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PRESIDENTIAL ADDRESS

WHAT THE CARDIOTHORACIC SURGEON OF THE TWENTY-FIRST CENTURY OUGHT TO BE

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To be president of The American Association for Thoracic Surgery is, of course, the greatest honor of our specialty. I remember my first AATS meeting in 1966 in Vancouver, when I stood at the back of the room and looked at those Olympian figures, John Kirklin and Denton Cooley, discussing fabulous topics of the time, and I was just simply in awe of the whole proceedings. Now I am here presenting my thoughts about the next millennium to a new generation of thoracic surgeons. This past year I have had the privilege to work with a superb council, a responsive executive director, Bill Maloney, and his staff, who do such an outstanding job for our Association. I have also been blessed to work with a talented and understanding staff, both attending and resident, at the Brigham and Women's Hospital.

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I want to pay tribute to my wife, Roberta, for all of her support, energy, and hard work on my behalf. As my friend Rick Barner said at the meeting of the Southern Thoracic Surgical Association, "Our wives work and labor for us and our families so that we can enjoy and selfishly indulge ourselves in surgery." That could not be more true in my case.

The title of my address, "What the Cardiorthoracic Surgeon of the Twenty-First Century Ought to Be," may ring a slightly familiar bell to those who are students of surgical history. A variation of this title has been used twice before. In the 14th century the French surgeon Guy de Chauliac wrote, "What the Surgeon Ought to Be." More recently, in a Vascular Society presidential address in 1972, Dr Glenn Morrow discussed, "What the Cardiac Surgeon Ought to Be."¹ Using this paradigm, I have chosen to discuss 11 individual qualities that, I think, will be important for every cardiorthoracic surgeon in the 21st century. On this framework, I would like to offer some reflections, some motivation, and also some initiatives that we as individuals, and perhaps as a specialty, should pursue.

The cardiorthoracic surgeon of the 21st century ought to be an excellent surgeon

Ultimately, the extent to which we will be judged as practitioners of surgery will be determined by how effectively we perform surgical procedures. In whatever economic or institutional setting we work, we must

strive to be the best technical surgeons that we can be and ensure that our trainees be the best they can be. Neither new technologies nor sophisticated postoperative care techniques can ever compensate for a poorly performed operation.

Equally important is the judgment used in determining the type of operation to be done. The surgeon should be the one ultimately to decide who should have what operation. Naturally, selection of patients and operations involves both physician and surgeon, but in the final analysis the surgeon has to be the one to make these decisions and justify the rationale.

To continue to be an expert technical surgeon, however, we must know our own capabilities and results. With the public increasingly looking at outcomes,² we need to be continually self-critical and willing to make changes in techniques to improve outcomes. I personally recall some suboptimal results my colleagues and I had with reoperative coronary bypass about 10 years ago, especially in patients with open, atherosclerotic grafts. We subsequently adhered to a strict, "no-touch" surgical strategy, and over the next 5 years the mortality for reoperative bypass was reduced to equal that of primary coronary bypass.³

We are often asked to do operations on high-risk patients as a last, desperate maneuver in a patient's course; outcomes of high-risk procedures may be part of published results, but that should not deter our decision to operate if we believe we have the technical expertise and the patient will benefit in the long-term.⁴ On the other hand, as Alfred Blalock, president of the AATS in 1951, said, "The fact that a patient is going to die does not necessarily mean that he should be operated upon."¹

The cardiothoracic surgeon of the 21st century ought to be a physiologist

In the next century a growing number of new therapies and new indications for standard therapies will change what we do. Selection of operations and postoperative care will be dictated by a thorough knowledge not only of pathophysiology, but also of molecular biology. In this past decade, for example, understanding the pathophysiology of mitral regurgitation and its effect on left ventricular function has allowed us to make more knowledgeable recommendations for surgery in both symptom-free and severely compromised patients.

This is a far cry from 1966, when I worked in the laboratory with Glenn Morrow at the National Institutes of Health. Using relatively crude measurements of left ventricular function by today's standard, we conclu-

sively proved that the papillary muscle integrity had absolutely no effect on postoperative function after experimental mitral valve surgery.⁵ How wrong we were! This misconception was promulgated for many years until new experiments with more sophisticated techniques and prospective clinical observations completely changed our thinking. We now know that preservation of the papillary muscle-annular continuity improves left ventricular function even in advanced decompensation. This knowledge has stimulated many to now do mitral valve repair rather than transplantation in some patients with severe heart failure, a concept that was anathema to surgeons just a few years ago.⁶

Similar changes in many therapies will be developed on the basis new physiology and biology, and we must be ready to learn and ready to change.

The cardiothoracic surgeon of the 21st century ought to be an excellent teacher

Thoracic surgeons earn their teaching credentials every day. We teach residents, support staff, referring physicians, and colleagues, and by doing so we improve the care of our patients. However, the educational agenda for the next century will be far more complex.

One of the most important education issues we face is whether we should revise our residency training programs.⁷ The key question is this: With the increasing amount of knowledge that we need to pass on to the next generation of surgeons, should we increase the length of time they spend in thoracic surgical training and decrease the time in general surgical training? This is being discussed now, not only because the knowledge base is growing but also because there are increasing concerns about the funding of graduate medical education.⁸ Funding cutbacks, especially through Medicare, may mandate both a reduced length of total training and a reduced number of subspecialty residents.

My proposal is that we continue to work with our general surgical colleagues toward developing an excellent training curriculum in general surgery with a flexible approach toward board certification, but at the same time establish case benchmarking, especially for gastrointestinal and vascular surgery. Most important, we should provide expanded training in thoracic surgery to teach our residents what they will need to know in the next century. All of the major thoracic surgical groups influencing education met recently to discuss these very issues. Working together, we should be able to make these changes and still guarantee that our residents will receive the best training possible.

The cardiothoracic surgeon of the 21st century ought to be very knowledgeable about the economics of health care

In 1997 more than \$1 trillion was spent on health care in the United States, with \$969 billion being spent on personal health care.⁹ The complexities of this system are so vast I thought I would just touch on just a few areas of interest.

As we all know, data and performance measurements are now the “buzz words” of health care management.¹⁰⁻¹² Many state governments and payer coalitions, public and private, have developed economic and medical outcome report cards on physicians and hospitals. Cardiac surgery leads the way. The use of large surgical databases, such as the Northern New England database or the Society of Thoracic Surgeons database, therefore, will be increasingly useful to learn who are the most cost efficient, who do the best work, and what new technologies are worth the expense. One feature about database information has concerned me, and that is the lack of a unified patient risk stratification system. Without such a standard, comparison of database information between hospitals, cities, regions, or care plans may be misleading.¹³ Therefore I propose that the thoracic societies, directed by the Professional Affairs Committee, stimulate discussion with major payers and other health care agencies and organize the necessary meetings to begin to formulate a truly universal risk stratification scheme. This could help eliminate the “gaming” of the system, prevent publication of inappropriate and misleading data, and discourage withholding of surgical therapy to the high-risk patient who may benefit from surgery.

A second general area that concerns all of us, but one that each of us needs to continually focus on, is the validation of surgical procedures in elderly patients.¹⁴ As the baby boomers age, the numbers of patients over 70 requiring cardiothoracic services will increase enormously in the coming decades. Analysis of the costs and benefits of the operative procedures we do in elderly patients, especially those 80 and 90 years old, will be important to ensure that we use our surgical expertise to help those elderly patients who will truly benefit from surgery by an improved quality of life and increased longevity.

Finally, an economic area on which we need to focus is capitated health care plans. There is no rational reason why we who provide care to the seriously ill should be in the business of denying care so that third-party payers, many of whom are for-profit corporations, can increase their bottom line. These systems are very costly for hospitals, especially the teach-

ing hospitals; they seriously erode our ability to provide free care, and they reduce funds for medical research and teaching. The American people are now resisting these programs, and I know in many areas these programs are beginning to fall by the wayside,¹⁵ much to the chagrin of the myriads of well-paid non-medical consultants who predicated otherwise. Jerome Kassirer,¹⁶ editor of *The New England Journal of Medicine*, summed this up best, when he recently stated, “After all, what oath, promise or pledge did we ever make, either as individuals or as a profession, that obligates us to restrict care; we pledged instead to provide care.”

The cardiothoracic surgeon of the 21st century ought to be well versed in digital technology

In the past decade the boundaries between the digital world of bits and the physical world of atoms have been disappearing rapidly. We can now carry our “bits” in our pockets with PalmPilot organizers (3Com Corporation, Santa Clara, Calif), we have digital navigation in our cars, and we can buy virtually anything on-line.

What does this digital revolution mean to us? It means that we are going to have to become fluent in the range of opportunities offered by this new technology and how they can be applied to our thoracic surgical practice.

Most of us already use the Internet for information retrieval, every journal is on-line, we communicate with colleagues via the CTSNet, and we evaluate real-time telemedicine consultations from around the world.

Digital technology will soon have a far wider reach in the practice of medicine to include such advances as wearable or implantable monitoring devices for home patients with left ventricular assist devices, robotic cardiothoracic surgery (already in its infancy), and state-of-the art imaging techniques. Across the Charles River from the Brigham at the Massachusetts Institute of Technology, researchers are currently developing advanced holographic imaging tools that will allow us to view 3-dimensional images of organs instead of using 2-dimensional magnetic resonance imaging or computed tomographic scans. A start-up company, also in the Massachusetts Institute of Technology area, is working on a new magnetic resonance vascular imaging process that will be able to accurately visualize the coronary arteries in the beating heart without an interventional catheter.

As surgeons of the 21st century, we need to understand and embrace these emerging digital technologies.

The cardiothoracic surgeon of the 21st century ought to be knowledgeable, if not expert, about advances in new surgical technology

Twelve years ago I¹⁷ gave a presidential address to The American College of Chest Physicians, titled "The Paradox of High-Tech Health Care," in which I said that our capability in cardiothoracic disease management could be extended almost without limits by new technology, but that these advances would be too expensive to apply without limits. This was prophetic, not surprisingly, since patients want these advancements despite the cost, and predictably third-party payers resist paying the cost.

Understanding and learning how to use these technologies economically and responsibly will be one of our toughest challenges for the new millennium. Take for example the whole field of minimally invasive surgery. After its beginning with the introduction of the Fogarty arterial embolectomy catheter in 1963, there was a great resistance to changing the old techniques. Since then, minimally invasive approaches have enhanced every field of surgery because, understandably, patients want the same quality operation, with less trauma, and a faster return to normal.

Many new technologies are being aggressively promoted by device manufacturers, but how do we assimilate them in a rational and cost-effective manner? As with any new group of therapies, we should first be appropriately skeptical before abandoning standard approaches.¹⁸ Critical appraisals have to be done in meetings such as the AATS, and in some cases prospective randomized studies of the new versus the standard, or comparison with alternative nonsurgical interventional procedures, may be necessary.

One of the most important questions will be this: Who will organize and monitor the education and assimilation of this new technology? In the November issues of this Journal and *The Annals of Thoracic Surgery*, the New Technology Committee published education guidelines for minimally invasive heart surgery.^{19a,19b} Although only guidelines, we suggested that there be multiple industrial sponsors for post-graduate courses, formation of licensed proctoring centers, and perhaps, in the future, even digital device simulator centers for some technologies. Manufacturers with whom I have spoken are keenly aware of the importance of teaching surgeons the right way to use their technologies; however, they do not want to be the only teachers, nor are they legally able to do this. If we do not learn to teach new techniques to our colleagues, the right way in the right patient, then third-party agencies may jump in and dictate to us

what is good technology, who gets to do it, and what gets reimbursed.

I recently attended an ad hoc meeting of surgical society presidents sponsored by the American College of Surgeons to discuss funding a pilot study to teach new procedures to surgeons in all surgical specialties. Programs like this must happen, and our organizations must take the lead. The companies want this, surgeons want this, and hospital credentialing boards want this. People in this room and in this Association, not the American Medical Association, not Blue Cross, must determine the educational and hospital credentialing guidelines for our specialty with new technology.

A cardiothoracic surgeon of the 21st century ought to be a leader

The organization required to do heart surgery with cardiopulmonary bypass or complicated thoracic surgical procedures thrusts us into a leadership position every day because of the numbers of people who interface on just a single complex thoracic operation. Consider the organization and logistics required for a recent simultaneous triple transplant performed by my colleagues at the Brigham: two single lung transplants and a heart transplant in three separate patients from one donor, directing some 75 support staff.

However, the fact that we are thrust into leadership positions does not necessarily mean we are good leaders. Leadership is taking the responsibility to direct the actions of others in carrying out the purposes of the organization and with accountability for both successful and failed endeavors. Leadership is determined by being a role model and trying to be the best you can be, it is the ability to make timely decisions, and it is caring about all those who work for you and with you. In his wonderful book, *Leadership Secrets of Attila the Hun*, Wess Roberts²⁰ states: "You must have a passion to succeed, a passion that drives you to prepare yourself and your colleagues to excel. By their actions, not words, do leaders establish the morale and integrity of their subordinates aided by the ability to make timely difficult decisions."

Now, more than ever, we must use our leadership skills to broaden our scope and think in terms of hospital and national leadership to become spokespersons for maintaining the highest quality and most cost-effective medical care. Many thoracic surgeons in the AATS have already demonstrated superb leadership in major health care institutions, regional and national medical organizations, and even in high government office, but this trend needs to increase if we want to be part of the solution and not part of the problem.^{21,22}

The cardiothoracic surgeon of the 21st century ought to be adaptable

The most successful thoracic surgeons are, by their very nature, adaptable because they deal with new predicaments every day in the operating room, on the ward, and in the clinic.

In the coming years we will need to demonstrate this adaptability in response to the changes in the treatment of certain diseases. Although coronary artery disease is one of the most common diseases in America, and is certainly the most common disease for which we operate, treatment options are changing dramatically. I recently read an article in *Business Week*, titled "Can We End Heart Disease?"²³ This article suggested the possibility that because of increasingly successful coronary interventions, angiogenesis, and genetic therapy, we as surgeons may soon be out of work! I do not believe this for a minute because of the surgical intellect, ingenuity, and adaptability. Although I disagree with the conclusion of the article, I do agree with the assertion that, to be successful in treating coronary artery disease, we are going to have to understand the trends in these alternative methods to increase blood supply to the heart and incorporate them into our surgical treatment plans, including minimally invasive coronary artery surgery.

Andy Grove,²⁴ the founder of Intel Corporation, discusses this quality extensively in his book, *Only the Paranoid Survive*. Grove believes that the more successful you are the more susceptible to attack you are from outside sources. His thesis revolves around "strategic inflection points." A strategic inflection point is a time in the life of a business or organization or specialty when its fundamentals are about to change. That change can mean an opportunity to rise to new heights or may signal the beginning of the end. How adaptable we are and how we respond when we hit these strategic inflection points will dictate our future success. One of the most important areas in which we have to be very adaptable is in our collaboration with nonsurgical specialists. In my opinion, and it is shared by many others, we will be best served by moving toward a "product" or "service line" concept.^{11,12,25} A service line developed jointly by cardiology and cardiac surgery or pulmonology and thoracic surgery is the future. This concept is especially good for the patient, de-emphasizing competitive financial incentives between internist and surgeon and promoting interrelating best therapies. Such service lines have already been developed with success at many institutions across the country. Although this approach is going to bring about some major changes in the classic academic departments, it

would appear to be the one plan that can ally specialists, economically and therapeutically, in a more efficient and cost-effective way. However, like any other major change, it will necessitate adaptability and flexibility in ourselves and the institutions in which we work.

The cardiothoracic surgeon of the 21st century ought to be persistent

Persistence is perhaps the most important personal quality in any successful cardiothoracic surgeon. How many times has each of us experienced success in a very difficult operation by simply adhering to our game plan in the operating room, no matter what the obstacles? This is one of the greatest lessons I learned as a resident from my surgical mentor, Norman Shumway. If things look bad, just keep working and collectively figure out the simplest and safest way to achieve your goal. I recall a patient with very complex congenital heart disease on whom Shumway and I operated together. After redoing baffles and anastomoses more than once to achieve the correct physiologic anatomy, we obtained an excellent outcome. For me, this was a defining moment, and it has been a guiding principle in my surgical practice.

This quality is as important for negotiations with managed care as it is in the operating room. It is a quality we need in clinical and laboratory research, following the example of Shumway, Lower, and Stofer, who worked for 10 years to perfect orthotopic cardiac transplantation. It is the same quality exhibited by members of our professional affairs committee who labored for 5 years to understand the economics of health care, learning the "ins and outs" of Washington beltway interactions, which eventually led to improved and slightly more rational Medicare funding for cardiothoracic surgery.

Gustav Mahler, the great composer, once said, "For success, nothing in the world can take the place of persistence; talent alone will not be successful because nothing is more common than the unsuccessful man with talent. Education alone will not be successful, because the world is full of educated fools. Persistence and determination are alone, omnipotent."²⁶

The cardiothoracic surgeon of the 21st century ought to have a good sense of the history of our specialty

I firmly believe that a person can deal more intelligently and more effectively with just about any subject if he or she fully understands its evolution. How many times have colleagues spun their wheels by simply not checking the Internet or speaking to senior colleagues about a "new" operation or case that is really not new.

Owen Wangensteen²⁷ once said, "If all problems in medicine could be taught with special emphasis on a historical approach, every physician would be better prepared to cope with future problems." Evaluating new operations or trying new protocols that are not observant of past data is sure folly, especially in this age of accelerated information access. It took John Gibbon more than 20 years to perfect the heart-lung machine until his first clinical success in May 1953. Even today, understanding his work is important for anyone interested in developing cardiopulmonary bypass techniques. I witnessed the signing of the Medicare bill in 1965 by President Johnson on the lawn of the National Institutes of Health. Understanding the history of the subsequent twists and turns in this legislation is important for understanding current health care economic policy.

I have always been fascinated with history. My historical hero is Thomas Jefferson, about whom I have studied and written.²⁸ Jefferson combined all of the intellectual qualities that a good physician and surgeon ought to have. He was inquisitive, he cared about people, and he had a huge intellect, allowing him a unique perspective on a vast array of subjects. He also was a firm believer in the scientific method, and he criticized nonscientific physicians of his time. He wrote in 1812, "While surgery is seated in the temple of exact sciences, medicine has scarcely entered its threshold, for their theories have resulted in ... the necrology of man."²⁸ These qualities exhibited by Thomas Jefferson are essential in our times, when we must possess a significant background of experience and knowledge in almost everything we do.

The cardiothoracic surgeon of the 21st century, above all, ought to be a humanist

Despite all of the advancements in technology and the changes in the economy of health care, it is still extremely important to be a good doctor and to demonstrate compassion, a quality we as cardiothoracic surgeons are often criticized for lacking.

Being a cardiothoracic surgeon is enormously satisfying because it offers the most rapid gratification for patient and physician, available in few specialties: one can operate on a sick patient and make that person well in a very short time, by performing a complex surgical operation that is challenging both intellectually and physically. However, we have to remember the humanistic side of each operation we do.

On a personal note, as many of you know, about a year and a half ago I underwent a minimally invasive aortic valve replacement performed by our vice president. As a patient I found it comforting and confidence building to

receive kind, thoughtful, and intelligent care. In return, I found that care was maximized when I, as a patient, gave back kindness and appreciation. During my hospital stay, one of the most important times of each day was when my surgeon came in late at night to make his rounds, shake my hand, and discuss my progress. There was an uplifting of spirits that made me feel better in every way, and I was encouraged that I would recover. It is important, if for only a brief social visit, to touch each patient, to give him or her confidence, and describe how things are progressing and why. I also now truly understood how important a supportive family is to a recovering surgical patient. I believe my personal experience has made me a better physician.

Conclusion

These are some of the qualities that I think will be very important for cardiothoracic surgeons as we enter the 21st century. They will be necessary to meet the challenges presented by the changing pathophysiology of diseases, by changing therapies, and by the commingling with interventional specialists in all areas of thoracic surgery. Superimposed on this new knowledge base will be vastly changing technology and new health care economics that are going to alter the way we practice and the way we are reimbursed for our surgical skills.

I hope these remarks have some relevance for all of you, and I hope many of these qualities will be learned, enjoyed, critically evaluated, and openly embraced as we enter the new millennium.

The Association has honored me by electing me to serve as its 79th president, and I am deeply grateful. Thank you very much.

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