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Cardiology Update: From the Frontier to the Bedside

✖ It was the best of times. It was the worst of times. The ironic reality of modern medicine in America is that a time of decline — when the intrusion of government and Wall Street and trial lawyers have propelled clinical practice into a difficult, at times painful series of dilemmas and compromises, is also a time of triumph—when scientific advancement has revealed entire new realms of knowledge and technology. Cardiology is no exception to this paradigm.

Advances in information technology are having a massive impact on medical knowledge. Aside from the obvious benefit to the

quality movement, enabling the creation and harvesting of huge databases to assess outcomes, this acceleration in processing capabilities has been essential in permitting the description of the human genome, as well as in pursuing its many applications. Perhaps, in the not too distant future, we will be able to identify, via genetic scanning, which heart failure patients would benefit from an implantable defibrillator, and which ones will not; which post-MI patients would benefit from aspirin, or an ACE inhibitor or a beta blocker or which ones (contrary to current "evidence-based medicine") would not; which patients will respond to which medications, and which ones will not; which genes, or specific loci need to be targeted for intervention, and which do not, etc.

Dogma to even the most elementary students of cardiology has always been that the highly specialized cells of the heart have undergone terminal differentiation, and, therefore, once destroyed, are irreplaceable. Recent and increasing evidence in the realm of molecular and cellular biology appears to be modifying these beliefs — in fact, heart cells may be capable of reproducing, but the process is highly controlled. Thus enter the era of tissue regeneration. The discovery of pluripotentiality — the ability to develop into multiple different cell types depending upon the local environment and systemic signals — in various cell types, especially in the bone marrow, has opened the possibility of heart repair and/or regeneration following injury. This would be a novel approach to the treatment of heart attack, as well as a major stride in the prevention of congestive heart failure.

Despite these many advances, congestive heart failure afflicts nearly 5 million Americans, accounts for more death, morbidity and cost than any other area of cardiology. And its incidence is increasing. Evolving understanding of the biochemical/hormonal milieu of CHF, as well as the emergence of mechanical assist devices, and the possibility of genetic and cellular therapy, may open a new era in the treatment of this debilitating and fatal disease. Patients with even the sickest of hearts will rest on a device while receiving multiple therapies to restore a level of function compatible with a normal life.

All of these diagnostic and therapeutic advances are being facilitated by the remarkable application of physics to the development of imaging capabilities. These remarkable new technologies not only demonstrate anatomy (more clearly and three-dimensionally than ever before), but simultaneously describe physiology, and highlight pathology.

All of this discussion of exciting new frontiers would be woefully deficient without the increasingly painful if not embarrassing realization, that much, if not most of clinical heart disease that we presently see would be preventable by the simple application of current knowledge. Only one quarter of people with hypertension (a major risk factor for heart disease, kidney failure and stroke) in this country are adequately treated. Obesity has become rampant, with over half of the adults in this country overweight and approximately one fifth clinically obese. Resultant diabetes has a synergistic relationship with other known risk factors for coronary heart disease. And let us not forget, cigarette smoking, which afflicts one quarter of the adult population, is still the leading cause of preventable death in our country. Despite all of the exciting new developments, the future □ “the new frontier” □ may well be found in the shift from intervention to prevention.

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