CL, Roselli EE, Welke KF, Caldarone CA, et al. Access or excess? Examining the argument for regionalized cardiac care. *J Thorac Cardiovasc Surg*. 2020;160:813-9.
3. Martin G. Straight Talk: Pediatric Cardiac Care and the Global Health Agenda | Gerard Martin, MD, July 01, 2016 CardioSource WorldNews. Available at: <https://www.acc.org/latest-in-cardiology/articles/2016/07/19/10/14/straight-talk>. Accessed September 24, 2020.
4. World Health Organization. Children: improving survival and well-being. September 8, 2020. Available at: <https://www.who.int/news-room/fact-sheets/detail/children-reducing-mortality>. Accessed September 24, 2020.

<https://doi.org/10.1016/j.jtcvs.2020.10.050>

**REPLY FROM AUTHOR:
AFTER ALMOST
30 YEARS OF
CENTRALIZED AND
REGIONALIZED
PEDIATRIC CARDIAC
SURGERY IN SWEDEN**

—STILL WORK IN PROGRESS

To the Editor:

Centralization and regionalization of pediatric cardiac surgery (PCS) is an accepted way to improve surgical results and patient care¹; however, numerous obstacles to achieving these goals remain, as very well described by Dr Vervoort.² When trying to understand the factors contributing to the positive effects of centralization, looking at the Swedish experience might offer some insights.

In Sweden, PCS was centralized from 4 centers to 2 centers in late 1992. The number of annual operations at Lund more than doubled initially, to 300 to 400. Over the years, the number stabilized at 275 to 300 operations annually. The case mix has changed to include more complex cases, including those involving Norwood surgery, as well as a move toward early correction. Overall 30-day mortality was reduced from 9.7% in 1988 to 1991 to 1.9% in 1995 to 1997.³ Operative risk has improved even further in subsequent years, recorded as 0.6% in 2010 to 2019.

The increased surgical volume was a sufficient rationale for creating a dedicated team of pediatric cardiac surgeons. But with an annual operative volume of approximately 300 and the need for surgical competence available 24/7, the need to optimize surgical exposure and training remains. Therefore, we have adopted a system that involves 4 or 5 staff surgeons, 2 or 3 senior surgeons, and 2 surgeons at a more junior level. Everyone participates in all operations as an operating surgeon or assisting surgeon depending on case complexity. This gives us the capability of assembling the best possible surgical team for all patients while maximizing surgical exposure and facilitating training for all.

After centralization pediatric cardiology, PCS and pediatric anesthesiology were organizationally merged, which allowed for better coordination and shorter decision making pathways. This has facilitated the recruitment of highly trained staff at all levels of support. In Sweden, by long tradition, anesthesiologists are trained in both perioperative and intensive care. This enabled us to create a pediatric intensive care unit (ICU) with a focus on congenital heart disease and PCS. In most complex cases, the pediatric anesthesiologist responsible for perioperative care will follow the patient to the ICU and continue with ICU care. This allows for a seamless transfer of the patient without any loss of momentum.

An annual meeting, inviting all medical doctors and staff involved in the care of patients with congenital heart disease