Economics and the education of nurse anesthetists: Part 2

Economic assumptions

The most difficult adjustment for clinicians to make when learning to think like an economist is becoming comfortable with the number and breadth of some of the assumptions made in economic models. The following is a partial listing of assumptions that healthcare economists believe the entire general population applies when making healthcare decisions.

When discussing healthcare, an economist’s assumption of a constrained budget is a foreign concept to most persons, especially since insurance pays the majority of healthcare bills for a large portion of the population, essentially creating an “unlimited budget” for healthcare services. Most patients pay only about 20% of their surgical bill up to some preset total out-of-pocket annual deductible. There is an entire body of literature dealing with the moral hazard that health insurance creates in the demand for healthcare services. Most patients pay only about 20% of their surgical bill up to some preset total out-of-pocket annual deductible. There is an entire body of literature dealing with the moral hazard that health insurance creates in the demand for healthcare services.

A second major assumption in economic analysis is that people in general, including patients, practitioners, and students, are rational decision makers and will make decisions in their best interest to maximize their personal welfare. This is probably the hardest assumption for healthcare providers to understand since many patients appear to act irrationally when making healthcare decisions. However, economists believe the pleasure (utility) that smokers presently receive from smoking outweighs the potential risk (disutility) of future cancer, which is rational. It must be assumed that nurse anesthesia students are rational decision makers, aware of the risks and benefits of their actions, and choose the action that will afford them the greatest increase in personal utility. If a student is unprepared for a clinical experience, it must be assumed that the student valued the time spent on some other activity rather than preparing for the clinical experience to a greater extent than he or she feared the disutility, or wrath, of the instructor. Unfortunately, with everything presently required of students, some are forced to choose between sleep and clinical preparation, which is an irrational choice.

The principle of monotonicity states that more is better, which means that everyone, even without unlimited time or money, would prefer to have more of everything. This includes health and healthcare services, which is why the United States annually spends 14% of its gross domestic product on healthcare. Monotonicity is apparent in the expansive facilities in which we work and the extensive...
operating room schedules that keep our students busy. However, when paired with the law of decreasing marginal rate of return, monotonicity is contrary to achieving maximal social utility. The law of diminishing marginal rate of return states that we achieve less and less gains from healthcare investment or consumption as we age and therefore we should invest less in healthcare as we age. This is directly contrary to the current utilization patterns of healthcare services in the United States, especially in the last decade of life.

Applications of economic theory to anesthesia practice and education

It is no wonder that healthcare providers who try to apply these principles and assumptions to their daily practice become greatly frustrated with health economics. It is even more difficult to understand the budget constraint assumption when none seems to exist. The national debt currently accounts for about 37% of the gross domestic product, and growing deficits in the federal budget are forecast for years to come. Further, anesthesia charges are not usually viewed as a big ticket item likely to “break the healthcare bank.” Payments for care provided by both anesthesiologists and nurse anesthetists in 2003 accounted for only 2.58% of the Medicare budget.  

Despite these facts, many authors have studied the economics of anesthesia practice. Klein published an analysis on the financial impact of different anesthesia care team scenarios would have on the overall costs of providing anesthesia for 10,000 surgeries annually. He assumed that nurse anesthetists (CRNAs) and physician anesthesiologists were equally productive and that each received median salaries and fringe benefits. Klein modeled 9 different practice scenarios and found an annual cost of $1.76 million for the CRNA-only model, $5.26 million for the anesthesiologist-only model, and $7.02 million for a model in which a CRNA and anesthesiologist worked together for every case. This analysis showed that a hospital administrator choosing an all-anesthesiologist anesthesia service would pay an opportunity cost of $3.5 million annually for that choice.

An almost identical analysis that included teaching hospitals and a $25,000 loaded cost for each nurse anesthesia student/anesthesia resident taught also found the highest anesthesia costs in an all-anesthesiologist teaching hospital and the lowest costs in a nonteaching facility with a 1-anesthesiologist: 2-CRNA model. Cromwell and Rosenbach studied economic incentives and anesthesia payments under Medicare while working for the Health Care Financing Administration (HCFA; now, Centers for Medicare & Medicaid Services or CMS) when HCFA was developing the first CRNA fee schedule. They suggested major changes in the reimbursement for anesthesia services and the way in which anesthesia is delivered in the United States including making anesthesia a hospital-based service similar to radiology and pathology, creating anesthesia specific diagnostic-related groups (DRGs), and scaling back the HCFA conversion factor. Regardless of recommendations by Cromwell and Rosenbach, they concluded about CRNAs that “unless reform is initiated soon, the opportunity to achieve an efficient anesthesiologist/CRNA mix could be lost, costs will remain unnecessarily high, and another occupation providing valuable care at low cost will be put on the endangered list.”

Cromwell published another article about the economic impact of nurse anesthetists and the benefits to society from increasing their use within the healthcare system. It appears that Cromwell and colleagues were acutely aware of the 7 core principles and would like to see them applied to anesthesia delivery.

A number of CRNAs have published economic analyses relating to anesthesia practice and the education of nurse anesthesia students. Gunn et al showed that 10 CRNAs could be educated for every anesthesiologist and that collectively those CRNAs would provide 35 to 40 years of anesthetics before the 1 anesthesiologist would be ready to enter practice. Gunn’s research offers direct support for the principle of increasing opportunity costs. Martin-Sheridan and colleagues have published a number of studies looking at the economics of nurse anesthesia education and the primary reasons for the closing of educational programs. They found financial issues to be the number 1 reason for program closure, but other factors included political influences, lack of hospital support and lack of jobs for graduates, changes in state and federal reimbursement laws, and changes in the configuration and delivery of healthcare services under managed care. These findings seem to contradict the 7 core principles, which were supported by the research of Klein, Cromwell and colleagues, and Gunn. Economic reasoning dictates that in times of budget shortfalls, hospital and managed care administrators should be doing everything they can to expand the number of nurse anesthesia programs instead of adding to the causes of their closure. Martin-Sheridan and colleagues have shown that the classic free market environment without barriers,
which is needed to achieve unrestricted trade, is not present in anesthesia education.

The internal rate of return (IRR) for a project is similar to an investment rate of return received from a bank or stock account and is just one of the tools the business community uses to decide between alternative investments. An educational IRR calculation should include the opportunity cost of the education, tuition costs, and the financial gains of completing the education, among other things. The IRR to an investment in nurse anesthesia education is in line with that of the IRR for other professional degrees. These findings were confirmed in an unpublished study completed in 2002 that also looked at the social rate of return to government subsidization of the education of a variety of healthcare practitioners in Iowa (C. O’Sullivan, University of Iowa, 2003). To calculate the social rate of return, one must include social costs, such as lost tax revenue and subsidization, and social gains including increased tax revenue after the completion of education. Groups receiving less subsidization, such as nurses and nurse anesthetists, will have higher social rates of return than groups receiving higher subsidization, such as physicians. It should be noted that, in general, rates of return to education decline as the length of education extends (ie, the social IRR to doctoral education for all citizens will be much lower than the social IRR to elementary or secondary education for all citizens).

The subsidization of medical education and residency programs can best be explained by viewing a well-trained physician workforce as a public good that should be paid for with public monies. To meet the recommendation of the Institute of Medicine, this statement should be modified to view a well-trained multidisciplinary healthcare practitioner workforce as a public good where all practitioners are subsidized with public monies. As the personal IRR to education declines, society should expect to see less people enter a given profession and choose to invest their money elsewhere. A decreased rate of return to nurse anesthesia education in the 1980s, due to oversupply, stagnant salaries, and loss of positions, may explain part of the shortage of CRNAs that existed for most of the 1990s.

Between 1986 and 1998, the IRR for anesthesiologists ranged from a high of 235% in 1992 to a low of 46.5% in 1998. Note that in 1998, the IRR for all surgical specialties decreased and for radiology and obstetrics and gynecology was roughly half of what it was in 1996. Data for anesthesiologists is incomplete for 1996, but there was a significant drop from the 1994 rate of return. These decreases are assumed to be part of HCFA’s attempt to realign Medicare payment schedules across specialties as part of the balanced budget act of 1997. Despite significant decreases in the IRR to subspecialization, anesthesiologists, radiologists, general surgeons, and orthopedic surgeons could still expect lifetime earnings in excess of $4.3 million 1998 dollars. The only explanation for continued high rates of return to a specific professional discipline despite an increased supply of those professionals is an increased demand for their services (G. Neuman, oral communication, Spring 2003). The IRR to education and training is dynamic and will fall for CRNAs unless the demand for anesthesia services continues to increase as the number of trained anesthesia providers continues to grow. The demand for CRNA services is directly related to the demand for surgical services and indirectly related to the public’s demand for health, both of which are outside our control. The demand for trained CRNAs is a direct result of the demand for anesthesia services and the IRR to a nurse anesthesia education.

Other factors affecting the economics of nurse anesthesia education

Production functions and production possibilities curves are tools that economists use to determine how many outputs can be produced from a given set of input. The 2 keys to understanding these concepts are deciding exactly what is being produced and what inputs are used to produce each specific output. Nurse anesthesia educators have multiple production functions to worry about. First and foremost is producing qualified nurse anesthetists; second, nurse anesthesia education also is part of the production of surgery in the institutions where CRNAs work and train; and third, nurse anesthesia educational programs are usually just a part of a larger educational system (ie, university, healthcare enterprise, etc). Important to this production function is the interdependence between surgeons and anesthesia providers. For professional survival, anesthesia providers and surgeons must work together to achieve maximum social utility.

Both anesthesia department and hospital administrators are probably most interested in the surgical production function and how many and what combination of nurse anesthesia students, CRNAs, and resident and staff anesthesiologists are needed to produce a completed surgical schedule at the minimum cost. A typical surgery production function might look like this:
Total surgeries completed = $\mu X^* + A \ (CRNAs) + B \ (anesthesiologists) + C \ (nurse anesthesia students) + D \ (surgeons) + E \ (operating room nurses) + F \ (postanesthesia care unit beds) + G \ (floor beds)$.  

* Where $X^*$ = productivity associated with basic hospital factors, such as operating rooms, electricity, and other unspecified factors.

Klein’s research, reviewed above, is an excellent resource about anesthesia personnel when trying to model this production function. A production possibilities curve is a graphic example of the different levels of output achievable and what different combinations of inputs will cost to produce those levels of output. The final decision is choosing the combination of inputs that achieves the desired level of output for the minimum cost.

Another important economic concept is whether certain goods are complements or substitutes for each other. An example of perfect substitutes is chicken and beef. When making tacos for dinner, many people are indifferent between selecting chicken or beef and will choose the cheaper of the two, especially as the price difference increases. A good example of perfect complements is automobiles and gasoline. Having a car is not beneficial if one does not have gas, and having a large supply of gas is not much good without a car. In healthcare there are very few examples of perfect substitutes or perfect complements. Surgeons and anesthetists are close to perfect complements. They are close substitutes in the production of surgeries.

A final important concept, which was alluded to earlier, is that of perfect competition. An assumption of perfect competition means that a free market exists that will function in a “fair and equitable” manner. Alternatively, there are no barriers to either entry into or exit from the marketplace. Martin-Sheridan and colleagues showed that this is not necessarily true in the nurse anesthesia education market. Neither is it true in most of the healthcare marketplace. Licensing and certification serve as major barriers for entry into a profession. Other barriers include high academic institutional costs and costly and lengthy educational programs. Without these barriers, however, anyone willing to take the risk could practice anesthesia. The result being that the only thing driving unqualified practitioners out of the marketplace would be the lack of patients demanding their services. This does not work well in healthcare, since most consumers only need anesthesia services once or twice in a lifetime.

Conclusion
The American people; their employers, who are the principal payers for the majority of health insurance in this country; and state and federal government have grown increasingly dissatisfied with the healthcare system and the cost of healthcare in the United States. All healthcare stakeholders are demanding a change. Healthcare educators are responsible for populating the current system with practitioners who function well within the system, benefit financially from the system, and are likely to resist any changes to the system. However, the Institute of Medicine and others have determined that the current system will not serve the healthcare needs of this country in the future. Nurse anesthesia educators must now determine how to educate nurse anesthetists for the 21st century healthcare system. This is an extremely difficult job since the structure of that healthcare system is currently unknown, and future changes may be evolutionary or revolutionary. Again, the focus is on some basic economic principles that can be applied to resource allocation and consumption in the face of scarcity. If nurse anesthesia educators apply these principles to resource allocation decisions for their programs, they will make economically sound decisions that should benefit their program, the nurse anesthesia profession, and the US healthcare system in general for many years to come.

REFERENCES


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