



Editorial Comment

Advances in Technology — Charging Ahead into the Future

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The article by Sassouni and Levin appropriately points out the significant growth opportunities for world-wide technological advances in the treatment of patients with cardiovascular disease. The list of scientific and therapeutic advances impacting the practice of medicine and the health of the world is significant (Figure 1). Can anyone seriously doubt that technological and scientific prowess has been the handmaiden of an improved longevity and quality of life in our country? However, while there have been a myriad of technological developments that allow physicians to perform powerful diagnostic and therapeutic interventions, our current environment is focused on the *economics* of health care delivery. Managed care continues to grow and network-based forms of managed care are predicted to be the major payment mechanisms for practitioners and health care facilities as we approach the turn of the century. Consolidation, downsizing, and mergers and acquisitions frequently lead to a debate concerning the usefulness of technology. In fact, there are some who view technology as the culprit for our previous unbridled increase in health care costs.

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Cardiologists and other specialists who have become facile in utilization of these technologies have sometimes borne the brunt of criticism for runaway health care costs, and perhaps some of this criticism is justifiable. There are unquestionably those who over utilized these new technologies, sometimes with little regard for costs or comparisons in effectiveness. The incentives to *over utilize* technology that sometimes existed in the 1970s and 1980s has appropriately been targeted by the government, insurers and payers, almost to the point where our current risks and incentives are to *under utilize* technology.

The demand for devices to treat arteriosclerosis, prostate disease, infertility and a host of other maladies has created a world-wide market of approximately \$120 billion — including \$50 billion in the

Figure 1. Milestones

1928	→	First antibiotic
1953	→	DNA double-helix structure
1955	→	Salk polio vaccine
1967	→	1st human heart transplant
1972	→	CAT scanner
1978	→	First test tube baby
1979	→	Small pox eradicated
1981	→	1st cases of AIDS
1982	→	Recombinant human insulin
1995	→	Cross species heart transplants

United States. This is growing at a rate of 8% annually. Coronary stents, for example, created a small market that grew from \$220 million globally in 1994 to more than \$1 billion in 1996 with projections for continued rapid growth.¹ However, the challenges in continuing the growth of technology are several-fold, as there are significant forces that threaten the development of these technologies especially in the United States. These forces include a somewhat stringent regulatory environment, an enforcement environment that has targeted health care providers, a litigious climate that is contributing to a shortage of raw materials needed for implantable devices, a payment mechanism that favors short-term contracts and bottom lines that frequently do not take into account the benefits of devices that may not show value for many years into the future (long after some of the current payers may have ceased to exist); and a relatively undefined and infantile outcomes and performance measurement system.^{2,3}

However, despite these forces there are many fantastic opportunities. It is technology that is making possible our "transformation of place" that provides for the delivery of many aspects of treatment at sites other than expensive acute care facilities. Technology becomes the primary enabler of this re-engineering. It is a tool that allows us to go from theory to real world practicality and it is a mechanism to create long-term value. In the rhetoric of health care reform over the past several years there has been emphasis on universal access to care and affordability. Having controlled our costs, we need now to emphasize the issue of value. The potential of technology is to add value to our patients (and we will all be patients), to the clinicians and providers of care. Our challenge is to appropriately apply technology and develop the mechanisms by which we can track our performances and benefits (long-term and short-term). We can anticipate continuing to be challenged to do more with less and that in and of itself should also serve as a stimulus to the development of a continued pipeline of useful technological devices. Our current environment should stimulate meaningful partnerships between industry, payers and providers, and not to be forgotten, an informed consumer will also be a significant part of the advancement of technology.

Steven Ambrose, author of the best-selling book entitled *Undaunted Courage: Meriwether Lewis, Thomas Jefferson, and the Opening of The American West*,⁴ discusses the impact of technology on the early 19th century. It mentions the fact that a single generation around the 1840s witnessed the inven-

tion of the train, telegraph and the steamship. Those were huge leaps made by the fact that there had been only incremental technological changes for thousands of years before. As he says "what strikes me about the beginning of the 19th century is that people never thought things would change". Here's what Ambrose wrote describing the world Lewis and Clark inhabited:

"since the birth of civilization, there had been almost no changes in commerce and transportation. Technology was hardly advanced over that of the Greeks. The Americans of 1801 had more gadgets, better weapons, a superior knowledge of geography and other advantages over the ancients, but they could not move goods or themselves, or information by land or water any faster than had the Greeks and Romans."

As we approach the turn of our century, we live in a time of expected and unprecedented change. We have come to expect technological advances as the "norm".

Technology has been and will continue to be a valued ally in our understanding and treatment of those who seek our care. Our challenge is to advance technological development in our own country and around the world, cognizant of our responsibility to do it appropriately and efficiently.

"A fundamental principle of economics is that the production of anything should be expanded only if the incremental benefits from further production cover the associated incremental costs. Undergraduates grasp this point quickly, because it is so sensible. Alas, clinicians and patients have only had difficulty with it, for it implies that clinicians may refrain from 'doing everything possible' for patients. Clinicians are not trained to practice that kind of benefit — cost analysis, and patients loath to accept it as well — perhaps even economists, when they are patients."

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