

## From the Editor

### The Diffusion of Innovation in ExtraCorporeal Technology

Why is it that sometimes there is a certain reluctance to change?

Long term extracorporeal support was first reported in an animal model with the Kolobow spiral membrane lung in 1971 (1). It is remarkable that the Spiral Flow Oxygenator and a servo-regulated roller pump system served as the principle system used for long term support for respiratory failure and for post cardiectomy heart failure for more than three decades in North America. During the past 10 years, however, a growing number of reports of the use of hollow fiber membranes and centrifugal pumps for ECMO support, particularly for post cardiectomy heart failure, appeared in journals. In 2004, Gunst and colleagues conducted a survey of 79 open heart centers in the United States and found that, while 60% of the centers used the Kolobow design oxygenator exclusively, 19% of centers reported off-label use of hollow fiber oxygenators exclusively and 40% reported use of at least some hollow fiber oxygenators (2). For blood propulsion, 65% reported exclusive use of roller pumps, 12% exclusive use of centrifugal pumps, and 35% reported at least use of one centrifugal pump. These findings were identical to our survey published in *The Journal* that same year (3). The diffusion of innovation related to ECMO support systems has been surprisingly slow in North America.

Everett Rodgers developed a theoretical framework that describes the diffusion of innovations (4). In his model, he describes five characteristics that affect the rate at which innovations are adopted: relative advantage, compatibility, complexity, trial-ability, and observability. Clearly, all of these factors are at play in the diffusion of innovation in extracorporeal technology. Rodgers goes on to describe five categories of adopters of new ideas: innovators, early adopters, the early majority, the late majority, and laggards. Each of these categories of practitioners brings important perspectives to the change process. Consideration must be given to why the so called "laggards" resist change and the concerns that they identify should be carefully explored. The rate of diffusion may be related to a learning curve, to the lack of sufficient evidence (uncertainty) that demonstrates the benefit of the proposed change, or to social factors related to those proposing the change.

Understanding the patterns of past decision-making provides instructive insight into the diffusion of change in clinical practice. Uncertainty will continue to emerge



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along with new techniques and devices. In this issue of *The Journal*, we are pleased to publish Mejak's retrospective analysis of blood product use, pressure drop and durability of the BabyRx microporous polypropylene hollow fiber oxygenator (Terumo Cardiovascular, Ann Arbor, MI) and the 800 silicone membrane oxygenator (Medtronic, Minneapolis, MN) on fourteen neonatal ECMO patients. This work illustrates a model for changing practice which progresses from a review of the generalizable evidence related to a subject, to a proposed test of change and followed by an examination of the effect of their change within the context of a system. Important decisions like this one deserve just such an effort. Their conclusion, "... the benefits of the newer technology presented in the hollow fiber oxygenator outweigh its lone disadvantage of endurance when compared to the silicone membrane." Is it fair for us to embrace this conclusion? While this reported experience is helpful, we must design a test of change within the context of our own system to confirm this improvement.

Also in this issue we are pleased to publish two papers related to intra aortic balloon pump (IABP) counterpulsation accompanied by Riley's Classic, a double feature of the early work of Kantrowitz and colleagues on counterpulsation. I had the privilege of meeting Dr. Kantrowitz some years ago at a conference in Galveston, Texas. His description of this remarkably innovative idea and the resistance that he and his colleagues encountered early on underscores the difficult path to adoption of an idea. Those involved in the birth of new ideas should take heart; today's seemingly absurd ideas will perhaps be the breakthroughs of tomorrow. Malcolm Gladwell's bestseller, *Tipping Point*, a phrase borrowed from the field of epidemiology, is a great read for anyone desiring to go deep into this topic.

Speaking of change, on April 25th, *The Journal's* electronic submission process went live. Authors may now submit manuscripts for consideration electronically using

internet access from anywhere in the world. The process begins by going to our website, [www.JECT.org](http://www.JECT.org) and opening the link entitled "Instructions for Authors." From there, you will be directed to our manuscript submission page <http://www.editorialmanager.com/jectjournal/>. Follow the prompts to register as an author, then login, and prompts will guide you through the submission process.

Why would you want to submit to *The Journal*? *The Journal* has the largest circulation in the field of extracorporeal technology and *The Journal* is read by perfusionists, anesthesiologist, surgeons, and researchers in 29 countries. Our editorial board is comprised of leaders in our field and they will provide an honest and thorough review of your work. *The Journal* is the longest continuously published periodical in the field of perfusion and has served as the official publication of the American Society of Extra-Corporeal Technology since 1967.

We would all do well to remember the words of Charles Darwin in our approach to the changes that we face today and those that we will face in the days that follow,

"It is not the strongest of the species that survives, nor the most intelligent, but the one most responsive to change."

**Charles Darwin**  
*English biologist (1809–1882)*

Perhaps a responsiveness to change should be classified as both a strength and a mark of intelligence.

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## REFERENCES

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