With regard to anticoagulation agents, we did not previously use warfarin in any small patients because of the complexity of warfarin control. However, we have recently used warfarin in patients with artificial valve replacement or suboptimal conditions after the Fontan operation.

Regardless of the methods used for evaluating Fontan candidates, we believe that the most important evaluation parameters are pulmonary vascular resistance, pulmonary artery pressure, and atrial pressure or ventricular end-diastolic pressure in patients undergoing the bidirectional Glenn procedure. We showed the Nakata index as the reference morphologic index for the pulmonary vascular tree to compare with other study groups, because the body size of our patients was relatively small and there were no alternative conventional indicators of the pulmonary vascular tree.

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CHALLENGES OF SMALL CARDIAC UNITS

To the Editor:

We read with interest the recent articles by Shahian and Normand¹ and Carey and colleagues² and would like to shed some light on the current prac-

tice of small cardiac units in the Middle East and third world countries. Numerous cardiac care units are located in several hospitals throughout a single city, and approximately 100 open surgeries are performed each year in these units. Many hospital administrations are racing and competing with each other to provide this delicate and highly sophisticated service without detailed understanding of the magnitude and financial commitment. It has to be emphasized that cardiac surgery, although highly needed and vital, is a complex, comprehensive and multidisciplinary subspecialty. Vast financial resources are needed to provide the nursing and medical staff, and cardiology and cardiac surgery equipment. Unfortunately, there is no administrative collaboration or even communication to obtain at least a satisfactory output. These small units share similar features and face the same difficulties and obstacles, including unsteady patient volume and flow, and a series of average cases followed by difficult high-risk cases. The overall setup is substandard and aimed for business, profit, and fame based on the attraction of more patients customers called to other subspecialties. Emergency catheter laboratory complications add to the problems and increase the surgical risk. Limited intensive care beds, limited nurse/staff coverage, and cardiac anesthesia shortages exist because these units are run with limited resources and 1 or 2 anesthesiologists working 1 or 2 days per week and involved with general surgery the rest of the week.

Each cardiac case requires an extensive arrangement of blood and blood products, intensive care unit beds and anesthesia during the day of surgery, and night coverage at least for the first night. The cardiac surgeon bears most of the responsibility. Each morbidity or mortality dramatically worsens the results. The overall system arrangement is suboptimal, with marginal benefit and substantial cost.

Administrators and health providers have to be aware of such problems.

Cardiac surgery cannot attain the expected productivity unless the necessary professionals and adequate resources are provided. Full coverage, 24 hours per day, 7 days per week, of diagnostic services, elective and emergency operations, post operative followup and rehabilitation, are crucial for success of these programs.

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Reply to the Editor:

Dr Al-Ebrahim's Letter to the Editor reinforces an important concept from our article. The fact that some lower-volume cardiac surgery programs have achieved excellent results should not be viewed as a general endorsement for developing more such programs. The justification for any new cardiac surgery program must be critically evaluated, including the adequacy of resources and referral base.

Ideally, such new programs are developed to serve populations who have no other local or regional access to cardiac surgery. To be successful, smaller cardiac surgery programs must be provided with the substantial hospital resources necessary to care for these complex patients. They should also be encouraged to use the strategies mentioned in our commentary to help compensate for their smaller volumes.

The scenario described by Dr Al-Ebrahim is quite different and certainly undesirable—the regional proliferation of small cardiac surgery programs without adequate justification, planning, resources, or infrastructure. Whatever the initial motivation, the development of numerous small units in close proximity makes little

sense from a health planning perspective. Regional cardiac centers shared by multiple institutions would seem to be a more rational approach.

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