EDITORIAL

ROGER M. MILLS, MD
Department of Cardiovascular Medicine,
The Cleveland Clinic

Mechanical cardiac support: Is the bridge a destination when you're stuck on it?

IT SHOULD come as no surprise that cardiologists and cardiac surgeons have a bias in favor of technology. The heart has a relatively straightforward mechanical function and minimal intrinsic endocrine activity. For decades, we have been intrigued with the prospect of building devices for cardiac support or replacement, first for temporary and then for long-term use.

In their review on page 223 of this issue of the *Journal*,[1] Nemeh and Smedira comprehensively define the state of the art of mechanical cardiac support. In particular, they emphasize:

- The growing numbers of patients with chronic heart failure
- The potential for cardiac recovery after device support
- The possibility that support devices may become "destination therapy," that is, the device will be used for permanent mechanical support.

As a clinician with an admittedly favorable prejudice towards this technology, I want to add a few comments to give perspective to their excellent review.

MORE PATIENTS, SICKER PATIENTS

Chronic heart failure has become the final common pathway for most patients with cardiovascular disease in the developed world. As better treatments—drugs, revascularization procedures, pacemakers, defibrillators, valve repair or replacement, and cardiac resynchronization—continue to delay the demise of individual patients with advanced disease, the heart failure population will continue to grow.

However, these patients will be older and burdened with ever-greater comorbidities. Mechanical support will be a realistic option for only a few.

Cardiologists will have to mediate between desperate patients and dramatic technology, explaining in detail the risks and potential benefits and initiating candid discussions about the morbidity, mortality, and quality of life of patients who depend on an implanted device for survival.

In addition to needing technical skills, the next generation of cardiologists will need a firm grounding in the humanities, compassion, bedside skills, and good judgment to deal with these issues; training programs must recognize and plan for these needs.

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BRIDGE VS DESTINATION

The question of whether the devices should be used only as "bridges" to transplantation or as "destinations" begs for an answer. Like many commuters, one wonders if the bridge becomes a destination when one is stuck on it.

Heart transplantation cannot truly be the destination. The mathematics of organ donation and the adverse effects of immunosuppression dictate that reality.

Effective intermediate-term mechanical support may allow patients with previously untreatable problems to recover. This approach will be particularly dramatic if the promise of stem cell myocardial reconstitution comes true.

However, it is the prospect of a large population of totally device-supported cardiac

patients, all requiring long-term specialty care, that raises ethical and economic issues that dwarf the long-term problems we already face in dialysis patients.

Before this new technology is widely accepted as permanent therapy, we must develop and apply high-quality guidelines to help physicians decide who would benefit from it and who would not. These guidelines should be based on multivariate analysis of objective factors such as maximal oxygen consumption, B-type natriuretic peptide levels, comorbid conditions, and nutritional, pulmonary, renal, and peripheral vascular status.

LVADs ARE LUXURY ITEMS

Finally and inevitably, economics must intrude into this discussion.

An economic measure called the *price elasticity of demand* gives an objective assessment of whether the market treats a good or service as a *luxury* or a *commodity*.

Demand for luxury goods shows relatively little sensitivity to price. For instance, the buyer of a $50,000 luxury vehicle will probably not change his choice to a slightly less prestigious one for $49,000. However, the same buyer purchasing a $2.00 pack of paper towels might well buy a different brand "on sale" for $1.89. The "price-insensitive," high-end auto is a luxury. The price-sensitive paper towel is a commodity.

What about left ventricular assist devices (LVADs)? The mean hospital costs (including the cost of the device) for a "destination LVAD" now run just over $202,000, with a wide standard deviation, depending on complications (data supplied by Thoratec Corporation, Pleasanton, Calif). Time is priceless, but LVADs don't buy much of it: only about 25% of the patients who received LVADs as destination therapy in the REMATCH (Randomized Evaluation of Mechanical Assistance for the Treatment of Congestive Heart Failure) trial survived 2 years.[2]

Mechanical support will be a realistic option for only a few

In this age of rising medical costs, third-party payers will almost certainly define mechanical support of the circulation as a luxury. Physicians will have to accept this economic fact and its implications without attempting to shift the argument to moral grounds. We will have to remember that funding the commodities of public health, such as clean air, clean water, public safety, good nutrition, vaccination, and reproductive health, comes before the luxuries.

The most likely administrative strategy to control costs will be for third-party payers to approve the device but limit payment to only a small fraction of the cost of implantation. This will effectively deter most institutions from developing mechanical support programs. Those institutions choosing to push on with destination therapy will certainly build significant constraints into the process on a local level.

ANSWERS WILL COME, BUT SLOWLY

Mechanical support of the circulation, so conceptually simple, raises myriad technical, biologic, ethical, and macro-economic problems. How do we do this? What happens when we do this? Should we do this? How can we afford this?

The answers will come as progress always does: slowly, stepwise, and with some false starts along the way. Nonetheless, our surgical colleagues deserve our support and respect for their continued efforts in this challenging arena.

REFERENCES

1. **Nemeh HA, Smedira NG.** Mechanical treatment of heart failure: the growing role of LVADs and artificial hearts. Cleve Clin J Med 2003; 70:223–233.
2. **Rose EA, Gelijns AC, Moskowitz AJ, et al.** Long-term mechanical left ventricular assistance for end-stage heart failure. N Engl J Med 2001; 345:1435–1443.

ADDRESS: *Roger M. Mills, MD, Department of Cardiovascular Medicine, F15, The Cleveland Clinic Foundation, 9500 Euclid Avenue, Cleveland, OH 44195; e-mail millsr@ccf.org.*

CME ANSWERS

Answers to the credit test on page 271 of this issue

1 **E** 2 **B** 3 **D** 4 **A** 5 **E** 6 **D** 7 **A** 8 **E** 9 **E** 10 **E** 11 **B** 12 **B**