Our Future Is Now: The 2012 Congress of Neurological Surgeons Presidential Address

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THE PAST

The 1933, the Chicago World's Fair was called "A Century of Progress." Highlights of this fair included homes of tomorrow, the arrival of the Graf Zeppelin, and Art Moderne architecture, a style reflected in the artwork for the 2012 Congress of Neurological Surgeons Annual Meeting. The theme of the 1933 Chicago World's Fair was "Science Finds, Industry Applies, Man Adapts." The promotional material for the fair reflected not only an expectation of a technological future but also optimism and an appreciation of esthetics. The first half of the 20th century was dominated by these themes. It was thought that the achievements of science and the application of technology would yield a new, better world of prosperity, intellectual freedom, and abundant health. Technological advancements that were envisioned included such things as computerized, push-button classrooms; flying and even orbital hospitals; and, of course, flying cars. The 1933 World's Fair was so successful that it was held over until 1934.

THE PRESENT

So where are those flying cars? The image of the flying car has become almost symbolic of a future that is yet to be. This image always seems to beg the question, "Is our world better or worse than the one that was envisioned?" In many ways, the answer is "Neither, just different." Sure, flying cars do not yet exist, although they could. And the reason they do not exist is not because the technology to do so does not exist. The Terrafugia Transition is available today, with an estimated base price of $279 000. Although there are many reasons that the skies are not currently teeming with flying cars, a major reason relates to their power source. Unfortunately, we are still using the same fossil fuels that we were using in 1933, fossil fuels that are becoming increasingly scarce. A recent study by the Association for the Study of Peak Oil showed that, in general, oil consumption has exceeded oil discovery since the early 1980s.[1] This gap has been steadily widening.

Much technology exists, however, that was not envisioned in the early part of the 20th century, especially in the area of computers. Powerful computers are everywhere, including on everyone's desk, in everyone's pocket, and in everyone's car. They are even present in our toys and toothbrushes. In fact, technology forecaster Paul Saffo noted in 2009 that the Furby doll of the late 1990s had more computing power than the Apollo 11 spacecraft that put the first man on the moon in 1969.[2]

In neurosurgery, we have amazing new technologies, things that could never have been envisioned in 1933. The operating microscope has revolutionized both cranial and spinal neurosurgery. Intracranial stents and coils allow the treatment of previously untreatable vascular lesions, and stereotactic radiosurgery has been applied to deep-seated cranial and spinal tumors and vascular lesions, as well as intracranial targets for the treatment of seizures and pain. Neuronavigation allows precise localization in both cranial and spinal surgery, increasing the precision and decreasing the invasiveness of neurosurgical procedures. Deep brain stimulations allows the treatment of medication-refractory Parkinson disease, whereas modern spinal instrumentation allows the treatment of degenerative disease, tumors, trauma, and deformity that were previously ineffectively treated. Such advanced technologies allow neurosurgeons to treat conditions that could never have been effectively treated in the past.

Equally important, we are beginning to appreciate the importance of evaluating the effectiveness of neurosurgical treatments and are developing tools to do so. Evidence-based guidelines apply rigorous methodology to the peer-reviewed literature to develop levels of evidence for or against the use of specific treatments for specific indications. In doing so, areas in need of additional research are generated. Many times, these research questions are best answered by effective clinical outcomes research, including the use of registries. Clinical outcomes research generates peer-reviewed research that completes the cycle by helping to refine guidelines. Organized neurosurgery is at the forefront of many of these efforts.

New technology allows neurosurgeons to treat more patients more effectively. Despite this technology, however, there are problems. Like fossil fuels, it turns out that neurosurgical care is also a limited resource. There is a limited number of neurosurgeons. In fact, there is already a shortage. In 2008, the American Association of Medical Colleges conducted a study of physician supply and demand, with projections through 2025.[3] The results projected a staggering and increasing shortage of all physicians over the next 2 decades. Proportionally, this shortage may actually be worse for neurosurgery because of its small numbers and long training period.

Furthermore, there is only a finite amount of money to pay for neurosurgical care. There is already a shortage of that, too. That point was reached quite some time ago. In 2011, the Centers for Medicare & Medicaid Services analyzed the

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difference between Medicare spending and revenue sources, expressed as a percentage of total spending.[4] The results showed that the last time this system broke even was in the 1970s, and it was operating at nearly a 50% deficit in 2011. To put it a different way, Medicare spends $2 for every $1 it takes in.

Given that, how do we get from here to there? How do we get the future we want?

THE FUTURE

Why should we even be concerned about the future? After all, it has been said that "whoever builds a house for future happiness builds a prison for the present." As a profession, neurosurgery currently has much of which to be proud. Neurosurgeons have a heritage of helping people with difficult problems in the most dire situations, a tradition of being the best and the brightest, and a history of research and clinical innovation. To compromise any of these things would be wrong. It is equally true, however, that everyone should be concerned about the future because we will have to spend the rest of our lives there. So what do we need to do to actualize the future we want?

Most important, we must remember why we became neurosurgeons. We must provide the best care we know how. We should not waste resources, but we should also never stop advocating for the individual patient. We must continue to seek treatments for incurable conditions. We must seek better treatments for curable ones. If we are going to continue to move forward, however, that is not enough. Many issues stand between where we are now and where we want to be. Two important issues, however, are healthcare spending policy and current policies related to the adoption of new medical technology.

First, we have adopted a flawed strategy for controlling healthcare spending. In a free market, supply, demand, and price are at equilibrium. When the price is above equilibrium, a surplus results. When the price falls below equilibrium, a shortage results. Current policy decisions appear to be based on the assumption that the price of health care is too high (Figure 1). Of course, in a free market situation, this could not happen for long because market forces would drive prices down. The current market for health care, however, is far from a free market. Consumers do not have the ability to freely choose between all available options, and multiple price controls exist.

Current strategies to address healthcare costs seem to involve decreased reimbursement and initiatives designed to increase quality. Most of the latter, however, also increase practice costs. Basic economics predicts that all policies that decrease reimbursement or increase practice costs both increase price and decrease supply over the long term. This shifts the supply curve such that, at all prices, the quantity produced is decreased. Similarly, all actions that increase quality shift the demand curve such that demand is increased, because presumably a better product is being produced (Figure 2). The net effect is predictably a new structure where, at the previously unacceptably high price, surplus turns to shortage. Consumers, dissatisfied by shortage, will invariably drive up the price to re-establish equilibrium (Figure 3).

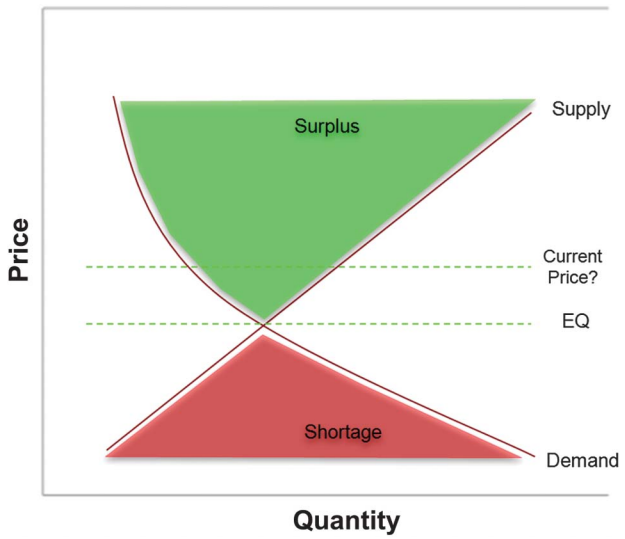

FIGURE 1. Graph showing the relationship between supply and demand for health care as a function of price and quantity. The price where the 2 curves cross (EQ) is the equilibrium point where there is neither surplus nor shortage. Current policy decisions appear to be based on the assumption that the price of health care is too high (current price?).

Most important, the demand for health care has been shown to be relatively inelastic. Therefore, any increase in price will always lead to an increase in total spending. This creates an effect exactly the opposite of what is desired.

There are only 2 ways to reduce the price of health care in the long term: reduce demand or increase supply. There are no other ways. On the demand side, we could decrease the quality

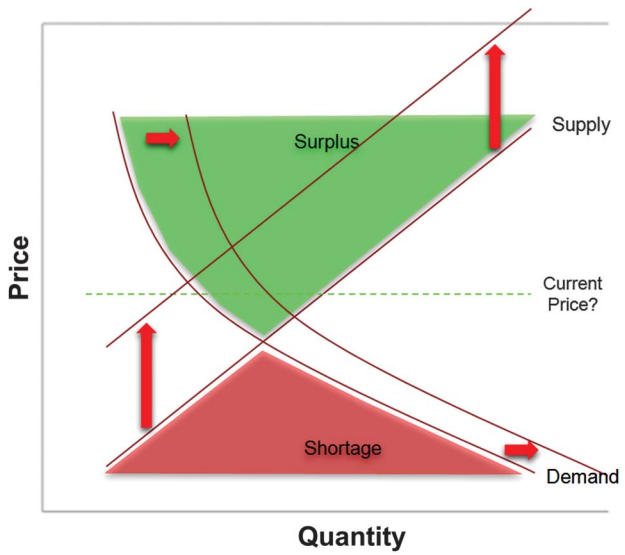

FIGURE 2. Graph showing the relationship between supply and demand for health care as a function of price and quantity. Policies that decrease reimbursement and/or increase practice costs shift the supply curve upward, whereas initiatives that increase quality push the demand curve to the right.

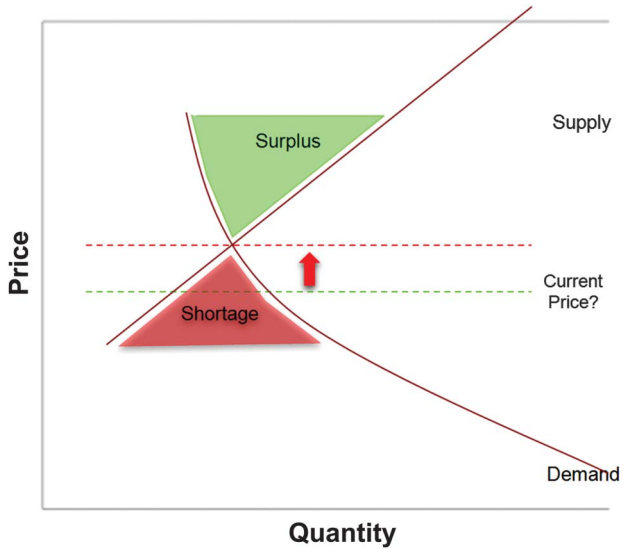

FIGURE 3. Graph showing the relationship between supply and demand for health care as a function of price and quantity. An upward shift in the supply curve and a rightward shift in the demand curve will push the equilibrium price upward, increasing the price of health care and total spending for health care.

of care, tell people to stop getting sick, or tell people to stop taking care of themselves when they do. None of these things will work in the United States, and trying to implement such a policy would be counterproductive.

On the supply side, we could make more physicians, and we could certainly pay them fairly. Most important, we could reduce the cost of doing business for physicians. There are certainly many opportunities for doing this. First, unfunded mandates like the Patient Quality and Reporting System, Health Insurance Portability and Accountability Act, International Statistical Classification of Diseases and Related Health Problems-10, and meaningful use criteria drive up the cost of doing business and provide no measureable health benefit to patients. Second, real medical liability reform would not only decrease liability insurance premiums but also eliminate defensive medicine, estimated to cost $70 to $126 billion per year as of 2003.

Neurosurgery and neurosurgeons must continue to strongly advocate for these things, not just through the Congress of Neurological Surgeons and the American Association of Neurological Surgeons but also at the state and local levels through the Council of State Neurosurgical Societies, through personal contacts, and by voting in every single election.

Second, technology is not our enemy. The reason we adopt new technology is because it works better. New technology makes the untreatable treatable and makes current treatments more effective. Arthur C. Clark once said that any sufficiently advanced technology is indistinguishable from magic. We want magic. We do not want to be stuck with 20th century medicine forever. Yes, there is a benefit to refining the indications for our current treatments through guidelines and outcome studies. The reality is that the current state of the art leaves much to be desired. Many of our patients do not have an effective, durable, safe treatment option for their condition. Progress lies not in enhancing what is but in advancing toward what will be. If we want neurosurgery of the future, we need to develop new technologies into actual patient treatments.

What are some of the barriers to the development of new technology? For the most part, neurosurgeons are not a barrier. Neurosurgeons have always been innovators and early adopters. The principal barriers are in research, regulation, and use.

In research, we have observed a decrease in internal funds available for academic research. We have observed an increased focus on clinical productivity over research at academic institutions. This is coupled with a decline in real dollars in National Institutes of Health research funding, which has been decreasing for nearly a decade. Industry-funded research has also come under increased scrutiny. Over the last decade, we have seen an increased awareness of potential bias resulting from conflicts of interest in medical research, including a 2009 report by the Institute of Medicine.[5]

Unfortunately, in many cases, the presence of potential conflicts of interest has become equated with the presence of real bias in many instances. As a result, a recent study showed that surveyed physicians downgraded the credibility of industry-funded research, potentially hindering the translation of results in the practice.[6]

The regulation of new technology is equally problematic. In the United States, all new technology must be approved by the Food and Drug Administration. For devices, there are 2 primary processes: the 510(k) process, and the premarket approval process. The 510(k) process is for devices substantially equivalent to previously approved devices. It is supposed to be used for low- and moderate-risk devices and does not generally require clinical trials. In contrast, the premarket approval process is supposed to be for higher-risk devices and requires clinical trials. It may also require bench and animal testing, as well as possible biocompatibility testing.

Approval is both costly and lengthy. A 2010 survey found that the cost of obtaining Food and Drug Administration approval for many devices was $31 million when approved through the 510(k) process and an average of $94 million when approved through the premarket approval process. This process may take 2 to 7 years. This does not compare favorably with other regions like Asia, where approval might require $3 million and 5 years, or Europe, where it might require $2 million and < 1 year.[7]

Given this, is it any wonder that a lot of our new devices look the same as the old ones or that implant materials have hardly changed in the last 20 years? Is it at all surprising that medical technology is so expensive in the United States or that a great deal of clinical research is now being done outside the United States? The current system incentivizes these things. After all, people do what they are incentivized to do.

The third barrier to new technology relates to regulation of use. Medical technology is highly valued as a beloved feature of American medicine. Patients expect it. Forty percent of Americans believe that medical technology can always save their lives. It is also thought, however, that new

or increased use of medical technology is responsible for 40% to 50% of annual healthcare cost increases and that controlling this technology is the most important factor in reducing them. As a result, even the Congressional Budget Office has studied the issue of technology in medicine.[8] It concluded that spending can be controlled only if new technology is adapted more selectively and the diffusion of new technology is slowed. Government, however, has a poor track record with such initiatives. Ayn Rand once poignantly wrote, "Unfortunately, when you see that in order to produce, you need to obtain permission from men who produce nothing, you may know that your society is doomed."

This strategy also appears fundamentally flawed. If one believes that current healthcare options leave much to be desired, why would one want to hold back progress? In addition, this strategy ignores the pricing life cycle of medical technology. Even today's old and cost-effective technology was new and expensive once. That is the cost of progress.

So how do we get the technological future we want? We must incentivize innovation and preserve the value of neurosurgeons as researchers. We must support public funds for neurosurgical education and develop strategies to enhance industry funding for neurosurgical research. We must break down the regulatory cost barriers associated with bringing new technology to market, barriers that drive up the cost of new technology, and that discourage revolutionary technology in favor of evolutionary technology.

We must validate the best, most effective use of established technologies through guidelines development, clinical research, and registries. We must discourage the use of ineffective treatments, especially quackery. We must discourage the use of unproven treatments outside the research setting. Most important, we must fight to put decisions regarding medical technology back into the hands of patients and doctors where they belong.

Finally, we must get over our fear of new technology. We must disseminate new technology through education and work to maintain awareness of the value of new technology in the eyes of third-party payers, including the government. There is one group of people who consistently recognize the value of what we do, and that is our patients.

If we want to move from the present to the future we desire, we are going to have to work for it. We are going to have to be like the turtle. We may need to stick our necks out a little.

For related video content, please access the Supplemental Digital Content: http://www.youtube.com/watch?v=E1l4j2szz0Q and http://www.youtube.com/watch?v=hsALbcHKjBc

Disclosure

The authors have no personal financial or institutional interest in any of the drugs, materials, or devices described in this article.

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